RECORD OF CHANGES

CHANGE NO.	DATED	TITLE OR BRIEF DESCRIPTION	ENTERED DATE	BY

LORAN-C
AN/FPN-60 TRANSMITTER CONTROL SET
TECHNICAL MANUAL
COMMENTS

CHECK ONE: PROBLEM ____ QUESTION ____ COMMENTS ____

DATE ________________

REMARKS:

NAME ______________________________ RANK/RATE/TITLE ________________

MAILING ADDRESS ____

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TELEPHONE NUMBER: FTS _______________ COMMERCIAL (   ) ______________

MAIL TO: COMMANDING OFFICER (sm)
USCG ELECTRONICS ENGINEERING CENTER
WILDWOOD, NJ 08260

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CHAPTER 1

GENERAL INFORMATION

1.1 Introduction. This Technical Manual provides a description of the various units of the AN/FPN-60(V) Transmitter Control Set (TCS). The Transmitter Control Set (TCS) is installed at LORAN-C Transmitting Stations which have the AN/FPN-39, 42, 44, 44A, or 45 LORAN-C Transmitter installed. The Transmitter Control Set generates the drive waveforms for the transmitters and monitors the transmitter status and parameters of the transmitted signal. The TCS also provides an interface between the transmitter and the timing and control equipment. Figures 1.1 and 1.2 show the equipment for a dual-rate and single-rate configuration, respectively. Figure 7.1 is the Loran-C System Block Diagram. Appendix A contains diagrams of changes that have been made to the various transmitters, and have not been placed in the transmitter technical manuals.

1.1.1 The following units of the AN/FPN-60(V) are covered in this manual:

a. 1 - Electrical Equipment Cabinet (CY-7523/FPN-60)

b. 1A1 - Switch Assembly (SA-2063/FPN-60)

c. 1A2 - Transmitter Coupler Control (C-9888/FPN-60)

d. 1A3 - Electrical Pulse Analyzer (TS-3550/FPN)

e. 1A4 - Pulse Generator No. 1 (Low Rate) (SG-1099/FPN-60)

f. 1A5 - Pulse Generator No. 1 (High Rate) (SG-1099/FPN-60) (installed at dual-rated stations only)

g. 1A6 - Pulse Generator No. 2 (Low Rate) (SG-1099/FPN-60)

h. 1A7 - Pulse Generator No. 2 (High Rate) (SG-1099/FPN-60) (installed at dual-rated stations only)

i. 1A8 - Waveform Panel (SB-4156/FPN-60)

j. 1A9 - Interface Unit (J-3353/FPN-60)

k. 1A10- EPA Dummy Load Junction Box

l. 1A11- TCC Dummy Load Junction Box

1.2 General Description.

1.2.1 The Transmitter Control Set (Figures 1.1 and 1.2) performs the following functions:

a. Generates the drive waveforms for the transmitters.

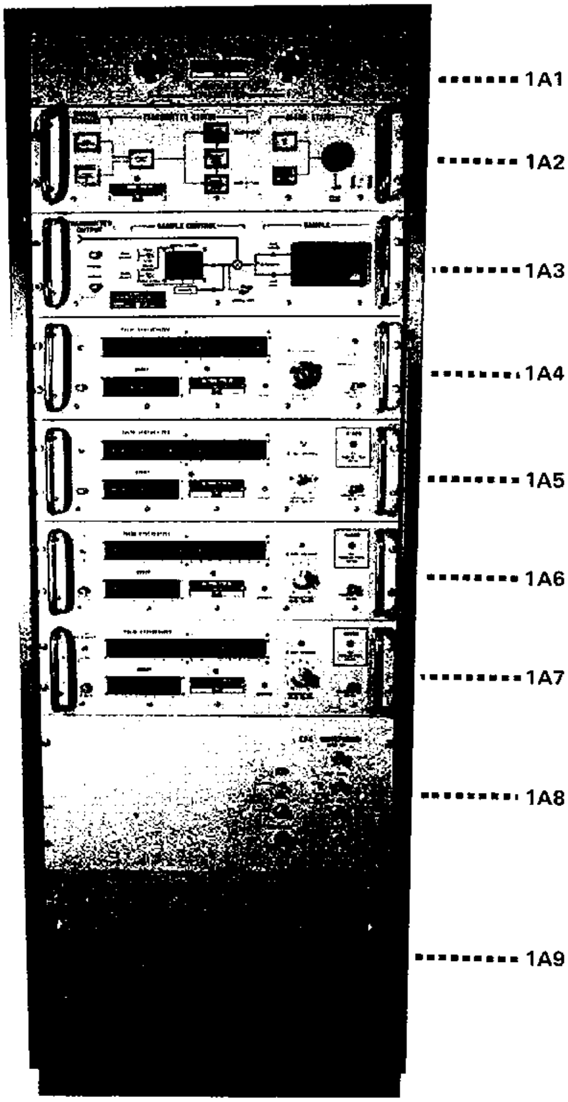


Figure 1.1. AN/FPN-60(V2) Transmitter Control Set
(Dual-rate configuration)

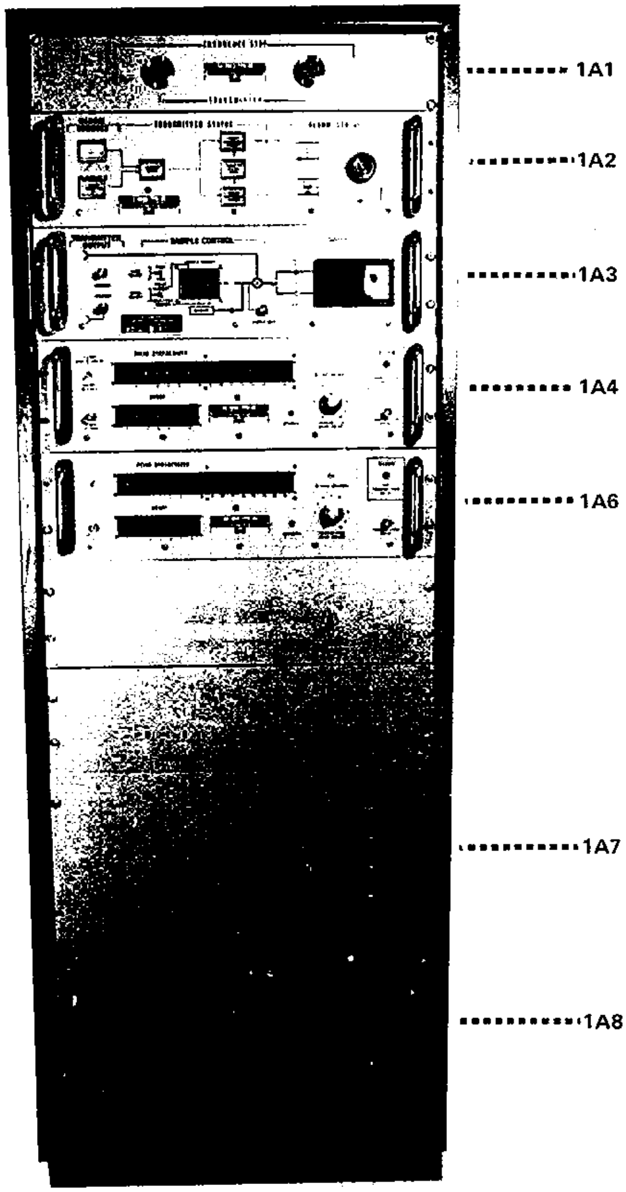


Figure 1.2. AN/FPN-60(V1) Transmitter Control Set
(Single-rate configuration)

b. Monitors the transmitted signal level.

c. Provides the interface between the AN/FPN-54A Loran Timing Set(s) and the transmitters.

d. Provides a measurement of the radiated LORAN-C pulse shape and amplitude.

e. Measures and displays the Envelope-to-Cycle-Difference (ECD).

f. Provides a means for remotely stopping the transmitters.

g. Indicates the status of both transmitters.

h. Automatically initiates a switch to the standby transmitter if the signal radiated by the operate transmitter drops below a preset level.

i. Provides a means for external monitoring of the LORAN-C signal.

1.3 Unit Description.

1.3.1 Switch Assembly (1A1). The Switch Assembly (Figure 1.3) contains an emergency stop pushbutton for each transmitter. These switches provide for the shutdown of power to the transmitters to prevent injury to personnel or damage to equipment. These switches are connected in series with the transmitter stop and emergency stop switches in the associated transmitting equipment (refer to the applicable transmitting set technical manual for locations).

1.3.1.1 AN/FPN-39 or AN/FPN-42 LORAN-C Transmitter. When the emergency stop pushbutton is depressed the control voltage to the holding coil of its associated transmitter blower control relays is interrupted, shutting down the transmitter (refer to the applicable transmitting set technical manual).

1.3.1.2 AN/FPN-44/44A/45 LORAN-C Transmitters.

WARNING

Hazardous voltages are still present in the AN/FPN-44/44A/45 transmitters, after the activation of the switch.

When the emergency stop pushbutton is depressed, the transmitter shuts down, with the exception of the blowers and primary cooling, which are on a time delay circuit. This is done to insure that the power amplifier (PA) vacuum tubes are cooled down properly.

Figure 1.3. 1A1-Switch Assembly (SA-2063/FPN-60)

1.3.2 Transmitter Coupler Control (1A2). The Transmitter Coupler Control (Figure 1.4) contains the Transmitter Control Module W0678-5/XMTR CON, Relay Assembly W0678-13, and Transmitter Control Driver W0678-6/XMTR CON DVR. The Transmitter Coupler Control (TCC) performs the following functions:

a. Monitors the status of the transmitters, pulse generators, and antenna coupler.

b. Switches transmitters automatically upon a transmitter failure.

c. Permits the manual switching of transmitters remotely.

d. Displays transmitter local/remote control mode.

e. Displays TRANSMITTER 1 and 2 status (OPERATE or STANDBY).

f. Enables the STANDBY TRANSMITTER to operate into dummy load.

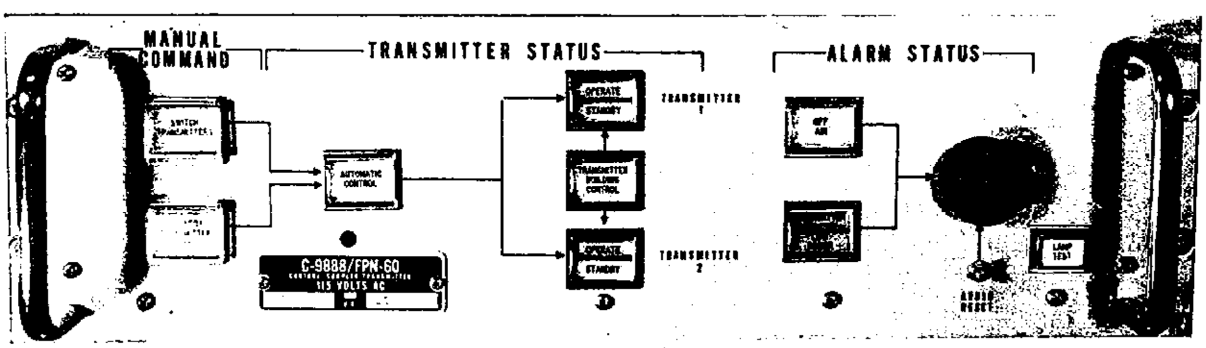


Figure 1.4. 1A2-Transmitter Coupler Control (C-9888/FPN-60)

1.3.3 Electrical Pulse Analyzer (1A3). The Electrical Pulse Analyzer (Figure 1.5) contains a Gate Control Module W0678-3A/GATCON, an Envelope-to-Cycle-Difference Module W0678-18C/ECD, a Peak Detector Module W0678-4/PK DET, and a Clip Attenuator Module W0678-11A/CLP

ATTN. The Electrical Pulse Analyzer (EPA) performs the following functions:

a. Generates a Reference Envelope Waveform.

b. Measures and displays the peak value of a selected half-cycle of a selected pulse or the peak amplitude of a LORAN-C pulse within a pulse group. The Electrical Pulse Analyzer can perform this function for either rate at a dual-rated station.

c. Displays a measure of ECD.

d. Generates the Local Envelope Crossover trigger.

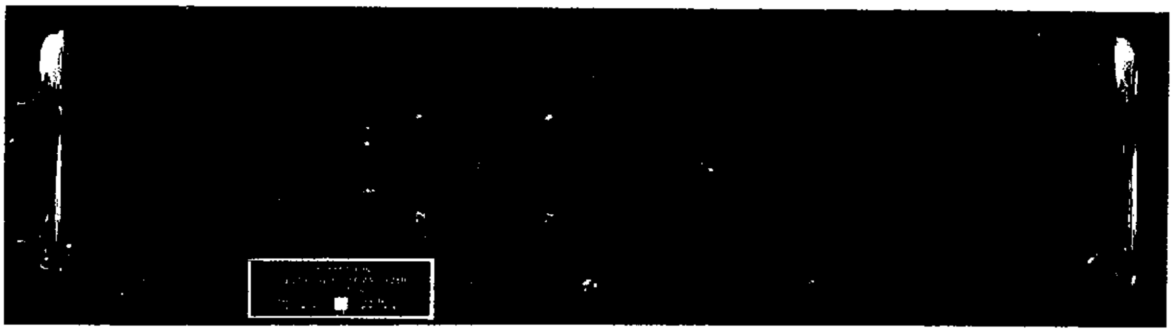


Figure 1.5. 1A3-Electrical Pulse Analyzer (TS-3550/FPN)

1.3.4 Pulse Generator (1A4-1A7). A dual-rated station has Pulse Generators 1A4 thru 1A7 (see Figure 1.1). A single-rated station has Pulse Generators 1A4 and 1A6 (see Figure 1.2). The Pulse Generator (Figure 1.6) contains the Pulse Control Module W0678-2/PCON, Group Droop Module W0678-19B/GR DROOP (for dual-rated stations and stations having tail drive), and Pulse Synthesizer Module W0678-1/PSYN. The Group Droop Module W0678-20/GR DROOP is unique to LORAN STATION CAPE RACE, replacing the W0678-19B/GR DROOP module. The Pulse Generator (PGEN) performs the following functions:

a. Generates a transmitter drive signal of adjustable shape.

b. Provides for phase code balance adjustments.

c. Generates an oscilloscope trigger signal.

d. Provides the capability of selecting either 1st MPT (NON-Ø CODED) or 2nd MPT (Ø CODED) for the SCOPE TRIGGER.

e. Provides for transmitted signal droop compensation.

f. Provides control of the transmitter drive signal amplitude.

g. Provides visual alarm and logic level output when transmitter drive is below a set level.

h. For dual-rated stations, provides dynamic droop compensation of the transmitter drive signal.

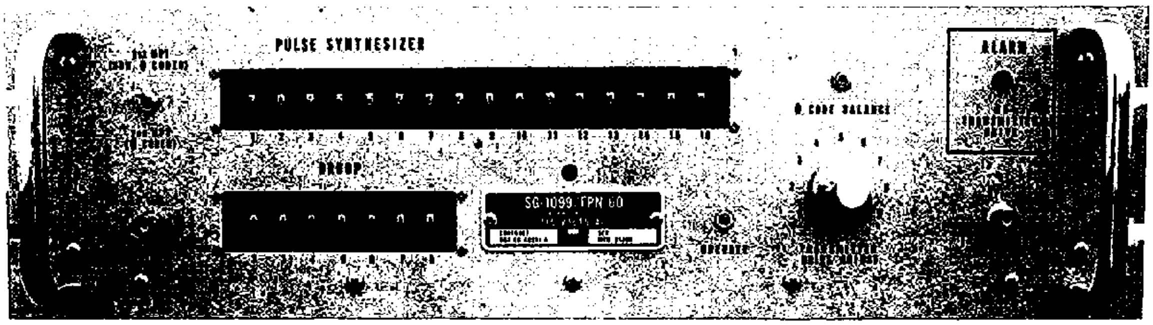


Figure 1.6. 1A4-1A7 - Pulse Generator (SG-1099/FPN-60)

1.3.5 Waveform Panel (1A8). The Waveform Panel (Figure 1.7) has two inputs, ENV TRIG+ and ENV TRIG-. It also provides a convenient access to the following signals:

a. Full wave rectified version of the LORAN-C signal.

b. Reference LORAN-C signal envelope.

c. Oscilloscope trigger (select operate high or low rate).

d. Optional waveform jack.

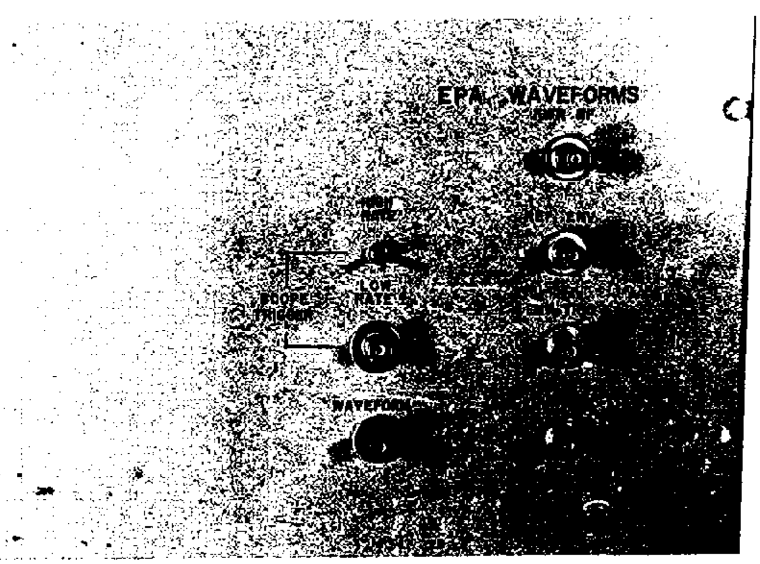


Figure 1.7. 1A8-Waveform Panel (SB-4156/FPN-60)

1.3.6 Interface Unit (1A9). The Interface Unit (Figure 1.8) is the unit through which all signals among the AN/FPN-54A Loran Timing Set and the Pulse Generators (PGENs) are routed. In addition, all signals among the units of the Transmitter Control Set (except those of the Waveform Panel) are routed to this unit. The Interface Unit also performs impedance matching, multicoupling, and signal isolation.

Figure 1.8. 1A9-Interface Unit (J-3353/FPN-60)

1.3.7 EPA Dummy Load Junction Box (1A10). The EPA Dummy Load Junction Box is used when the EPA is removed from the equipment cabinet.

1.3.8 TCC Dummy Load Junction Box (1A11). The TCC Dummy Load Junction Box is used when the TCC is removed from the equipment cabinet.

1.4 Reference Data. Table 1.1 lists the electrical power requirements of several units of the Transmitter Control Set. Tables 1.2 and 1.3 list the equipment supplied and the equipment required but not supplied, respectively. Figure 1.9 shows the relationships of all the units of the Transmitter Control Set. The PGEN at LORAN STATION CAPE RACE is unique (refer to Chapter 4 for more detailed information).

Table 1.1. Electrical Power Requirements

NAME/DESIGNATION	INPUT POWER
Transmitter Coupler Control C-9888/FPN-60	115 VAC ± 10% 50-60 Hz, 22 W
Electrical Pulse Analyzer TS-3550/FPN	115 VAC ± 10% 50-60 Hz, 31 W
Pulse Generator SG-1099/FPN-60	115 VAC ± 10% 50-60 Hz, 28 W

Table 1.2. Equipment Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		OVERALL DIMENSIONS			VOLUME	WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1	Switch Assembly	SA-2063/FPN-60	3.5 in 9 cm	19.0 in 48 cm	2.0 in 5 cm	.08 ft3 2192 cm3	1.5 lbs .7 kg
1	Transmitter Coupler Control	C-9888/FPN-60	5.25 13	19.0 48	17.0 43	.98 27751	21.0 9.5
1	Electrical Pulse Analyzer	TS-3550/FPN	5.25 13	19.0 48	20.75 53	1.19 33854	28.0 12.7
NOTE A	Pulse Generator	SG-1099/FPN-60	5.25 13	19.0 48	17.0 43	.98 27751	17.0 7.7
1	Waveform Panel	SB-4156/FPN-60	8.75 22	19.0 48	1.0 3	.1 2681	2.5 1.1
1	Interface Unit	J-3353/FPN-60	8.75 22	19.0 48	10.0 25.4	.96 27235	11.5 5.2
NOTE B	Blank Panel		10.5 27	19.0 48	-- --	-- --	-- --
1	Electrical Equipment Cabinet	CY-7523/FPN-60	59.5 151	21.875 56	31.125 79	23.4 668024	170.0 77.2

NOTES: A. Four for dual-rated stations;
Two for single-rated stations.
B. One for single-rated stations, only.

Table 1.3. Equipment Required But Not Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
1	Status Alarm Unit	BZ-265/FSN-2	Displays TCS Alarm Data	
NOTE A	Time Interval Counter Panel	CM-497/FSN-2	Sets ECD Limits	
1	Remote Control Group Technical Manual			
NOTE B	Timer Set	AN/FPN-54A	Generates Timing and Phase Code Signals	MPT, PCI, and LI
2	LORAN-C Transmitter	NOTE C		
1	Oscilloscope	AN/USM-281 or Equivalent	Installation Alignment and Testing	50 MHz BW; 10 mV Sensitivity; Delayed Sweep; Delayed Gate Output
1	Multimeter	CCUH-8000A or Equivalent	Installation Alignment and Testing	50 VDC; 150 VAC; 5 Amp (DC); 200 to 2 M

NOTES:
A. Quantity dependent upon number of rates and responsibilities.
B. Two for dual-rated stations; One for single-rated stations.
C. AN/FPN-39/42/44/44A or 45.

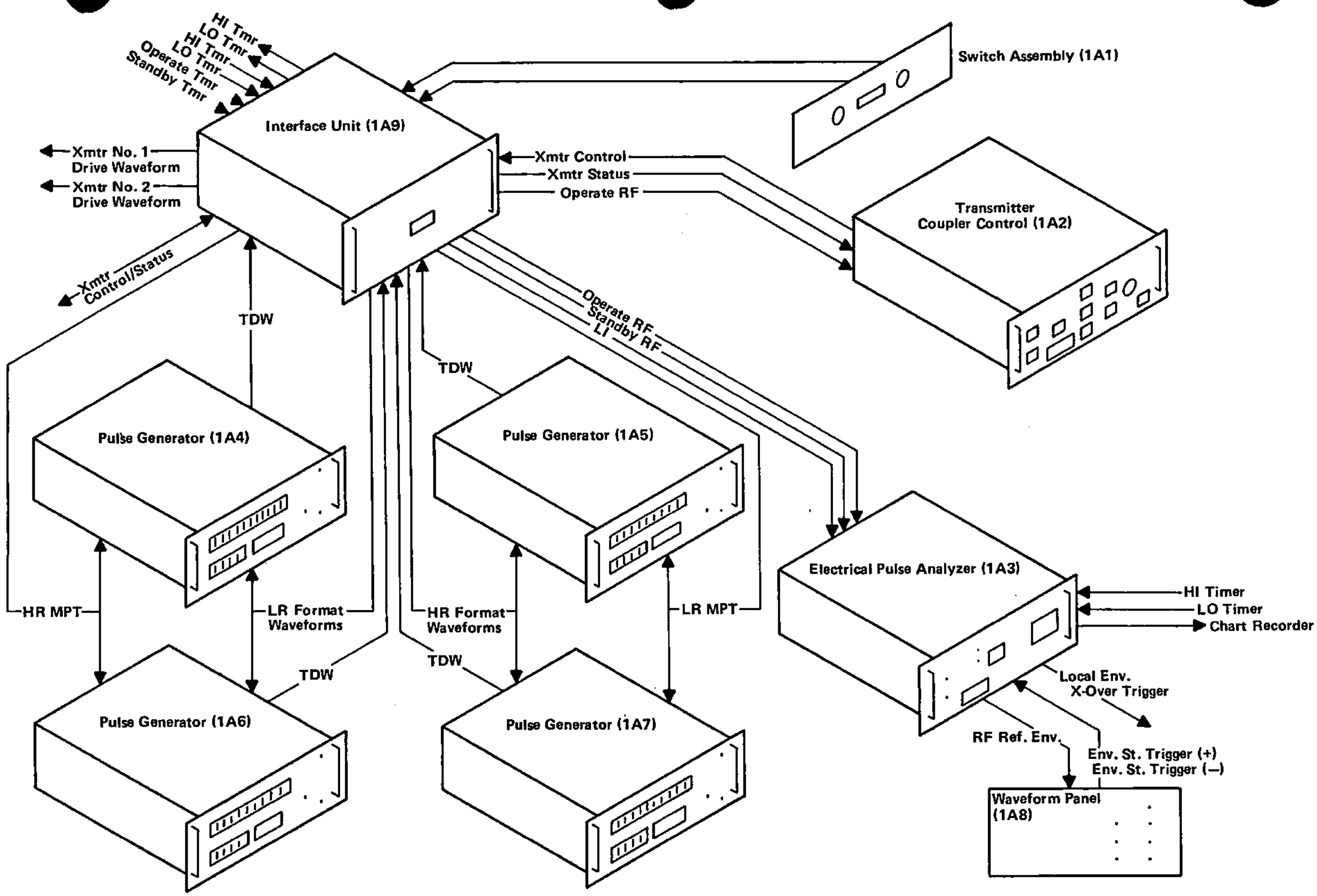


Figure 1.9. Interrelationship Of TCS Units

1.5 Inquiries. For logistics support, Supply Center Brooklyn is the Inventory Control Point (ICP). Refer to E/GICPINST 4408.1 (series) for XB stock number assistance. For logistic assistance, contact Customer Services Branch at Supply Center, Brooklyn, NY.

NOTE

For the latest version of the E/GICPINST 4408.1 (series) instruction, contact:

Commanding Officer (Code 340)
U.S. Coast Guard Supply Center
830 Third Avenue
Brooklyn, NY 11232

1.6 Abbreviations. The abbreviations used throughout this manual are listed and defined in Table 1.4.

1.7 Safety Precautions.

1.7.1 Reference Publications. The following is a list of publications that all technical personnel must be familiar with:

a. M10550.13 - Electronics Manual
b. M10550.14 - Electronics Manual
c. M10550.15 - Electronics Manual
d. M5100.29 - Safety Manual
e. M11000.1 - Civil Engineering Manual
f. CG-139 - Cardiopulmonary Resuscitation Handbook
g. CG-516 - First Aid Health Lesson Plan

1.7.2 Notes, Warnings, and Cautions.

NOTE

READ ALL — They are used in narrative or illustrative non-procedural data.

WARNING

READ ALL — THEY DISCLOSE HAZARDS WHICH MAY CAUSE BODILY INJURY OR DEATH!

CAUTION

READ ALL — THEY REVEAL INFORMATION WHICH MAY DAMAGE OR DESTROY EQUIPMENT!

Table 1.4. List of Abbreviations

CODE	DEFINITION
AM	AMPLITUDE MODULATED
CCW	COUNTER CLOCKWISE
CLP ATTN	CLIP ATTENUATOR
DPM	DIGITAL PANEL METER
DR	DUAL RATE
DVM	DIGITAL VOLT METER
ECD	ENVELOPE-TO-CYCLE-DIFFERENCE
EMPT	EARLY MULTIPULSE TRIGGER
EOC	END OF CONVERSION (A LOGIC SIGNAL GENERATED IN THE DIGITAL PANEL METER OF THE ELECTRICAL PULSE ANALYZER)
EPA	ELECTRICAL PULSE ANALYZER
ET	EARLY TRIGGER
ETA	ENVELOPE TIMING ADJUSTMENT
FWR	FULL WAVE RECTIFIED
GATCON	GATE CONTROL
GR DROOP	GROUP DROOP
GRI	GROUP REPETITION INTERVAL
GRR	GROUP REPETITION RATE
HR	HIGH RATE
IAW	IN ACCORDANCE WITH
ICP	INVENTORY CONTROL POINT
I/F	INTERFACE
LED	LIGHT EMITTING DIODE
LEN	LOCAL ENVELOPE NUMBER
LI	LOCAL INTERVAL
LPA	LOCAL PHASE ADJUSTMENT
LR	LOW RATE
LRE	LORAN REPLACEMENT EQUIPMENT
LSB	LEAST SIGNIFICANT BIT
MPT	MULTIPULSE TRIGGER
MSB	MOST SIGNIFICANT BIT
MTBF	MEAN TIME BETWEEN FAILURE
OOT	OUT OF TOLERANCE
OP	OPERATE

CODE	DEFINITION
PC	PHASE CODE
PC RESET	PHASE CODE RESET
PC SET	PHASE CODE SET
PCI	PHASE CODE INTERVAL
PCON	PULSE CONTROL
PGEN	PULSE GENERATOR
PK DET	PEAK DETECTOR
PSYN	PULSE SYNTHESIZER
RCG	REMOTE CONTROL GROUP
RCI	REMOTE CONTROL INTERFACE
RF	RADIO FREQUENCY
SA	SWITCH ASSEMBLY
SMEF	SYSTEM MAINTENANCE ENGINEERING FACILITY
STBY, STDBY	STANDBY
SYNC	SYNCHRONOUS NUMBER
TBC	TRANSMITTER BUILDING CONTROL
TCC	TRANSMITTER COUPLER CONTROL
TCE	TIMING AND CONTROL EQUIPMENT
TCS	TRANSMITTER CONTROL SET
TDW	TRANSMITTER DRIVE WAVEFORM
TIC	TIME INTERVAL COUNTER
TINO	TIME INTERVAL NUMBER
TMR	TIMER
TP	TEST POINT
TTL	TRANSISTOR TRANSISTOR LOGIC
TTY	TELETYPE
VPK	PEAK VALUE OF VOLTAGE
W	WATTS
WF	WAVEFORM
WP	WAVEFORM PANEL
XMTR	TRANSMITTER
XMTR CON	TRANSMITTER CONTROL
XMTR CON DVR	TRANSMITTER CONTROL DRIVER
100 kHz	NON-PHASE CODED 100 kHz SINEWAVE

CHAPTER 2

INSTALLATION

2.1 Introduction. This chapter provides procedures for unpacking and inspecting the Transmitter Control Set equipment. It describes procedures for installing, programming, adjusting, and initially operating each unit of the TCS. There are also procedures for the de-installation and shipment of equipment.

2.2 Unpacking and Initial Inspection.

2.2.1 Inspect the shipping containers for external damage. If the containers are damaged, have the carrier's agent present when the containers are unpacked.

2.2.2 After unpacking the containers, inspect the chassis and modules for mechanical damage. Inspect all electrical wiring and connections to ensure that connections have not been damaged. Inspect for damage and note any scratches, dents, broken knobs, or broken wires on the units, including cables (see Table 2.1).

Table 2.1. Materials Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		OVERALL DIMENSIONS			VOLUME	WEIGHT
	NAME	DESIGNATION	LENGTH	WIDTH	DEPTH		
36	Mounting Screws	10-32	.5 in. 1.3 cm.				
36	Captive Nuts	10-32					
2	Two conductor cables	Alpha 1897	114 in. 289 cm.				
Note A	Interconnect Cable	W0678-7	78 in. 198 cm.				
1	Interconnect Cable (PA)	W0678-8	78 in. 198 cm.				
1	Interconnect Cable (AC)	W0678-9	78 in. 198 cm.				
1	Copper Strap		55 in. 139 cm.	1.0 in. 2.5 cm.	.0625 in. .16 cm.		

NOTE A: Six for Dual-Rated stations.
Four for Single-Rated stations.

2.3 Installation Instructions.

2.3.1 Materials. Table 2.1 lists the materials that are supplied. Table 2.2 lists the materials that are required, but not supplied. Table 2.3 is a cable interconnect list between the TCS units. For more information on cables listed in Table 2.3 see Figure 7.3.

Table 2.2. Materials Required But Not Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
4	Coaxial Cables	RG-58C/U	Connect EPA to WP	Length 4 feet
8	Connectors	UG-88/U	For Cables used between EPA and WP	BNC
NOTE A	Twinaxial Cables	RG-22B/U	Connect PGEN's to I/F	Length 4 feet
NOTE B	Connectors	UG-421B/U	For PGEN's to I/F Cables	Polarized Twinax
1	AC Power Cable(Note C)	ALPHA 1937	Connect Electrical Power from Circuit Breaker to to Cabinet	12-2

NOTES: A. Four each for Dual-Rated Stations.
Two each for Single-Rated Stations.

B. Eight each for Dual-Rated Stations.
Four each for Single-Rated Stations.

C. Length as required to meet Station Equipment Location.

2.3.2 Electrical Equipment Cabinet.

2.3.2.1 The location of the TCS equipment cabinet is to the right of the AN/FPN-54A Loran Timing Set (as viewed from the front). Locations of the individual units are as shown in Figure 1.1 or Figure 1.2.

> WARNING
>
> Ensure that the circuit breaker designated for this cabinet is OFF and tagged.

Table 2.3. TCS Units Cable Interconnect List

FROM	CABLE CONNECTOR	CABLE	CABLE CONNECTOR	TO
SA (S1) *	#22-16 Lugs	Alpha 1897	#22-16 Lugs	I/F (TB1-1,TB1-6)
SA (S2) *	#22-16 Lugs	Alpha 1897	#22-16 Lugs	I/F (TB2-2,TB2-6)
TCC (J1) *	Multiconductor Cable ALPHA #6025 W0678-9/AC Interconnect Cable			I/F (J23)
TCC (J2) *	Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable			I/F (J21)
EPA (J4)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J1)
EPA (J5)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J4)
EPA (J6) *	Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable			I/F (J22)
EPA (J7) *	Multiconductor Cable ALPHA #6016 W0678-8/PA Interconnect Cable			I/F (J20)
EPA (J8)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J3)
EPA (J9)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J2)
PGEN (J5)*	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J31)
PGEN (J7)*	Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable			I/F (J15)
PGEN (J5)*	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J33)
PGEN (J7)*	Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable			I/F (J17)
PGEN (J5) **	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J27)
PGEN (J7) **	Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable			I/F (J18)
PGEN (J5) **	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J29)
PGEN (J7) **	Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable			I/F (J16)

* These cables are supplied.
** These cables are supplied for dual-rated stations.

2.3.2.2 Ground the cabinet to the timer room grounding system (see Figure 2.1 for the overhead ducting scheme). Local connection with the system is made with silver solder and pigtail connections at either the overhead or below floor ducting. Additional grounding information may be found in COMDTINST M10550.15.

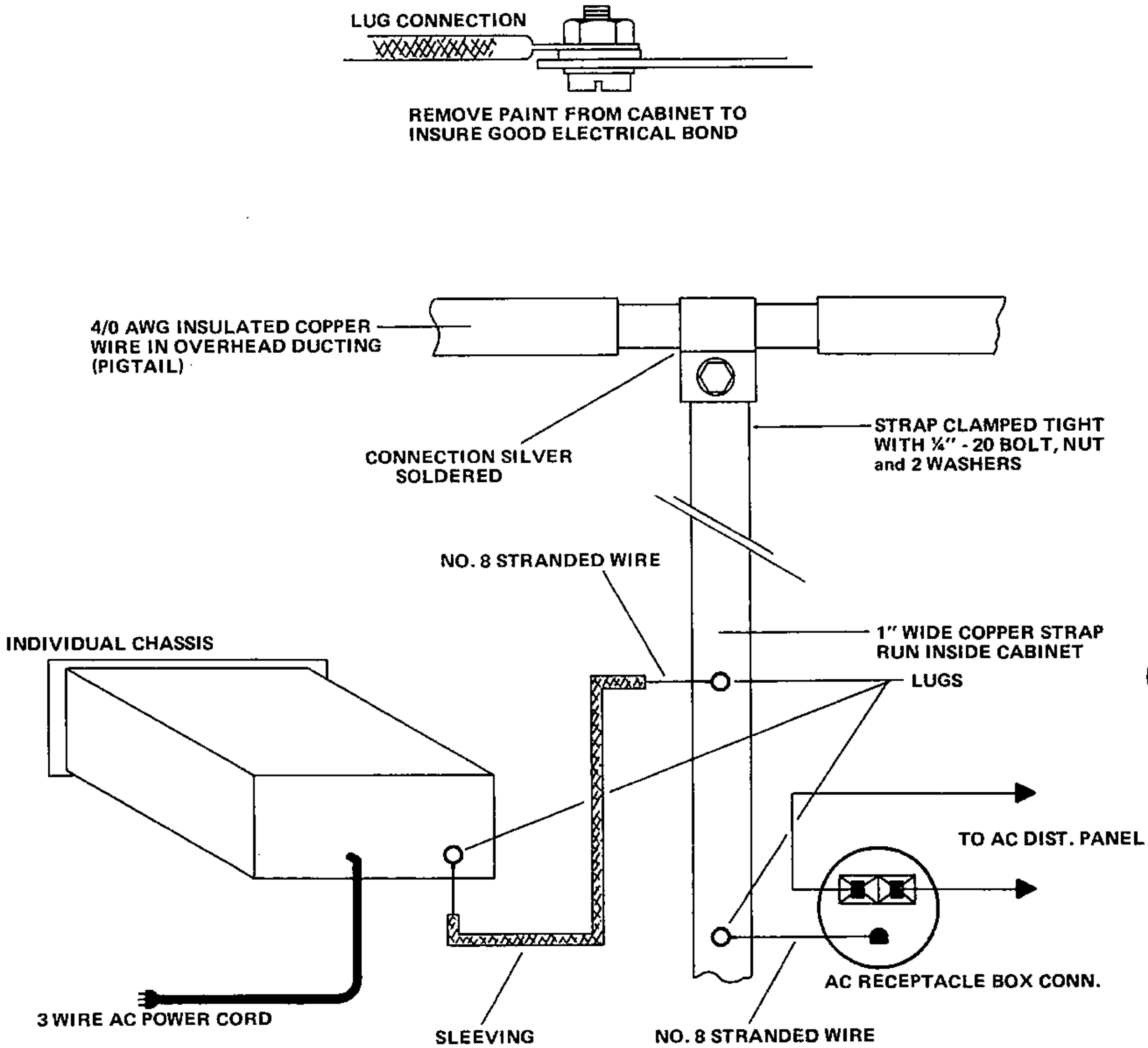


Figure 2.1. Chassis and Cabinet Grounding Details for Overhead Ducting

CAUTION
The Electrical Equipment Cabinet is on a separate circuit breaker, located inside the timer room. DO NOT energize the cabinet, until after the installation of all units. All units are energized upon the application of power.

2.3.2.3 Connect the AC line power cable from the power distribution panel (ensure that the circuit breaker is off) to the cabinet terminal block 1TB1 via the duct at the top of the cabinet. The terminal block supplies power to an AC outlet strip, located inside the cabinet.

2.3.2.4 Figure 2.2 is an illustration of the Electrical Equipment Cabinet. The Electrical Equipment Cabinet is a standard item that has been modified for Coast Guard use.

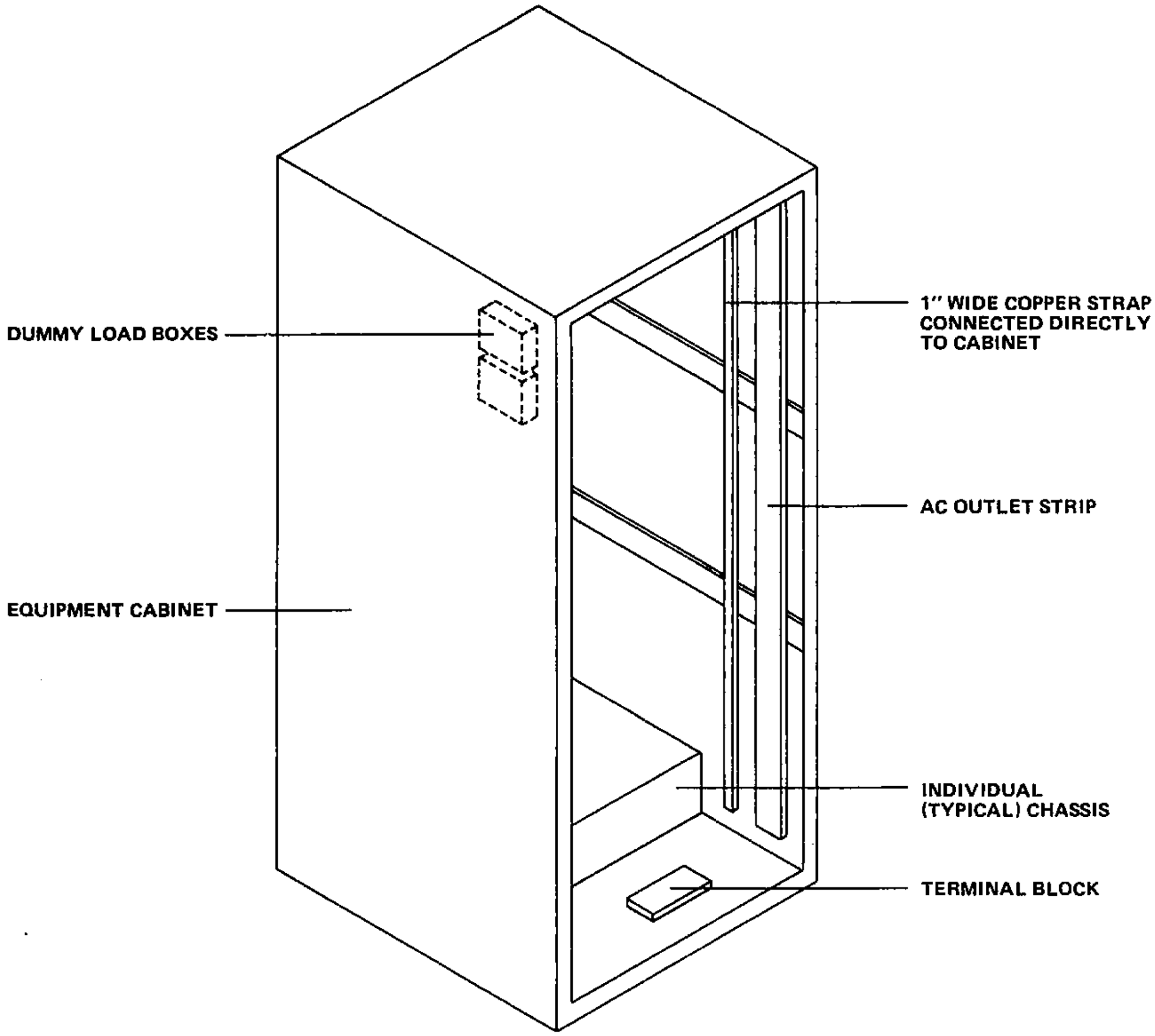


Figure 2.2. Electrical Equipment Cabinet (Rear View)

NOTE

The station's drawings contain the types of cables used between the TCS and other equipments. This manual contains cable specifications of the cables interconnecting the units of the TCS. All of the wiring/cabling in this chapter is for dual-rated stations. Single-rated stations will make connections to "low rate" or "rate 1" only.

2.3.3 Switch Assembly

2.3.3.1 Mount the Switch Assembly (SA) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.3.2 Refer to Table 2.3 and Figure 7.3 to connect the Switch Assembly to the Interface Unit.

2.3.4 Transmitter Coupler Control

2.3.4.1 Mount the Transmitter Coupler Control (TCC) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.5 Electrical Pulse Analyzer

2.3.5.1 Mount the Electrical Pulse Analyzer (EPA) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.5.2 Set the FRONT PANEL CONTROL/REMOTE CONTROL switch (S5), located on the rear of the EPA (Figure 2.3), to the FRONT PANEL CONTROL position.

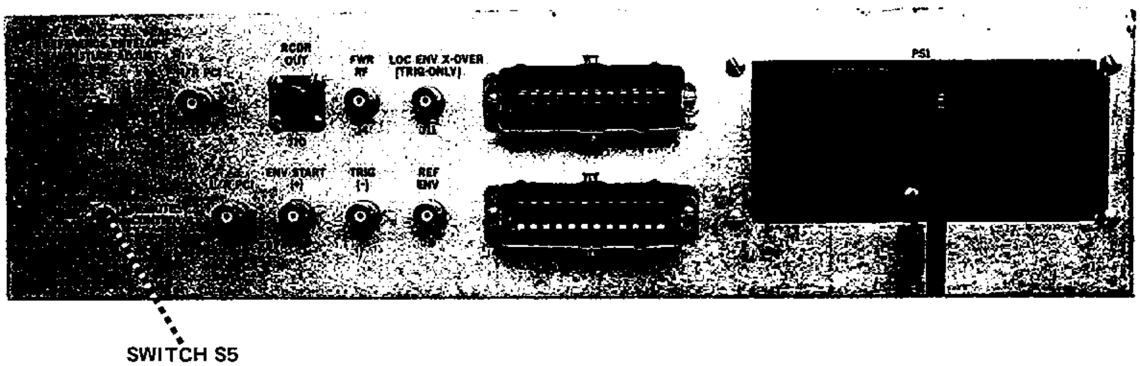


Figure 2.3. EPA Rear Panel Location of Switch S5

2.3.5.3 Connect the coaxial cables in accordance with Figure 7.4.

2.3.5.4 Connect a two conductor, shielded cable from a chart recorder (refer to the Remote Control Group technical manual) to J10 on the EPA (see Figure 7.4). Table 2.4 shows the required connections to be made.

Table 2.4. EPA-Chart Recorder Wiring

To Connect From J10 to Recorder	Use Pins		
	A	B	C (shield)
For Current Drive (0-1 ma) Zin $\leq$ 1500Ω	+	-	
For Voltage Drive (0-5 v) Zin $\geq$ 50 KΩ		+	-

2.3.6 Pulse Generator

2.3.6.1 At dual-rated stations, mount the four Pulse Generators (PGENs) as shown in Figure 1.1, using sixteen 10-32 mounting screws and captive nuts.

2.3.6.2 At single-rate stations, mount the two PGENs in the 1A4 and 1A5 locations (see Figure 1.2) using eight 10-32 mounting screws and captive nuts. Mount the blank panel in the 1A6 and 1A7 locations.

2.3.7 Waveform Panel

2.3.7.1 Mount the Waveform Panel (WP) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.7.2 Connect the coaxial cables between the EPA and the Waveform Panel in accordance with Figure 7.3.

2.3.8 Interface Unit

2.3.8.1 Mount the Interface Unit (I/F) in the cabinet (see Figure 1.1 or Figure 1.2) using four 10-32 mounting screws and captive nuts.

2.3.8.2 Connect the coaxial cables between the Timer Control Unit and the Interface Unit in accordance with Figure 7.4.

2.3.8.3 Refer to Figure 2.4 for twin-axial connector polarity. This polarity configuration must be maintained to obtain correct signal distribution.

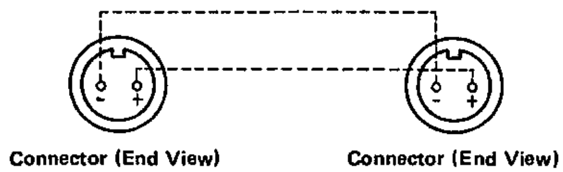


Figure 2.4. Twin-axial Polarity

2.3.8.4 Connect the twin-axial cables in accordance with Figures 7.3 and 7.4. If the station is single-rated make only the low rate connections.

2.3.8.5 Connect cables between the following pairs of jacks:

a. J15 I/F to J7 PGEN (1A4) (W0678-7/Interconnect Cable).

b. If dual-rated, J16 I/F to J7 PGEN (1A7) (W0678-7/Interconnect Cable).

c. J17 I/F to J7 PGEN (1A6) (W0678-7/Interconnect Cable).

d. If dual-rated, J18 I/F to J7 PGEN (1A5) (W0678-7/Interconnect Cable).

e. J19 I/F to Status Alarm Unit (BZ-265/FSN-2(V)) TB3-12 thru TB3-18 (see Figure 7.4).

f. J20 I/F to J6 EPA (W0678-7/Interconnect Cable).

g. J21 I/F to J2 TCC (W0678-7/Interconnect Cable).

h. J22 I/F to J7 EPA (W0678-8/PA Interconnect Cable).

i. J23 I/F to J1 TCC (W0678-9/AC Interconnect Cable).

2.3.9 Ground all units to the copper strap in the cabinet, according to Figure 2.1.

2.3.10 Plug the TCC, EPA, and PGENs into the cabinet's AC power receptacles.

2.4 Installation Drawings. Figures 2.6-2.11 show the dimensions of the units of the TCS.

2.5 Adjusting and Programming.

2.5.1 Electrical Pulse Analyzer programming.

NOTE

> To prevent transmitted signal timing shifts due to the cycle compensation loop in the operate timer when working on the EPA, connect a jumper from TP2 (Orange) to TP6 (Black) on the M Card of the operate timer. This disables the cycle compensation loop. If the station is dual-rated, connect a jumper from TP2 (Orange) to TP6 (Black) on the M Card of the operate timers of both rates. Remove the jumper(s) when done.

2.5.1.1 ECD module programming. Program both the operate W0678-18C/ECD module and the spare W0678-18C/ECD module according to Table 2.5.

Table 2.5. W0678-18C/ECD Module Programming

STATION CONFIGURATION	PROGRAMMING
Low Rate Master	Connect E3 to E5
High Rate Master	Connect E3 to E4
Low Rate Secondary	Do Not Connect E3 to E5
High Rate Secondary	Do Not Connect E3 to E4

2.5.1.2 Chassis programming. Program the EPA chassis according to Figure 2.5.

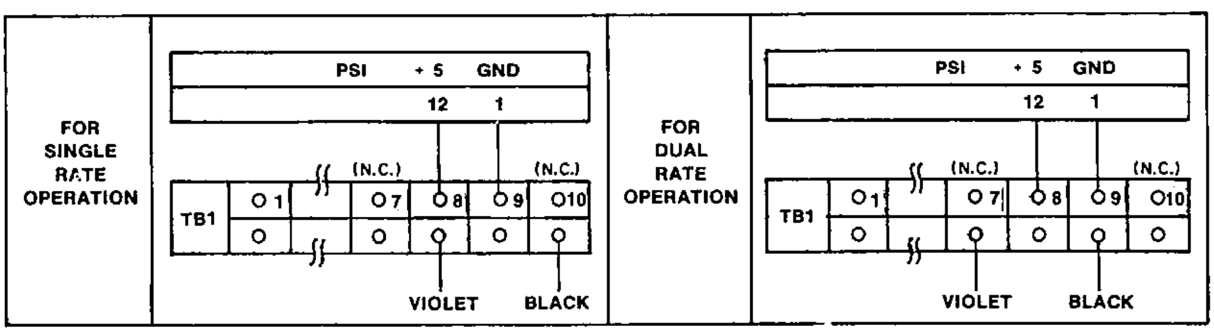


Figure 2.5. Pictorial of EPA Chassis Programming

2.5.2 Pulse Generator programming. Refer to Figure 7.31 for the backplane wiring differences between PGENs at various stations.

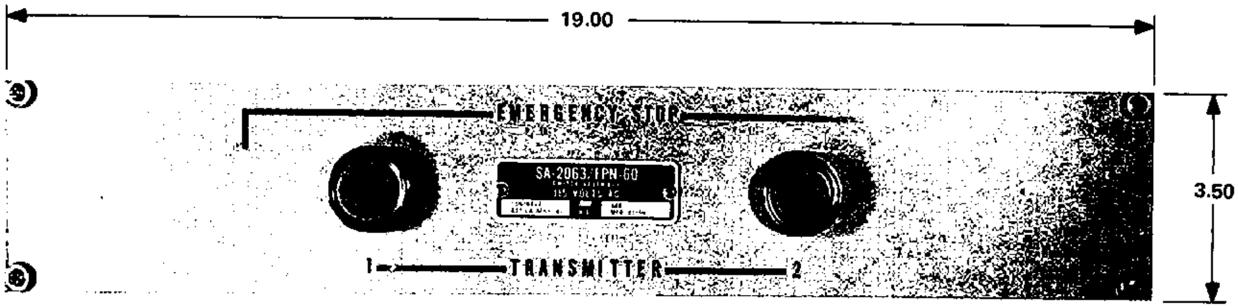


Figure 2.6. 1A1 Switch Assembly

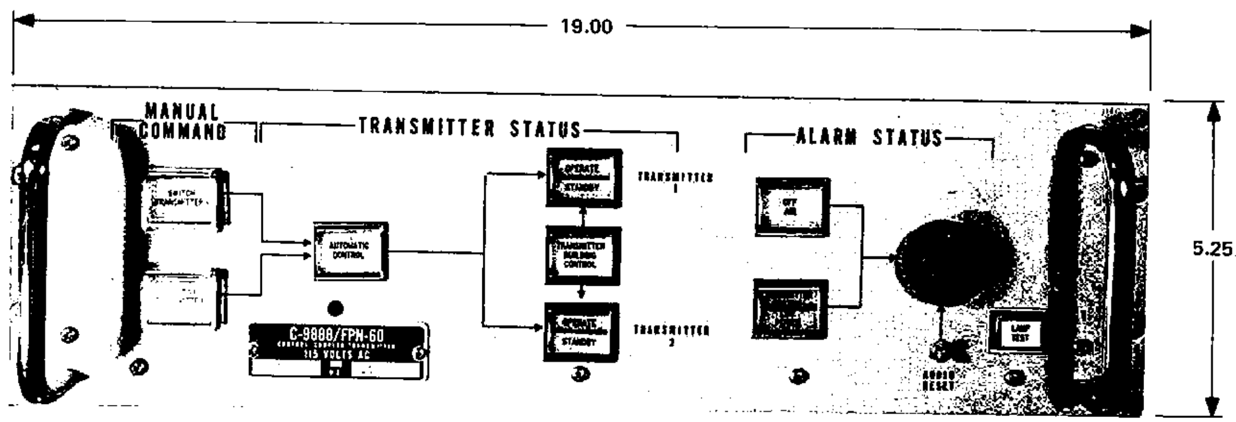


Figure 2.7. 1A2 Transmitter Coupler Control

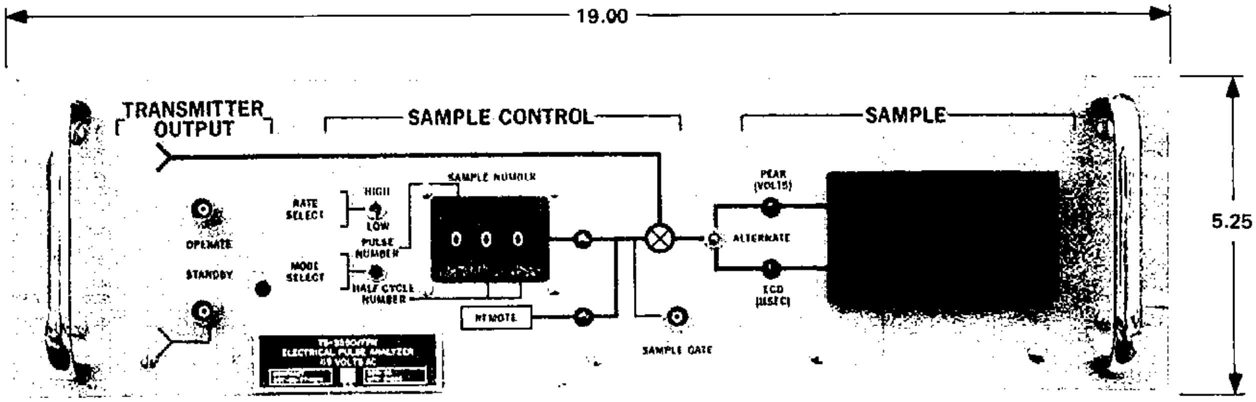


Figure 2.8. Electrical Pulse Analyzer

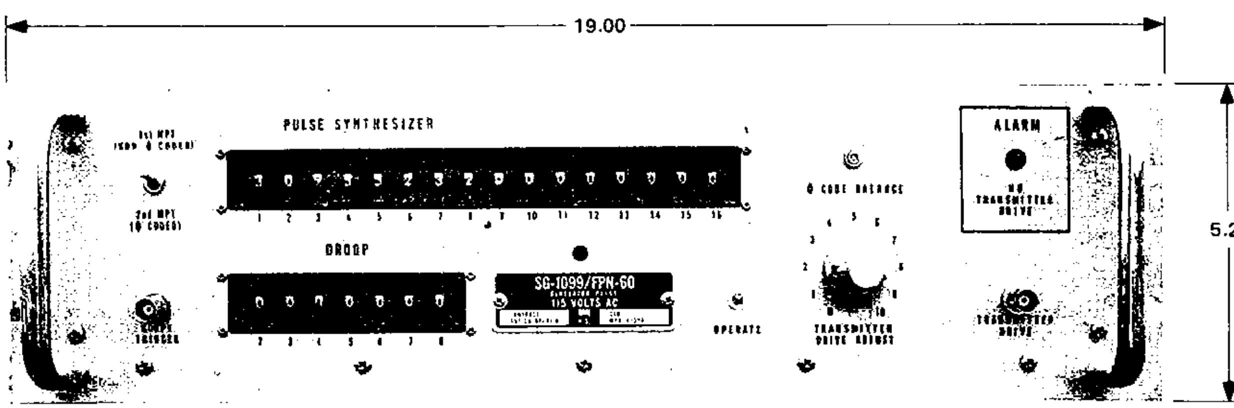


Figure 2.9. 1A4-1A7 Pulse Generator

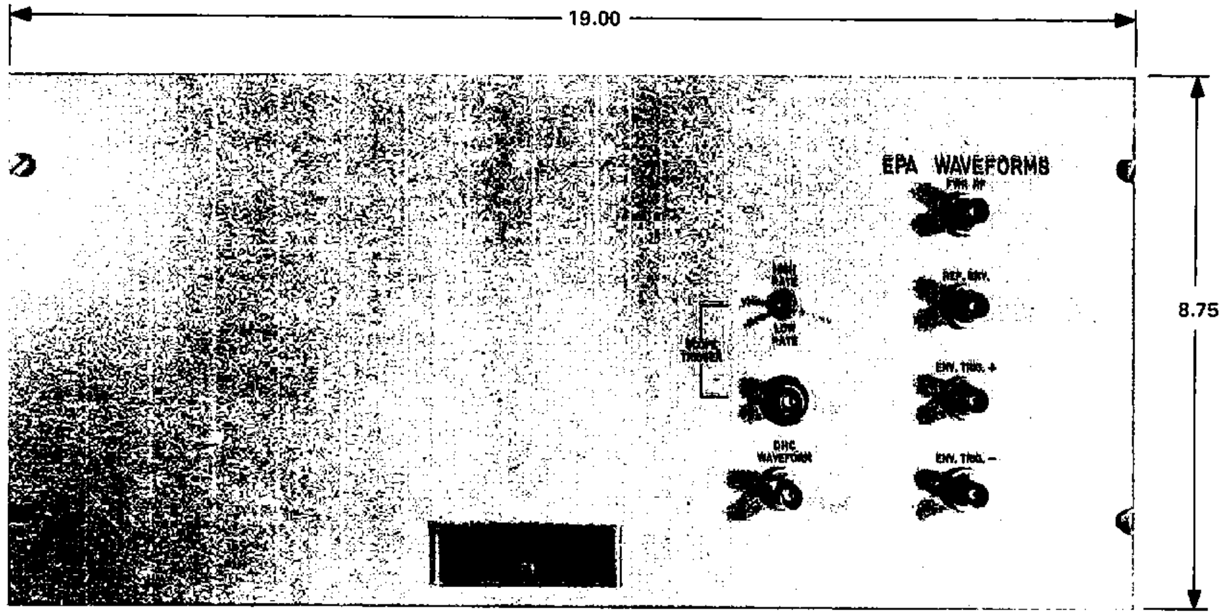


Figure 2.10. 1A8 Waveform Panel

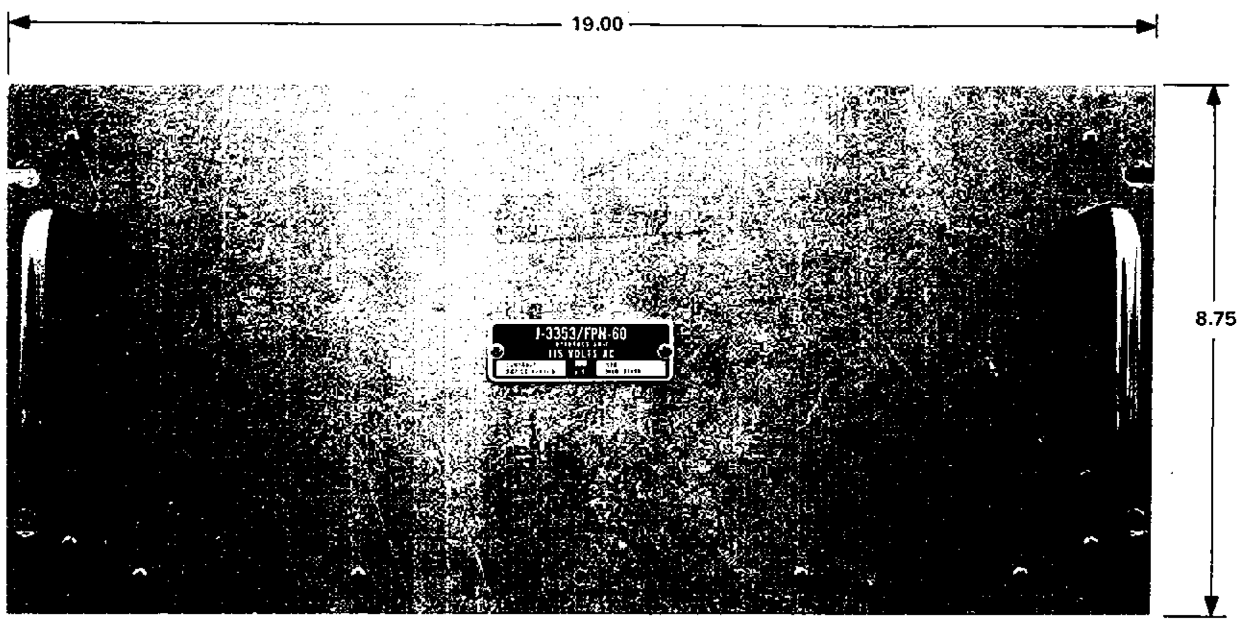


Figure 2.11. 1A9 Interface Unit

2.5.3 Group Droop Module Programming and Initial Settings. This procedure is required when replacing a Group Droop module as well as for initial installation. For test point and potentiometer locations refer to Figure 2.12.

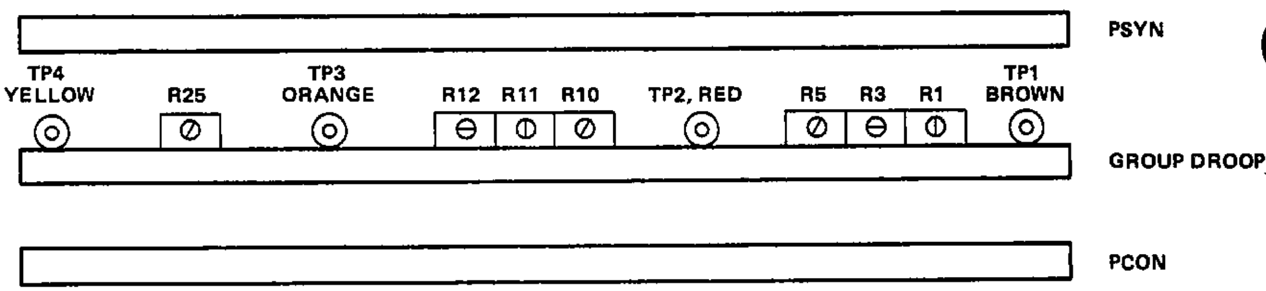


Figure 2.12. Test Point and Potentiometer Locations (as viewed with PGEN side panel removed)

NOTE

All jumpers are to be of #22 AWG solid wire.

a. W0678-19B/GR DROOP module for AN/FPN-44/44A/45 Transmitters.

(1) Jumper pin 1 to pin 14 and pin 5 to pin 16 on E2. Jumper pin 3 to pin 9 and pin 7 to pin 8 on E4. (See Figure 2.13.)

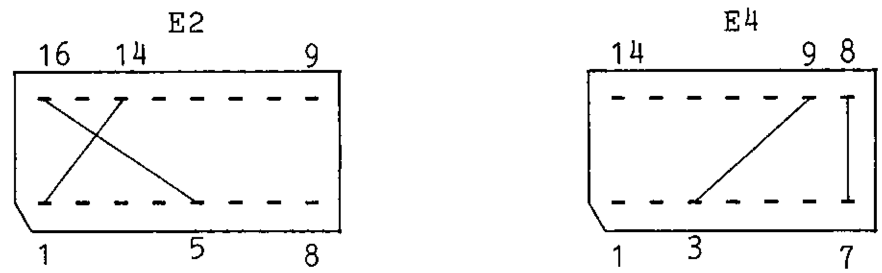


Figure 2.13. Programming of W0678-19B/GR DROOP Module Headers for AN/FPN-44/44A/45 Transmitters

(2) For stations not employing tail drive, if Q4 has not been removed, do so now. Insert a jumper between the source and drain of Q4, see Figures 2.14 and 7.34.

(3) For stations not employing tail drive, if C10 has not been removed, remove it.

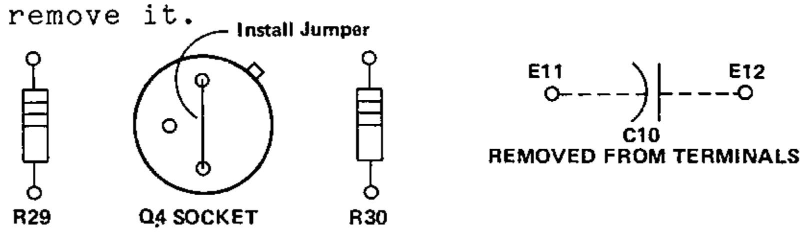


Figure 2.14. W0678-19B/GR/DROOP MODULE CHANGES

(4) Adjust R1 and R5 (see Figure 2.12) fully in the clockwise direction.

(5) Adjust R12 and R10 (see Figure 2.12) fully in the counterclockwise direction.

2.5.3.a. (6) R3, R11, and R25 require no adjustment.

(7) Install the module in the PGEN and set the PGEN DROOP thumbwheels to all zeroes (0's) and the TRANSMITTER DRIVE ADJUST to zero.

b. W0678-19B/GR DROOP module for AN/FPN-42 Transmitters.

(1) Jumper pin 5 to pin 9 and pin 7 to pin 8 on E4. Insert a jumper between pin 3 and pins 5, 14, and 16 on E2. (See Figure 2.15.) Insert a jumper between the source and drain pins of the Q4 socket and remove C10 (see Figures 2.14 and 7.34).

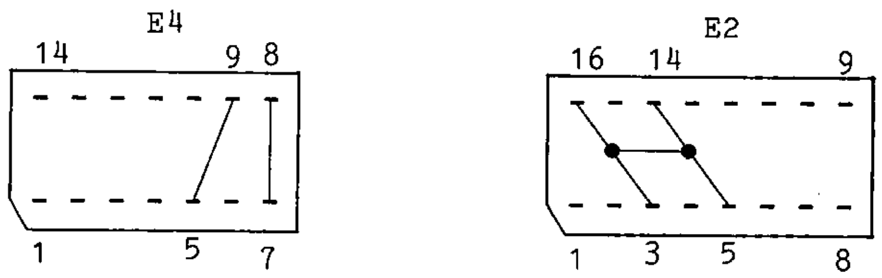


Figure 2.15. Programming of W0678-19B/GR DROOP Module Headers for AN/FPN-42 Transmitters

(2) Adjust R12 and R25 fully in the counterclockwise direction. Do not touch again.

c. For Tail Drive adjustment procedure for the W0678-19B/GR DROOP module for the AN/FPN-44/44A/45 Transmitters with feedback modification, see Paragraph 2.7.

d. Refer to local instructions to program the W0678-20/GR DROOP module for LORAN Station CAPE RACE.

e. A Group Droop module is not used with the AN/FPN-39 Transmitter.

2.6 Initial Operation.

2.6.1 Equipment turn-on. Energize the circuit breaker to the TCS Electrical Equipment Cabinet.

2.6.2 Power Supplies. Check the power supplies of all units according to:

Power Supply	Reference paragraph
TCC PS1	5.3.3.1.a
TCC PS2	5.3.3.1.b
EPA PS1	5.3.3.2.a
EPA PS2	5.3.3.2.a
PGEN PS1	5.3.3.3

2.6.3 Electrical Pulse Analyzer initial operation.

2.6.3.1 Set the front panel switches as follows:

a. RATE SELECT switch to LOW.
b. MODE SELECT switch to PULSE NUMBER position.
c. PEAK (VOLTS)/ECD (usec) switch to ALTERNATE.

2.6.3.2 Turn the left hand thumbwheel (or PULSE NUMBER switch) to the number one (1) position. Observe the Digital Panel Meter and PEAK/ALTERNATE/ECD LEDs for both PEAK (VOLTS) and ECD (usec) readings (see Figure 3.3).

2.6.3.3 Monitor the Sample Gate and Operate RF on the oscilloscope (see Figure 2.16). Trigger the oscilloscope from the red test point (TP7) on one of the DRRG modules in the standby low rate timer. The Sample Gate should move from pulse to pulse as the pulse select thumbwheel is rotated from one (1) to nine (9) for master, and from one (1) to eight (8) for a secondary station.

2.6.3.4 Set the PULSE NUMBER thumbwheel to one (1), and observe the alternate PEAK (VOLTS) and ECD (usec) readings on the Digital Panel Meter and alternate lighting of the respective LEDs.

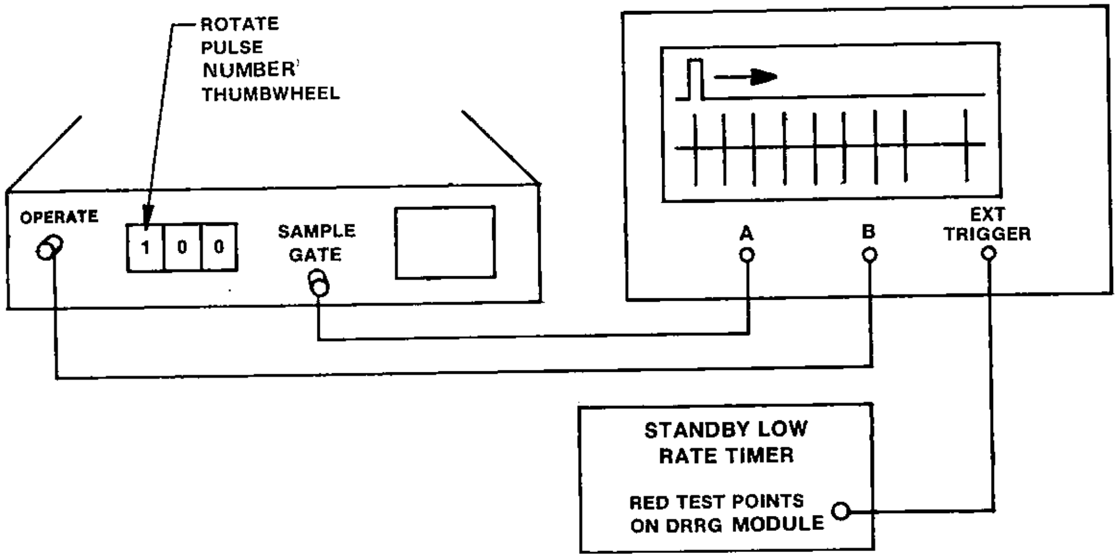


Figure 2.16. Sample Gate Versus Operate RF

2.6.3.5 Make half-cycle readings as follows:

a. Set the MODE SELECT switch to the HALF-CYCLE position.

b. Set the PULSE NUMBER thumbwheel to one (1).

c. Set the PEAK (VOLTS)/ECD (usec) switch to PEAK (VOLTS) position.

d. Rotate the two (2) HALF-CYCLE NUMBER thumbwheels from one (1) to nineteen (19) and observe the Digital Panel Meter. The Digital Panel Meter reading should increase, reaching a peak value at about the 13th, 14th, or 15th half-cycle. From then on the voltage should decrease in value.

e. Repeat step d. for each position of the PULSE NUMBER thumbwheel from one (1) to eight (8), or nine (9) for a master station.

2.6.3.6 For a dual-rated station, change the RATE SELECT switch to high rate and repeat paragraghs 2.6.3.3 to 2.6.3.5. Use the DRRG red test point of the standby high rate timer.

2.6.3.7 Observe the EPA Full Wave Rectified RF, Reference Envelope, and chart recorder drive as follows (see Figure 2.17):

a. Connect one oscilloscope channel to the REF ENV jack, J2, on the Waveform Panel (this is the same signal that is on the EPA rear panel jack, J9).

b. Connect the other oscilloscope channel to the FWR RF jack, J1, on the Waveform Panel (this is the same signal that is on the EPA rear panel jack, J4).

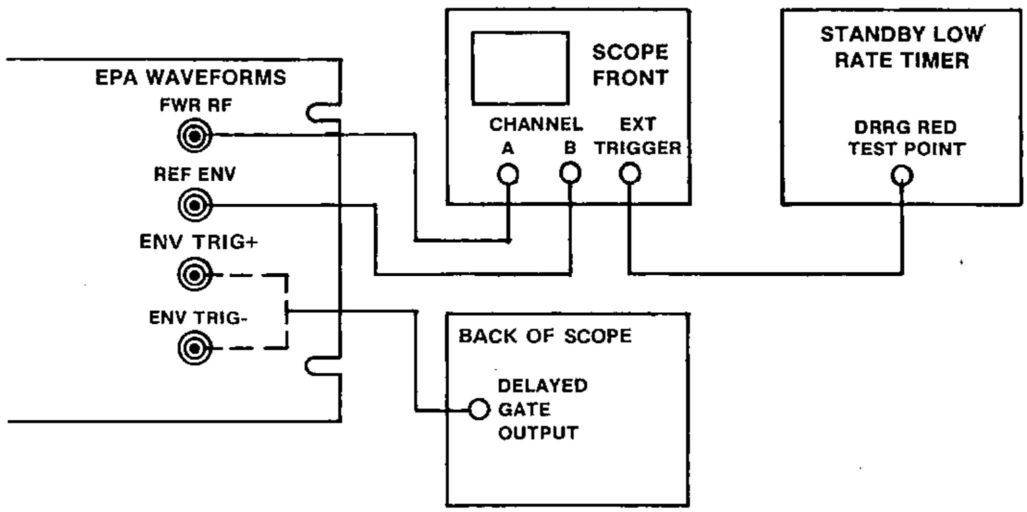


Figure 2.17. Oscilloscope Connections for Monitoring EPA Waveforms

c. Connect the delayed gate output of the oscilloscope to one of the ENV TRIG jacks, J3 (positive) or J4 (negative) on the Waveform Panel, depending upon the polarity of the oscilloscope delayed gate output. These are the same as EPA rear panel jacks, J8 or J5, respectively.

d. Set the horizontal sweep of the oscilloscope to 200 us per division, and the delay sweep to 20 us per division.

e. Adjust the oscilloscope sweep delay to line up the Reference Envelope and the Full Wave Rectified RF waveforms on the oscilloscope.

f. If the station is dual-rated, shift the oscilloscope trigger to the standby high rate timer DRRG red test point, and repeat step e.

g. Check J10 on the rear of the EPA for a voltage of 0-5 volts. A chart recorder can be connected in accordance with Table 2.4. Further information on the chart recorder can be found in the Remote Control Set AN/FSN-2(v) technical manual.

2.6.3.8 Adjust the W0678-11A/CLP ATTN module as follows:

a. On Channel A of the oscilloscope, monitor the Sample Gate (see Figure 5.19) at J3 located on the EPA front panel. If the Sample Gate is not present refer to paragraph 5.3.

b. Place the MODE SELECT switch (S2) in the HALF-CYCLE NUMBER position. Set the PULSE NUMBER thumbwheel to position 1 and the HALF-CYCLE NUMBER to position 08.

c. Remove the chassis mount screws and pull the EPA chassis out far enough from the cabinet so that the top cover of the chassis can be removed. Leave all input/output cables connected to the EPA.

d. On Channel B of the oscilloscope, monitor the Clip Attenuator Gate at TP1 (white test point) on the Clip Attenuator module (see Figure 2.18).

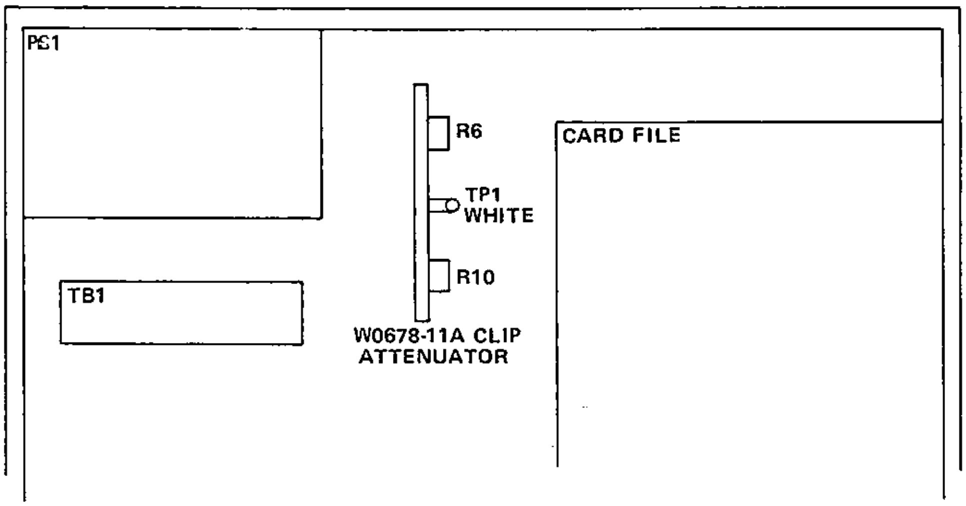


Figure 2.18. Top View of EPA Showing Location of Clip Attenuator Module

e. Adjust R10 on the Clip Attenuator module so that the Sample Gate overlaps with the leading edge of the Clip Attenuator Gate (see Figure 2.19.a).

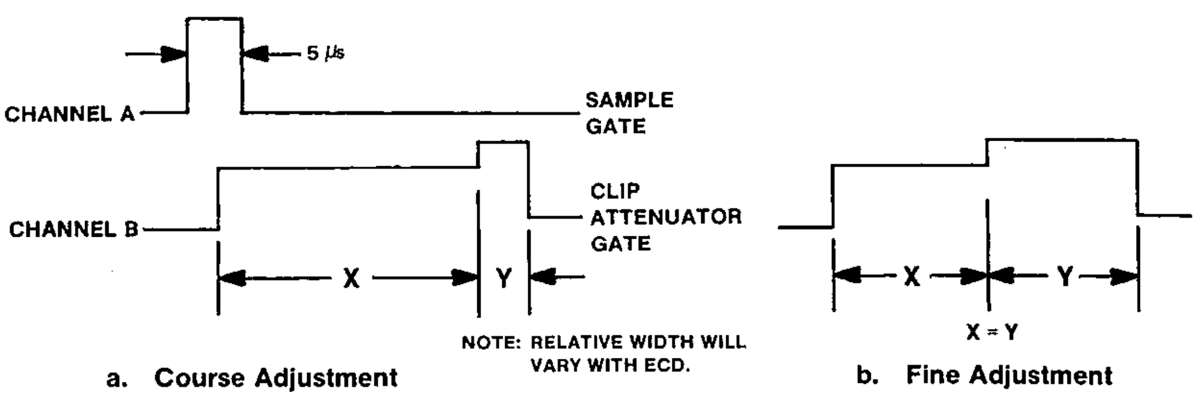


Figure 2.19. Clip Attenuator Waveform Adjust

f. Monitor only the Clip Attenuator Gate and adjust R10 so that X=Y (see Figure 2.19.b).

2.6.3.9 Check for the presence of the Local Envelope Crossover trigger as follows:

a. Set the Time Interval Counter (TIC) to the following settings:

(1) TIME BASE - 0.1 usec.

(2) FUNCTION - T.I. A to B.

(3) A channel trig - Negative ( ).

(4) B channel trig - Positive ( ).

(5) SAMPLE RATE - Turn clockwise, then fully counterclockwise but not into off detent.

b. Set the TIC Panel switches to:

(1) START thumbwheel - 2.

(2) STOP thumbwheel - 3.

(3) RATE select switch - LOW RATE.

c. Observe a LEN number on the TIC digital display.

2.6.3.10 Check the Envelope-to-Cycle-Difference recorder to observe that there is a recorder output from the EPA.

2.6.3.11 Adjust the PEAK (VOLTS) display as follows:

a. Set the front panel controls as follows:

(1) MODE SELECT switch to PULSE NUMBER position.

(2) SAMPLE NUMBER switch to 100.

b. Disable the cycle compensation loop by connecting a jumper from TP2 (Orange) to TP6 (Black) on the M Card of the operate timer (of both rates, if dual-rated).

NOTE

If TP2 (Orange) on the M Card is not jumpered to ground, transmitted signal timing shifts due to the cycle compensation loop may occur.

c. Remove the chassis cover of the EPA.

WARNING

Hazardous voltages are present in the RF return cable.

d. Locate and disconnect the keyed twinax connector in the Current Transformer cable (as close to the transformer as possible).

e. Use a 100 ohm, 5%, ½ W, resistor and a calibrated oscilloscope to differentially measure the zero-to-peak voltage on the first LORAN-C pulse of the transmitted pulse group. Ensure that the resistor is placed across the plus and minus pins of the twinax connector (refer to Figure 2.20).

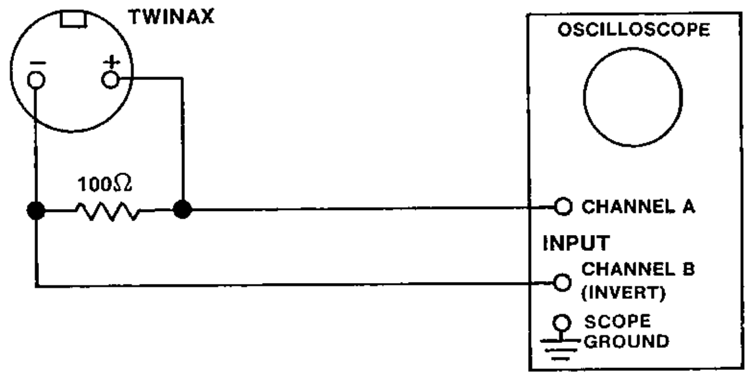


Figure 2.20. Oscilloscope Twinax Connector Test Setup

f. Remove the resistor and reconnect the twinax connector.

g. Adjust the potentiometer (R6) on the Clip Attenuator module (refer to Figure 2.18 for location of R6) until the pulse peak reading on the EPA DPM is the same as the value obtained in step e. (±1 volt) or in accordance with local directives. Since the volt/ampere ratio of the Current Transformer (Pearson Model 1705) is 1/10, the peak current on the antenna may be obtained by multiplying this reading by ten.

h. Replace the top cover on the EPA and re-install the EPA back into the rack using four panel mount screws to securely hold the EPA in place.

i. Enable the cycle compensation loop on the operate timer(s) by removing the jumper(s) from TP2 (Orange) to TP6 (Black) on the M Card(s).

2.6.4 Transmitter Coupler Control initial operation.

2.6.4.1 Perform the following adjustments of the TCC with the AN/FPN-42/44/44A/45 Transmitters:

a. Monitor the peak amplitude of the first LORAN pulse of a group as outlined in paragraph 3.3.2.2. Insure that the transmitter is operating at the prescribed output power.

b. Reduce the transmitter drive adjust on the operate PGEN until the EPA reads a DPM voltage 80% of the prescribed DPM voltage reading, as promulgated by current operating directives. (This corresponds to a 64% radiated power level.)

c. Adjust the TCC threshold detector level adjust, R8 (see Figure 5.13) on the W0678-5/XMTR CON module, clockwise until the OFF AIR lamp goes off, and then counterclockwise until the OFF AIR lamp illuminates. The OFF AIR indicator is a one-half second delayed action indication. Adjust R8 in small increments to avoid over-correction.

d. Return the transmitter drive to the original settings.

e. Repeat steps a. and b. to insure that the OFF AIR alarm condition occurs properly.

2.6.4.2 Perform the following adjustments of the TCC with the AN/FPN-39 Transmitter:

NOTE

> Three personnel are required to perform the following checks; two in the transmitter building, and one in the timer room.

a. On the oscilloscope, monitor the amplitude of the pulse group (8 for secondary station, 9 for master station) as outlined in paragraph 3.3.2.2. Ensure that the transmitter is operating at the prescribed output power.

b. Adjust the oscilloscope vertical deflection and position controls until the positive portion of the waveform (the portion from the zero line to the positive peak) measures 5 major divisions.

c. At the transmitter building, lower the plate voltage on the operate transmitter (see the AN/FPN-39 technical manual) until the positive portion of the waveform measures 4 major divisions (this indicates that the transmitter is now at 80% of rated voltage output, which corresponds to 64% rated power).

d. Adjust the TCC threshold detector level adjust, R8 (see Figure 5.13) on the W0678-5/XMTR CON module, clockwise until the OFF AIR lamp extinguishes, and then counterclockwise until the OFF AIR lamp illuminates. The OFF AIR indicator is a one-half second delayed action indication. Adjust R8 in small increments to avoid over-correction.

e. Return the transmitter drive to the original settings.

f. Repeat steps a. and b. to insure that the OFF AIR alarm condition occurs properly.

2.6.5 Pulse Generator initial operations for dual-rated stations.

2.6.5.1 The following are definitions and measurement procedures to be followed in performing adjustments to the Pulse Generator.

NOTE

> READ ALL STEPS PRIOR TO STARTING ANY ADJUSTMENTS.

a. The following are definitions used in the adjustment procedures:

(1) Phase code balance - Operate RF: equal amplitude peaks of the alternately phase coded pulses between the phase code intervals observed at the OPERATE RF jack of the EPA.

(2) Phase code balance - PGEN: equal amplitude peaks of the Transmitter Drive Waveform (TDW) alternately phase coded pulses. Proper phase code balance of the PGEN includes phase offset of less than 100 nsec, as defined below.

(3) Phase code offset of 30-usec zero crossing: the 30-usec zero crossing of a phase coded pulse observed at the TRANSMITTER DRIVE jack on PGEN. The phase offset is the magnitude of the separation between the zero crossing of the positively and negatively phase coded pulses.

(4) Phase jitter of the 30-usec zero crossing: the peak-to-peak phase shift of the 30-usec zero crossing of any operate RF pulse during the crossover epoch.

(5) Droop - The amplitude differences between any individual pulse and any other pulse within the same pulse group.

(6) Group Droop - The amplitude differences between any pulse of one group to any pulse of the other group over the interval.

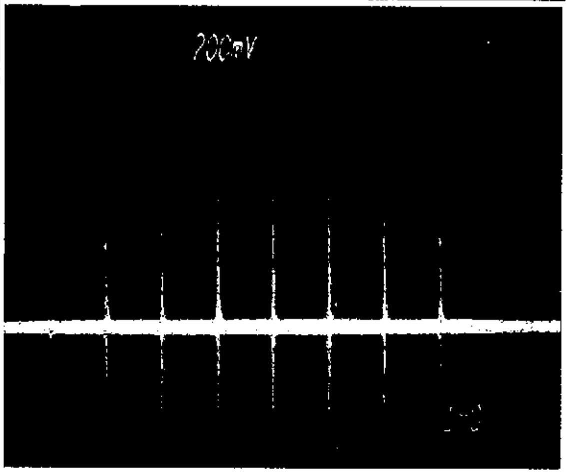
b. The following are the measurement procedures to be used:

(1) Triggering: Trigger the oscilloscope from the red test point of a DRRG board in the standby timer. This trigger is moved by inserting Local Phase Adjustments (LPAs) into the standby timer. Write down each LPA, as it is inserted, for easy recovery, should it become necessary to switch timers during the measurements. Also, once the LPA necessary to find the 30-usec zero crossing is found, it is a fixed value and can be used for future measurements.

(2) Oscilloscope sweep mode: Never use delayed sweep when measuring phase jitter, as it introduces some jitter. 50 nsec per division is desired to obtain accurate jitter measurements. Use delayed sweep only when determining the LPA necessary to obtain the 30-usec zero crossing.

(3) Obtaining the 30-usec zero crossing: Observe the desired pulse at any sweep time that will display only that pulse at the left side of the display (trigger with TP7 (Red) of DRRG module). Expand the sweep and locate the 30-usec zero crossing. Ensure that the oscilloscope trace is centered on a major horizontal division. Alternately insert LPAs in the standby timer and expand the sweep time to keep the 30-usec zero crossing in the left center of the display. As the display time decreases, reduce the volts per division scale to increase the slope of the waveform. Intensity and focus need to be adjusted accordingly. Upon reaching 50 nsec per division of sweep, center the zero crossing (it is a vertical line) on the display and record the total LPA insertion. Inserting LPAs in 5 usec increments moves the start of the pulse. Inserting LPAs in 1000 usec increments displays the 30-usec zero crossing of the adjacent pulses.

(4) Figures 2.21 and 2.22 show proper and improper phase code balance, respectively. Figure 2.22 is observed when the PSYN module is not properly adjusted (if this occurs, return the module in accordance with E/GICP instructions).

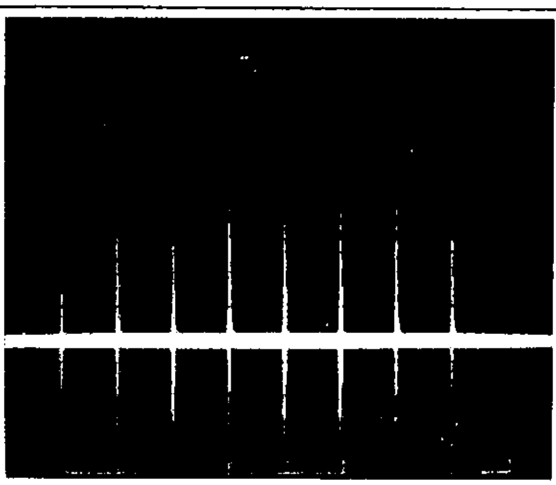


COMMENTS	SOURCE	SETTINGS
GROUND REF: Two divisions below center.	SIGNAL: Xmtr. Drive jack on PGEN. Coaxial cable.	TRIGGER: External (+)
	TRIGGER: TP7 (Red) of E,F,or G module (DRRG) of stby rate timer.	MODE: Main Sweep
		HORIZONTAL: 1 ms/Div
		VERTICAL: 0.2 V/Div

Figure 2.21. Proper Phase Code Amplitude Balance

NOTE

A properly adjusted PSYN module allows the positive and negative halves of the pulses to be balanced.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Two divisions below center.	SIGNAL: Xmtr. Drive jack on PGEN. Coaxial cable.	TRIGGER: External (+)
	TRIGGER: TP7 (Red) of E,F,or G module (DRRG) of stby rate timer.	MODE: Main Sweep
		HORIZONTAL: 1 ms/Div
		VERTICAL: 0.2 V/Div

Figure 2.22. Improper Phase Code Amplitude Balance

c. These adjustments ensure a more efficient operation of the transmitter with a minimum of phase jitter.

(1) Adjust the PGEN phase code balance and ensure that the phase offset is less than 100 nsec.

(2) Ensure that the transmitter Power Amplifier (PA) section cathode current is balanced to within 5% tube-to-tube and 5% bank-to-bank. Ensure that PA tube filaments do not exceed the rated voltage. Neutralize the 1st and 2nd Intermediate Power Amplifiers (IPAs). Ensure that the 1st IPA is not in saturation. After the transmitter has been properly balanced, proceed to the adjustments.

d. The following are phase jitter maximums that must be maintained at dual-rated transmitting stations:

(1) Phase jitter of all sixteen pulses must not exceed that described in COMDTINST M16562.4 paragraph 2.B.5.c.

(2) Phase code offset of the alternately phase coded pulses must not exceed 100 nsec.

(3) Phase code amplitude imbalance (bounce) of the transmitter drive waveform (TDW) peaks at the PGEN must not exceed .1 volt, while achieving phase code balance of the Operate RF.

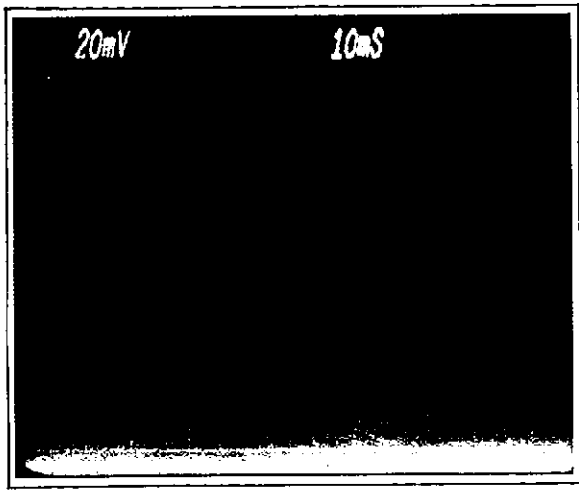
2.6.5.2 <u>W0678-19B/GR DROOP module adjustments for AN/FPN-44/44A/45 Transmitters.</u> Perform the following steps to adjust the W0678-19B/GR DROOP module for use with the AN/FPN-44/44A/45 transmitters without the Feedback Modification.

NOTE

READ ALL STEPS PRIOR TO STARTING ANY ADJUSTMENTS. Steps a. through m. are to be performed on any initial issue or replacement modules, prior to performing step n.

a. Place the DROOP thumbwheels to zeroes (0's) and the TRANSMITTER DRIVE ADJUST to zero. Insure that all modules are programmed according to paragraph 2.5.3.a.

b. Set up a calibrated oscilloscope (with x10 probe) according to Figure 2.23.



COMMENTS	SOURCE	SETTINGS
Channel input coupling switch in ground position. Adjust the scope trace to bottom of graticule.	SIGNAL:	TRIGGER: Internal Auto
		MODE: Main Sweep
	TRIGGER:	HORIZONTAL: 10 ms/Div
		VERTICAL: 0.02 V/Div

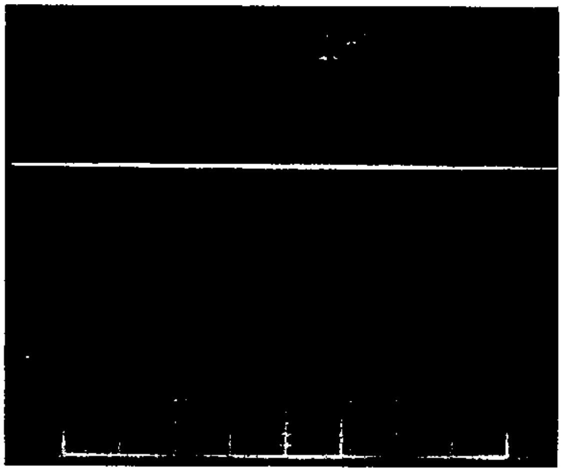
Figure 2.23. Oscilloscope Set Up

c. Place the oscilloscope vertical channel input coupling switch to the DC position.

d. Place the oscilloscope Trigger Source switch to External. Trigger the scope from an opposite rate PGEN front panel SCOPE TRIGGER jack (1st MPT selected). This means that if the low rate PGEN is being adjusted, the trigger would be from the high rate PGEN front panel jack.

e. Connect the oscilloscope to TP4 (Yellow) on the Group Droop module being adjusted. Connect the probe ground clip to the chassis.

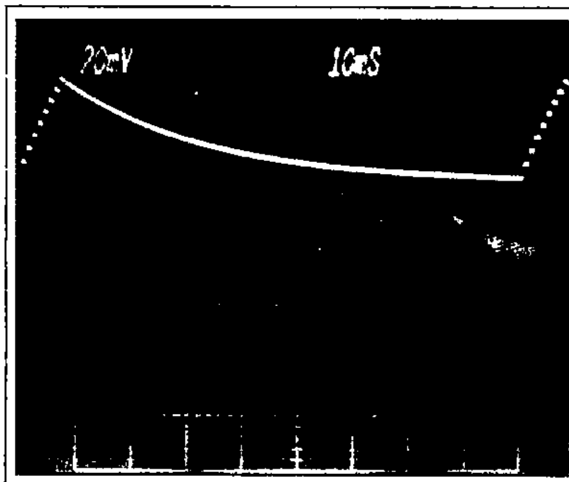
f. Record the DC Reference level (see Figure 2.24). This DC reference level should be in the range of +0.9 to 1.1VDC.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom of graticule. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module. x10 Probe	TRIGGER: External (+) Normal
	TRIGGER: SCOPE TRIGGER jack of opposite rate PGEN.	MODE: Main Sweep
		HORIZONTAL: 10 ms/Div
		VERTICAL: 0.02 V/Div

Figure 2.24. DC Reference Level

g. Adjust R1 counterclockwise until a ladder waveform appears (see Figure 2.25) and its peak reaches +1.4VDC. Adjust R12 clockwise until the decay of the ladder waveform reaches the DC level recorded in step f. just before the start of the next ladder waveform. While adjusting R12, it will be necessary to readjust R1 to maintain the peak of the ladder waveform at +1.4VDC.



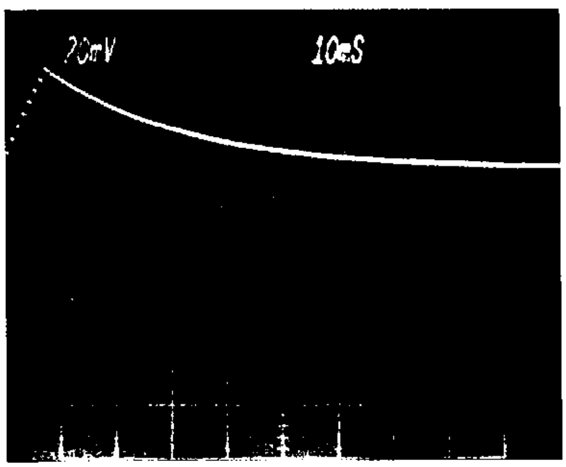
COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. LR is 9960 HR is 8970 Waveform may vary slightly for different rates. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module. x10 Probe	TRIGGER: External (+)
	TRIGGER: SCOPE TRIGGER jack of opposite rate PGEN.	MODE: Main Sweep
		HORIZONTAL: 10 ms/Div
		VERTICAL: 0.02 V/Div

Figure 2.25. Opposite Rate Ladder Waveform

h. Do not readjust R12 again. Adjust R1 clockwise until the ladder waveform just disappears (DC level signal) see Figure 2.24.

i. Move the oscilloscope trigger cable from the opposite rate PGEN to the SCOPE TRIGGER jack of the PGEN being adjusted.

j. Adjust R5 counterclockwise until a ladder waveform appears (see Figure 2.26) and its peak reaches +1.4VDC. Adjust R10 clockwise until the decay of the ladder waveform reaches the DC Reference level recorded in step f. just before the start of the next ladder waveform. While adjusting R10, it will be necessary to readjust R5 to maintain the peak of the ladder waveform at +1.4VDC.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. Waveform is for 9960 rate. Waveform may vary slightly for different rates. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module x10 Probe TRIGGER: SCOPE TRIGGER jack of same rate PGEN.	TRIGGER: External (+) MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

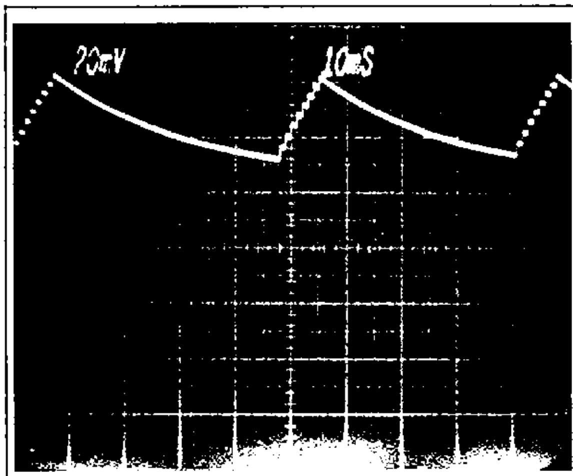
Figure 2.26. Same Rate Ladder Waveform

k. Do not readjust R5 or R10.

l. Move the oscilloscope trigger cable from the PGEN being adjusted to the SCOPE TRIGGER jack of the opposite rate PGEN.

m. Adjust R1 counterclockwise until a stable ladder waveform appears. Both the stable and crossing ladder waveforms will be varying in amplitude. Adjust R1 counterclockwise until the stable waveform reaches +1.4VDC when the crossing ladder waveform nears point A in Figure 2.27. The crossing ladder waveform should be +1.4VDC near point A in Figure 2.27.

A



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. LR is 9960. HR is 8970. Waveforms may vary slightly for different rates. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module x10 Probe TRIGGER: SCOPE TRIGGER jack of opposite rate PGEN.	TRIGGER: External (+) MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.27. Crossing Ladder Waveforms

n. Operate the transmitter in Dummy Load, adjust the PGEN drive to obtain normal drive level and insure that the PGEN is operating correctly.

2.6.5.3 <u>W0678-19B/GR DROOP module initial adjustments for AN/FPN-42 Transmitters</u>. Perform the following steps to adjust the W0678-19B/GR DROOP module for use with the AN/FPN-42 Transmitters:

a. Ensure that all W0678-19B modules are programmed according to para 2.5.3.b.

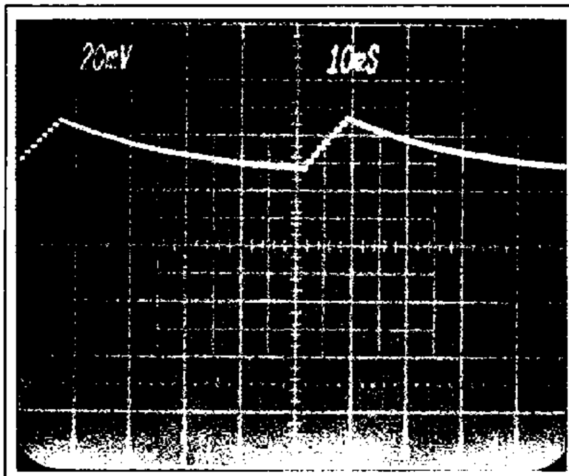
b. Set oscilloscope with zero reference level at the bottom of the graticule with the vertical input set at .02 V/Div. Set the horizontal sweep at 10 msec/div. Use properly calibrated divide by 10 probes.

c. In the standby high rate PGEN, observe the waveform on TP4 (Yellow) on Channel A of the oscilloscope and trigger the oscilloscope from the SCOPE TRIGGER jack (1st MPT selected) of the same PGEN. Adjust R1, R3, and R11 (see Figure 2.12) until two ladder waveforms are present.

d. Adjust R11 until the ladder waveforms disappear, then turn R11 in the opposite direction until the ladder waveforms reappear. The DC level of the waveform should be between 1.0 and 1.1 volts. Adjust R3 until the peak of the stable ladder (the other will drift across the screen) is between 1.2 and 1.25 volts.

e. Move the oscilloscope trigger cable to the SCOPE TRIGGER jack of the low rate standby PGEN. Adjust R1 until the peak of the stable ladder is between 1.2 and 1.25 volts.

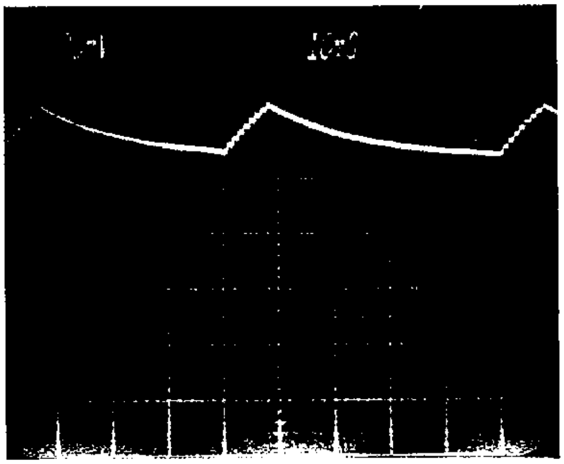
f. Both ladder waveforms are now equal in magnitude, and the DC Reference level is approximately 1.1 volts. There should be no difference in the waveforms when the trigger is moved. If there is, repeat the above steps until the two waveforms are equal. When this is accomplished, this module is the standard. Do not adjust it in any of the following steps. Figures 2.28 and 2.29 show the proper appearance of the "standard" waveform.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. Use x10 probe for signal connection. Ground probe	SIGNAL: TP4 (Yellow) on GR DROOP module of high rate PGEN.	TRIGGER: External (+)
	TRIGGER: SCOPE TRIGGER jack on PGEN being adjusted.	MODE: Main Sweep
		HORIZONTAL: 10 ms/Div
		VERTICAL: 0.02 V/Div

Figure 2.28. Proper Same Rate Ladder Waveform

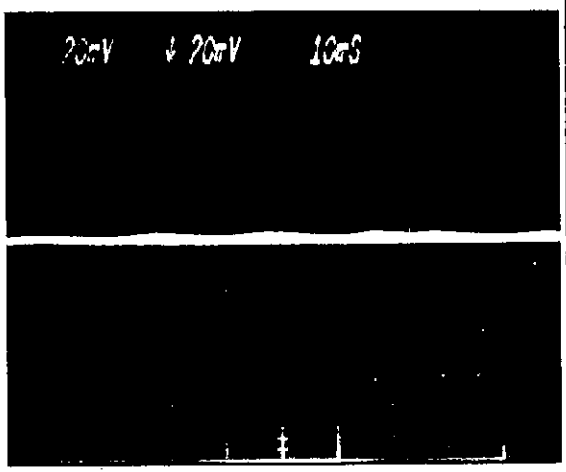
g. With the standard waveform on Channel A of the oscilloscope, observe the waveform at TP4 (Yellow) on the Group Droop module in the standby low rate PGEN on Channel B (use same settings). Adjust this module using steps (a) thru (f) above. Invert Channel B and add it to Channel A (A+B). Adjust the vertical position control to center the trace when both channels are grounded. Return to the A+B display.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. Use x10 probe for signal connection. Ground probe	SIGNAL: TP4 (Yellow) on GR DROOP module of low rate PGEN. TRIGGER: SCOPE TRIGGER jack of PGEN being adjusted.	TRIGGER: External (+) MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.29. Proper Opposite Rate Ladder Waveform

h. With the oscilloscope trigger coming from the same PGEN, adjust R3 for as straight as possible line on the left side of the display. Trigger the oscilloscope from an opposite rate PGEN and adjust R1 for as straight a line as possible on the left side of the display. Adjust R11 for a straight line across the entire display. Repeat these steps until the two waveforms add to a straight line similar to Figure 2.30. Observe Channel B alone and not inverted, to ensure that it is set properly.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. Channel B inverted. Use x10 probe for signal connection. Ground probe	SIGNAL: TP4 (Yellow) on GR DROOP module of both rate PGENS. TRIGGER: SCOPE TRIGGER jack of low rate PGEN.	TRIGGER: External (+) MODE: Main Sweep (A+B) HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.30. A+B Waveform

i. Switch transmitters and adjust the phase code balance and transmitter drive (drive may have to be reduced). Droop should be less than 5% for both the group and pulse train.

NOTE

The following step adjusts droop. Any attempt to improve droop shall maintain the voltage values given in the above steps. During any adjustment ensure that (1) the two ladders on the TP4 waveform are equal in magnitude and (2) the high and low rate TP4 waveforms are identical among all PGENs.

j. Continue to observe the standard waveform on Channel A of the scope, and adjust the remaining PGEN Group Droop modules in accordance with the above steps. Repeat step i, for the other transmitter, first making sure that it is properly balanced. Adjust the spare module. All Group Droop modules should now be interchangeable without any readjustments.

k. The peak-to-peak amplitude of the TDW observed at the PGEN TRANSMITTER DRIVE jack must not exceed 2.5 volts to achieve the constraints in the above paragraph. At this drive level, the station is still able to transmit at its assigned power level.

2.6.5.4 Adjustment procedures for the W0678-20/GR DROOP module. The adjustments for this module are done at the depot.

NOTE

Three personnel are required to perform the following checks; two in the transmitter building, and the other in the timer room.

2.6.6 Operational Checks. Paragraph 2.6.6.1 is a step-by-step check of the TCS equipment. Paragraphs 2.6.6.2 and 2.6.6.3 require the switching of transmitters and contain additional checks. These procedures are written for a dual-rated station, but can be used at a single-rated station, remembering that a single-rated station has only one operate and one standby PGEN. If any of the checks fail, recheck all connections and repeat the checks. If any of the checks still fail, refer to Chapter 5 for the troubleshooting procedures. After the successful completion of the below checks, the Transmitter Control Set will be ready for operation.

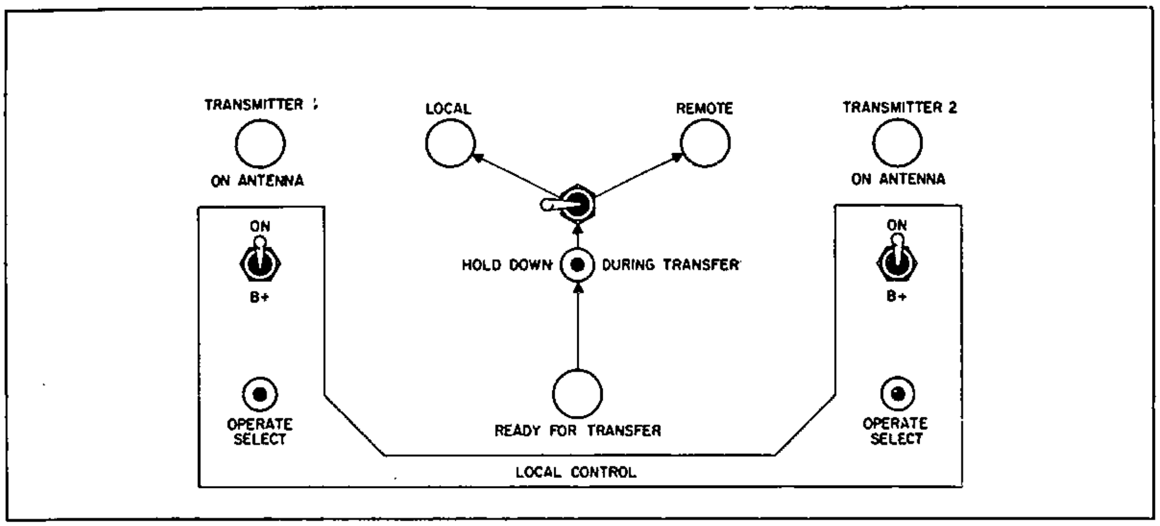
2.6.6.1 Perform the following steps:

a. Insure that the following are set:

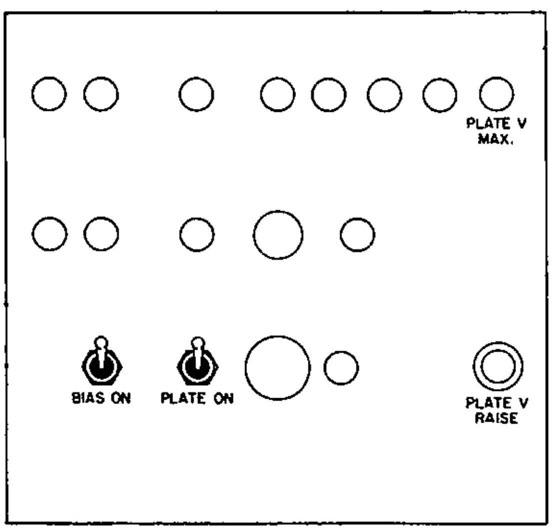
(1) All alarms are off and the TRANSMITTER DRIVE ADJUST on the PGENs is set for full rated power.

(2) The B+ switch turned on for the operate transmitter only on the Local Control Panel. (Figures 2.31-2.34 show the panels and control units of the AN/FPN-39, 42, 44/45 and 44A transmitters respectively).

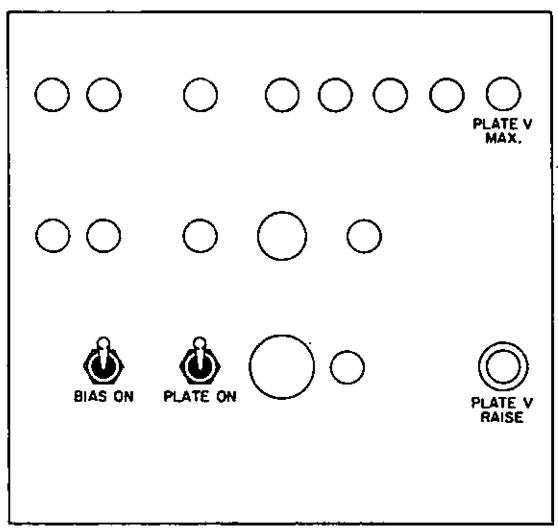
AN/FPN-39 TRANSMITTER



LOCAL CONTROL PANEL IN POWER DISTRIBUTION UNIT (3A4)



LOW POWER UNIT -(2A8)
TRANSMITTER NO. 1



LOW POWER UNIT -(2A8)
TRANSMITTER NO. 2

Figure 2.31. AN/FPN-39 Local Control Panel and Low Power Units

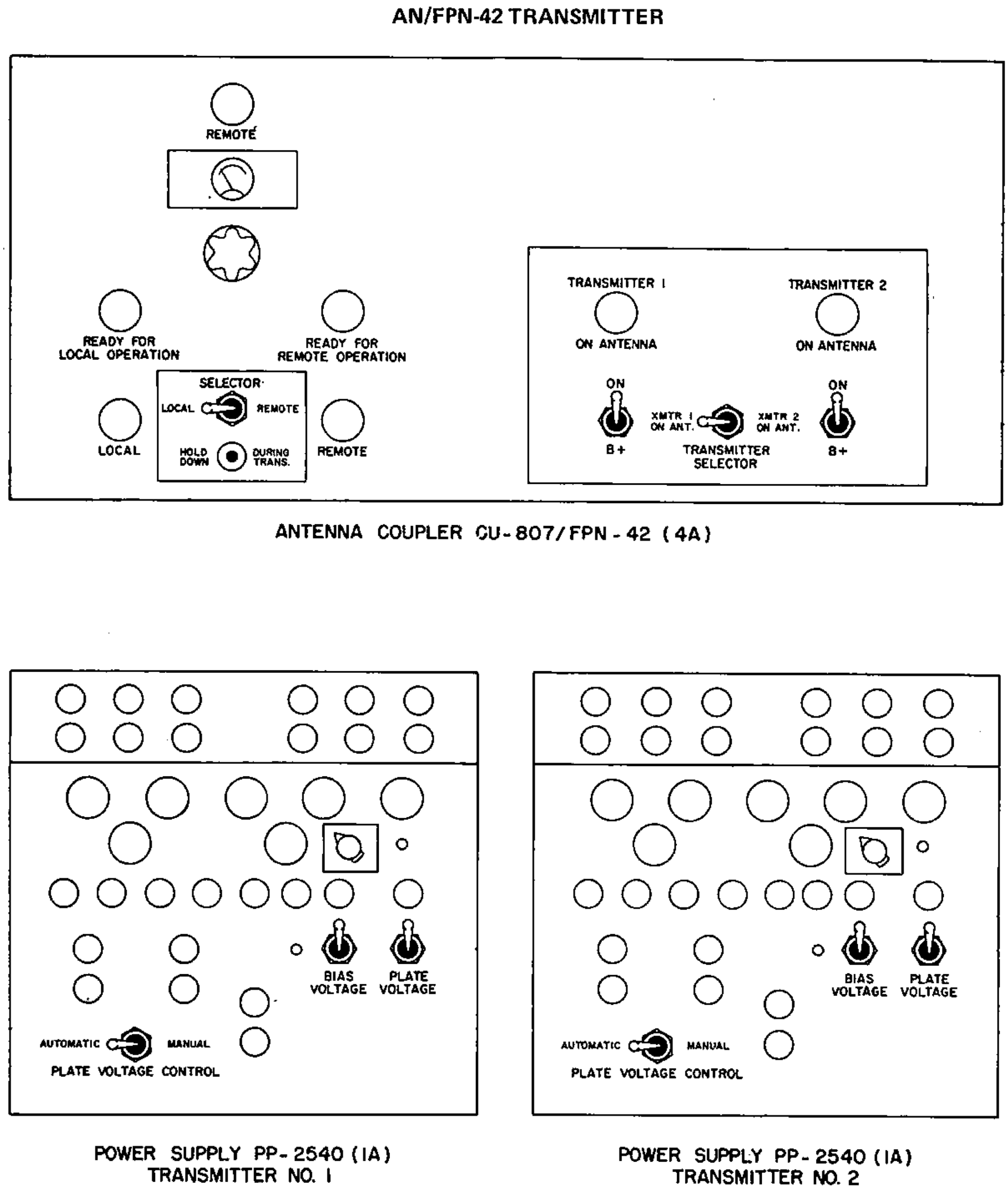
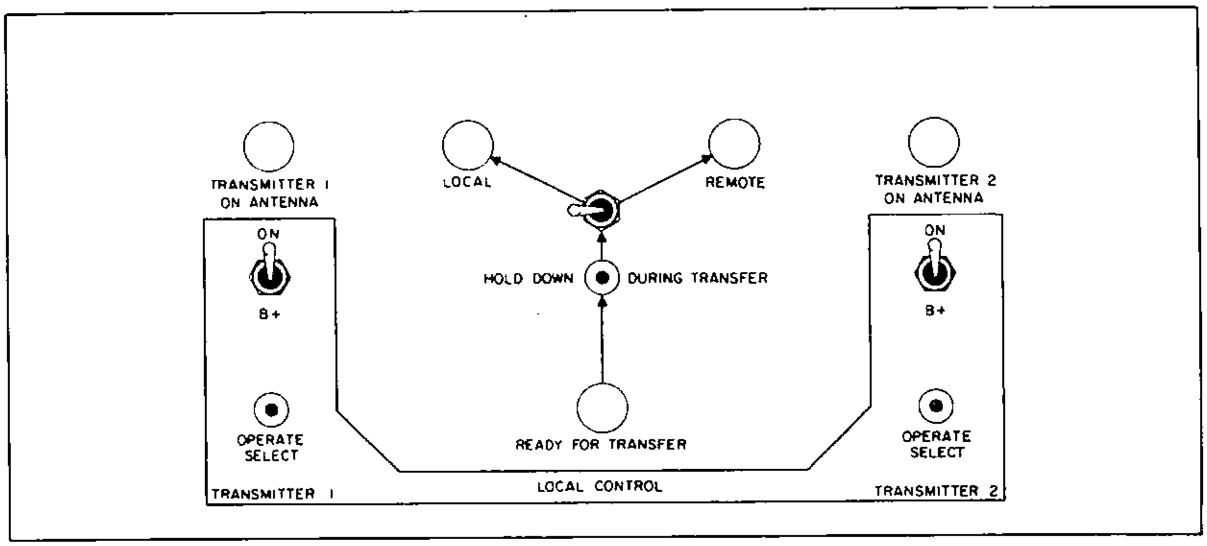
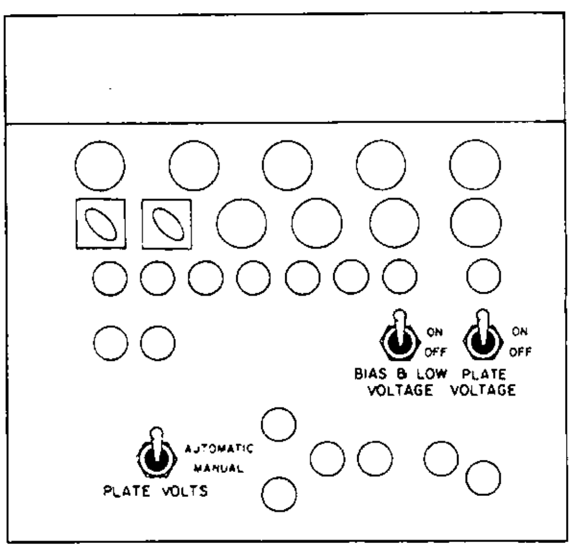


Figure 2.32. AN/FPN-42 Antenna Coupler and Power Supply Panels

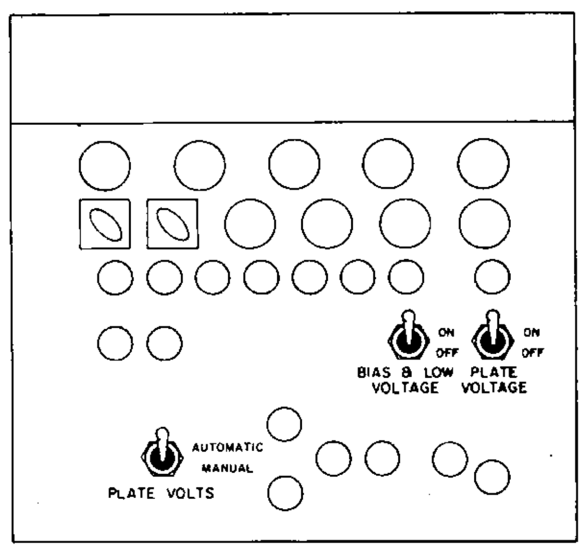
AN/FPN-44/45 TRANSMITTER



LOCAL CONTROL UNIT (UD5)



CONTROL INDICATOR C-4752 (1A3A2)
TRANSMITTER NO. 1



CONTROL INDICATOR C-4752 (1A3A2)
TRANSMITTER NO. 2

Figure 2.33. AN/FPN-44/45 Local Control and Control Indicator Panels

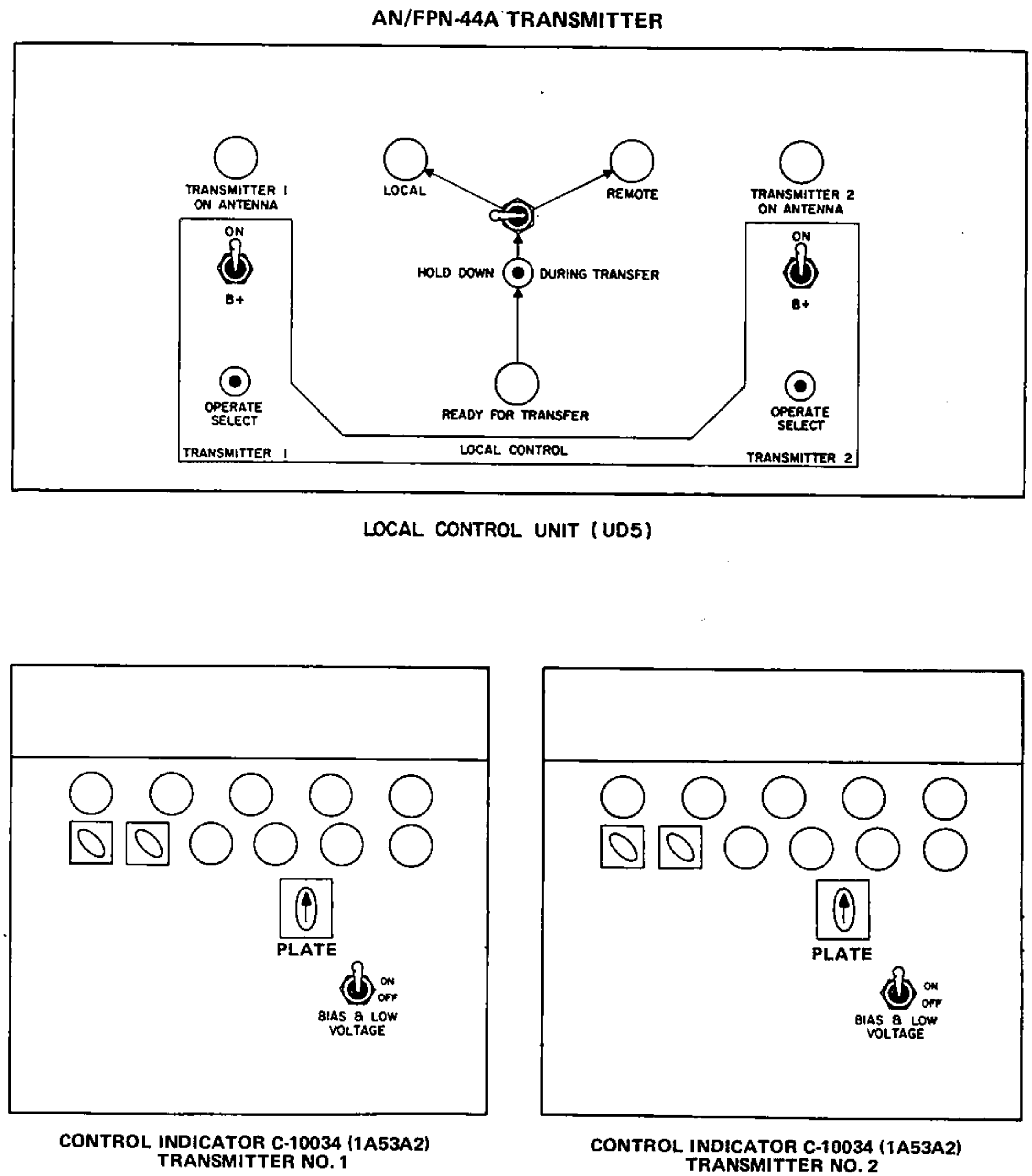


Figure 2.34. AN/FPN-44A Local Control and Control Indicator Panels

(3) The LOCAL/REMOTE switch on the Local Control Panel is in the LOCAL position.

(4) The BIAS switch turned on for both transmitters. The plate volts automatic switch in AUTOMATIC position. (both are on the transmitter, see Figures 2.32-2.33).

(5) Transmitter No.1 is the operate transmitter.

b. Press the LAMP TEST switch on the TCC, and the following should occur:

(1) All lights on the TCC illuminate.

(2) The Audio alarm sounds.

(3) The PGEN ALARM and OPERATE LEDs illuminate.

c. Release the LAMP TEST switch, and the following Lamps/LEDs remain lit:

(1) OPERATE LEDs on the operate PGENs.

(2) ON THE TCC: TRANSMITTER BUILDING CONTROL, TRANSMITTER 1 OPERATE,TRANSMITTER 2 STANDBY.

(3) ON THE LOCAL CONTROL PANEL: READY FOR LOCAL OPERATION and LOCAL CONTROL (AN/FPN-42), and READY FOR TRANSFER (AN/FPN-39/44/44A/45).

d. Record the present setting of the TRANSMITTER DRIVE ADJUST, for future reference. Turn the TRANSMITTER DRIVE ADJUST of the operate and standby PGENs, of the same rate, fully counterclockwise and observe the TCC OFF AIR and TRANSMITTER FAILURE lamps illuminate and the TRANSMITTER 2 STANDBY lamp extinguishes. Thirty seconds later the Audio alarm sounds.

e. Return the TRANSMITTER DRIVE ADJUST of the PGENs to the recorded settings of step d. The OFF AIR and TRANSMITTER FAILURE lamps extinguish, and the TRANSMITTER 2 STANDBY lamp illuminates.

f. Turn the standby transmitter BIAS switch off. The TRANSMITTER 2 STANDBY lamp extinguishes and the TRANSMITTER FAILURE lamp illuminates. The TRANSMITTER 1 OPERATE lamp blinks off for approximately 1 second.

g. Turn the standby transmitter BIAS switch on. The TRANSMITTER FAILURE lamp extinguishes. The TRANSMITTER 2 STANDBY lamp illuminates. The TRANSMITTER 1 OPERATE lamp blinks off for approximately 1 second.

h. Turn the TRANSMITTER DRIVE ADJUST of a standby PGEN fully counterclockwise. The NO TRANSMITTER DRIVE LED of the PGEN and the TRANSMITTER FAILURE lamp of the TCC illuminate. The TRANSMITTER 2 STANDBY lamp extinguishes.

i. Return the TRANSMITTER DRIVE ADJUST of the standby PGEN to its original position. The NO TRANSMITTER DRIVE LED of the PGEN and the TRANSMITTER FAILURE lamp of the TCC extinguish. The TRANSMITTER 2 STANDBY lamp illuminates.

2.6.6.2 The following steps require switching transmitters.

a. On the Local Control Panel, turn off the operate transmitter B+ switch, couple transmitter No. 2 to the antenna, turn on the B+ switch for transmitter No. 2, and observe the following indications:

(1) On the Local Control Panel, the READY FOR TRANSFER (AN/FPN-39/44/44A/45), TRANSMITTER 2 ON ANTENNA (all), READY FOR LOCAL OPERATION (AN/FPN-42), and LOCAL (all) lamps illuminate.

(2) On the TCC, the TRANSMITTER BUILDING CONTROL, TRANSMITTER 2 OPERATE, and TRANSMITTER 1 STANDBY lamps illuminate.

b. On the TCC, press the SWITCH TRANSMITTERS switch. There is no effect, as the system is in local control. Press the STANDBY TRANSMITTER B+ switch. There is no effect, as the system is in local control.

c. Repeat steps d. through i. of the paragraph 2.6.6.1.

d. Press the HOLD DOWN TO TRANSFER switch. Place the LOCAL/REMOTE switch on the Local Control Panel in the REMOTE position. Then release the HOLD DOWN TO TRANSFER switch. Observe on the TCC, that the TRANSMITTER BUILDING CONTROL lamp extinguishes, and the AUTOMATIC CONTROL lamp illuminates.

e. Press the STANDBY TRANSMITTER B+ switch on the TCC. Observe that the STANDBY TRANSMITTER B+ lamp illuminates.

f. Press the STANDBY TRANSMITTER B+ switch again. Observe that the STANDBY TRANSMITTER B+ lamp extinguishes.

g. Turn the TRANSMITTER DRIVE ADJUST of an operate PGEN fully counterclockwise. The OFF AIR lamp on the TCC illuminates.

h. Within 30 seconds of the above step, return the TRANSMITTER DRIVE ADJUST of the operate PGEN to its original position. This must be done to stop the automatic transmitter switch sequence. The OFF AIR lamp extinguishes.

i. Turn the TRANSMITTER DRIVE ADJUST of a standby PGEN fully counterclockwise. Observe that the PGEN's ALARM LED and TRANSMITTER FAILURE lamp illuminate and the Audio alarm sounds.

j. Press the SWITCH TRANSMITTER switch and observe that a transmitter switch does not occur.

k. Press the STANDBY TRANSMITTER B+ switch and observe that the STANDBY TRANSMITTER B+ lamp on the TCC illuminates. Press the switch again to extinguish the lamp.

l. Return the TRANSMITTER DRIVE ADJUST of the standby PGEN to its original position. This extinguishes the TRANSMITTER FAILURE lamp and secures the Audio alarm.

m. Turn off the standby transmitter BIAS switch. Observe that the TRANSMITTER FAILURE lamp illuminates, Audio alarm sounds, and that the TRANSMITTER 1 STANDBY lamp extinguishes.

n. Press the SWITCH TRANSMITTERS switch. Observe that a transmitter switch did not occur. The standby transmitter bias was turned off in the previous step, therefore, the standby transmitter is inoperative.

o. Press the STANDBY TRANSMITTER B+ switch and observe that the STANDBY TRANSMITTER B+ lamp remains extinguished (no standby transmitter).

p. Turn on the standby transmitter BIAS switch. Observe that the TRANSMITTER FAILURE lamp extinguishes and the Audio alarm is secured. Also observe, that the TRANSMITTER 1 STANDBY lamp illuminates.

2.6.6.3 Perform the the following steps to check the automatic transmitter change sequence:

a. Turn the TRANSMITTER DRIVE ADJUST of an operate PGEN fully counterclockwise. Observe the OFF AIR lamp illuminate. Thirty seconds later, observe the following:

(1) Different operate PGENs indicated.

(2) The TRANSMITTER 2 OPERATE, TRANSMITTER 1 STANDBY, and TRANSMITTER 2 ON ANTENNA lamps extinguish.

(3) The TRANSMITTER 1 ON ANTENNA and TRANSMITTER FAILURE lamps illuminate and the Audio alarm sounds.

b. Eight seconds later, observe that the TRANSMITTER 1 OPERATE lamp illuminates.

c. Eight to sixteen seconds later, observe the OFF AIR lamp extinguish.

d. Return the TRANSMITTER DRIVE ADJUST of the now standby PGEN to its original position. This clears the TRANSMITTER FAILURE lamp and secures the Audio alarm.

e. Press the SWITCH TRANSMITTERS switch on the TCC. Observe the following:

(1) The SWITCH TRANSMITTERS lamp remains lit during the pressing of the switch.

(2) The TRANSMITTER 1 ON ANTENNA, TRANSMITTER 1 OPERATE, and TRANSMITTER 2 STANDBY lamps extinguish.

(3) The OFF AIR, TRANSMITTER 1 STANDBY, and TRANSMITTER 2 ON ANTENNA lamps illuminate.

(4) Eight seconds later, observe the TRANSMITTER 2 OPERATE lamp illuminate.

(5) Eight to sixteen seconds later, observe the OFF AIR lamp extinguish.

2.6.6.4 This completes the initial operation. Install other equipments of the Loran system.

2.6.7 TCS Input Signals. Table 2.6 is a list of the Input Signals to the Transmitter Control Set.

Table 2.6. TCS INPUT SIGNALS

	EQUIPMENT	JACK OR TERMINAL	SIGNAL
INPUTS TO TCS	EPA	J12	PCI High Rate
		J13	PCI Low Rate
	WP	J3	ENV TRIG +
		J4	ENV TRIG -
	I/F	J1	High Rate 100 kHz
		J2	High Rate MPT
		J3	High Rate PC Reset
		J4	High Rate PC Set
		J5	High Rate Local Interval
		J7	High Rate Local Interval
		J8	Low Rate 100 kHz
		J9	Low Rate MPT
		J10	Low Rate PC Reset
		J11	Low Rate PC Set
		J12	Low Rate ET & EMPT
		J14	Low Rate Local Interval
		J23A	XMTR No. 1 AC Control Voltage Common
		J23B	XMTR No. 1 Ready Relay
		J23D	XMTR No. 1 Plate On Return
		J23E	Antenna Switching, XMTR No. 2 to Antenna
		J23F	Antenna Switching, XMTR No. 1 to Antenna
		J23G	Remote DC Common
		J23H	Ready for Remote Common
		J23J	Standby XMTR AC Common
		J23L	XMTR No. 2 AC Control Voltage Common
		J23M	XMTR No. 2 Ready Relay
		J23P	XMTR No. 2 Plate On Return
		J23R	XMTR No. 2 Operate Relay
		J23S	XMTR No. 1 Ready for Remote
		J23T	XMTR No. 2 Ready for Remote
		J23U	Remote Relay
		J25	Operate RF
		J26	Standby RF

2.6.8 TCS Output Signals. Table 2.7 is a list of the Output Signals from the Transmitter Control Set.

Table 2.7. TCS Output Signals

OUTPUTS FROM TCS	I/F	J6	High Rate Operate RF
		J13	Low Rate Operate RF
		J19	TCS Alarm Data
		J28	XMTR No. 1 Drive Waveform
		J30	XMTR No. 2 Drive Waveform
		J32	M175 No. 1
		J34	M175 No. 2
		J36	XMTR No. 1 ET & EMPT
		J38	XMTR No. 2 ET & EMPT
	EPA	J10	ECD Chart Recorder Drive
		J11	LOCAL ENV X-OVER (+ TRIGGER ONLY)

2.7. TAIL DRIVE ADJUSTMENT Tail Drive adjustment procedures apply only to the W0678-19B/GR DROOP module for the AN/FPN-44/44A/45 Transmitters with feedback modification installed.

a. The Group Droop module (W0678-19B/GR-DR) is used to generate a tail drive signal for AN/FPN-44/44A/45 Transmitters that have the Feedback modification installed. The Group Droop section of this module is not used.

b. The preliminary adjustments outlined in section 2.7.1.1 are performed on the Pulse Generators (PGENS) that are driving the standby transmitter. This will ensure a drive signal that requires a minimum of on-air adjustments. This will also verify that the module is operating properly.

2.7.1.2 This completes the initial adjustment procedure. Operate the standby transmitter into the dummy load and check for proper operation of the equipment.

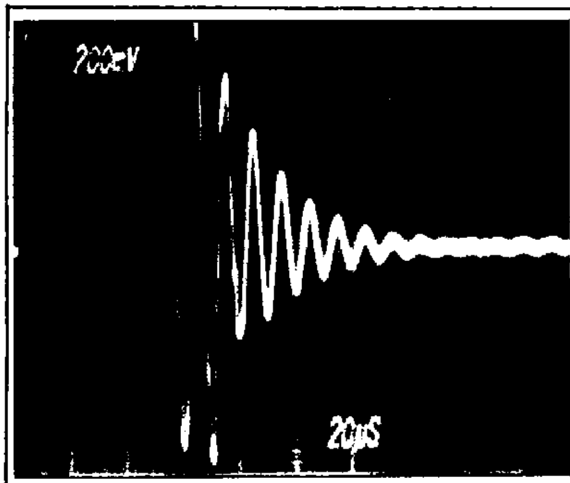
2.7.1.3 ON-AIR ADJUSTMENTS The on-air adjustment of the Group Droop module will require that the operator be familiar with the effect that R25 has on the transmitter drive waveform. The following steps are the suggested method of performing the on-air adjustments to obtain optimum transmitted signal parameters. All adjustments are made to the operate PGENs. Place the transmitter to be adjusted on air.

a. Monitor the transmitted signal from the EPA front panel OPERATE jack. Trigger the oscilloscope from the PGEN of the rate to be adjusted.

b. Using the procedure outlined in Paragraph 2.7.1.1, set up the oscilloscope to monitor the Reference Envelope and the transmitted signals 5th pulse.

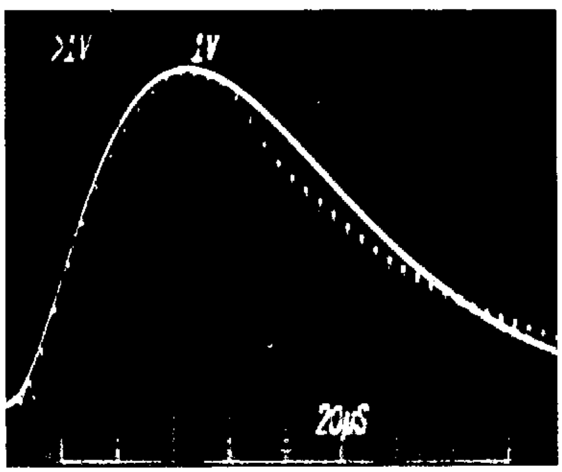
c. If the transmitted tail does not match the level of the Reference Envelope at 80 usec, adjust the 8th/16th thumbwheel switch to achieve the closest match. (see figures 2.38 and 2.39)

d. Adjust R25 in small increments so that the transmitted tail



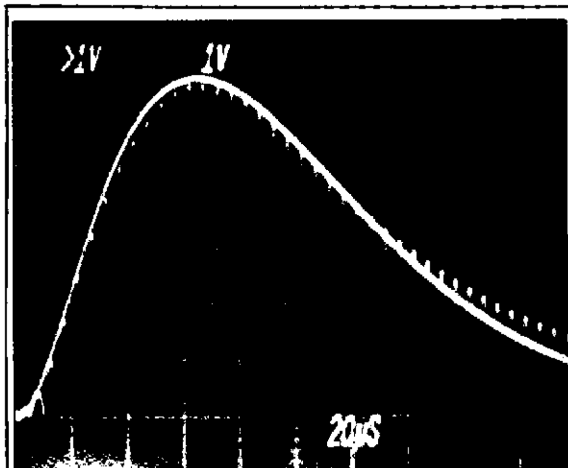
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center of Graticule	SIGNAL: PGEN Front Panel Jack	TRIGGER: External (+)
		MODE: Delayed Sweep
	TRIGGER: PGEN Scope Trigger Jack	HORIZONTAL: Main 1mSec Delay 20uSec
		VERTICAL: 0.2 V/Div

Figure 2.37. Transmitter Drive Waveform with Tail Drive



COMMENTS	SOURCE	SETTINGS
GROUND REF:	SIGNAL: WP REF ENV WP Full Wave Rectified RF	TRIGGER: External (+)
		MODE: Delayed Sweep
	TRIGGER: PGEN Scope Trigger Jack	HORIZONTAL: Main 1mSec Delay 20uSec
		VERTICAL: 1.0 V/Div

Figure 2.38. RF Waveform and Reference Envelope without Tail Drive



COMMENTS	SOURCE	SETTINGS
GROUND REF:	SIGNAL: WP REF ENV WP Full Wave Rectified RF	TRIGGER: Extenal (+)
		MODE: Delayed Sweep
	TRIGGER: PGEN Scope Trigger Jack	HORIZONTAL: Main 1mSec Delay 20uSec
		VERTICAL: 1.0 V/Div

Figure 2.39. RF Waveform and Reference Envelope with Tail Drive

2.8 De-installation and Shipping. Paragragh 2.8.1 contains instructions for the complete de-installation of the TCS units. Paragraph 2.8.2 contains instructions for the de-installation of some of the TCS units, while maintaining operations. Paragraph 2.8.3 contains instructions for the shipping of the unit involved.

2.8.1 De-energize the unit to be de-installed. Disconnect all cables from the unit. Remove the unit from the equipment rack.

2.8.2 Below are procedures to de-install TCS units, while maintaining operations:

NOTE

Take local control prior to the removal of any unit. If the removal of the EPA or TCC takes too long, the cycle compensation loop will jump, due to OP RF load change and amplitude shift.

a. Standby PGEN(s) - unplug unit, disconnect all cables, and remove from the equipment rack.

b. Electrical Pulse Analyzer (EPA)

(1) Unplug AC power cord.

(2) Disconnect all cables.

(3) Reconnect W0678-8/PA Interconnect cable to dummy load (see Figure 2.40 for dummy load internal wiring).

(4) Remove from equipment cabinet.

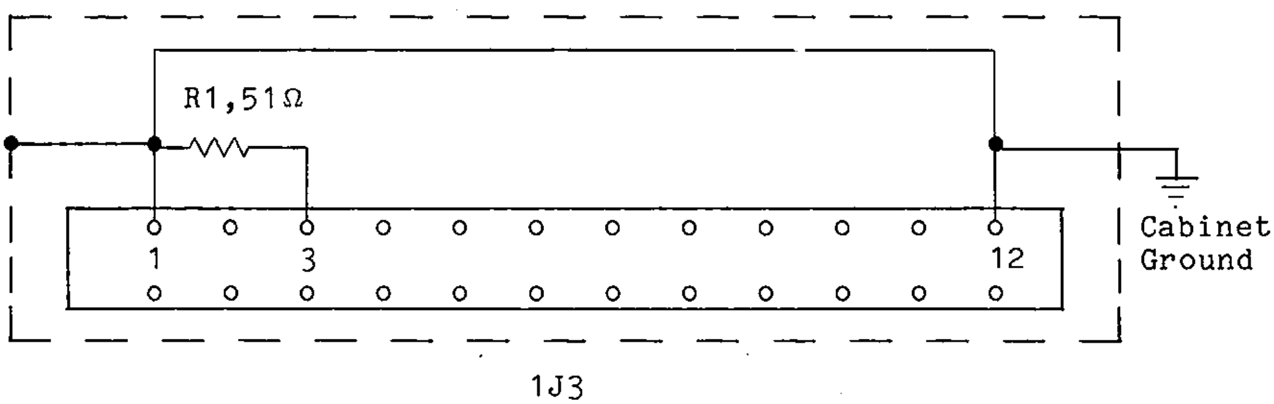


Figure 2.40. EPA Dummy Load Internal Wiring

2.8.2.c. Transmitter Coupler Control (TCC)

(1) Place transmitters in Transmitter Building Control.

(2) Unplug AC power cord.

(3) Disconnect all cables.

(4) Reconnect W0678-7/Interconnect cable to dummy load (see Figure 2.41 for dummy load internal wiring).

(5) Remove from equipment cabinet.

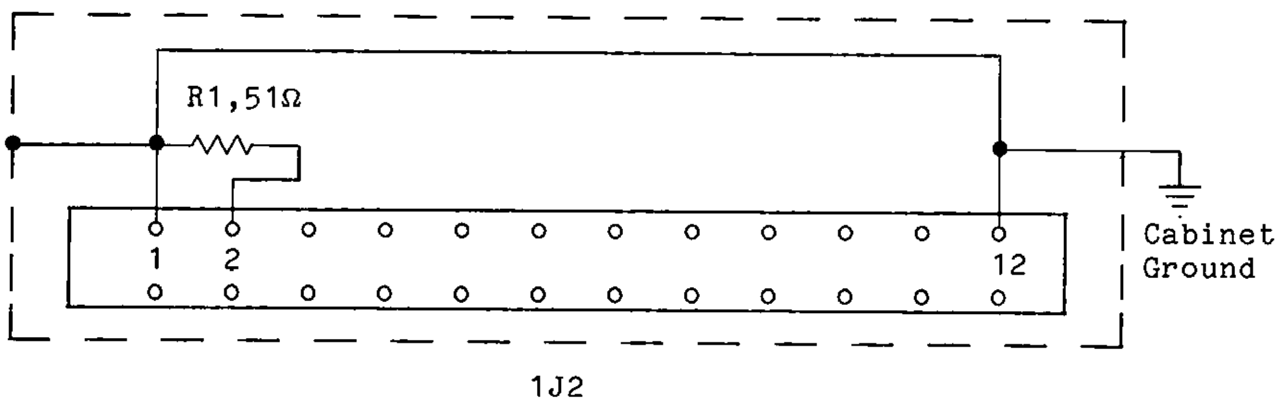


Figure 2.41. TCC Dummy Load Internal Wiring

2.8.3 Return the defective unit in the accordance with applicable instructions. Refer to MIL-E-17555G for packing instructions.

CHAPTER 3

OPERATION

3.1 Introduction. The Transmitter Control Set provides various alarm and transmitter status information to the watchstander. It also routes the drive signal to the transmitter and monitors various parameters of the transmitted signal. The Switch Assembly, TCC, EPA, PGENs, and Waveform Panel have controls and/or indicators listed in the following paragraphs. The following units either provide information to, or act as an interface for, the TCS:

a. AN/FPN-54A Loran Timing Set(s) (MPT, PCI, LI, 100 kHz, PC Set, PC Reset).

b. Current Transformer, Pearson Model 1705 (antenna and dummy load RF).

c. Status Alarm Unit (displays alarm information).

d. Time Interval Counter Panel (displays timing information).

e. Transmitter/coupler (allows for remote/local control).

3.2 Controls and Indicators.

3.2.1 Switch Assembly. The Switch Assembly (Figure 3.1) contains the following controls:

REFERENCE	DESIGNATION	DESCRIPTION
1	EMERGENCY STOP SWITCH	These switches (S1 for transmitter #1, S2 for transmitter #2) provide for the shutdown of power to the transmitters to prevent injury to personnel or damage to equipment. The switches are connected in series with other emergency stop switches located on the station. The switch is reset by the activation of the transmitter START button.

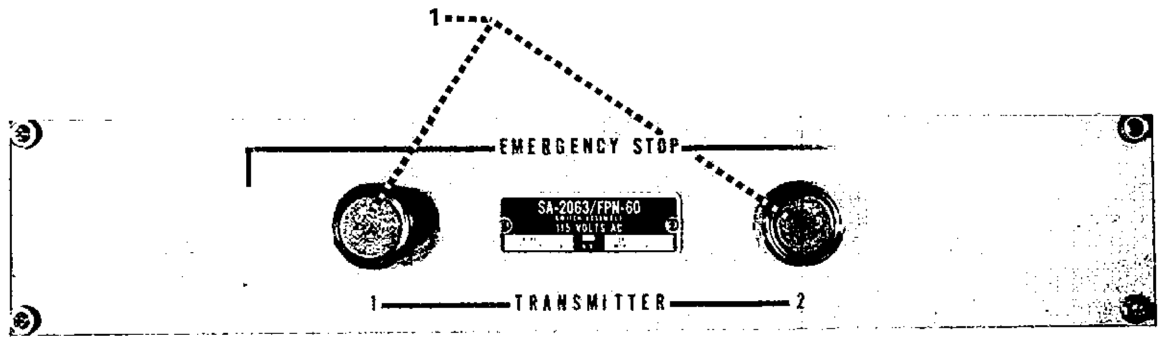


Figure 3.1. Switch Assembly

3.2.2 Transmitter Coupler Control. The following is a list of the controls and indicators of the TCC (see Figure 3.2):

REFERENCE	DESIGNATION	DESCRIPTION
1	SWITCH TRANSMITTERS switch/lamp (S1)	Activation of this pushbutton switch remotely switches the transmitters. When illuminated, this lamp is amber.
2	AUTOMATIC CONTROL lamp (DS1)	This lamp indicates that the transmitter switching function is controlled by the TCC. When illuminated, this lamp is green.
3	TRANSMITTER 1 OPERATE/STANDBY (DS2)	These lamps indicate whether Transmitter 1 is coupled to the antenna or is in a ready state, with the associated PGEN(s) providing TDW(s). When illuminated, OPERATE is green and STANDBY is white.
4	OFF AIR lamp (DS6)	This lamp indicates the failure of the operate PGEN(s) or that the transmitted signal is below the prescribed antenna current level. This lamp is normally off. When illuminated, this lamp is red.
5	Audio alarm	This audio alarm sounds when a TRANSMITTER FAILURE, OFF AIR, or LOW POWER indication is observed. This alarm is normally off.
6	LAMP TEST switch/lamp (S4)	Activation of this pushbutton switch tests all the lamps/LEDs of the TCC and PGENs. When illuminated, the lamp is yellow.

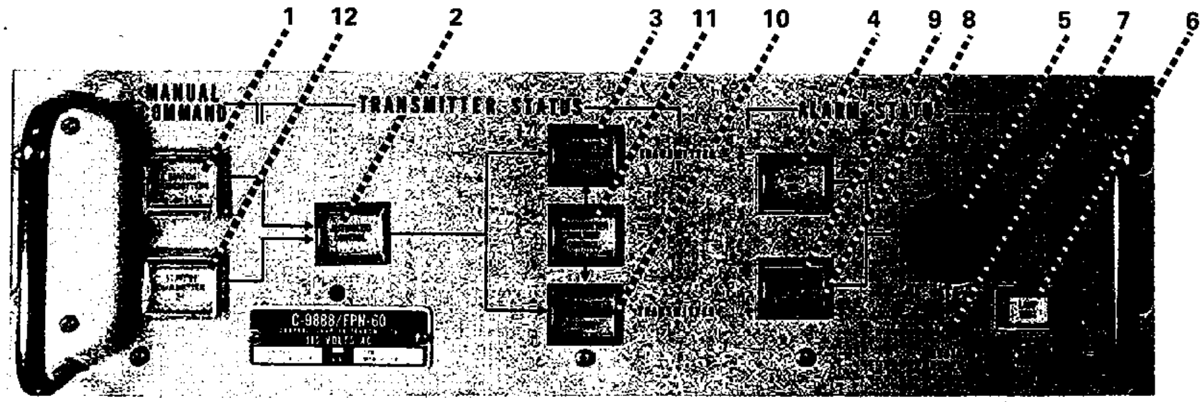


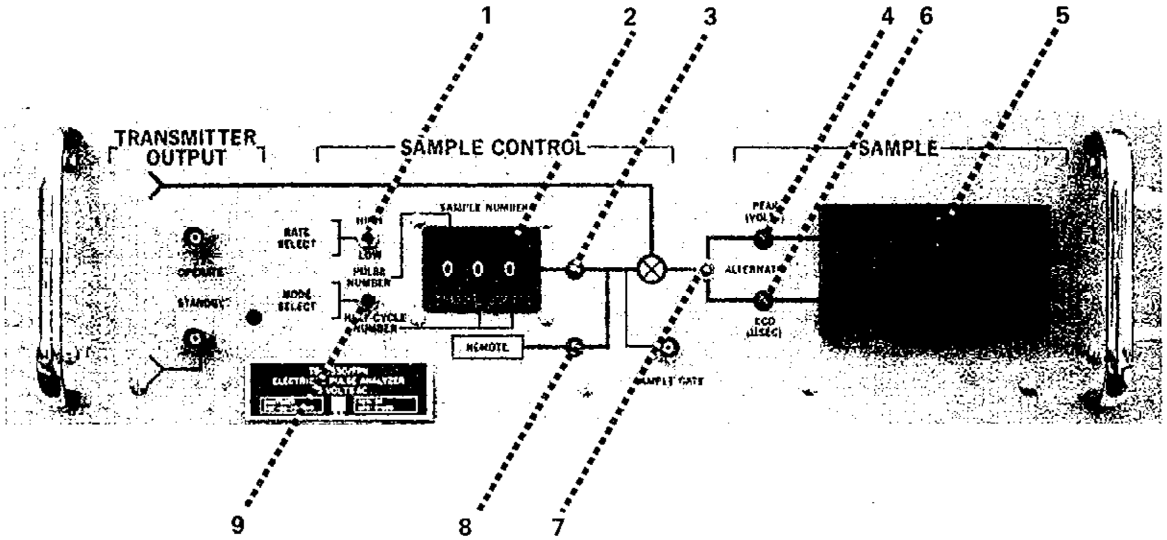
Figure 3.2. TCC Controls and Indicators

REFERENCE	DESIGNATION	DESCRIPTION
7	AUDIO RESET (S3)	This pushbutton switch secures the audio alarm.
8	LOW POWER lamp (DS5)	This lamp indicates a transmitter low power or PGEN low drive level condition that occurred prior to a transmitter switch. This lamp is normally off. When illuminated, this lamp is red.
9	TRANSMITTER FAILURE lamp (DS5)	This lamp indicates the failure of the standby PGEN(s), or that the operate transmitter has been off air for at least 30 seconds, or that the standby transmitter is not in a ready status. This lamp is normally off. When illuminated, this lamp is red.
10	TRANSMITTER 2 OPERATE/STANDBY (DS4)	These lamps indicate whether Transmitter 2 is coupled to the antenna or is in a ready state, with the associated PGEN(s) providing TDW(s). When illuminated, OPERATE is green and STANDBY is white.
11	TRANSMITTER BUILDING CONTROL lamp (DS3)	This lamp indicates that the transmitter switching function is controlled from the transmitter building. When illuminated, this lamp is yellow.

REFERENCE	DESIGNATION	DESCRIPTION
12	STANDBY TRANSMITTER B+ switch/lamp (S2)	This pushbutton switch is used to energize or de-energize the standby transmitter's B+ voltage. If the standby transmitter is not in a ready status, the B+ voltage cannot be energized. When illuminated, the lamp is yellow.

3.2.3 <u>Electrical Pulse Analyzer</u>. The following are the controls and indicators of the EPA (see Figure 3.3):

REFERENCE	DESIGNATION	DESCRIPTION
1	RATE SELECT switch (S1)	This switch is provided for use at dual-rated stations. At single-rated stations, actuation of the switch does not affect operation.
2	SAMPLE NUMBER switch (S3)	This is a three digit thumbwheel switch. The pulse number to be sampled is selected by the setting of the left most thumbwheel. The half-cycle number is selected by the setting of the center and right thumbwheels.
3	Local control indicator (DS1)	This indicator is illuminated (yellow) when the EPA is in local control. This indicator is normally on.
4	PEAK (VOLTS) (DS3)	This indicator is illuminated (green) when a peak voltage measurement is being displayed.
5	Display	This DPM displays the value of the quantity measurement.
6	ECD (μsec) (DS4)	This indicator is illuminated (green) when an ECD measurement is being displayed.
7	PEAK/ALTERNATE/ECD switch (S6)	This toggle switch provides for a selection of the quantitative value of the pulse or half-cycle peak voltage samples. The results are displayed on the Digital Panel Meter. The switch can be set to PEAK (measures peak amplitude in volts), ECD (takes average of



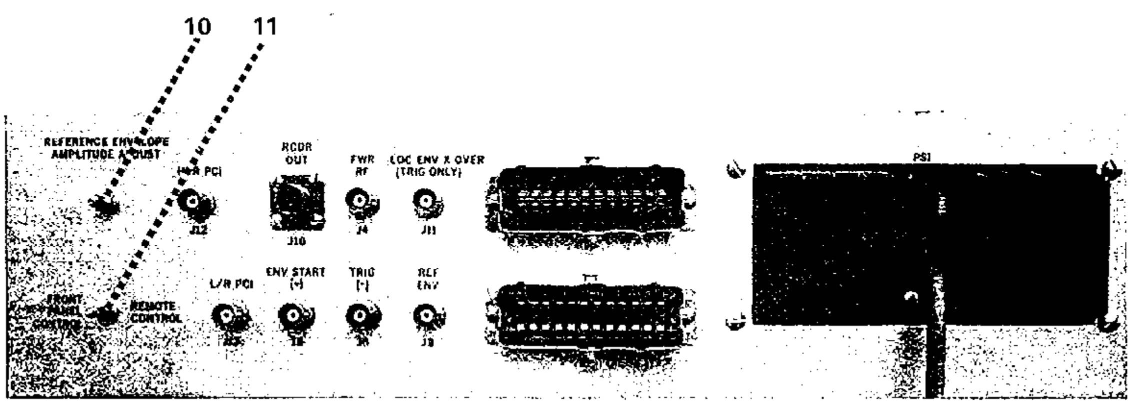


Figure 3.3. EPA Controls and Indicators

REFERENCE	DESIGNATION	DESCRIPTION
		first pulse and third pulse (for master) or seventh pulse (for secondary)) in μsec, or ALTERNATE (alternates between the two). The ALTERNATE and ECD (μsec) settings result in a blank SAMPLE display unless the MODE SELECT switch is in the PULSE NUMBER position.
8	REMOTE control indicator (DS2)	This indicator is illuminated (green) when the EPA is in remote control. This indicator is normally off.
9	MODE SELECT switch (S2)	This switch is a two position toggle switch which selects between PULSE NUMBER and HALF-CYCLE NUMBER mode of operation. In the PULSE NUMBER position, the SAMPLE display indicates peak voltage or ECD of the pulse selected, depending on the position of the PEAK/ALTERNATE/ECD switch. In the HALF-CYCLE NUMBER position, the SAMPLE display indicates the peak voltage of the half cycle of the pulse selected by the SAMPLE NUMBER thumbwheel switch. The PEAK/ALTERNATE/ECD switch must be placed in the PEAK voltage position when the mode switch is in the HALF-CYCLE position.
10	REFERENCE ENVELOPE AMPLITUDE ADJUST	This is a potentiometer on the rear of the EPA that allows the adjustment of the amplitude of the Reference Envelope signal available at J9. Refer to Figure 5.18 for the adjustment of this potentiometer.
11	FRONT PANEL CONTROL/ REMOTE CONTROL switch (S5)	This switch is on the rear of the EPA and selects EPA control via either the front panel or remote control. The remote control option is not used, and if selected, will disable the front panel controls, causing the Display to be blank.

3.2.4 Pulse Generator. The following is a list of the controls and indicators of the PGEN (see Figure 3.4):

REFERENCE	DESIGNATION	DESCRIPTION
1	1st MPT (NON Ø CODED) 2nd MPT (Ø CODED) switch (S1)	This two position toggle switch is used to select the oscilloscope trigger for the SCOPE TRIGGER jack on the front panel. The selectable triggers are the first MPT or the second MPT.
2	PULSE SYNTHESIZER switches (S2)	The PULSE SYNTHESIZER switches are used to adjust the amplitude of the sixteen half-cycles of the Transmitter Drive Waveform or of the eight full cycles (using the first eight thumbwheel switch sections from the left) of the Transmitter Drive Waveform. The S1 switch on the PCON module is used to select half-cycle or full cycle control.
3	Ø CODE BALANCE potentiometer	This potentiometer is used to minimize the amplitude variation (bounce) in alternating phase-coded pulses.
4	ALARM - NO TRANSMITTER DRIVE (DS2)	This light emitting diode (red) illuminates when the TDW signal level falls below 1 volt peak-to-peak.
5	TRANSMITTER DRIVE ADJUST	This potentiometer is used to adjust the amplitude of the Transmitter Drive Waveform (TDW).
6	OPERATE (DS1)	This light emitting diode (green) indicates that the PGEN is supplying the drive signal to the transmitter.
7	DROOP switches (S3)	This seven section thumbwheel switch is used to adjust the amplitude of the second through the eighth pulses. This switch is not used with the Group Droop module (set all switches to "0").

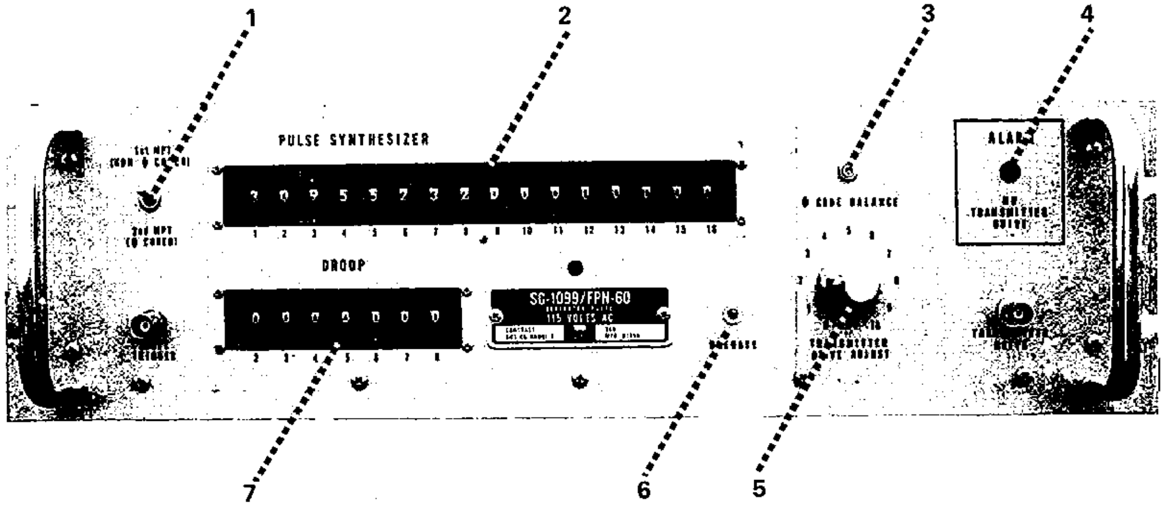


Figure 3.4. PGEN Controls and Indicators

3.2.5 Waveform Panel. The Waveform Panel (Figure 3.5) has the following control:

REFERENCE	DESIGNATION	DESCRIPTION
1	SCOPE TRIGGER switch	This switch allows for the selection of the oscilloscope trigger for the high or low rate signal(s).

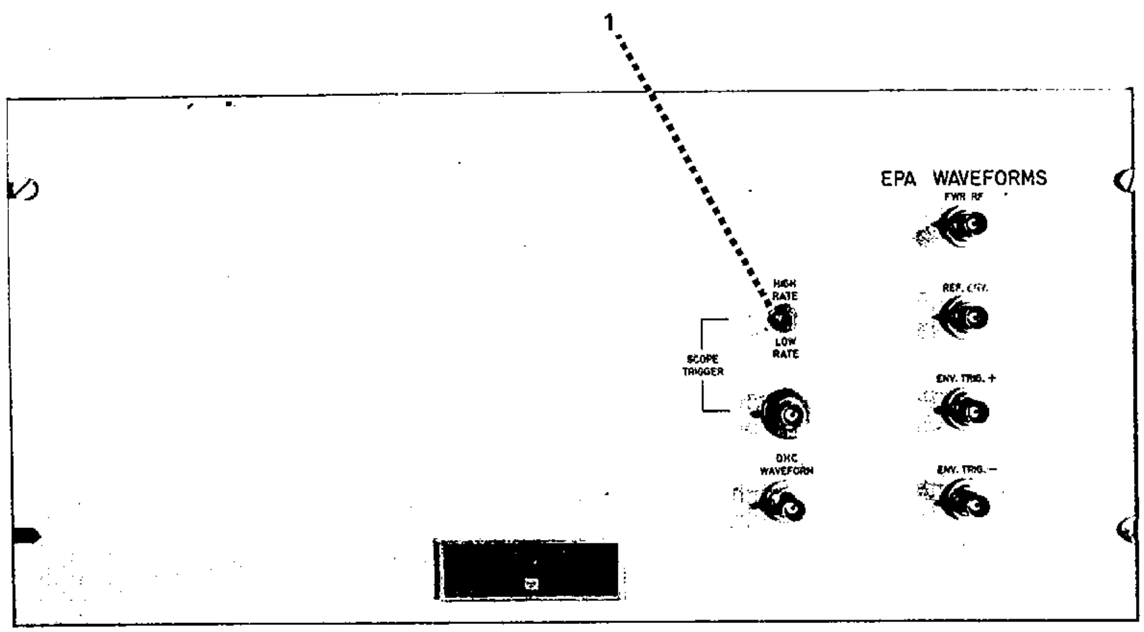


Figure 3.5. Waveform Panel Control

3.3 Operating Procedures. Ensure that all units of the TCS are installed in the cabinet and all programming and operational checks have been made prior to performing any steps in the following paragraphs.

3.3.1 Equipment turn-on. The TCC, EPA, and PGENS are turned on by plugging the power cords into the power strip in the electrical equipment cabinet.

3.3.2 Modes of operation. The TCS has only the local mode of operation.

3.3.2.1 Pulse shape monitoring. Refer to Figure 3.6 and the following steps to monitor the pulse shape:

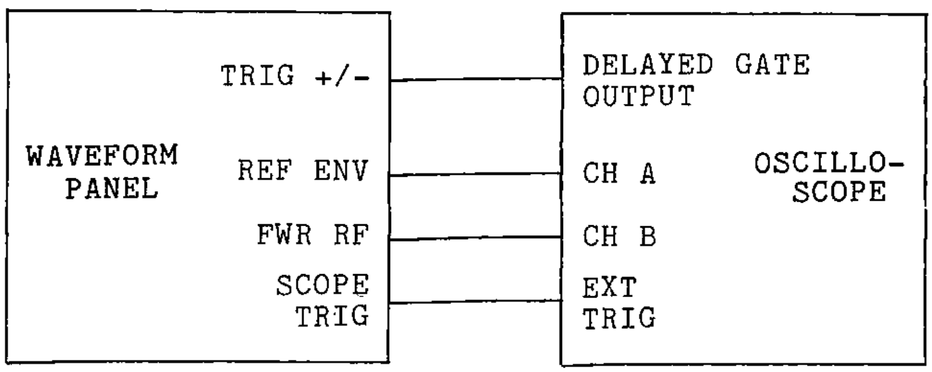


Figure 3.6. Equipment Setup for Pulse Shape Monitoring

a. Set vertical Channels A and B to 0.5 volts per division.

b. Set the oscilloscope to External Trigger mode, Display Trigger Source to alternate, and Time Base to 1 millisecond per division.

c. Using the Delay Vernier Control, set the Reference Envelope waveform on the pulse to be checked.

d. With the Reference Envelope set on the desired pulse, set the Delay Sweep Control to 10 microseconds per division.

e. The amplitude of the Reference Envelope may be adjusted by the Reference Amplitude Adjust potentiometer on the rear of the EPA.

3.3.2.2 Pulse amplitude monitoring. Refer to Figure 3.7 and the following steps to monitor the pulse amplitude:

a. Set vertical Channel A to 2 volts per division.

b. Set vertical Channel B to 5 volts per division.

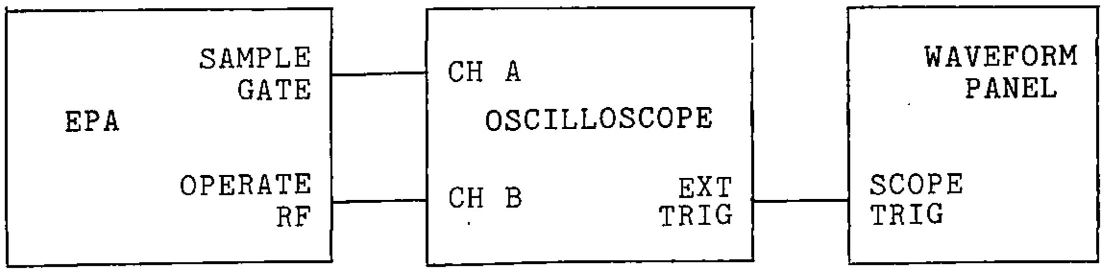


Figure 3.7. Equipment Setup for Pulse Amplitude Monitoring

c. Connect the Waveform Panel Scope Trigger jack to the external Trigger input of the oscilloscope. Set the PEAK/ALTERNATE/ECD switch to ALTERNATE.

d. Set the MODE SELECT switch to the Pulse Number position.

e. Set the left-hand thumbwheel of the SAMPLE NUMBER switch to the number of the desired pulse.

f. Set the oscilloscope Time Base to 1 millisecond per division.

g. As the SAMPLE NUMBER switch is changed, the Sample Gate will move across the oscilloscope to the corresponding pulse, and the peak voltage/ECD will alternately be displayed.

3.3.2.3 Half-cycle amplitude monitoring. Refer to Figure 3.8 and the following steps to monitor the half-cycle amplitude:

a. Set vertical Channel A to 2 volts per division.

b. Set vertical Channel B to 5 volts per division.

c. Connect the Waveform Panel SCOPE TRIGGER jack to the External Trigger input of the oscilloscope.

d. Set the EPA PEAK/ALTERNATE/ECD switch to PEAK (VOLTS).

e. Set the EPA MODE SELECT switch to the HALF-CYCLE position.

f. Set the EPA SAMPLE NUMBER switch to the desired half-cycle number.

g. As the SAMPLE NUMBER switch is changed, the Sample Gate will move across the scope to the corresponding half-cycle.

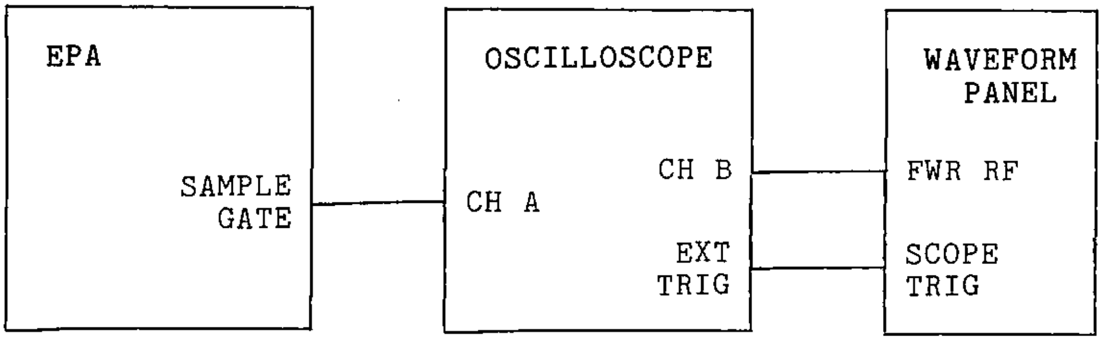


Figure 3.8. Equipment Setup for Half-Cycle Amplitude Monitoring

3.3.2.4 Droop and Phase Code monitoring. Refer to Figure 3.9 and the following steps to monitor droop and phase code:

a. Connect the Waveform Panel SCOPE TRIGGER jack to the External Trigger input of the oscilloscope.

b. Set vertical Channel A to 5 volts per division.

c. Set the oscilloscope Time Base to 1 millisecond per division.

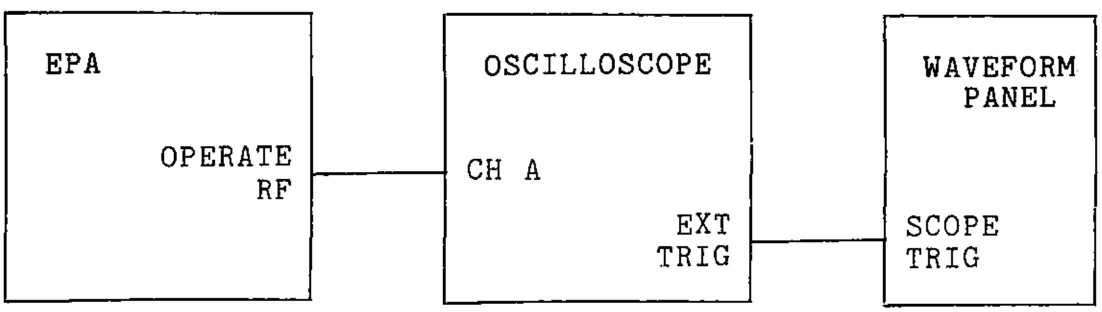


Figure 3.9. Equipment Setup for Droop and Phase Code Monitoring

3.3.3 Equipment turn-off. The TCC, EPA, and PGENs are secured by removing the plugs from their electrical receptacles. The power to the cabinet is secured at the wall circuit breaker.

3.3.4 Emergency turn-off. In the event of an emergency, power to the TCS equipment can be secured at the wall circuit breaker.

CHAPTER 4

THEORY OF OPERATION

4.1 Introduction. The Transmitter Control Set (TCS) receives signals from the Loran Timing Set(s), processes these signals, and generates the drive signals for the transmitters. The TCS monitors the Operate RF and the status of the transmitters, and provides a means of emergency shut down of the transmitters. The TCS also displays various alarm information for the station watchstander. Figure 7.1 shows the Loran-C System Block Diagram. Figure 7.2 shows the Transmitter Control Set Functional Block Text Diagram.

4.2 Functional Description.

4.2.1 Switch Assembly. There is a normally closed, manually actuated, pushbutton switch on this panel for each transmitter. The switches are connected in series with the transmitter stop and emergency stop switches in the associated transmitting equipment (refer to applicable transmitting set technical manual for location). Depressing a switch interrupts the control voltage to the holding coil of the transmitter blower control relays (refer to applicable transmitting set technical manual). The switches are used to secure power to the transmitters to prevent injury to personnel or damage to equipment.

4.2.2 Transmitter Coupler Control. The TCC monitors the Operate RF and the status of the transmitters. With the standby transmitter in a ready status, the standby PGEN(s) providing drive waveform(s), and the antenna coupler in remote control, the TCC controls the switching of the transmitters. When the TCC detects a drop below a preset level of the Operate RF or an operate PGEN failure, the TCC will automatically switch transmitters. Otherwise, the switching of transmitters is accomplished by the actuation of the SWITCH TRANSMITTERS switch. The standby transmitter's B+ voltage is controlled by the TCC when the antenna coupler is in remote control. The TCC displays OFF AIR, TRANSMITTER FAILURE, and LOW POWER conditions.

4.2.3 Electrical Pulse Analyzer. The EPA displays half-cycle amplitude, pulse amplitude, and ECD information. The EPA receives signals from the I/F Unit and Loran Timing Set(s). The EPA also receives an oscilloscope (via the Waveform Panel) trigger, which is used to generate the Reference Envelope. The EPA provides for oscilloscope viewing of a Local Envelope Crossover trigger, a Full Wave Rectified RF, a Reference Envelope, and RF signals.

4.2.4 Pulse Generator. The PGEN generates the drive signal required by the transmitter in order to radiate the standard LORAN-C pulse. The drive signal shape is adjustable by the 16-section PULSE SYNTHESIZER digital thumbwheel switch. The PGEN also controls droop compensation and phase code balance. Another output of the PGEN is an oscilloscope trigger.

4.2.5 Waveform Panel. The Waveform Panel provides a convenient access to the Full Wave Rectified RF, the Reference Envelope, and a Scope Trigger. The Envelope Triggers (+ and -) are inputs to the Waveform Panel which are used by the EPA to develop the Reference Envelope. The Waveform Panel has an "optional" waveform jack that is not used.

4.2.6 Interface Unit. The Interface Unit is an interface between the transmitters and the Loran Timing Set(s). The Interface Unit receives signals from the PGENs, TCC, Switch Assembly, Loran Timing Set(s), and current transformers. Signals are passed to the transmitters, PGENs, EPA, TCC, and Status Alarm Unit.

4.3 Unit Description.

4.3.1 Transmitter Coupler Control (see Figure 7.14).

4.3.1.1 W0678-5/XMTR CON module (see Figure 7.16). The TTL active low Transmitter 1 & 2 Operate, Transmitter 1 & 2 Ready & Ready, Remote and Local signals are inputs to the Transmitter Status section on this module. These signals are inputs to set-reset circuits, and become active high signals. The transmitter operate signals are then routed to the Status Steerage, Loss of Signal Detector, and Transmitter Selector sections and the W0678-6/XMTR CON DVR module. The loss of transmitter drive alarms from the PGENs and Operate RF are inputs to the Loss of Signal Detector section. In this section, these signals are compared to detect an off air condition and triggers the timer chip to start counting the 30 seconds before a transmitter failure condition is indicated. This 30 second time period is to prevent a transmitter switch as a result of a transient overload condition. At single-rated stations, the PGEN I & II High Rate lines are tied to ground. The Initialize section resets the OFF AIR and TRANSMITTER FAILURE circuits on power up or a transmitter switch. The actuation of the standby transmitter's B+ switch turns on the standby transmitter's B+ voltage via the W0678-6/XMTR CON DVR module and the W0678-13/Relay Assembly. The transmitter (from the Transmitter Status section) and PGEN (from the Loss of Signal Detector section) signals are inputs to the Status Steerage section. This section generates alarm condition signals and signals for the lamp driver circuits on the W0678-6/XMTR CON DVR module. Outputs of this section are inputs to the Visual Alarm Generator, Audio Alarm Generator, and Interrupt Timer Start sections. Other outputs of the Status Steerage section are signals to the TRANSMITTER 1 STANDBY and TRANSMITTER 2 STANDBY lamp driver circuits on the W0678-6/XMTR CON DVR module. Outputs from the Loss of Signal Detector, Status Steerage, and Interrupt Timer Start sections are used in the Visual Alarm Generator section to generate the signals for the TRANSMITTER FAILURE and LOW POWER circuits, in the W0678-6/XMTR CON DVR module. The LOW POWER signal becomes active when the TCC is in remote control and a switch has been made to a transmitter which has low PGEN drive, but not an alarm condition. In the Audio Alarm Generator section, when the transmitter is in local control, the Audio alarm sounds when the LOW POWER and TRANSMITTER FAILURE circuits are enabled. When the transmitter is in remote control, the Audio alarm sounds when the TRANSMITTER FAILURE circuit is enabled. The Loss of Signal Detector, Status Steerage, and Manual Transmitter Command sections input signals to the Interrupt Timer Start section. The output of this section triggers the 8 Second

Interrupt Timer section, generating an eight second delay in switching transmitters. During this eight second delay, the high voltage in the standby transmitter is brought up to the proper level. This delayed signal is an input to the W0678-6/XMTR CON DVR module and the Transmitter Selector section. The SWITCH TRANSMITTERS switch on the front panel controls the inputs to the Manual Transmitter Command section. The Transmitter Selector section inputs are the Remote and Operate signals from the Transmitter Status section, the 8 second delayed signal from the 8 Second Interrupt Timer section, and the Initialize signal. This section generates the Latch and Reset signals for the W0678-6/XMTR CON DVR module and Standby B+ Control section of this module. The STANDBY TRANSMITTER B+ switch on the front panel provides the other inputs to the Standby B+ Control section. The output turns on/off the standby transmitter's B+ voltage, when the TCC is displaying AUTOMATIC CONTROL.

4.3.1.2 W0678-6/XMTR CON DVR (see Figure 7.18). This module contains nine lamp drivers, one alarm driver, and four relay driver circuits. Each circuit generates two outputs. One output latches or resets a relay, lights a lamp, or sounds an alarm. The other output is provided for computer control. The computer control outputs are not presently used. The inputs to the circuits are generated on the W0678-5/XMTR CON module. The C-LDR-2 and C-LDR-5 Lamp Drivers also have inputs from the respective Relay Drivers. The LAMP TEST switch on the front panel also activates the lamp drivers and the alarm driver.

4.3.1.3 W0678/Relay Assembly (see Figure 7.15). The Relay Assembly acts as a DC/AC convertor for the signals to the transmitter from the TCC and as an AC/DC convertor for the signals to the TCC from the transmitter. The signals from the TCC, to switch the transmitters, are sent through relays K1 and K3. Relay K3 is a latching relay that is used to place the transmitters in remote or local control. Relays K4 through K7 are the AC/DC converting relays. The Xmtr No. 1 & 2 Ready and Xmtr No. 2 Operate AC signals are sent to the TCC through these relays.

4.3.2 Electrical Pulse Analyzer (see Figure 7.20).

4.3.2.1 W0678-3A/GATCON module (see Figure 7.22). Local Interval (high and low rate) and Remote and Local Rate Select signals are inputs to the Rate Select Circuit section of this module. The Local and Remote Rate Select signals are used to generate the Rate Select signal. The Rate Select and Local Interval signals are used to generate the Strobe Enable and Initiate Sequence signals. Local Mode Select, Local/Remote Select, and Remote Mode Select signals are routed to the Mode Select Circuit section to generate the Mode Select signal. The ½ Cycle From Bi-Directional 1-Shot, Initiate Sequence, ½ Cycle Pulse Select (from ECD module), and Selected MPTs (from ECD module) signals are also sent to the Mode Select Circuit section. The Count Waveform is generated from these signals. The binary bits of the pulse or half cycle selected for measurement are inputs to the Address Control Circuit section. The Strobe Enable and Relatch signals are sent to this section to transfer the binary bit information to the Data Strobe Generator section. Inputs to the Data Strobe Generator section (Count Waveform, Pulse/½ Cycle/(Remote) Select, Strobe Enable, Initiate Sequence, and binary bits from the Address Control Circuit section) are used to generate the $\overline{\text{Data Strobe}}$ signal (see Figure 5.22). $\overline{\text{Data Strobe}}$ occurs once each interval and corresponds in time to the particular pulse (or half-cycle of the pulse) selected by the SAMPLE NUMBER switches. Sixty-four $\overline{\text{Data Strobes}}$ are generated prior to the start of the DPM measurement. Mode Select, Rate Select, and a trigger from the Address Control Circuit section are used to generate the Relatch signal in the Data Control Circuit section. Also generated in this section are $\overline{\text{Convert}}$ (for the DPM to start measurement), $\overline{\text{Data Ready}}$ (not used), ECD/VP Toggle (for the ECD module), and Peak Detector Reset (see Figure 5.21), from Initate Sequence, EOC, $\overline{\text{EOC}}$, Relatch, and the divide-by-64 output signals. The divide-by-64 circuit is used to count the sixty-four $\overline{\text{Data Strobes}}$ generated on this module.

4.3.2.2 W0678-18C/ECD module (see Figure 7.24). The ATTN RF from the W0678-11A/CLP ATTN module enters the RF Deriver section of the ECD module, which is an active allpass filter-and-add. This filter-and-add produces a derived LORAN-C pulse having an amplitude null and a phase reversal on the leading edge. This occurs at 18 microseconds after the start of a pulse having an ECD of zero. The ATTN RF is also hardlimited in the Pulse Hard Limiter section. The resulting TTL signal is used to gate the programmable amplifier of the RF Detector section and to synchronously detect the derived pulse. The detected signal enters a two-pole lowpass active filter with 11 kHz cutoff, which smooths the signal, to form a derived envelope (see Figure 5.27). This derived envelope is initially negative, crossing zero at forty microseconds, then becoming positive, for a zero ECD pulse. The Envelope Hard Limiter section converts the derived envelope to TTL levels; low before the crossover and high after. The hardlimited envelope is outputted at pin 51 of the module, where it is "wire ANDed" with the Clip Attenuator Gate generated on the W0678-11A/CLP ATTN module. The "ANDed" signal is jumpered to the Envelope Start Cycle Stop Generator section via pin 42 of the ECD module. On the pulse selected by the Sample Strobe Generator, MPT Count and Select, and PCI Synchronizer sections; the Envelope Start Cycle Stop Generator section generates a Local Envelope Crossover trigger, which goes high at the crossover and returns low at the next RF zero crossing. The ECD Voltage Generator section converts the 0 to 10 microsecond pulse width of the trigger (which corresponds to an ECD of -5 to +5 microseconds) to a -5 to +5 volt level to drive the Digital Panel Meter via the DPM Combiner Driver section. This level is also shifted and scaled to provide a chart recorder drive signal of either 0 to 1 milliampere or 0 to 5 volts full scale. The DPM Combiner Driver section selects either the ECD or pulse peak voltage for display by the DPM, scales the DPM voltage to a range of -1 to +1 volts, sets the decimal point location on the DPM, and lights the ECD (μsec) or PEAK (VOLTS) indicators, as controlled by the PEAK/ALTERNATE/ECD switch. The center position (ALTERNATE) of this switch allows the ECD/VP Toggle waveform from the W0678-3A/GATCON module to toggle the state of this section and alternately display ECD and peak volts. The high-going Initiate Sequence signal from the W0678-3A/GATCON module enables the MPT Count and Select section to count the MPTs from the start of PCI interval A of the selected rate. The MPT Count and Select section also enables the Sample Strobe Generator section to initiate an ECD measurement on the first pulse of PCI interval B (positive phase code) and the negatively coded seventh pulse (secondary) or third pulse (master) of PCI interval A. The grounding of E4 or E5 to E3 programs, respectively, the HI or LOW rate for master. A selected MPT corresponding to the setting of the pulse number, on the SAMPLE NUMBER switch, is output to the Peak Detector module.

4.3.2.3 W0678-4/PK DET module (see Figure 7.26). In response to an externally applied trigger (positive or negative), the Reference Envelope Generator section generates the adjustable Reference Envelope waveform. A Clipped RF signal from the W0678-11A/CLP ATTN module is sent to one of the active two-pole Butterworth low-pass filters. The output of this filter is a clipped filtered RF of 10V positive and 8V negative amplitude. This clipped filtered RF is sent to the Tri-State Discriminator section. This section generates two hardlimited RF signals (180 degrees out-of-phase) to control the Fullwave Rectifier section. The Count Waveform (see Figure 5.30) and the Count Waveform (for the Peak Detect and Hold section) are also outputs of the Tri-State Discriminator section. These outputs consist of a hard limited signal of +4V amplitude. An Operate RF (Attenuated) from the W0678-11A/CLP ATTN module is sent to the other low-pass filter on this module. The output of this filter is a filtered attenuated RF of 6V positive and 8V negative amplitude. This signal is then sent to the Fullwave Rectifier section. A full wave rectified RF is developed in this section and is sent to the Peak Detect and Hold section. This full wave rectified RF is also fed through a voltage follower (buffered), then is sent to the EPA rear panel jack, J4. The Peak Detect and Hold section generates a Sample Gate signal from the $\overline{\text{Data Strobe}}$, Peak Detector Reset, and Count Waveform signals. This section also uses an inverted Sample Gate signal, a full wave rectified RF (from the Fullwave Rectifier section), and the Peak Detector Reset signal to detect and hold the peak value of the full wave rectified RF during the sample period. This DC level (see Figure 5.29) is then sent to the W0678-18C/ECD module.

4.3.2.4 W0678-11A/CLP ATTN module (see Figure 7.28). The resistors and potentiometer in the Attenuator section provide passive attenuation of the Operate RF and a means of calibrating the DPM. In the Limiter section of this module are five resistors (R1, R2, R3, R7, and R8). Four of these resistors (R1, R2, R3, and R8) are used to limit the current through the front panel LED indicators (DS1 through DS4). R7 forms a voltage divider with R1, located on the EPA rear panel. When the Operate RF input to the EPA exceeds 30V peak-to-peak, the Clipper section of the W0678-11A/CLP ATTN module clips the operate RF to 30V peak-to-peak. The Selected MPTs signal from the W0678-18C/ECD module is sent to the Delay Gate Generator section. In this section, a 15 sec gate (see Figure 5.31) is generated and coupled to the output of the Envelope Hard Limiter section of the W0678-18C/ECD module. This is done to ensure that spurious transitions of the hardlimited envelope cannot cause erroneous ECD indications.

4.3.2.5 Digital Panel Meter. Upon receipt of the $\overline{\text{Convert}}$ signal from the W0678-3A/GATCON module, peak volts or ECD analog voltages received from the W0678-18C/ECD module are measured. The DPM converts and displays the peak volts or ECD on a three-and-a-half digit panel display. After the DPM completes the conversion, it sends an EOC signal to the W0678-3A/GATCON module.

4.3.3 Pulse Generator (see Figure 7.30).

4.3.3.1 W0678-1/PSYN module (see Figure 7.32). The Multiplying Digital to Analog Convertor section of this module receives the 100-kHz sine wave input from the timer set. Data control words from the Cycle Data Control section of the Pulse Control module are also inputs to the Multiplying Digital to Analog Convertor section. These control words control the amplitude of the individual 100-kHz cycles. The output of this section is a preshaped version of the Transmitter Drive Waveform. This waveform is an input to the Switched Inverting Amplifier section, where it is phase coded. Phase code balance is provided via the front panel Ø CODE BALANCE potentiometer, which provides an amplitude balance between the positive and negative half cycles. The output is a phase coded signal, which along with data control words from the Pulse Data Control section of the Pulse Control module are inputs to the Gain Control Amplifier section. This section acts as a multiplying analog-to-digital convertor to provide pulse droop compensation and an ungated, amplitude modulated Transmitter Drive Waveform (TDW) is outputted. This signal is buffered in the Amplifier section and output to the front panel TRANSMITTER DRIVE potentiometer via the W0678-19B/GR DROOP module (at single-rated stations, the signal is output directly to the front panel). The signal returns to the Amplifier section where it is again buffered, then enters the Gating Power Amplifier section. This section controls the start of the TDW by using the 500-μsec Gate-H and Gate-L signals from the Tail Gate Generator section of the W0678-19B/GR DROOP module. The timing of the Gate-H and Gate-L signals is controlled by the Envelope Timing Adjust (ETA) switch on the timer or Remote Control Interface (RCI) by controlling the MPT timing. This section outputs a balanced Transmitter Drive Waveform to the transmitters via the Interface Unit, and signals to the Lost Signal Detector section (see Figures 5.34 and 5.35). A loss of the drive waveform generates a No Transmitter Drive signal to the TCC and will light the ALARM-NO TRANSMITTER DRIVE LED on the front panel of the PGEN. The Transmitter 1 & 2 Operate and Lamp Test signals are also inputs to the Lost Signal Detector section. These signals light the correct LED (ALARM or OPERATE).

4.3.3.2 W0678-19B/GR DROOP module (see Figure 7.34). The MPTs of both rates are inputs to the Droop Generator and Filter section. The programming (paragraph 2.6.2) and adjustments (paragraph 2.7.2) of the low pass filters generate the droop compensating waveforms in this section. Pulse droop compensation is produced by using the rate of interest MPTs. The other rate MPTs are used to produce a dynamic compensation waveform as the two rates move with respect to each other. The droop compensating waveforms are inputs to the Group Droop Summing Amplifier section. This section produces a 1-volt reference level and sums the compensating waveforms with the 1-volt reference level to produce a composite, compensation waveform (see paragraph 2.7.2). Inputs to the Tail Gate Generator section are Local Interval and the 80-μsec Gate-L signal from the Control section of the W0678-2/PCON module. The 80-μsec Gate-L signal is used to generate two 500-μsec gates (Gate-H, Figure 5.36, and Gate-L) used by the Gating Power Amplifier section of the W0678-1/PSYN module. The 500-μsec Gate-L signal and Local Interval are used to generate a tail gate signal for the Pulse Tail Generator section of this module. This section uses the tail gate signal to superimpose an exponentially decaying, tail shaping waveform on the composite, compensation waveform from the Group Droop Summing Amplifier section. The decay time constant is varied by the adjustment of R25. This signal is used to modulate the ungated, amplitude modulated TDW in the Hundred Kilohertz Modulator section. This provides dynamic droop compensation and a controlled tail for the drive pulses. The 500-μsec Gate-L signal and the Phase Code-H signal from the Phase Code Control section of the W0678-2/PCON module are used to produce a Reclocked Phase Code-H signal in the Phase Code Reclock section. This signal is an input to the Switched Inverting Amplifier section of the W0678-1/PSYN module. Also present on this module is the Deccajector Summing Amplifier section. This section is only wired for use on the W0686-20/GR DROOP module. The Deccajector Summing Amplifier section sums the deccajector outphasing signals with the 100 kHz used to produce the drive waveform. This prevents interference to DECCA navigation equipment by LORAN-C transmitters.

4.3.3.3 <u>W0678-2/PCON module (see Figure 7.36)</u>. The Local Interval (see Figure 5.40), 100-kHz sine wave (see Figure 5.39), and MPT-H (see Figure 5.46) signals are inputs to the Control section of this module. These inputs are used to generate the Gate-L and Gate-H signals. At single-rated stations not employing tail drive, both signals are inputs to the W0678-1/PSYN module. At dual-rated stations, the 80-μsec Gate-H signal is not used, and the 80-μsec Gate-L signal is a W0678-19B/GR DROOP module input. The switch, S1, allows for the selection of half drive cycle or full drive cycle control with the PULSE SYNTHESIZER thumbwheel switches. A threshold detector is used to determine the zero crossing of the 100-kHz sine wave. This is used to generate a timing control waveform for the Cycle Selection section. This section uses the timing control waveform to select the front panel PULSE SYNTHESIZER switch digit to be read. The Pulse Selection section uses the timing control waveform to select the proper front panel DROOP switch digit. The Cycle Data Control section has inputs from the PULSE SYNTHESIZER thumbwheel switches and outputs data control words to the Multiplying Digital to Analog Convertor section of the W0678-1/PSYN module. The Pulse Data Control section has inputs from the DROOP thumbwheel switches and outputs data control words to the Gain Control Amplifier section of the W0678-1/PSYN module. The Scope Trigger Generator section uses inputs from the Pulse Selection section, the Gate-L signal and the position of the front panel SCOPE TRIGGER switch (S1) to generate a scope trigger from the 1st or 2nd MPT. The Phase Code Control section uses Phase Code Set and Reset (see Figures 5.42 through 5.45) from the Loran Timing Set(s) and the inverted Local Interval from the Control section to generate the Phase Code-H signal for the Phase Code Reclock section of the W0678-19B/GR DROOP module (at stations with tail drive). At stations without tail drive, the Phase Code-H signal is generated for the Switched Inverting Amplifier section of the W0678-1/PSYN module.

4.3.4 <u>Interface Unit (see Figure 7.38)</u>. The Interface Unit distributes signals to other units. This unit receives the Operate RF from the Current Transformer through a balanced, 100-ohm, double shielded cable. Two hybrid power splitters receive this signal. One splitter outputs two in-phase RF signals to the Loran Timing Set(s) (for the cycle compensation loop); the EPA and TCC receive an inverted RF signal from the other splitter. If either in-phase output is unused (single-rated operation), it must be terminated in 50 ohms.

4.4 Time-ladder Diagrams. Figures 4.1 and 4.2 are the time-ladder diagrams for master and secondary stations, respectively. The signals are received by the TCS equipment from the Loran Timing Set(s). The Local Interval starts 500 μsec before the first MPT and ends 1,400 μsec after the last MPT. The master station's Local Interval is 10,900 μsec long, and the secondary station's Local Interval is 8,900 μsec long. Phase Coding of the MPTs occur between the Phase Code Reset (starts the negative Ø code) and Phase Code Set (starts the positive Ø code) pulses.

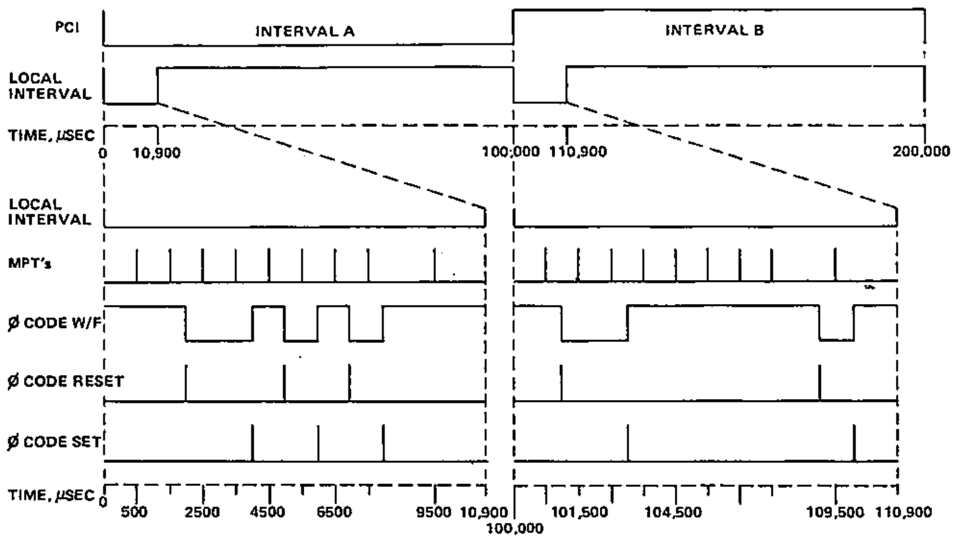


Figure 4.1. Master Station Time-Ladder Diagram
(Non-Existing Rate 10,000)

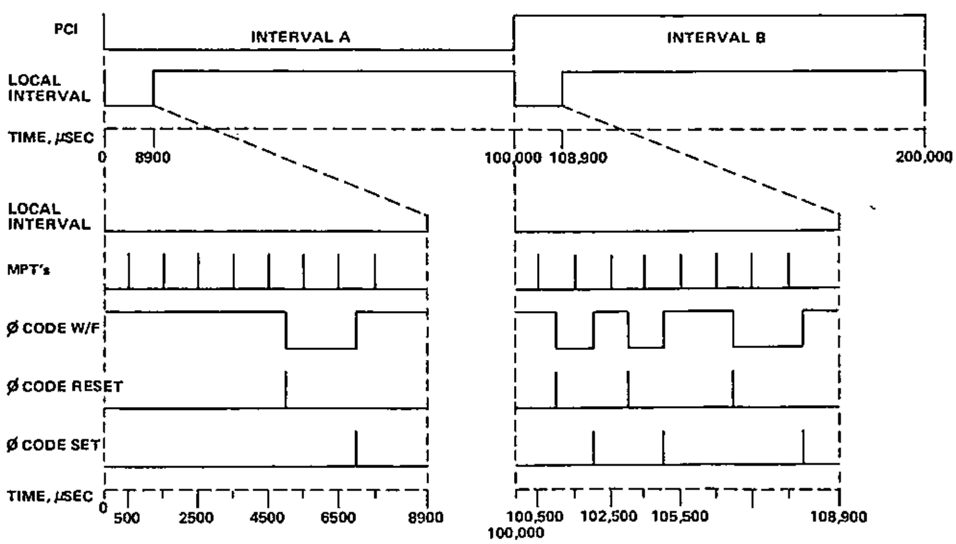


Figure 4.2. Secondary Station Time-Ladder Diagram
(Non-Existing Rate 10,000)

CHAPTER 5

MAINTENANCE

5.1 Maintenance Policy. The Inventory Control Point (ICP) designates the maintenance policy, which is found in E/GICPINST 4408.1 (series).

NOTE

> Insure that proper care is taken while performing the following checks, measurements, or adjustments, as improper procedures may cause an OFF AIR condition.

5.2 Preventive Maintenance. If the following checks fail, refer to paragraph 5.3 for corrective maintenance.

5.2.1 Electrical Equipment Cabinet. Perform the following inspections quarterly:

a. Inspect the cabling and wiring for frayed, damaged, or broken wiring, and repair as necessary.

b. Inspect the power receptacle strip and power cords for damaged or exposed leads, and repair or replace as necessary.

c. Inspect the ground system to ensure that there are no breaks, and repair or replace as necessary.

d. Inspect the cabinet power cable to ensure that it is in good condition and not exposed.

5.2.2 Switch Assembly. Perform preventive maintenance procedures in accordance with local directives.

5.2.3 Transmitter Coupler Control. Periodically use the TCC to routinely switch transmitters.

5.2.4 Electrical Pulse Analyzer. In conjunction with the station inspection, adjust the W0678-11A/CLP ATTN module as outlined in paragraph 5.3.3.2.c.

5.2.5 Pulse Generator. Perform preventive maintenance procedures in accordance with local directives.

5.2.6 Waveform Panel. Perform preventive maintenance procedures in accordance with local directives.

5.2.7 Interface Unit. Perform preventive maintenance procedures in accordance with local directives.

5.3 Corrective Maintenance. There are no troubleshooting guides for the Switch Assembly, Waveform Panel, and Interface Unit. If problems occur with these units, replace the unit according to E/GICPINST 4408.1 (series).

5.3.1 Troubleshooting guide.

5.3.1.1 Transmitter Control Set. The troubleshooting guide for the Transmitter Control Set is shown in Figure 5.1.

5.3.1.2 Switch Assembly. There is no troubleshooting guide for the Switch Assembly.

5.3.1.3 Transmitter Coupler Control. The troubleshooting charts for the TCC are shown in Figures 5.2 and 5.3.

5.3.1.4 Electrical Pulse Analyzer. The troubleshooting charts for the EPA are shown in Figures 5.4 through 5.9.

5.3.1.5 Pulse Generator. The troubleshooting charts for the PGEN are shown in Figures 5.10 and 5.11.

5.3.1.6 Waveform Panel. There is no troubleshooting guide for the Waveform Panel.

5.3.1.7 Interface Unit. There is no troubleshooting guide for the I/F Unit.

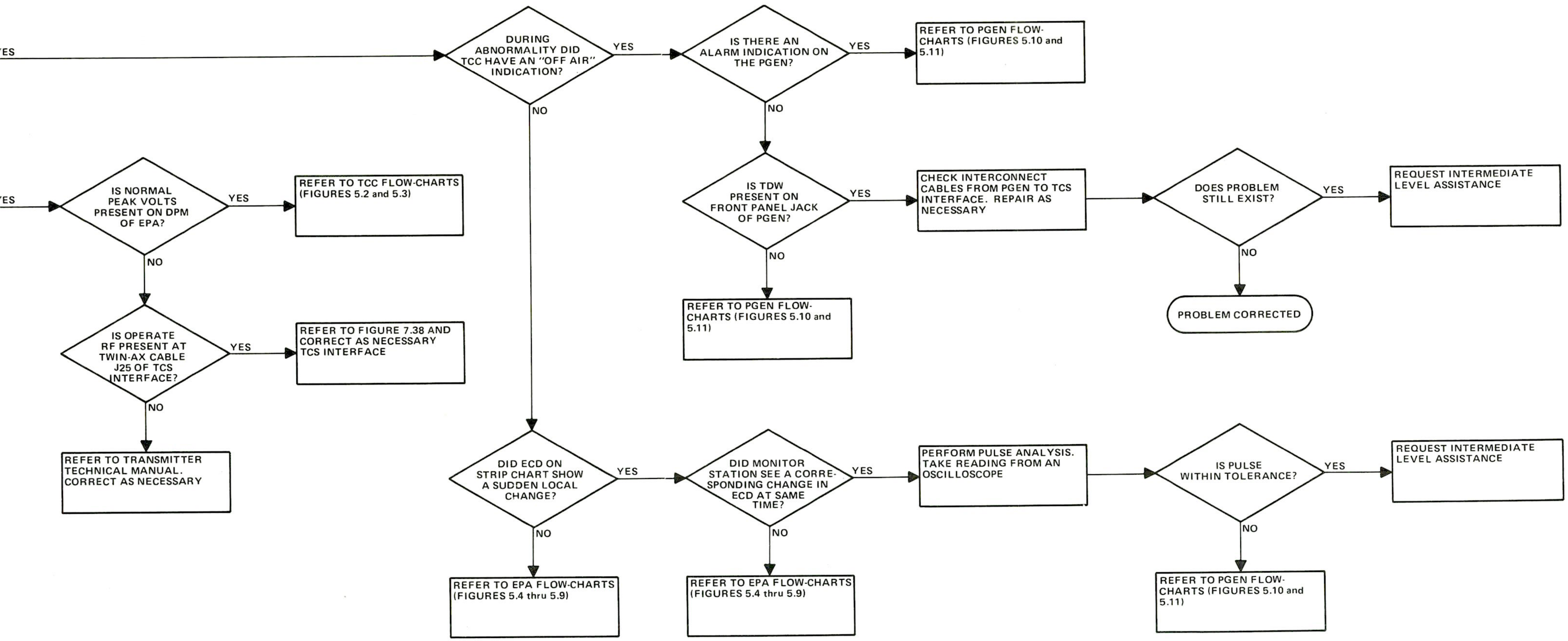


Figure 5.1. Transmitter Control Set (TCS) Troubleshooting Flow-Chart

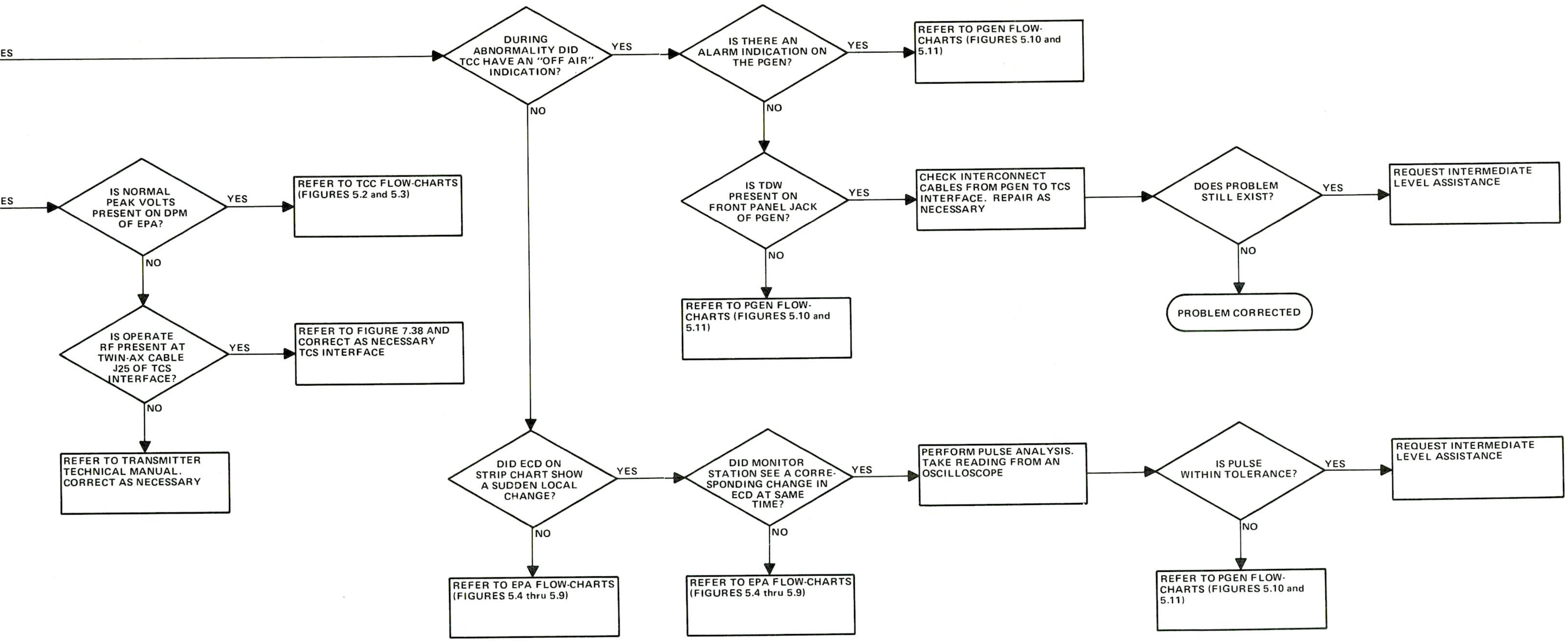
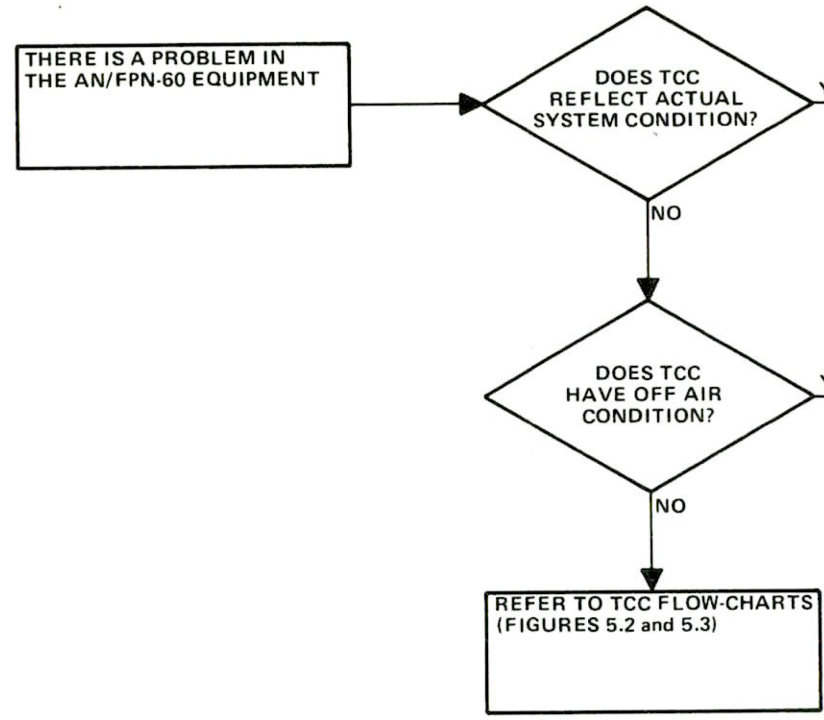
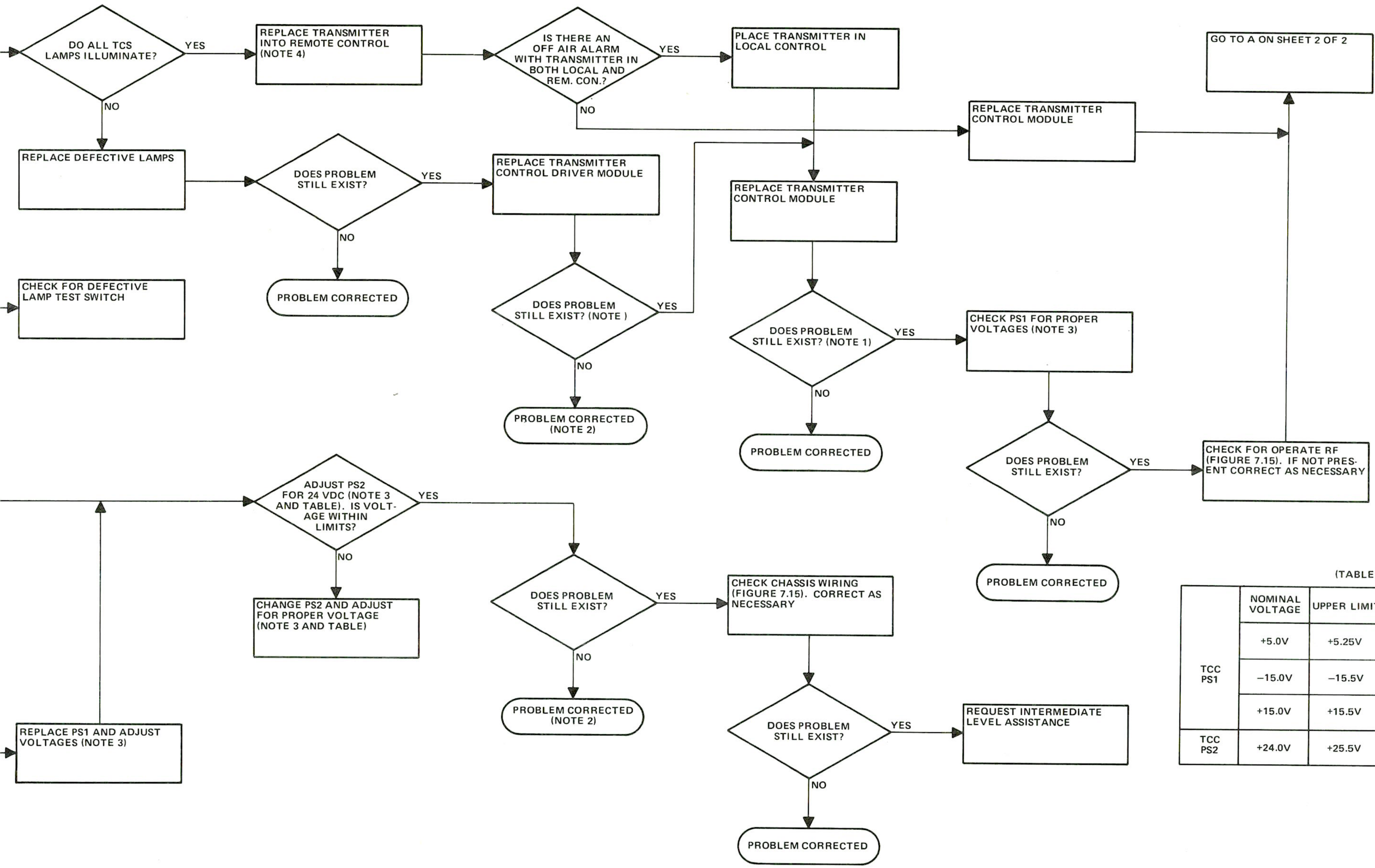


Figure 5.1. Transmitter Control Set (TCS) Troubleshooting Flow-Chart

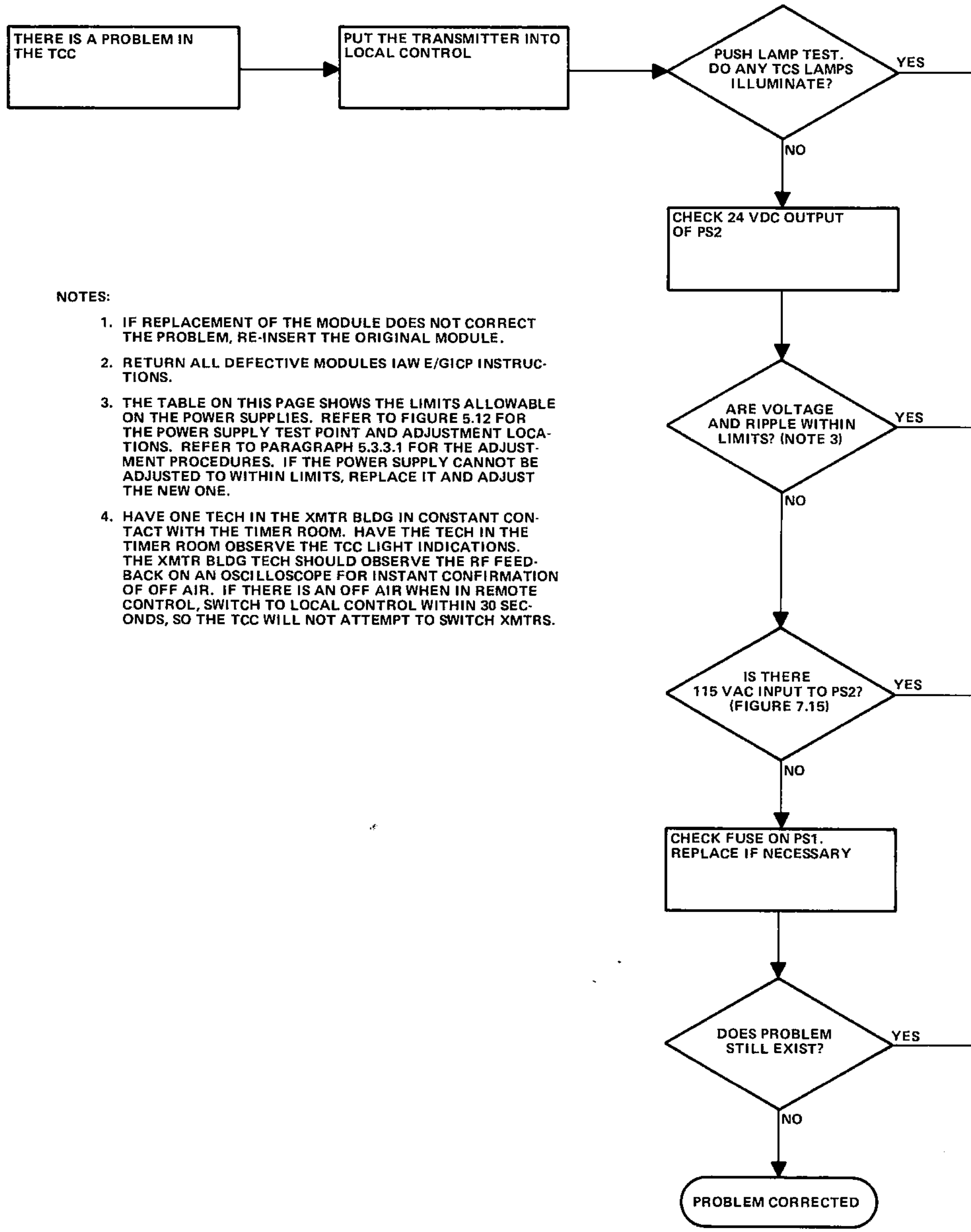

THERE IS A PROBLEM IN THE AN/FPN-60 EQUIPMENT
DOES TCC REFLECT ACTUAL SYSTEM CONDITION?
Y
NO
DOES TCC HAVE OFF AIR CONDITION?
Y
NO
REFER TO TCC FLOW-CHARTS (FIGURES 5.2 and 5.3)



(TABLE)

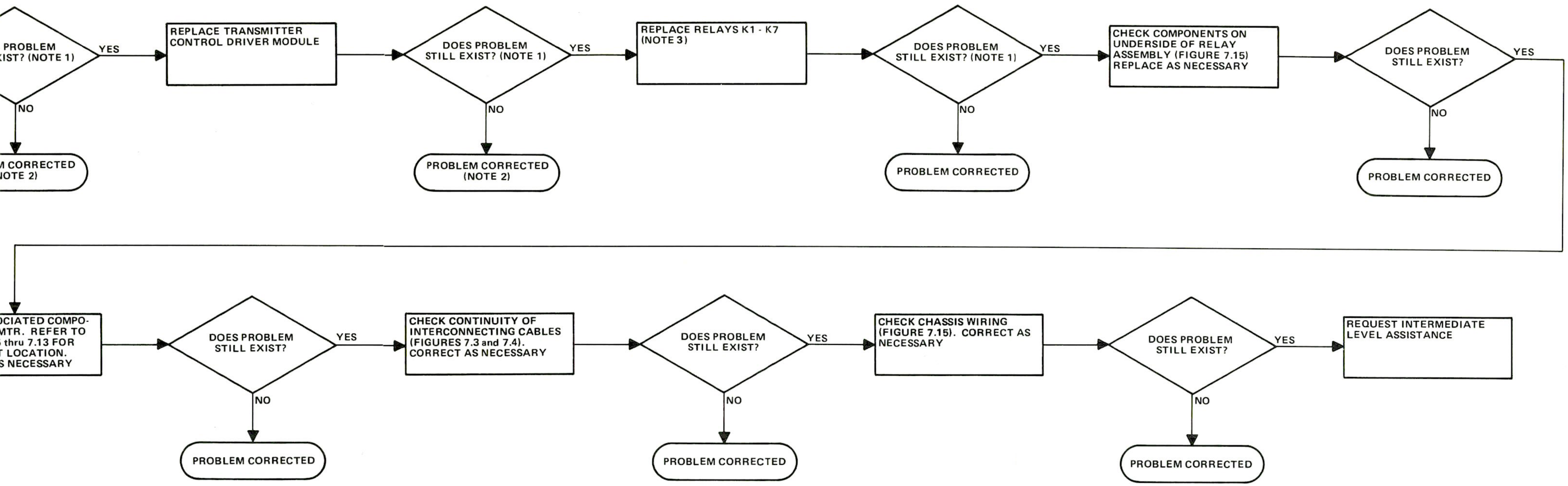
	NOMINAL VOLTAGE	UPPER LIMIT	LOW. LIMIT	AC RIPPLE LIMIT
TCC PS1	+5.0V	+5.25V	+4.75V	1.4 mV
	−15.0V	−15.5V	−14.5V	2.8 mV
	+15.0V	+15.5V	+14.5V	2.8 mV
TCC PS2	+24.0V	+25.5V	+22.5V	4.2 mV

Figure 5.2. Transmitter Coupler Control (TCC) Troubleshooting Flow-Chart (Sheet 1 of 2)



NOTES:

1. IF REPLACEMENT OF THE MODULE DOES NOT CORRECT THE PROBLEM, RE-INSERT THE ORIGINAL MODULE.
2. RETURN ALL DEFECTIVE MODULES IAW E/GICP INSTRUCTIONS.
3. THE TABLE ON THIS PAGE SHOWS THE LIMITS ALLOWABLE ON THE POWER SUPPLIES. REFER TO FIGURE 5.12 FOR THE POWER SUPPLY TEST POINT AND ADJUSTMENT LOCATIONS. REFER TO PARAGRAPH 5.3.3.1 FOR THE ADJUSTMENT PROCEDURES. IF THE POWER SUPPLY CANNOT BE ADJUSTED TO WITHIN LIMITS, REPLACE IT AND ADJUST THE NEW ONE.
4. HAVE ONE TECH IN THE XMTR BLDG IN CONSTANT CONTACT WITH THE TIMER ROOM. HAVE THE TECH IN THE TIMER ROOM OBSERVE THE TCC LIGHT INDICATIONS. THE XMTR BLDG TECH SHOULD OBSERVE THE RF FEEDBACK ON AN OSCILLOSCOPE FOR INSTANT CONFIRMATION OF OFF AIR. IF THERE IS AN OFF AIR WHEN IN REMOTE CONTROL, SWITCH TO LOCAL CONTROL WITHIN 30 SECONDS, SO THE TCC WILL NOT ATTEMPT TO SWITCH XMTRS.

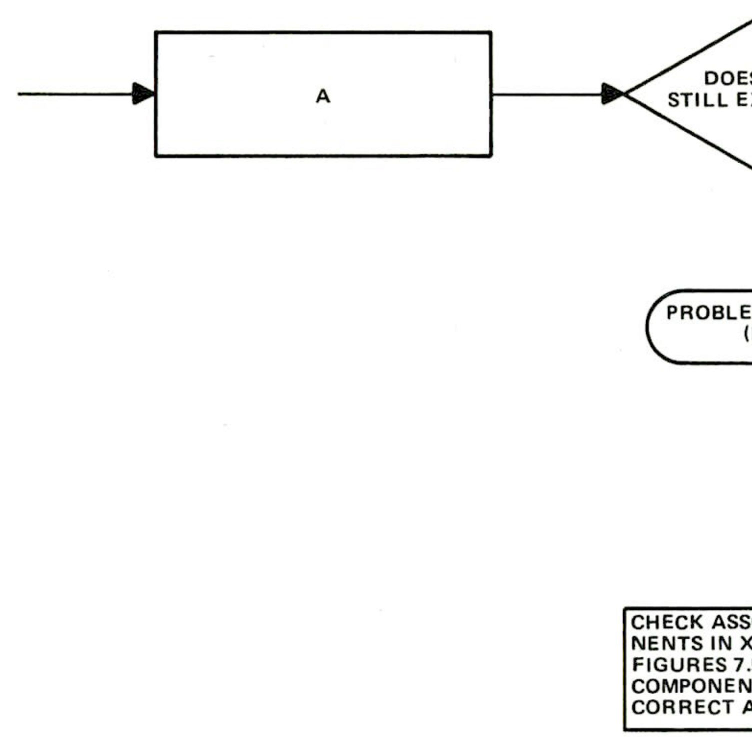


NOTES:

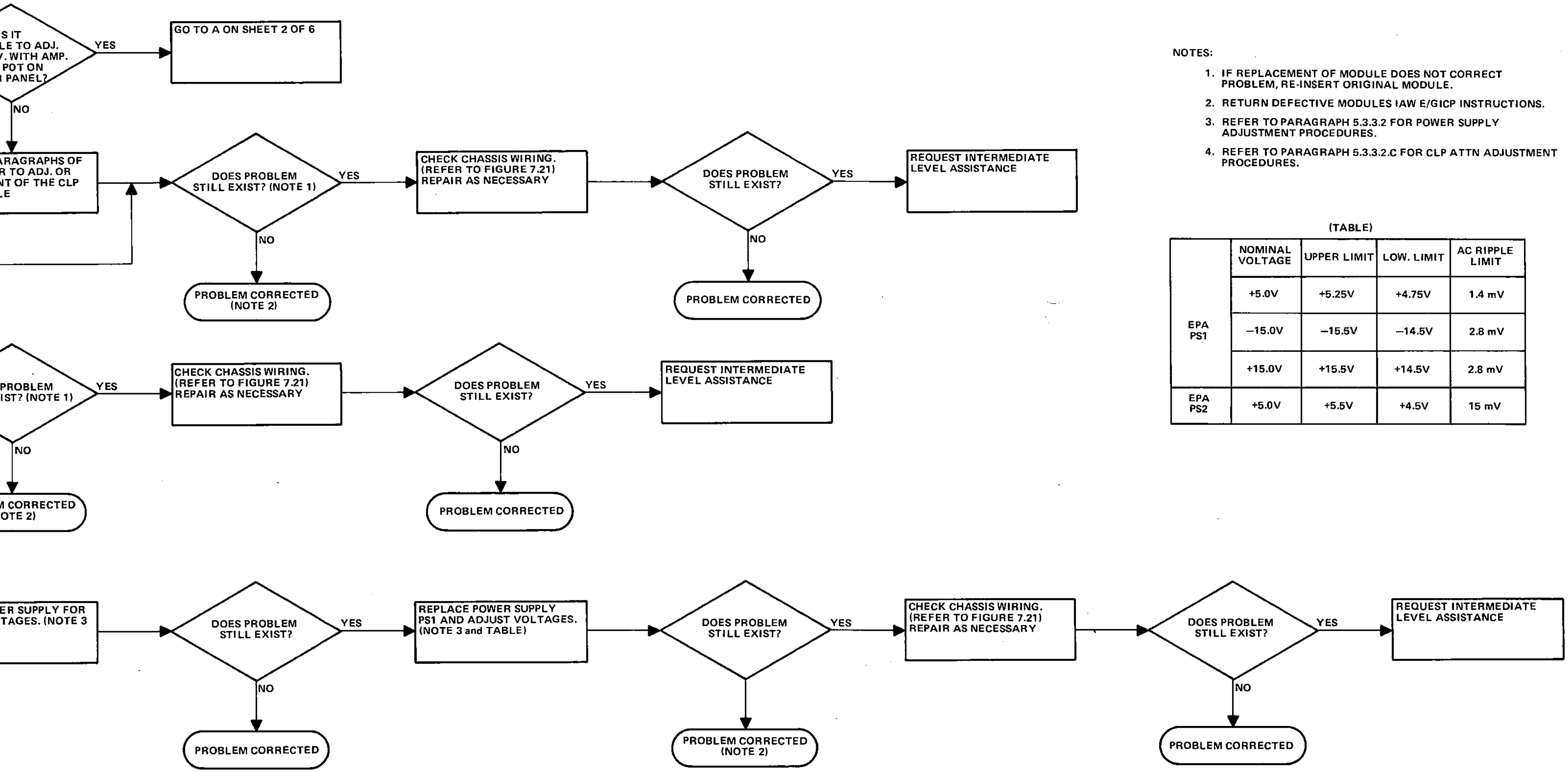
1. IF REPLACEMENT OF MODULE DOES NOT CORRECT PROBLEM, INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULES IAW E/GICP INSTRUCTIONS.
3. REPLACE RELAYS IN THREE STEPS:
   (1) K3, K4, K6 and K7
   (2) K1 and K5
   (3) K2

   CHECK FOR PROBLEM AFTER EACH STEP. IF PROBLEM IS CORRECTED CONTINUE TO NEXT DECISION BLOCK.

Figure 5.3. Transmitter Coupler Control (TCC) Troubleshooting Flow-Chart (Sheet 2 of 2)



A
DOES
STILL EX
PROBLEM
(N
CHECK ASSO
NENTS IN XI
FIGURES 7.5
COMPONENT
CORRECT A



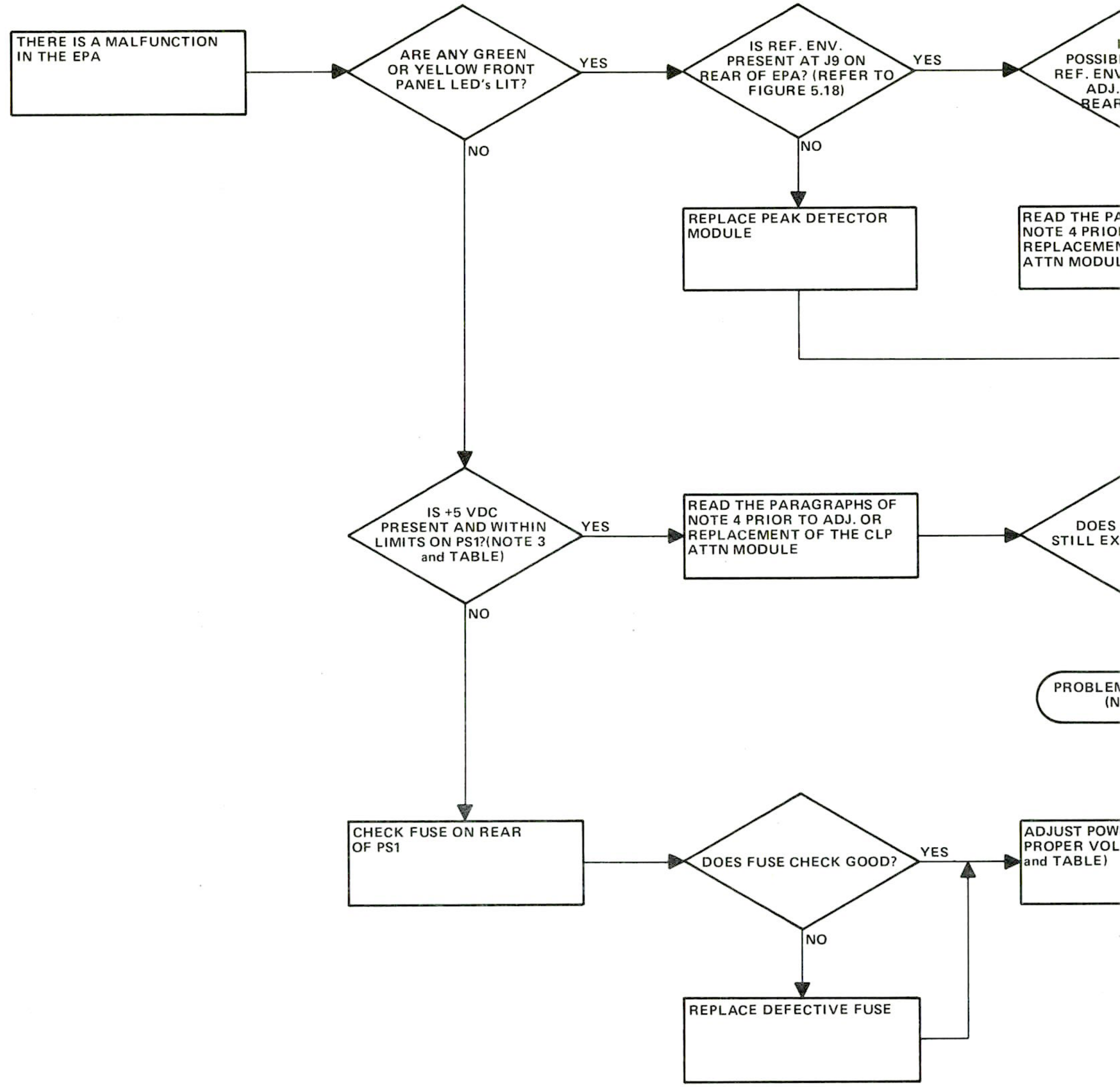
NOTES:

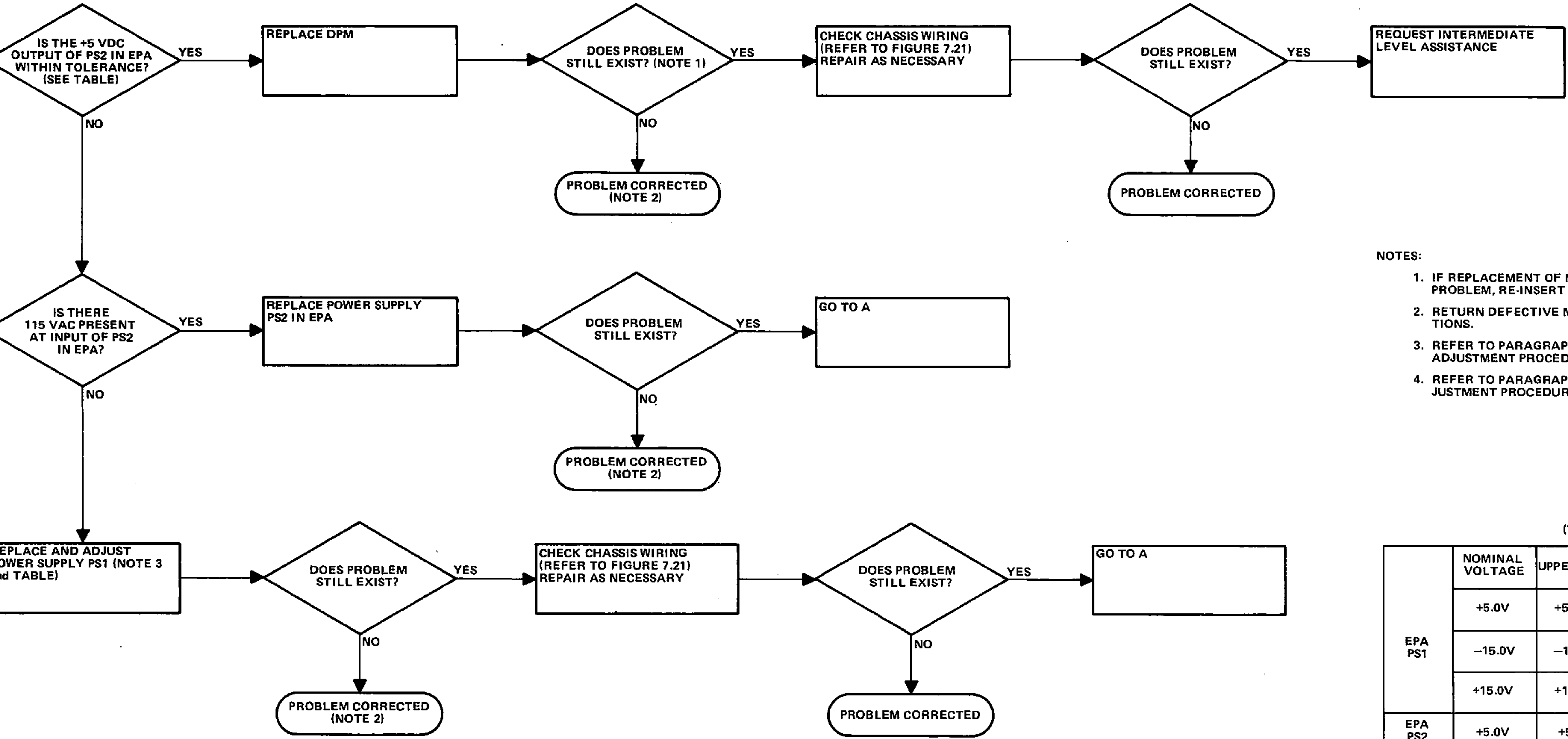
1. IF REPLACEMENT OF MODULE DOES NOT CORRECT PROBLEM, RE-INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULES IAW E/GICP INSTRUCTIONS.
3. REFER TO PARAGRAPH 5.3.3.2 FOR POWER SUPPLY ADJUSTMENT PROCEDURES.
4. REFER TO PARAGRAPH 5.3.3.2.C FOR CLP ATTN ADJUSTMENT PROCEDURES.

(TABLE)

	NOMINAL VOLTAGE	UPPER LIMIT	LOW. LIMIT	AC RIPPLE LIMIT
EPA PS1	+5.0V	+5.25V	+4.75V	1.4 mV
	−15.0V	−15.5V	−14.5V	2.8 mV
	+15.0V	+15.5V	+14.5V	2.8 mV
EPA PS2	+5.0V	+5.5V	+4.5V	15 mV

Figure 5.4. Electrical Pulse Analyzer (EPA) Troubleshooting Flow-Chart (Sheet 1 of 6)


THERE IS A MALFUNCTION IN THE EPA
ARE ANY GREEN OR YELLOW FRONT PANEL LED's LIT?
YES
NO
IS REF. ENV. PRESENT AT J9 ON REAR OF EPA? (REFER TO FIGURE 5.18)
YES
NO
REPLACE PEAK DETECTOR MODULE
IS +5 VDC PRESENT AND WITHIN LIMITS ON PS1?(NOTE 3 and TABLE)
YES
NO
READ THE PARAGRAPHS OF NOTE 4 PRIOR TO ADJ. OR REPLACEMENT OF THE CLP ATTN MODULE
CHECK FUSE ON REAR OF PS1
DOES FUSE CHECK GOOD?
YES
NO
REPLACE DEFECTIVE FUSE



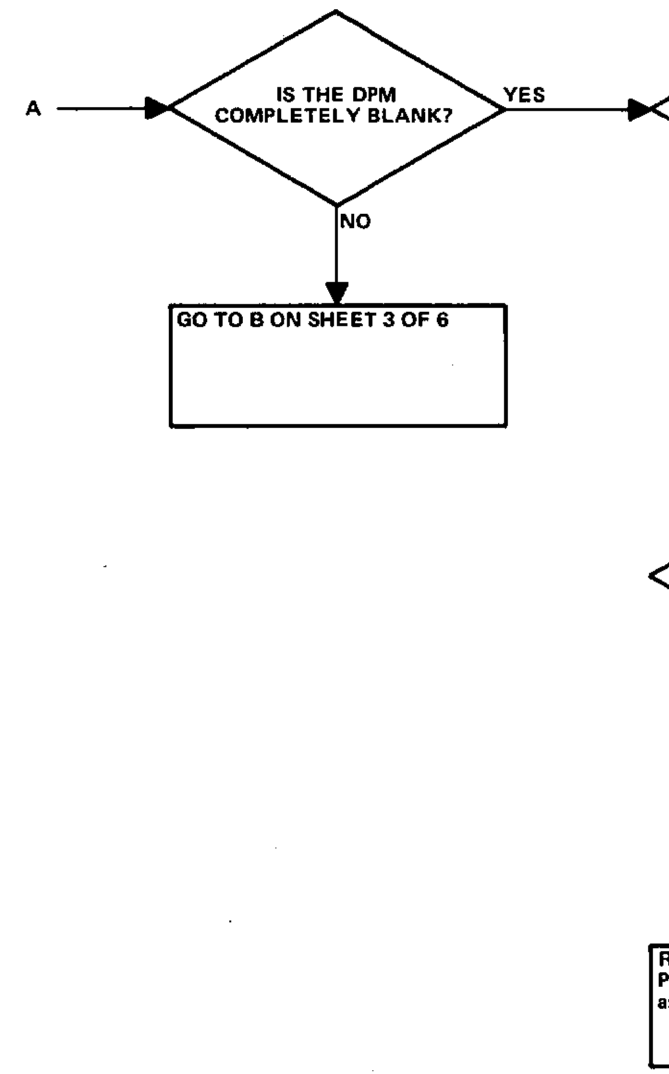
NOTES:

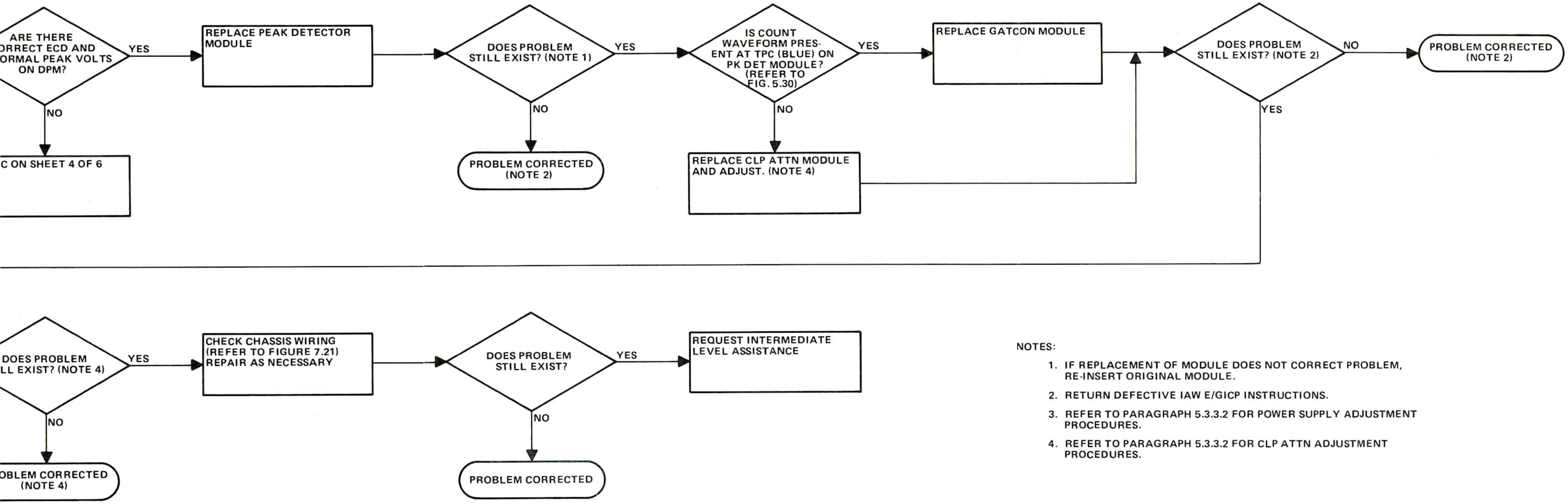
1. IF REPLACEMENT OF MODULE DOES NOT CORRECT PROBLEM, RE-INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULES IAW E/GICP INSTRUCTIONS.
3. REFER TO PARAGRAPH 5.3.3.2 FOR POWER SUPPLY ADJUSTMENT PROCEDURES.
4. REFER TO PARAGRAPH 5.3.3.2 FOR CLP ATTN ADJUSTMENT PROCEDURES.

(TABLE)

	NOMINAL VOLTAGE	UPPER LIMIT	LOW. LIMIT	AC RIPPLE LIMIT
EPA PS1	+5.0V	+5.25V	+4.75V	1.4 mV
	−15.0V	−15.5V	−14.5V	2.8 mV
	+15.0V	+15.5V	+14.5V	2.8 mV
EPA PS2	+5.0V	+5.5V	+4.5V	15 mV

Figure 5.5. Electrical Pulse Analyzer (EPA) Troubleshooting Flow-Chart (Sheet 2 of 6)


A
IS THE DPM COMPLETELY BLANK?
YES
NO
GO TO B ON SHEET 3 OF 6

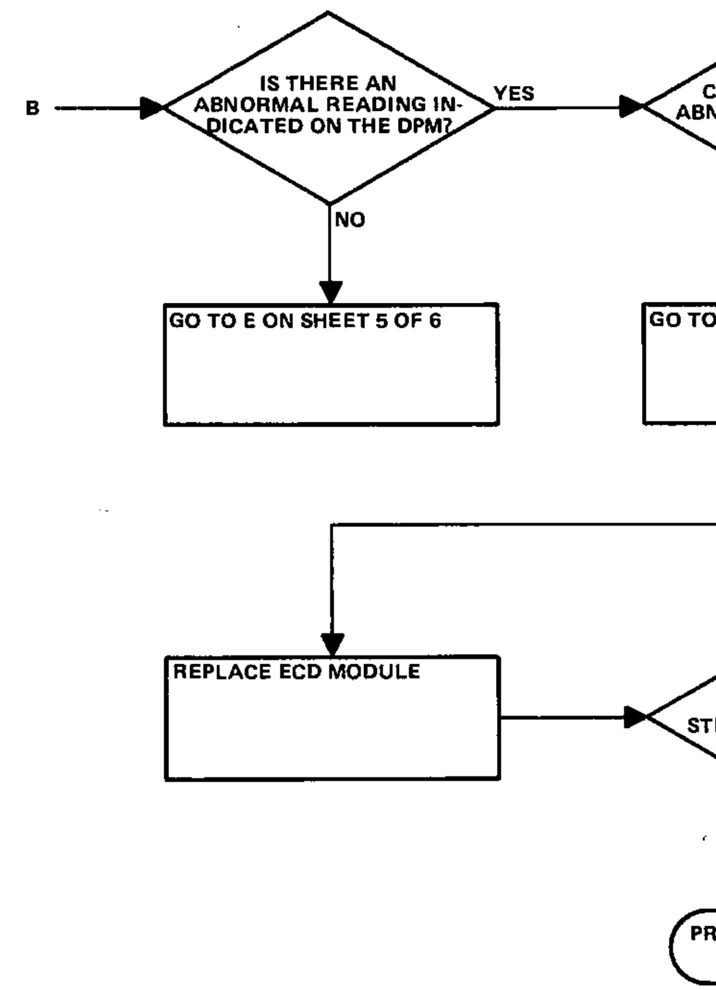


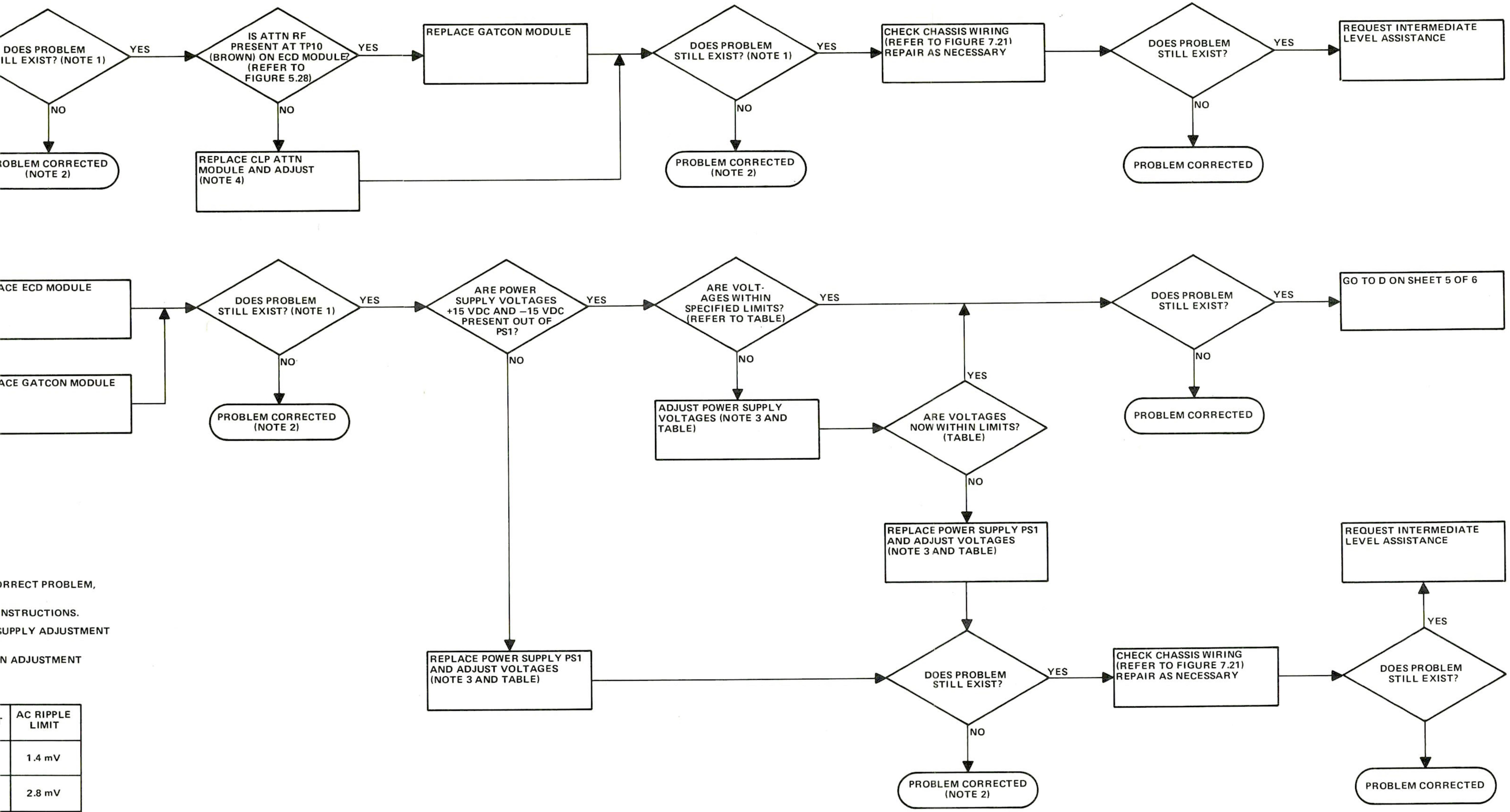
NOTES:

1. IF REPLACEMENT OF MODULE DOES NOT CORRECT PROBLEM, RE-INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE IAW E/GICP INSTRUCTIONS.
3. REFER TO PARAGRAPH 5.3.3.2 FOR POWER SUPPLY ADJUSTMENT PROCEDURES.
4. REFER TO PARAGRAPH 5.3.3.2 FOR CLP ATTN ADJUSTMENT PROCEDURES.

	NOMINAL VOLTAGE	UPPER LIMIT	LOW. LIMIT	AC RIPPLE LIMIT
EPA PS1	+5.0V	+5.25V	+4.75V	1.4 mV
	−15.0V	−15.5V	−14.5V	2.8 mV
	+15.0V	+15.5V	+14.5V	2.8 mV
EPA PS2	+5.0V	+5.5V	+4.5V	15 mV

Figure 5.6. Electrical Pulse Analyzer (EPA) Troubleshooting Flow-Chart (Sheet 3 of 6)


B
IS THERE AN ABNORMAL READING INDICATED ON THE DPM?
YES
NO
GO TO E ON SHEET 5 OF 6
CO
ABN
GO TO
REPLACE ECD MODULE
STI
PR



...RRECT PROBLEM,

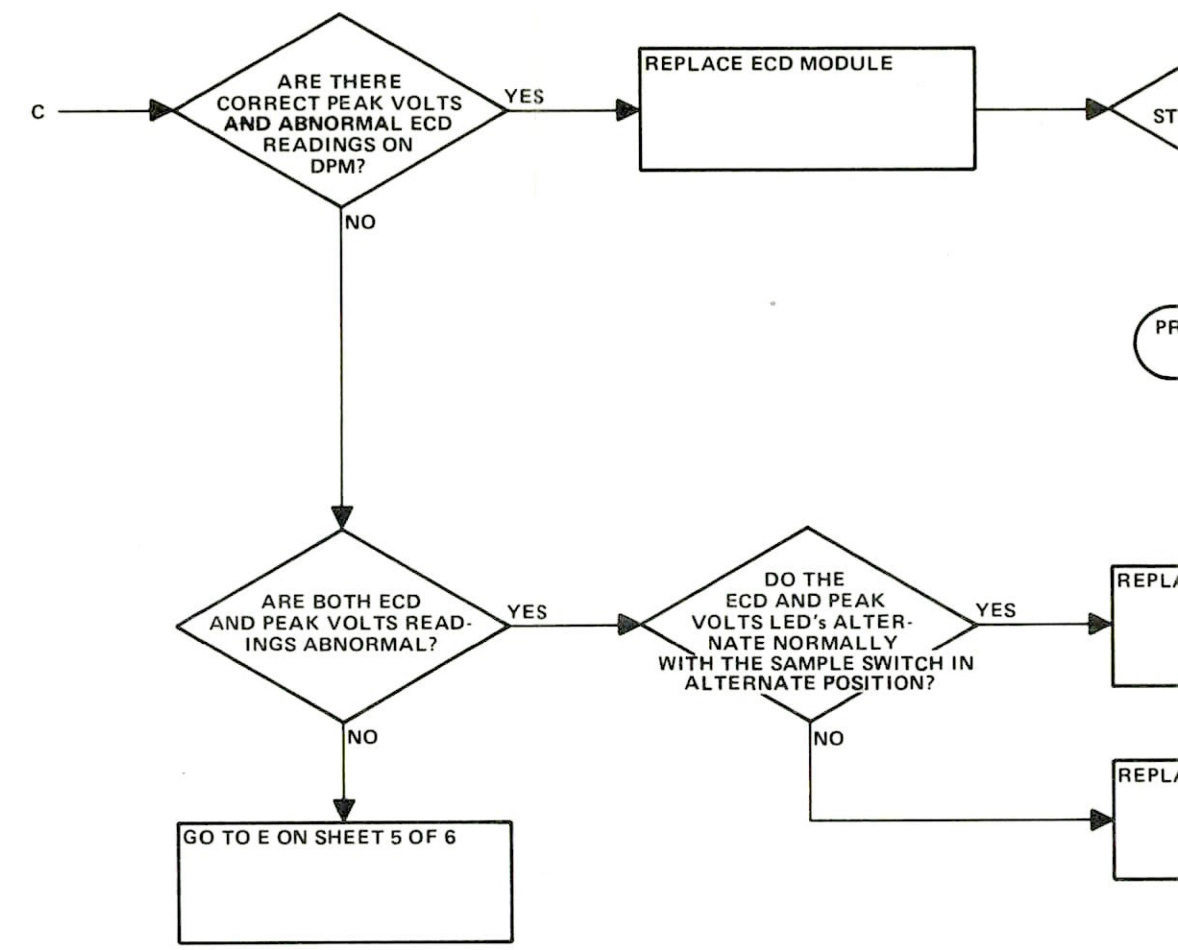
...NSTRUCTIONS.

...UPPLY ADJUSTMENT

...N ADJUSTMENT

AC RIPPLE LIMIT
1.4 mV
2.8 mV
2.8 mV

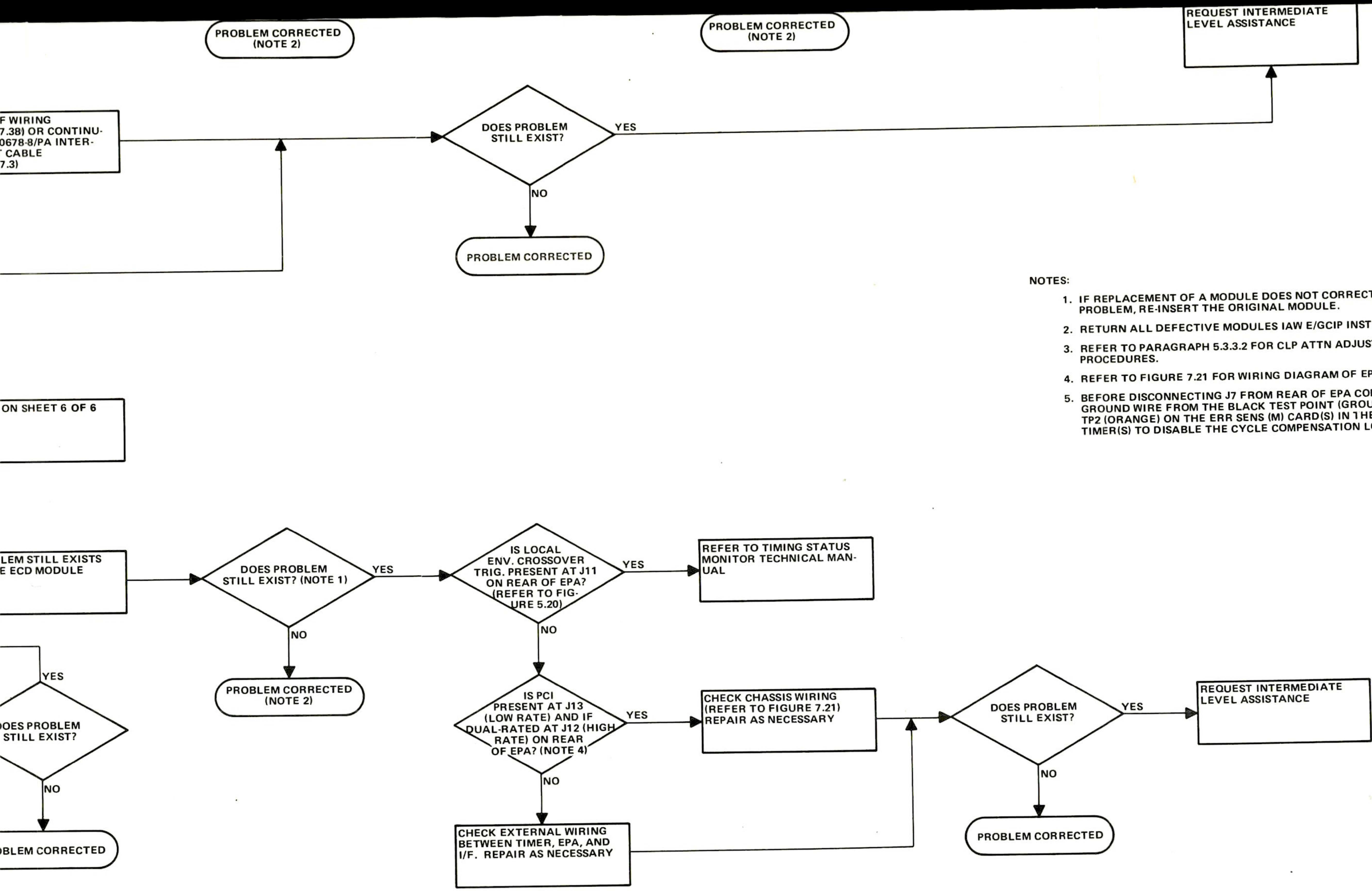
Figure 5.7. Electrical Pulse Analyzer (EPA) Troubleshooting Flow-Chart (Sheet 4 of 6)



NOTES:

1. IF REPLACEMENT OF MODULE DOES NOT CO
   RE–INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULES IAW E/GICP I
3. REFER TO PARAGRAPH 5.3.3.2 FOR POWER S
   PROCEDURES.
4. REFER TO PARAGRAPH 5.3.3.2 FOR CLP ATT
   PROCEDURES.

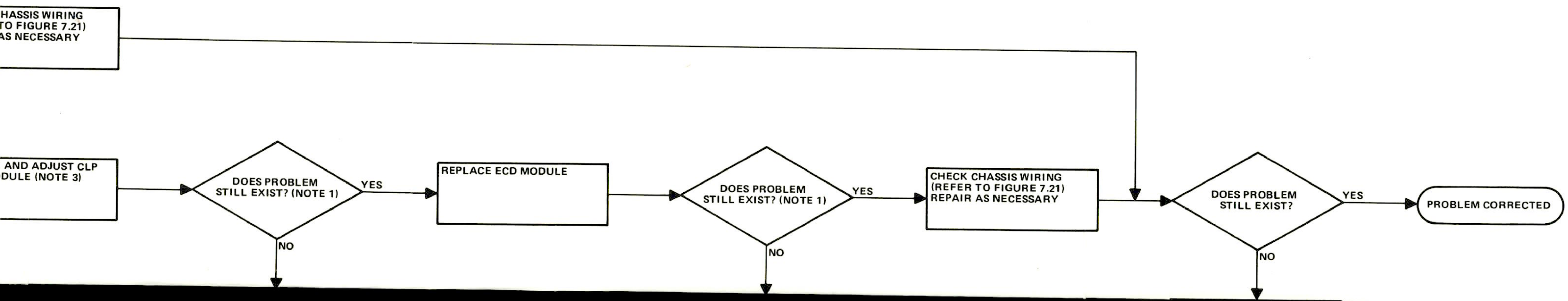
	NOMINAL VOLTAGE	UPPER LIMIT	LOW. LIMIT
EPA PS1	+5.0V	+5.25V	+4.75V
	−15.0V	−15.5V	−14.5V
	+15.0V	+15.5V	+14.5V



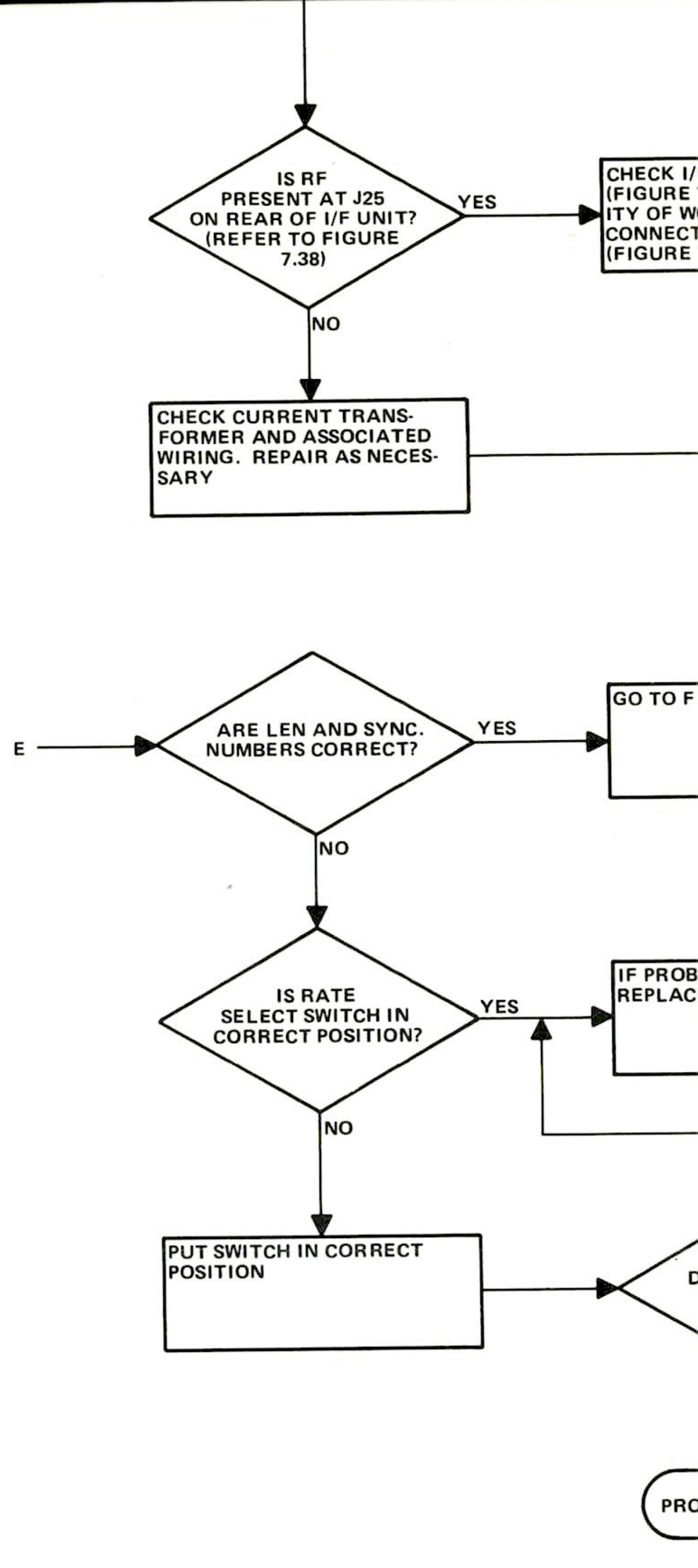
NOTES:

1. IF REPLACEMENT OF A MODULE DOES NOT CORRECT THE PROBLEM, RE-INSERT THE ORIGINAL MODULE.
2. RETURN ALL DEFECTIVE MODULES IAW E/GCIP INSTRUCTIONS.
3. REFER TO PARAGRAPH 5.3.3.2 FOR CLP ATTN ADJUSTMENT PROCEDURES.
4. REFER TO FIGURE 7.21 FOR WIRING DIAGRAM OF EPA.
5. BEFORE DISCONNECTING J7 FROM REAR OF EPA CONNECT A GROUND WIRE FROM THE BLACK TEST POINT (GROUND) TO TP2 (ORANGE) ON THE ERR SENS (M) CARD(S) IN THE OPER. TIMER(S) TO DISABLE THE CYCLE COMPENSATION LOOP.

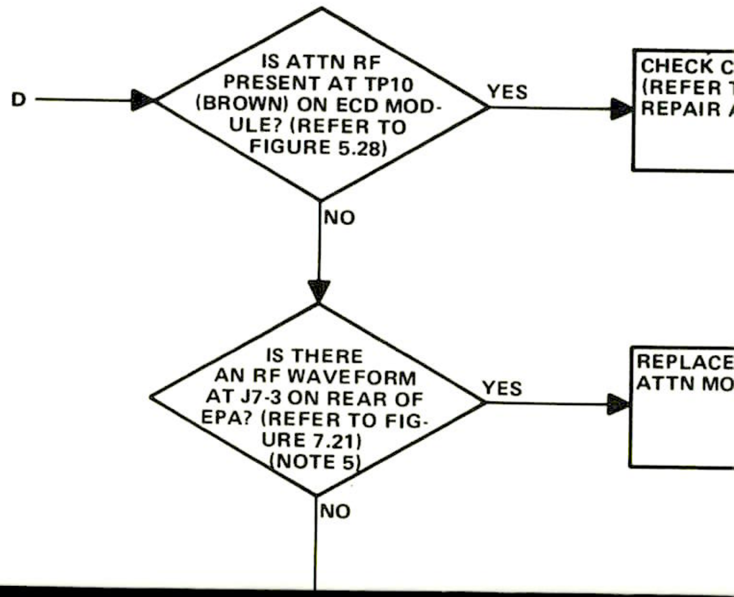
Figure 5.8. Electrical Pulse Analyzer (EPA) Troubleshooting Flow-Chart (Sheet 5 of 6)



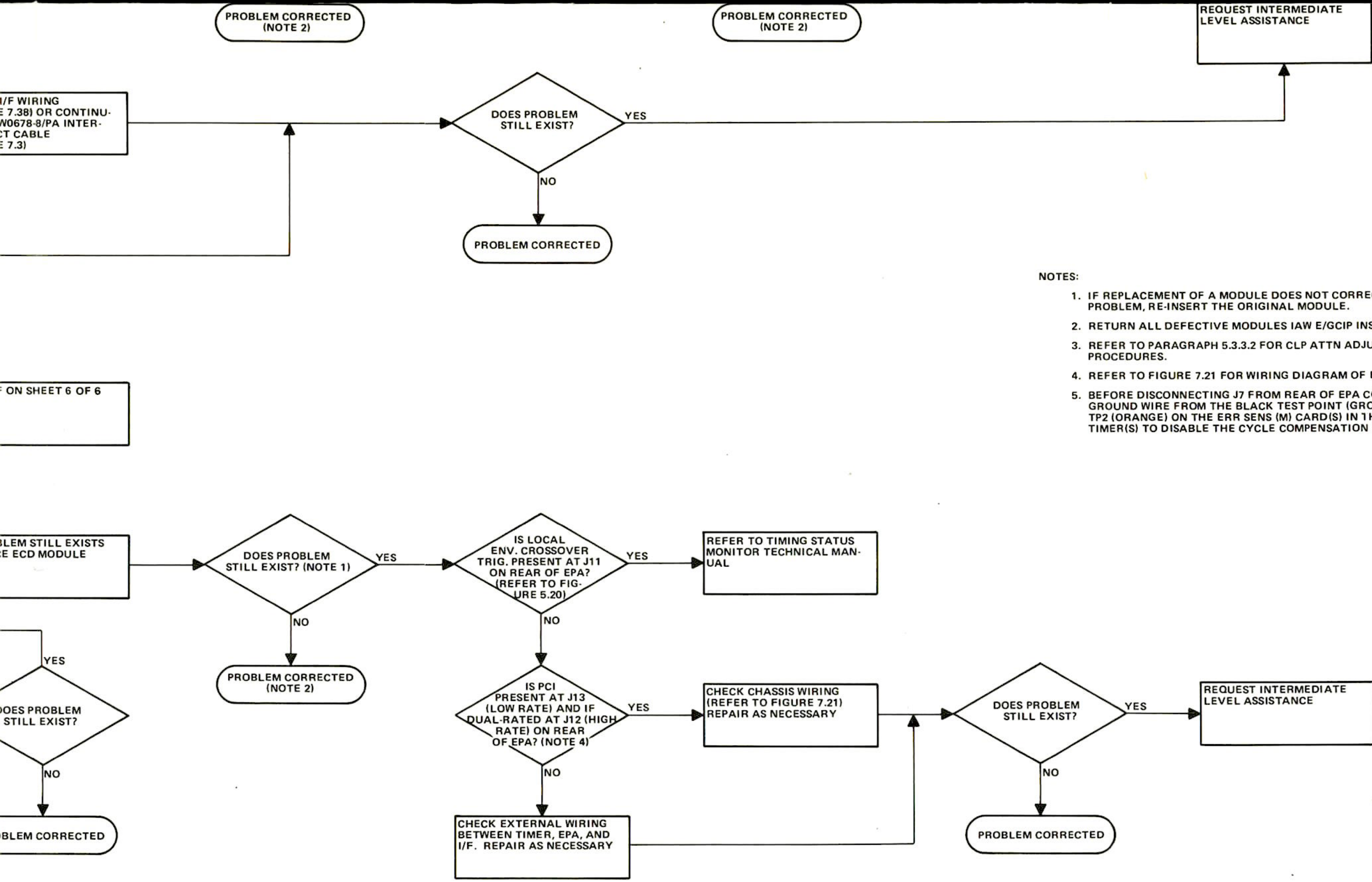
HASSIS WIRING
TO FIGURE 7.21)
AS NECESSARY
AND ADJUST CLP
DULE (NOTE 3)
DOES PROBLEM
STILL EXIST? (NOTE 1)
YES
NO
REPLACE ECD MODULE
DOES PROBLEM
STILL EXIST? (NOTE 1)
YES
NO
CHECK CHASSIS WIRING
(REFER TO FIGURE 7.21)
REPAIR AS NECESSARY
DOES PROBLEM
STILL EXIST?
YES
NO
PROBLEM CORRECTED



IS RF PRESENT AT J25 ON REAR OF I/F UNIT? (REFER TO FIGURE 7.38)
YES
NO
CHECK I/
(FIGURE
ITY OF W
CONNECT
(FIGURE
CHECK CURRENT TRANSFORMER AND ASSOCIATED WIRING. REPAIR AS NECESSARY
E
ARE LEN AND SYNC. NUMBERS CORRECT?
YES
NO
GO TO F
IS RATE SELECT SWITCH IN CORRECT POSITION?
YES
NO
IF PROB
REPLAC
PUT SWITCH IN CORRECT POSITION
D
PRO



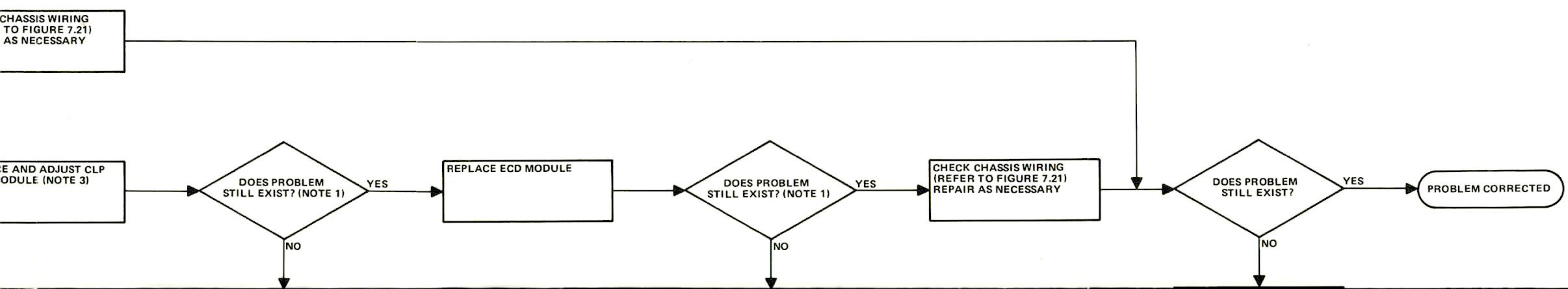
D
IS ATTN RF PRESENT AT TP10 (BROWN) ON ECD MODULE? (REFER TO FIGURE 5.28)
YES
CHECK C
(REFER T
REPAIR A
NO
IS THERE AN RF WAVEFORM AT J7-3 ON REAR OF EPA? (REFER TO FIGURE 7.21) (NOTE 5)
YES
REPLACE
ATTN MO
NO

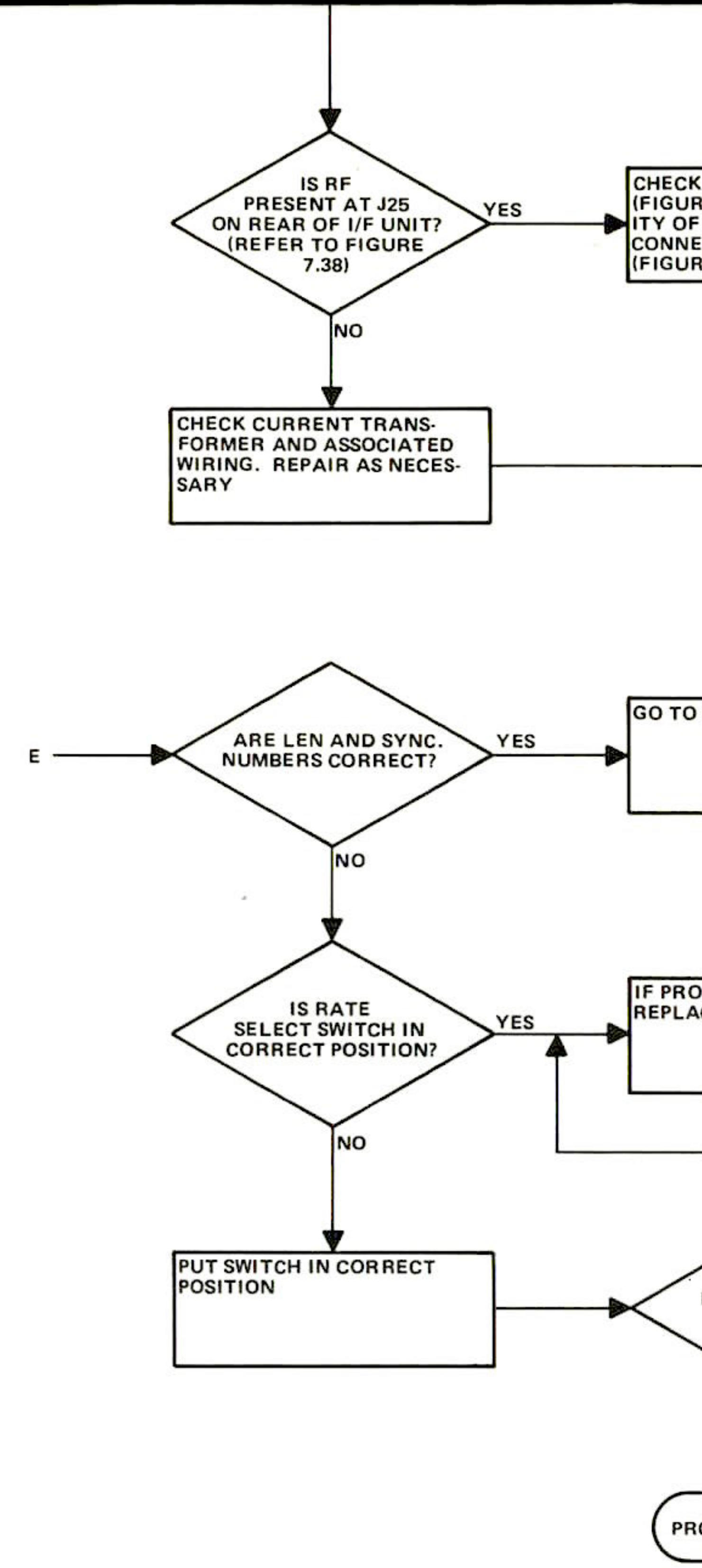


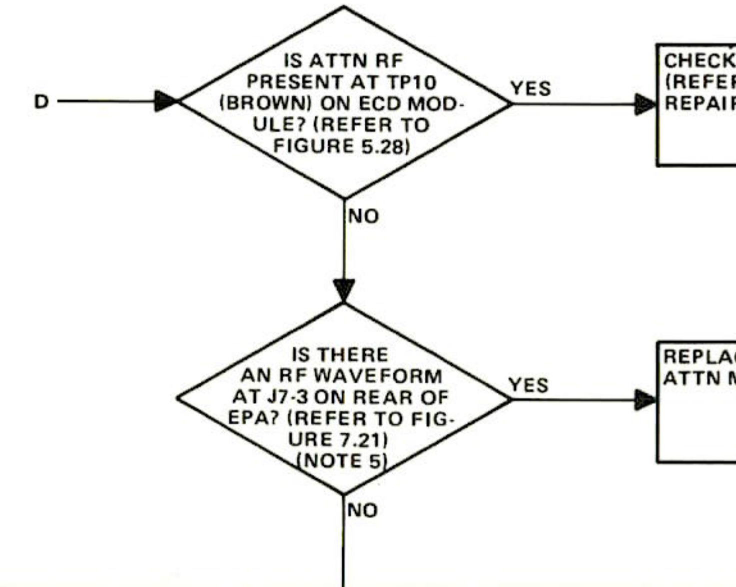
NOTES:

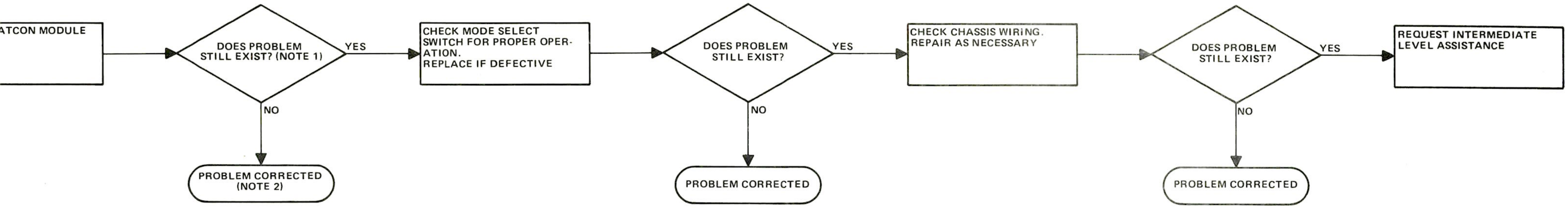
1. IF REPLACEMENT OF A MODULE DOES NOT CORRECT THE PROBLEM, RE-INSERT THE ORIGINAL MODULE.
2. RETURN ALL DEFECTIVE MODULES IAW E/GCIP INSTRUCTIONS.
3. REFER TO PARAGRAPH 5.3.3.2 FOR CLP ATTN ADJUSTMENT PROCEDURES.
4. REFER TO FIGURE 7.21 FOR WIRING DIAGRAM OF EPA.
5. BEFORE DISCONNECTING J7 FROM REAR OF EPA CONNECT A GROUND WIRE FROM THE BLACK TEST POINT (GROUND) TO TP2 (ORANGE) ON THE ERR SENS (M) CARD(S) IN THE OPER. TIMER(S) TO DISABLE THE CYCLE COMPENSATION LOOP.

Figure 5.8. Electrical Pulse Analyzer (EPA) Troubleshooting Flow-Chart (Sheet 5 of 6)


CHASSIS WIRING
TO FIGURE 7.21)
AS NECESSARY
E AND ADJUST CLP
ODULE (NOTE 3)
DOES PROBLEM
STILL EXIST? (NOTE 1)
YES
NO
REPLACE ECD MODULE
DOES PROBLEM
STILL EXIST? (NOTE 1)
YES
NO
CHECK CHASSIS WIRING
(REFER TO FIGURE 7.21)
REPAIR AS NECESSARY
DOES PROBLEM
STILL EXIST?
YES
NO
PROBLEM CORRECTED


IS RF PRESENT AT J25 ON REAR OF I/F UNIT? (REFER TO FIGURE 7.38)
YES
CHECK
(FIGURE
ITY OF W
CONNEC
(FIGURE
NO
CHECK CURRENT TRANS-FORMER AND ASSOCIATED WIRING. REPAIR AS NECES-SARY
E
ARE LEN AND SYNC. NUMBERS CORRECT?
YES
GO TO F
NO
IS RATE SELECT SWITCH IN CORRECT POSITION?
YES
IF PROB
REPLAC
NO
PUT SWITCH IN CORRECT POSITION
D
PRO

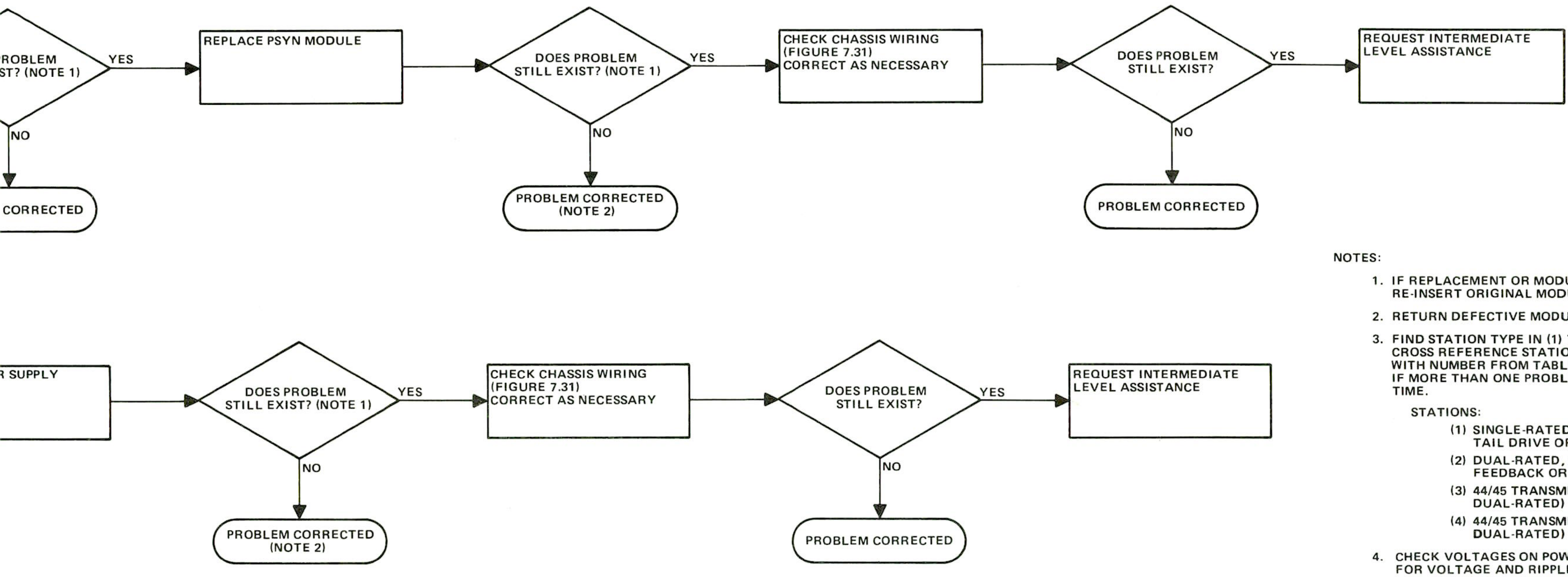

D
IS ATTN RF PRESENT AT TP10 (BROWN) ON ECD MODULE? (REFER TO FIGURE 5.28)
YES
NO
CHECK
(REFER
REPAIR
IS THERE AN RF WAVEFORM AT J7-3 ON REAR OF EPA? (REFER TO FIGURE 7.21) (NOTE 5)
YES
NO
REPLAC
ATTN M



NOTES:

1. IF REPLACEMENT OF MODULE DOES NOT CORRECT PROBLEM, RE-INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULES IAW E/GICP INSTRUCTIONS.

Figure 5.9. Electrical Pulse Analyzer (EPA) Troubleshooting Flow-Chart (Sheet 6 of 6)



SE CODE
F-CYCLE CONTROL FROM
WHEEL SWITCHES (ONLY STA-
USING HALF-CYCLE CONTROL)
L-RATE COMPENSATION
SE DROOP COMPENSATION
HUMBWHEEL SWITCHES
SE CODE BALANCE CONTROL

(TABLE 2)

	NOMINAL VOLTAGE	UPP. LIMIT	LOW. LIMIT	AC RIPPLE LIMIT
PGEN PS1	+5.0V	+5.25V	+4.75V	1.4 mV
	−15.0V	−15.5V	−14.5V	2.8 mV
	+15.0V	+15.5V	+14.5V	2.8 mV

NOTES:

1. IF REPLACEMENT OR MODULE DOES NOT CORRECT PROBLEM, RE-INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULE IAW E/GICP INSTRUCTIONS.
3. FIND STATION TYPE IN (1) THROUGH (4) BELOW. USING TABLE 1, CROSS REFERENCE STATION TYPE WITH PROBLEM IN PGEN. WITH NUMBER FROM TABLE 1 CONTINUE FLOW-CHART ON SHEET 2. IF MORE THAN ONE PROBLEM EXISTS, SOLVE ONE PROBLEM AT A TIME.

   STATIONS:

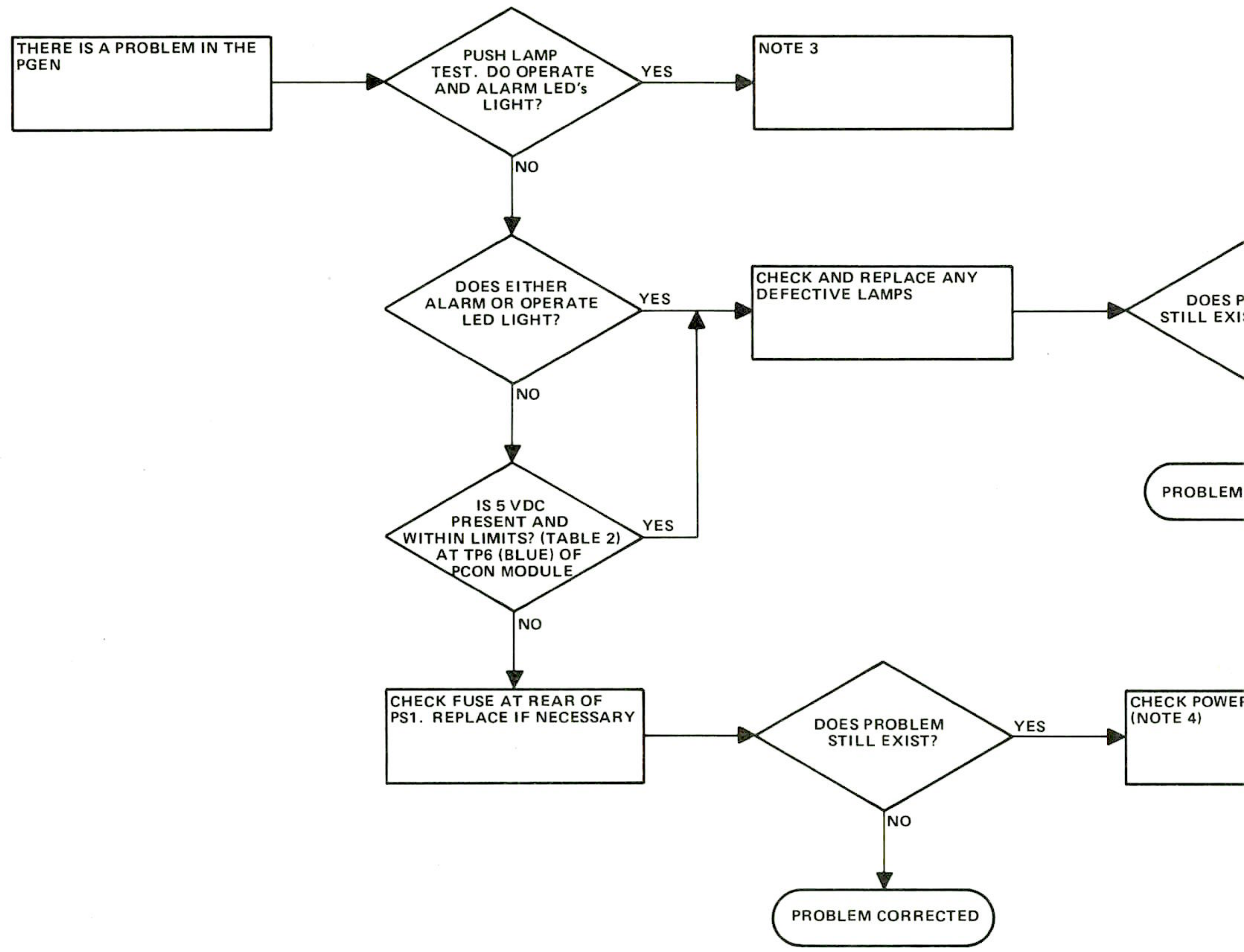
   (1) SINGLE-RATED, 39/42 OR 44/45 TRANSMITTER WITHOUT TAIL DRIVE OR FEEDBACK MOD.

   (2) DUAL-RATED, 39/42 OR 44/45 TRANSMITTER WITHOUT FEEDBACK OR TAIL DRIVE MOD.

   (3) 44/45 TRANSMITTER WITH TAIL DRIVE MOD. (SINGLE OR DUAL-RATED)

   (4) 44/45 TRANSMITTER WITH FEEDBACK MOD. (SINGLE OR DUAL-RATED)
4. CHECK VOLTAGES ON POWER SUPPLY AND ADJUST TO WITHIN LIMITS FOR VOLTAGE AND RIPPLE, REFER TO TABLE 2. REFER TO FIGURE 5.32 FOR TEST POINT AND ADJUSTMENT LOCATIONS. REFER TO PARAGRAPH 5.3.3.3 FOR THE ADJUSTMENT PROCEDURES. IF THE POWER SUPPLY CANNOT BE ADJUSTED TO WITHIN LIMITS, REPLACE THE POWER SUPPLY AND PERFORM THE ADJUSTMENTS.

Figure 5.10 Pulse Generator (PGEN) Troubleshooting Flow-Chart (Sheet 1 of 2)



(TABLE 1)

	A	B	C	D	E	F
(1)	1	2	3	N/A	3	7
(2)	5	6	3	4	3	7
(3)	5	6	3	4	3	7
(4)	5	6	3	N/A	N/A	7

A. NO TDW
B. NO PHA
C. NO HAL
THUMBW
TIONS U
D. NO DUA
E. NO PULS
FROM T
F. NO PHA

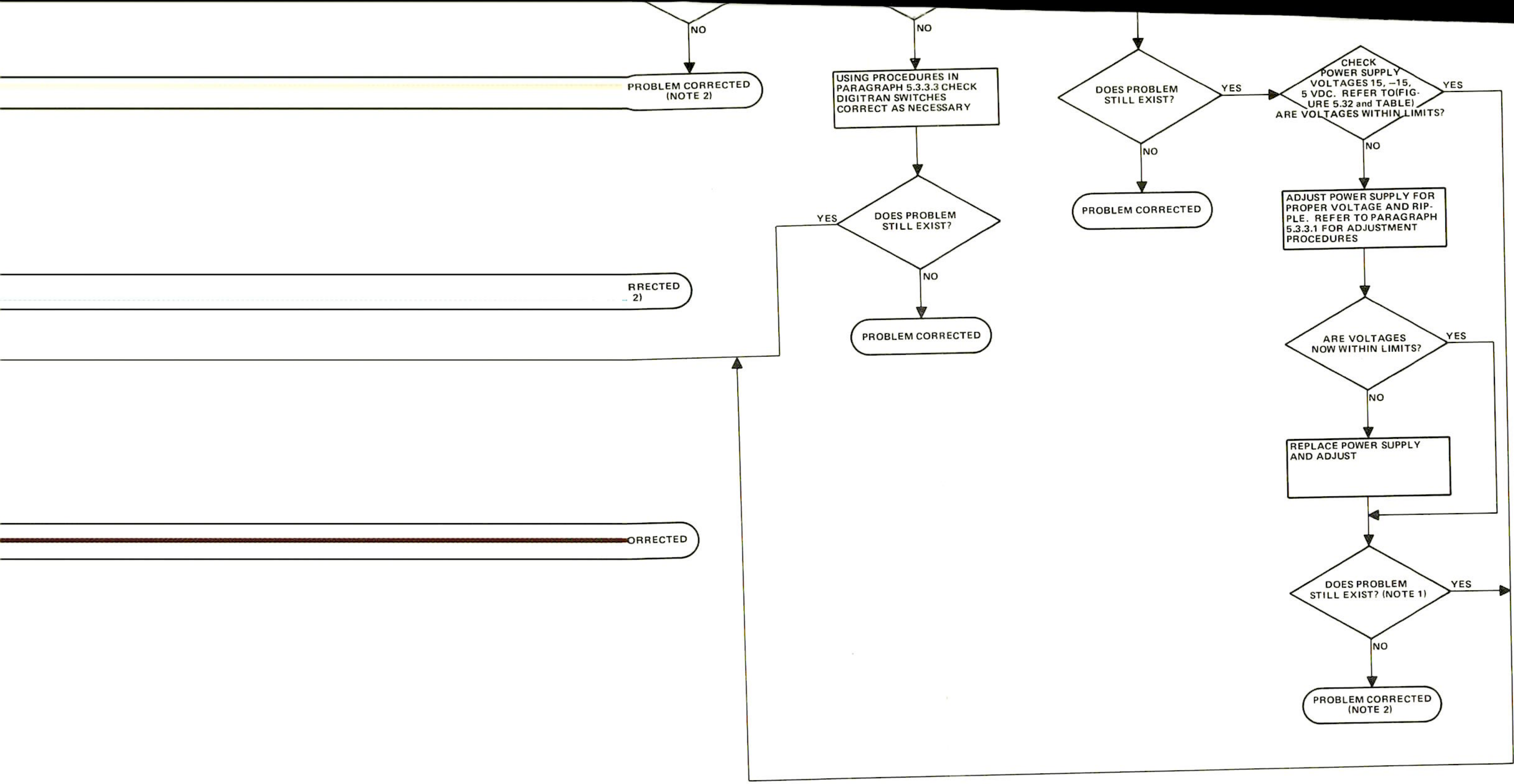
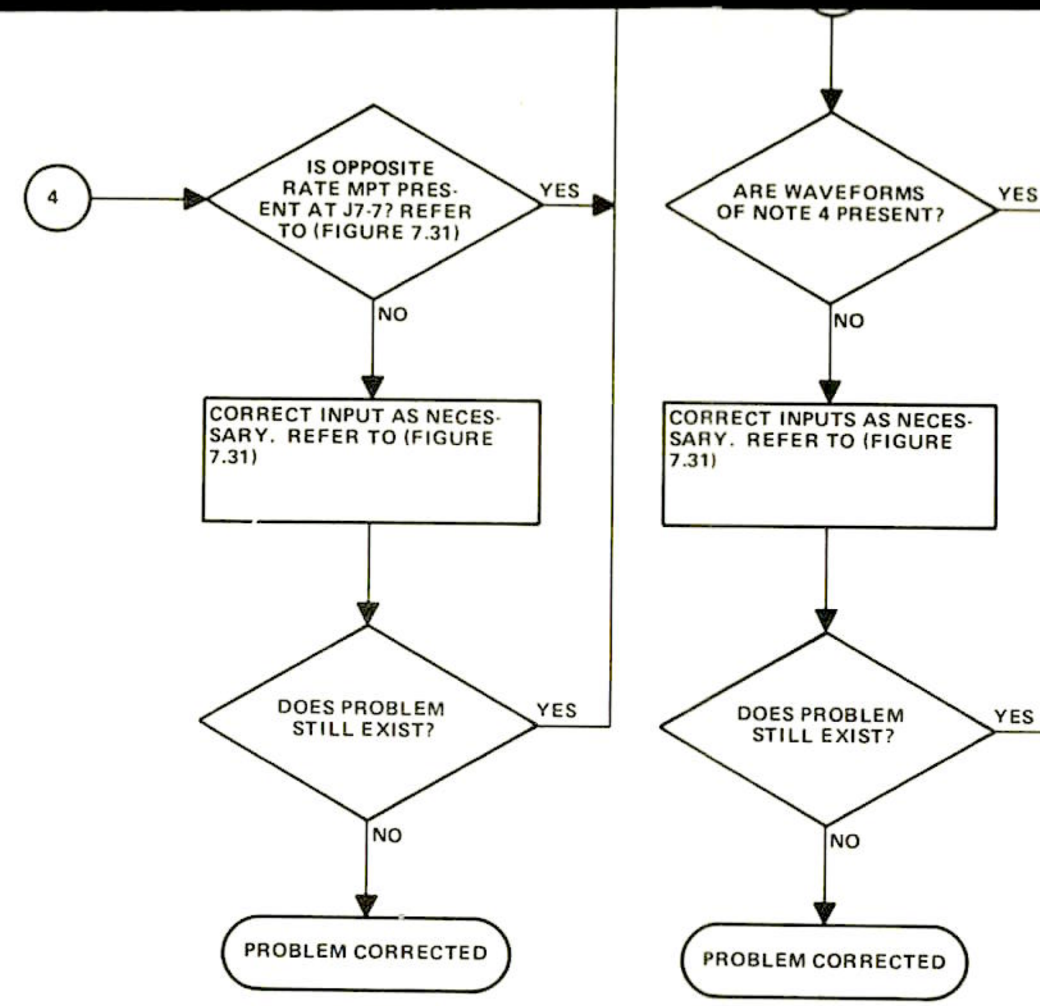


Figure 5.11. Pulse Generator (PGEN) Troubleshooting Flow-Chart (Sheet 2 of 2)

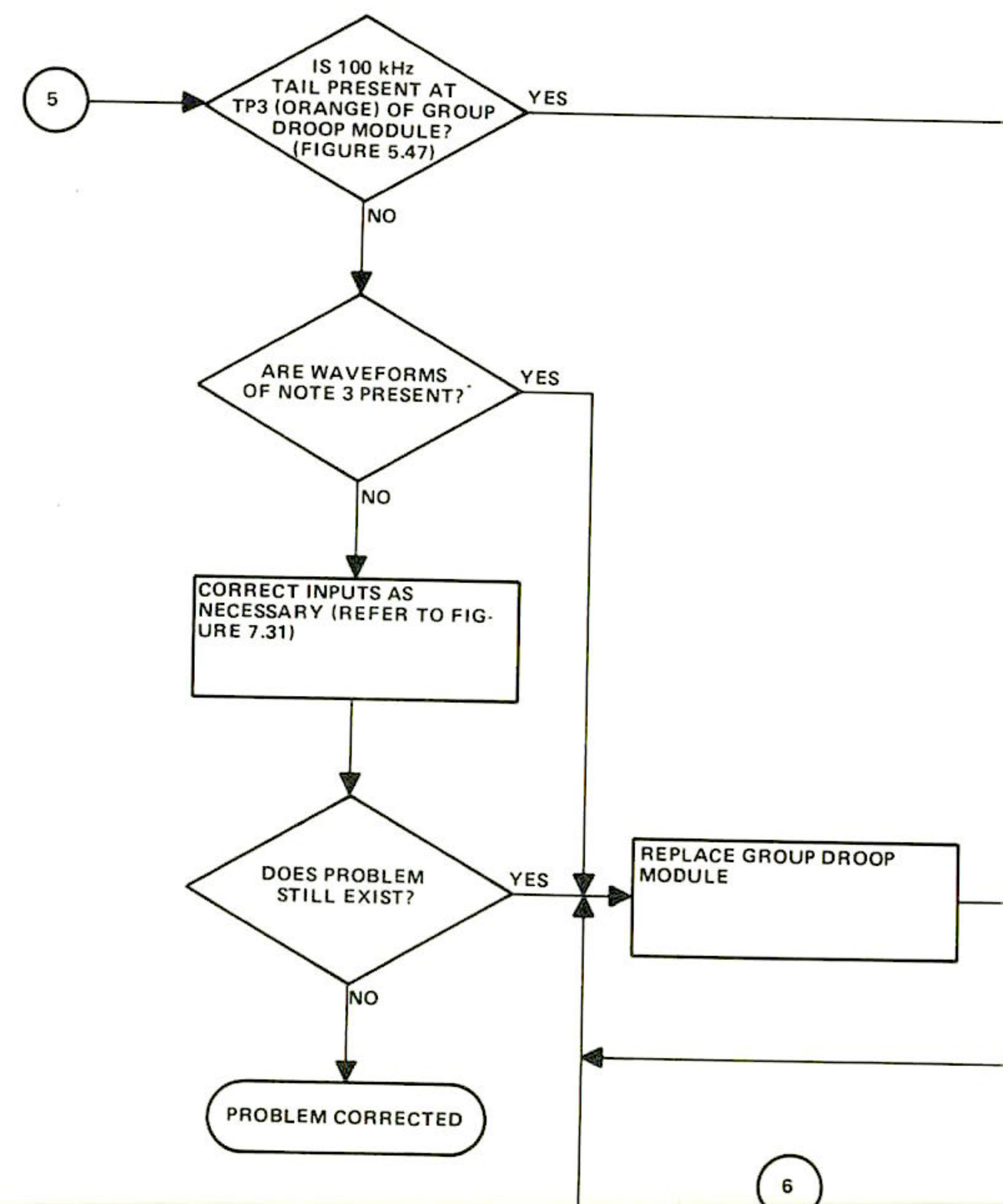
NOTES:

1. IF REPLACEMENT OF MODULE DOES NOT CORRECT PROBLEM, RE-INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULES IAW E/GICP INSTRUCTIONS.
3. (A) LOCAL INTERVAL FIGURE 5.40.
   (B) 100 kHz FIGURE 5.39.
   (C) MPT FIGURE 5.41.
4. (A) PHASE CODE SET FIGURES 5.44 AND 5.45.
   (B) PHASE CODE RESET FIGURES 5.42 AND 5.43.



(TABLE)

	NOMINAL VOLTAGE	UPPER LIMIT	LOW. LIMIT	AC RIPPLE LIMIT
PGEN PS1	+5.0V	+5.25V	+4.75V	1.4 mV
	–15.0V	–15.5V	–14.5V	2.8 mV
	+15.0V	+15.5V	+14.5V	2.8 mV


5
IS 100 kHz TAIL PRESENT AT TP3 (ORANGE) OF GROUP DROOP MODULE? (FIGURE 5.47)
YES
NO
ARE WAVEFORMS OF NOTE 3 PRESENT?
YES
NO
CORRECT INPUTS AS NECESSARY (REFER TO FIGURE 7.31)
DOES PROBLEM STILL EXIST?
YES
NO
PROBLEM CORRECTED
REPLACE GROUP DROOP MODULE
6

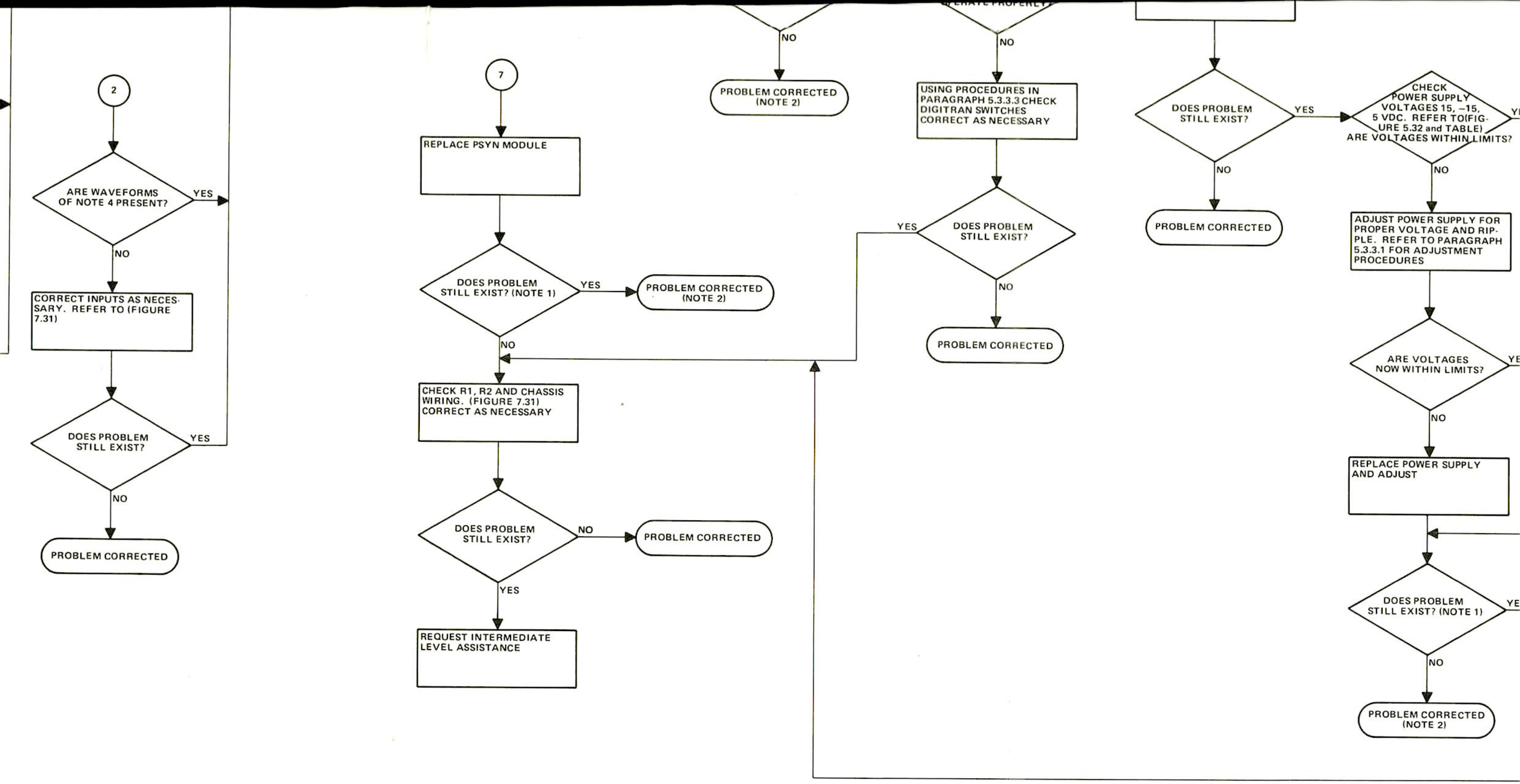
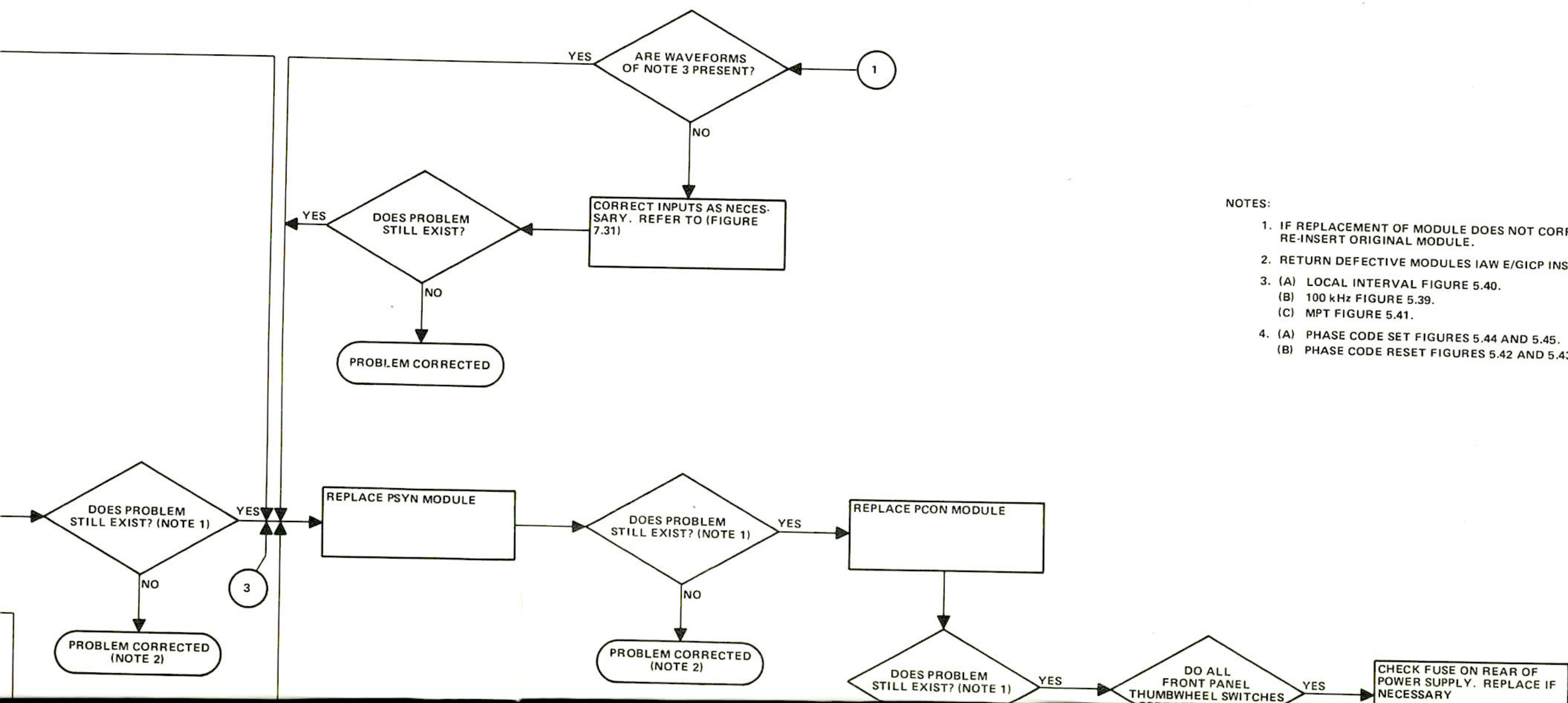


Figure 5.11. Pulse Generator (PGEN) Troubleshooting Flow-Chart (Sheet 2



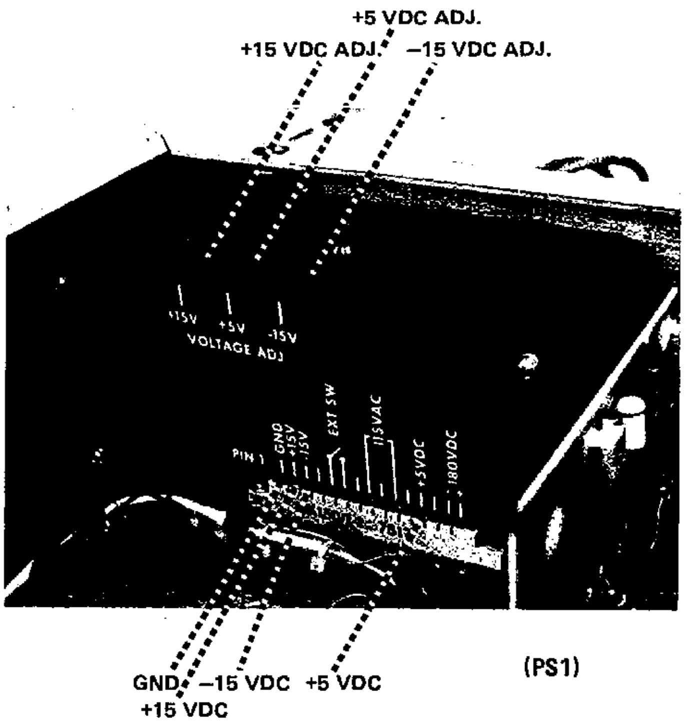
NOTES:

1. IF REPLACEMENT OF MODULE DOES NOT CORRECT PROBLEM, RE-INSERT ORIGINAL MODULE.
2. RETURN DEFECTIVE MODULES IAW E/GICP INSTRUCTIONS.
3. (A) LOCAL INTERVAL FIGURE 5.40.
   (B) 100 kHz FIGURE 5.39.
   (C) MPT FIGURE 5.41.
4. (A) PHASE CODE SET FIGURES 5.44 AND 5.45.
   (B) PHASE CODE RESET FIGURES 5.42 AND 5.43.

2 of 2)
23/5.24

5.3.2 Test point data.

5.3.2.1 Transmitter Coupler Control. Figure 5.12 shows the location of the voltage test and adjustment points of the power supplies in the TCC. Figure 5.13 shows the locations of the test points of the modules of the TCC. Figure 5.13 also shows the location of a potentiometer (R8) of the Transmitter Control Module. The test point waveforms are TTL level waveforms.



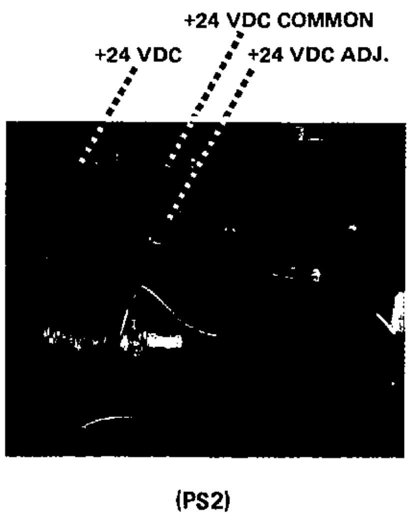


Figure 5.12. Voltage Test Point and Adjustment Locations of the TCC Power Supplies

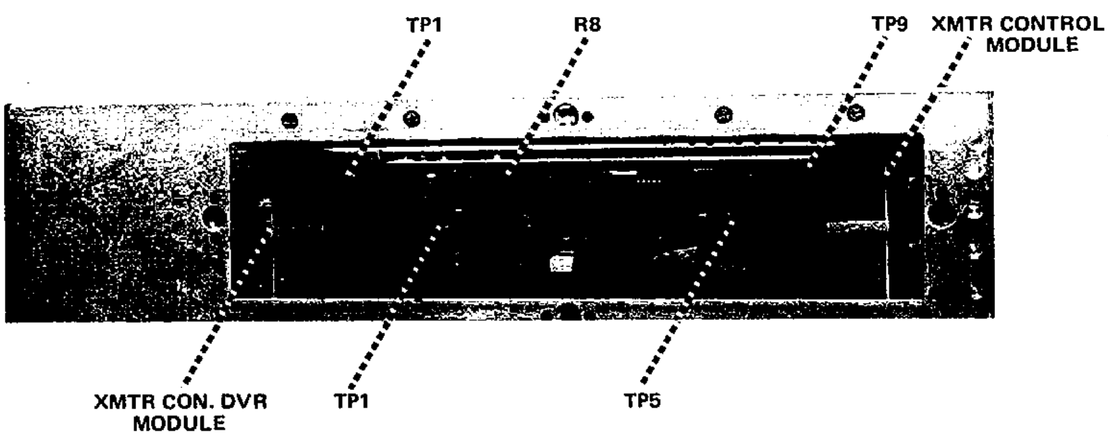


Figure 5.13. Test Point and Potentiometer Locations of the TCC Modules

5.3.2.2 Electrical Pulse Analyzer. Figure 5.14 shows the locations of the voltage test and adjustment points of the (PS1) power supply of the EPA. It also shows the location of the test points and R10 of the Clip Attenuator module. Figure 5.15 shows the test point locations of the Peak Detector, Gate Control, and ECD modules. Figures 5.16 to 5.31 show the waveforms of various jacks and test points of the EPA.

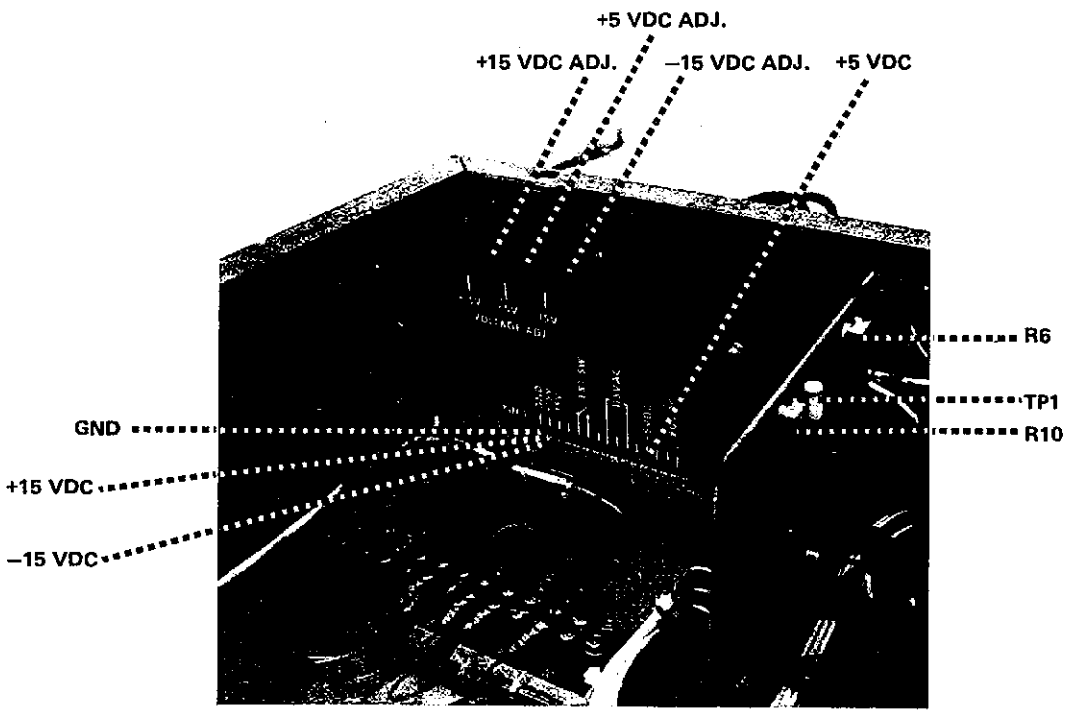


Figure 5.14. PS1 and CLP ATTN Test Point and Adjustment Locations

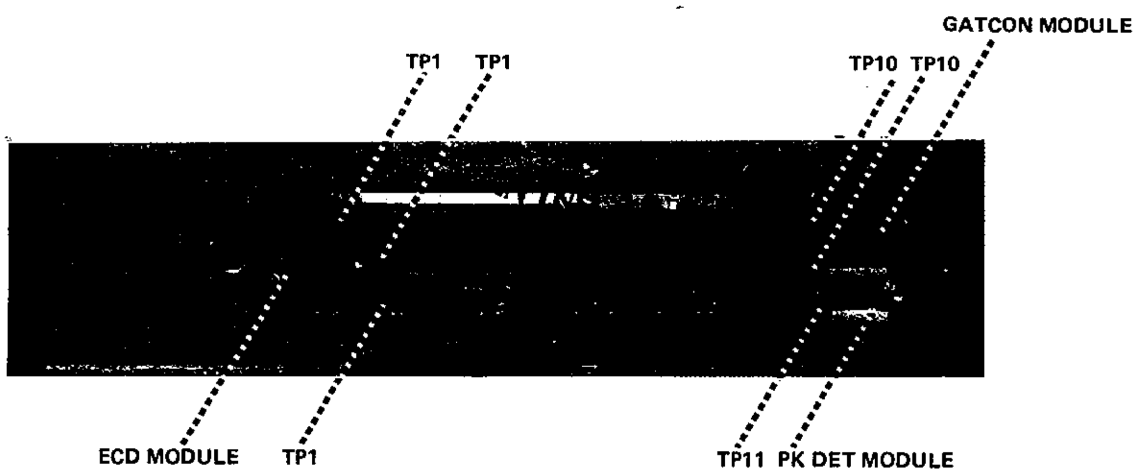
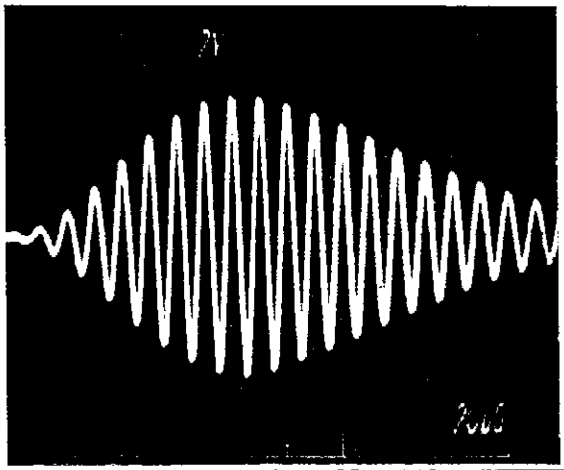
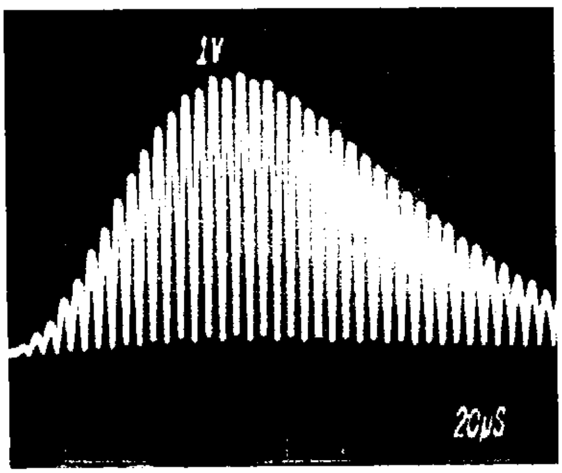


Figure 5.15. PK DET, GATCON, and ECD Test Point Locations



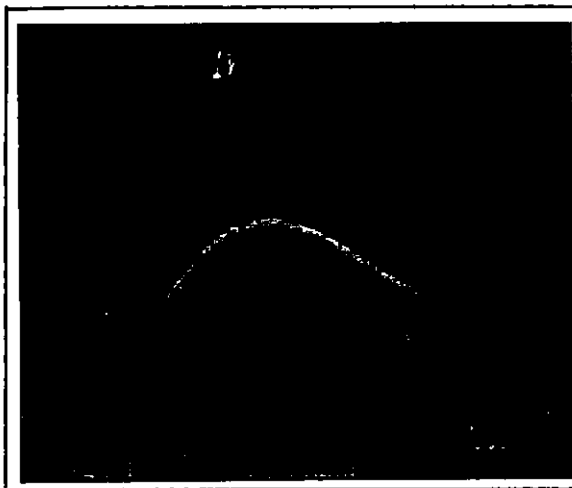
COMMENTS		SOURCE	SETTINGS
GROUND REF:		SIGNAL:	TRIGGER:
Center		EPA OPERATE RF jack.	(+) External
		Coaxial Cable.	MODE:
		TRIGGER:	Main Sweep
EPA SETTINGS		PGEN SCOPE	HORIZONTAL:
RATE	Either	TRIGGER	
MODE	Either	jack w/	20 us/Div
SAMPLE NO.	Any	1st MPT selected	VERTICAL: 2 v/Div

Figure 5.16. Operate RF Waveform



COMMENTS		SOURCE	SETTINGS
GROUND REF:		SIGNAL:	TRIGGER:
Two divisions below center.		FWR RF jack (J1) on Waveform Panel.	(-) External
Use coaxial Cable for signal source.			MODE: Main Sweep
		TRIGGER:	
EPA SETTINGS		PGEN SCOPE	HORIZONTAL:
RATE	Either	TRIGGER	
MODE	Either	jack w/	20 us/Div
SAMPLE NO.	Any	1st MPT selected	VERTICAL: 1 v/Div

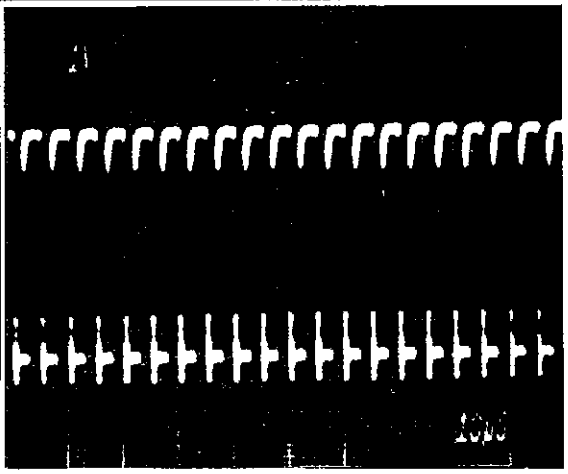
Figure 5.17. Full Wave Rectified RF Waveform



COMMENTS		SOURCE	SETTINGS
GROUND REF:		SIGNAL:	TRIGGER:
Three divisions below center.		REF ENV jack (J2) on Waveform Panel.	(-) External
AMPLITUDE:			NOTE
Adjustable using pot R1 on rear of EPA.		Coax Cable	MODE: Delayed Sweep
		TRIGGER:	HORIZONTAL:
EPA SETTINGS		PGEN SCOPE	20 us/Div
RATE	Either	TRIGGER	(Main Sweep
MODE	Either	jack w/	0.2 ms/Div)
SAMPLE NO.	Any	1st MPT selected	VERTICAL: 1 v/Div

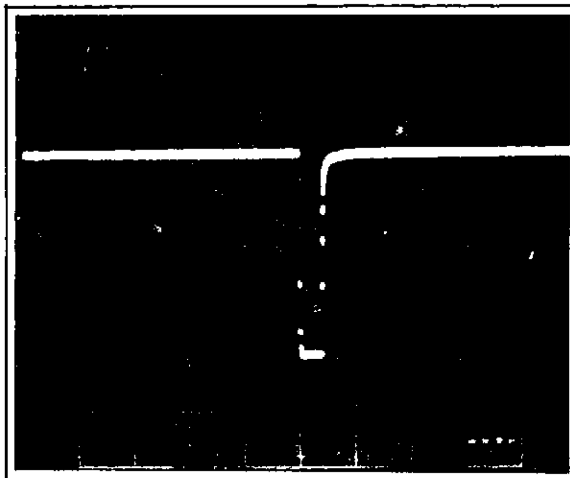
Note: Connect WP J3 to the oscilloscope delayed gate output. If no waveform is present, move the connection to WP J4.

Figure 5.18. Reference Envelope Waveform



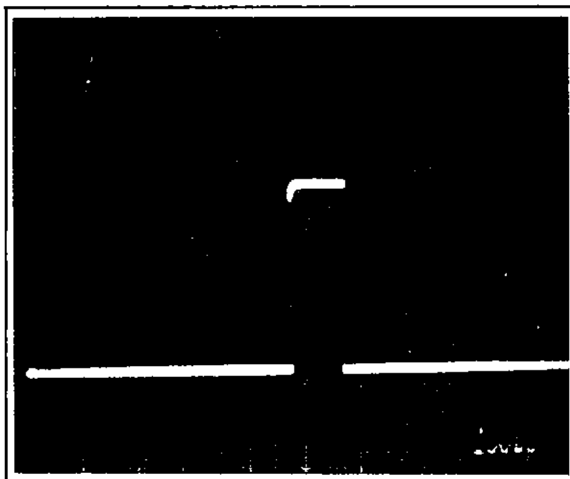
COMMENTS		SOURCE	SETTINGS
GROUND REF: Two divisions below center		SIGNAL: SAMPLE GATE jack on EPA. Coaxial Cable.	TRIGGER: (+) External
			MODE: Main Sweep
EPA SETTINGS		TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	HORIZONTAL: 10 us/Div
RATE	Either		
MODE	Pulse		
SAMPLE NO.	Any		VERTICAL: 1.0 v/Div

Figure 5.19. Sample Gate Waveform



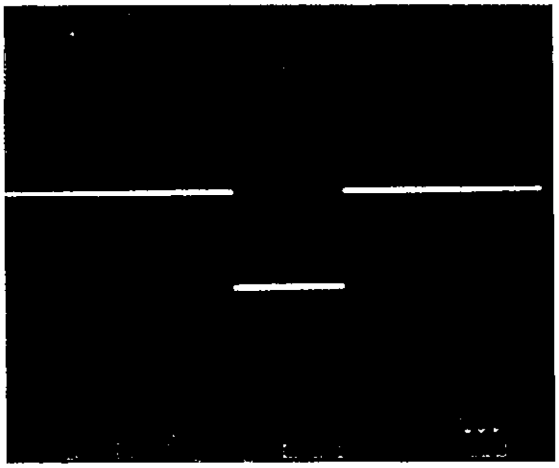
COMMENTS		SOURCE	SETTINGS
GROUND REF: One division below center. Signal width varies with ECD.		SIGNAL: LOCAL ENV X-OVER Trigger jack on EPA rear. Coax Cable	TRIGGER: (+) External
			MODE: Main Sweep
EPA SETTINGS		TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	HORIZONTAL: 10 us/Div
RATE	Either		
MODE	Either		
SAMPLE NO.	Any		VERTICAL: 1.0 v/Div

Figure 5.20. Local Envelope Crossover Trigger



COMMENTS		SOURCE	SETTINGS
GROUND REF: Two divisions below center.		SIGNAL: TP1 Brown of GATCON Module. x1 Probe.	TRIGGER: (+) External
			MODE: Main Sweep
EPA SETTINGS		TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	HORIZONTAL: 100 us/Div
RATE	Either		
MODE	Either		
SAMPLE NO.	Any		VERTICAL: 1.0 v/Div

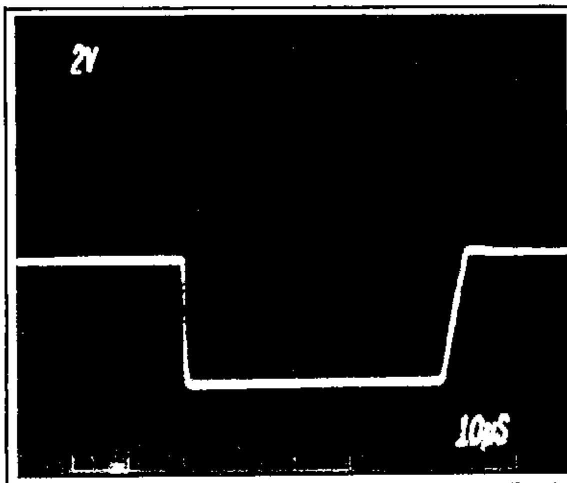
Figure 5.21. Peak Detector Reset Waveform



COMMENTS	SOURCE	SETTINGS
GROUND REF: One divi- sion below center. PULSE MODE: see Note 1. HALF CYCLE MODE: see Note 2. EPA SETTINGS RATE Either MODE Either SAMPLE NO. Any	SIGNAL: GATCON Module TP4 (Yel- low). x1 Probe. TRIGGER: Stby Timer TP7 (Red) E,F, or G Module (DRRG) of sel. rate	TRIGGER: (+) External MODE: Main Sweep HORIZONTAL: 500 us/Div VERTICAL: 2.0 v/Div

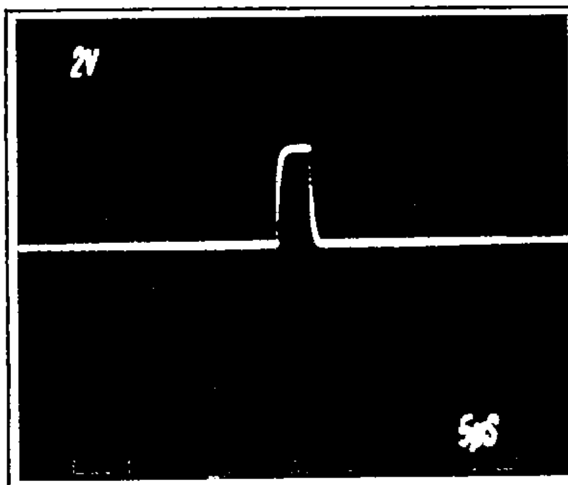
Notes: 1. Gate moves in time from pulse to pulse. 2. Gate width increases with sample number.

Figure 5.22. Data Strobe Waveform



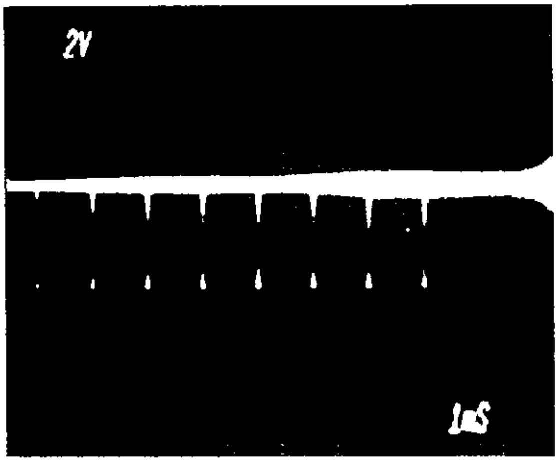
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center. Waveform changes with change of ECD and DC level of GRI. EPA SETTINGS RATE Either MODE Either SAMPLE NO. Any	SIGNAL: ECD Module TP1 (Brown). x1 Probe. TRIGGER: Stby Timer TP7 (Red) E,F, or G Module (DRRG) of sel. rate	TRIGGER: (+) External MODE: Delayed Sweep HORIZONTAL: 10 us/Div (Main Sweep 0.2 ms/Div) VERTICAL: 2.0 v/Div

Figure 5.23. ECD Ramp Voltage Waveform



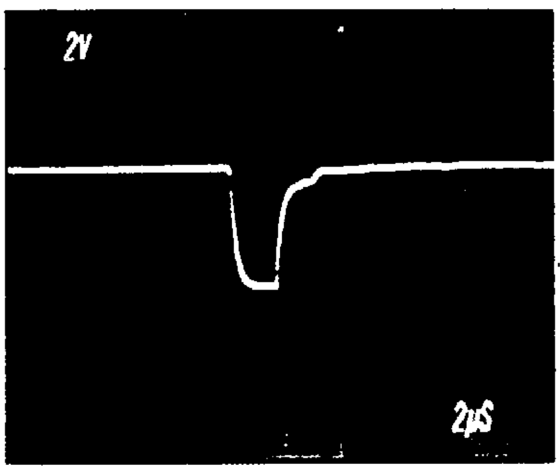
COMMENTS	SOURCE	SETTINGS
GROUND REF: One divi- sion below center EPA SETTINGS RATE Either MODE Either SAMPLE NO. Any	SIGNAL: ECD Module TP2 (Red). x1 Probe. TRIGGER: Stby Timer TP7 (Red) E,F, or G Module (DRRG) of sel. rate	TRIGGER: (+) External MODE: Delayed Sweep HORIZONTAL: 5 us/Div (Main Sweep 0.1 ms/Div) VERTICAL: 2.0 v/Div

Figure 5.24. MPT Count and Select Strobe Generator Waveform



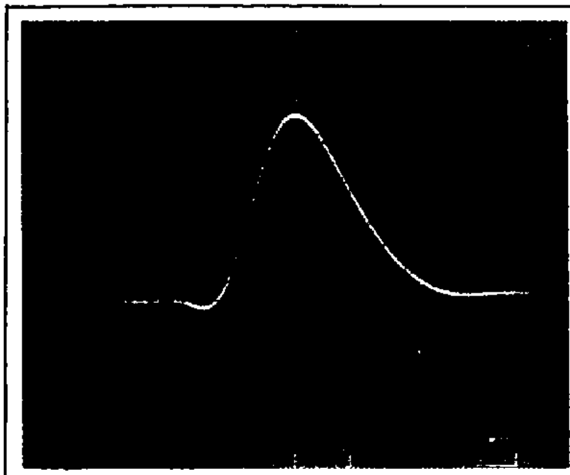
COMMENTS		SOURCE	SETTINGS
GROUND REF: One division below center.		SIGNAL: ECD Module TP4 (Yellow). x1 Probe.	TRIGGER: (+) External
			MODE: Main Sweep
EPA SETTINGS		TRIGGER: Stby Timer TP7 (Red) E,F, or G Module (DRRG) of sel. rate	HORIZONTAL: 1 ms/Div
RATE	Either		
MODE	Either		
SAMPLE NO.	Any		VERTICAL: 2.0 v/Div

Figure 5.25. MPT Count and Select (Output of U17) Waveform



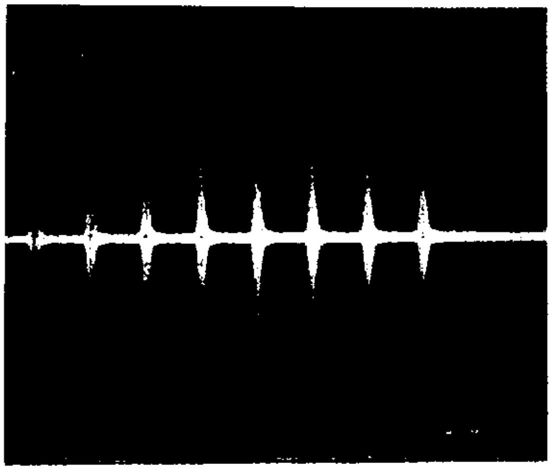
COMMENTS		SOURCE	SETTINGS
GROUND REF: One division below center		SIGNAL: ECD Module TP5 (Green). x1 Probe.	TRIGGER: (+) External
			MODE: Delayed Sweep
EPA SETTINGS		TRIGGER: Stby Timer TP7 (Red) E,F, or G Module (DRRG) of sel. rate	HORIZONTAL: 2 us/Div (Main Sweep 0.1 ms/Div)
RATE	Either		
MODE	Either		
SAMPLE NO.	Any		VERTICAL: 2.0 v/Div

Figure 5.26. Half Cycle Pulse Select Waveform



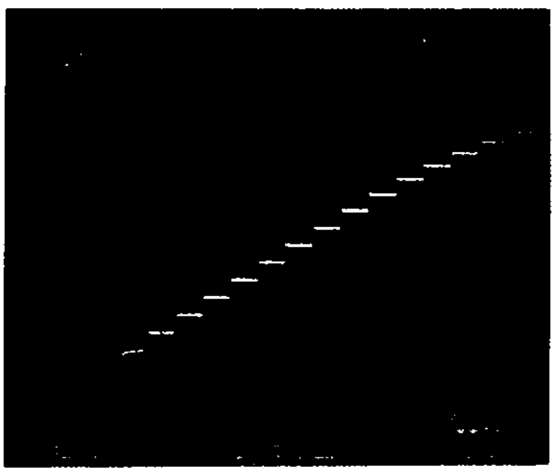
COMMENTS		SOURCE	SETTINGS
GROUND REF: One division below center		SIGNAL: ECD Module TP7 (Violet). x1 Probe.	TRIGGER: (+) External
			MODE: Delayed Sweep
EPA SETTINGS		TRIGGER: Stby Timer TP7 (Red) E,F, or G Module (DRRG) of sel. rate	HORIZONTAL: 50 us/Div (Main Sweep 0.1 ms/Div)
RATE	Either		
MODE	Either		
SAMPLE NO.	Any		VERTICAL: 1.0 v/Div

Figure 5.27. Low Pass Filter Output to Envelope Hard Limiter Waveform



COMMENTS	SOURCE	SETTINGS
GROUND REF: Center. Amplitude may vary.	SIGNAL: ECD Module TP10 (Brown). x1 Probe.	TRIGGER: (+) External
EPA SETTINGS RATE: Either MODE: Either SAMPLE NO.: Any	TRIGGER: Waveform Panel SCOPE TRIGGER jack	MODE: Main Sweep HORIZONTAL: 1 ms/Div VERTICAL: 1.0 v/Div

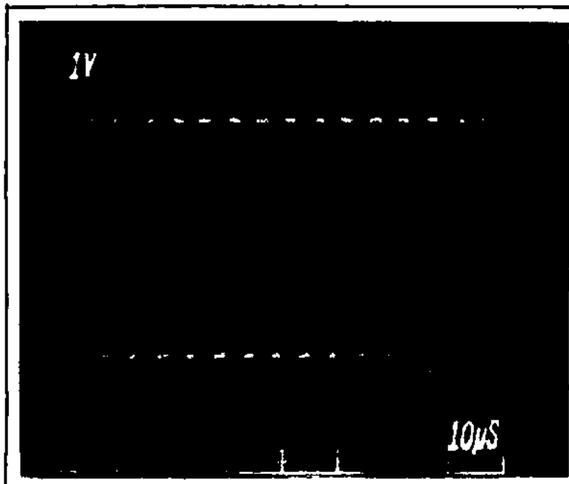
Figure 5.28. Attenuated RF



COMMENTS	SOURCE	SETTINGS
GROUND REF: Two divisions below center. SWEEP: Note 1 PEAK AMP: Note 2	SIGNAL: PK DET Module TP3 (Orange). x1 Probe.	TRIGGER: (+) External
EPA SETTINGS RATE: Either MODE: Either SAMPLE NO.: Any	TRIGGER: Waveform Panel SCOPE TRIGGER jack	MODE: Main Sweep HORIZONTAL: 200 ms/Div VERTICAL: 1.0 v/Div

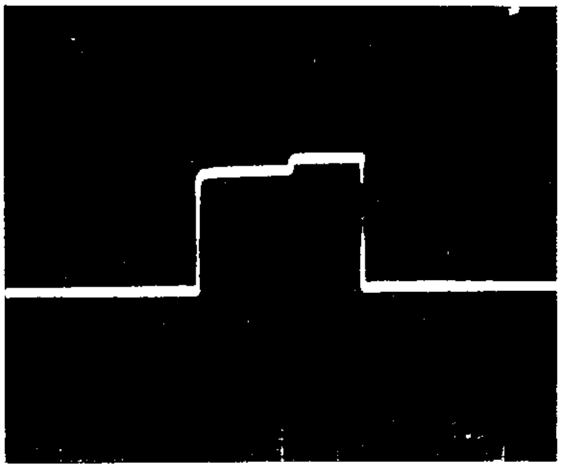
Notes: 1. Entire waveform may not be retained for complete sweep (sweep speed extremely slow). 2. Dependent upon half cycle selected and transmitter output.

Figure 5.29. Peak Volts Waveform



COMMENTS	SOURCE	SETTINGS
GROUND REF: Two divisions below center	SIGNAL: PK DET Module TP6 (Blue). x1 Probe.	TRIGGER: (-) External
EPA SETTINGS RATE: Either MODE: Either SAMPLE NO.: Any	TRIGGER: Waveform Panel SCOPE TRIGGER jack	MODE: Delayed Sweep HORIZONTAL: 10 us/Div (Main Sweep 0.2 ms/Div) VERTICAL: 1.0 v/Div

Figure 5.30. Count Waveform



COMMENTS	SOURCE	SETTINGS
GROUND REF: One division below center	SIGNAL: CLIP ATTN Module TP1 (White). x1 Probe.	TRIGGER: (+) External
		MODE: Delayed Sweep
	TRIGGER: Stby Timer TP7 (Red) E,F, or G Module (DRRG) of sel. rate	HORIZONTAL: 5 us/Div (Main Sweep 0.2 ms/Div)
		VERTICAL: 2.0 v/Div

EPA SETTINGS	
RATE	Either
MODE	Either
SAMPLE NO.	Any

Figure 5.31. Switching Gate Output to Envelope Hard Limiter Waveform

5.3.2.3 Pulse Generator. Figure 5.32 shows the voltage test and adjustment points of the power supply in the PGEN. Figure 5.33 shows the locations of the test points of the modules of the PGEN. Figure 5.33 also shows the location of various potentiometers of the W0678-19B/GR DROOP module. Figures 5.34 through 5.47 show the waveforms of the various test points of the PGEN modules. All waveforms are shown with the timers configured for a secondary station.

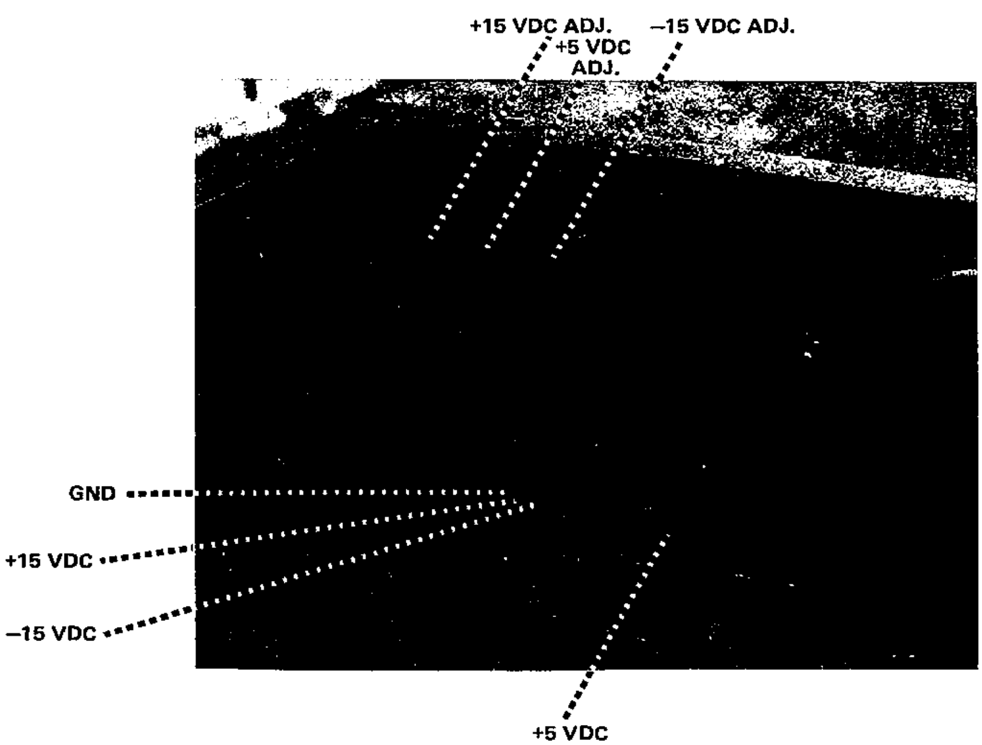


Figure 5.32. Voltage Test Point and Adjustment Locations of the PGEN Power Supply

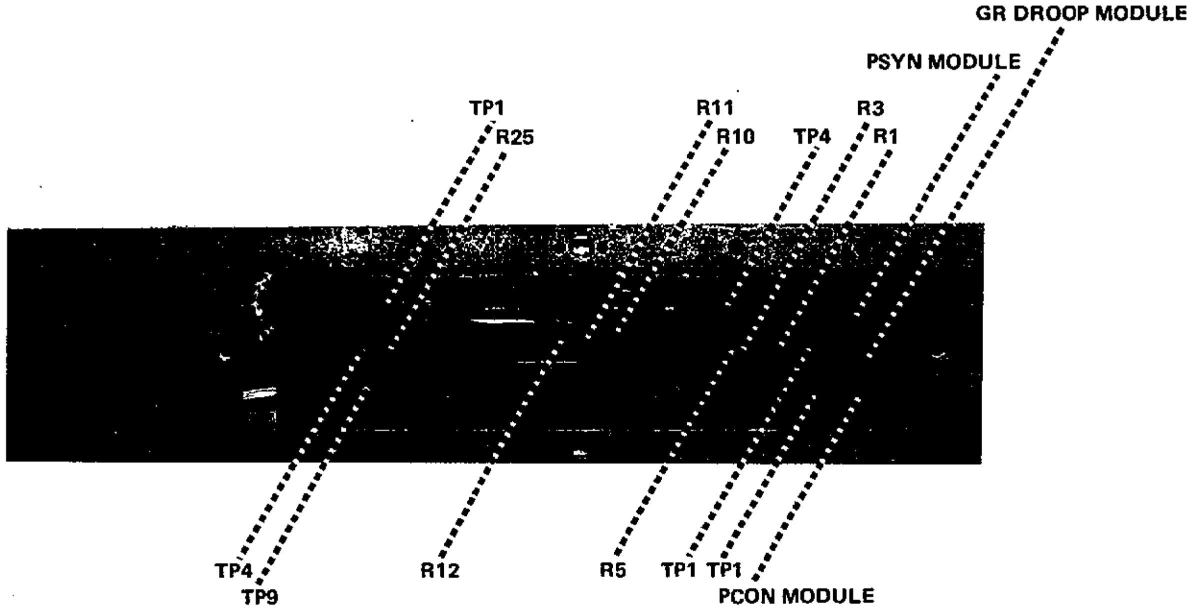
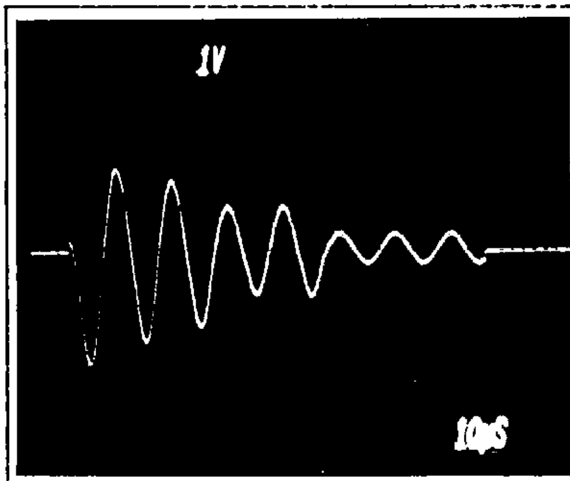
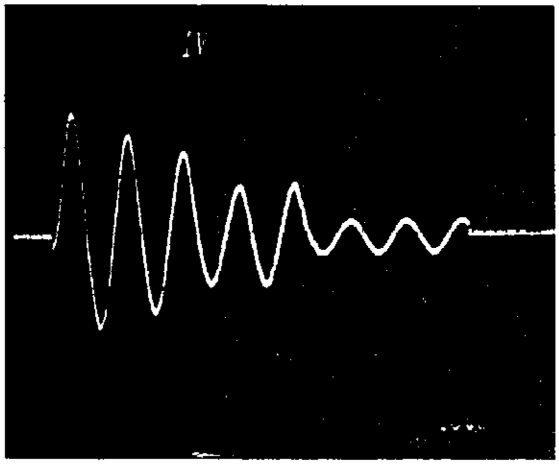


Figure 5.33. Test Point and Potentiometer Locations of the PGEN Modules



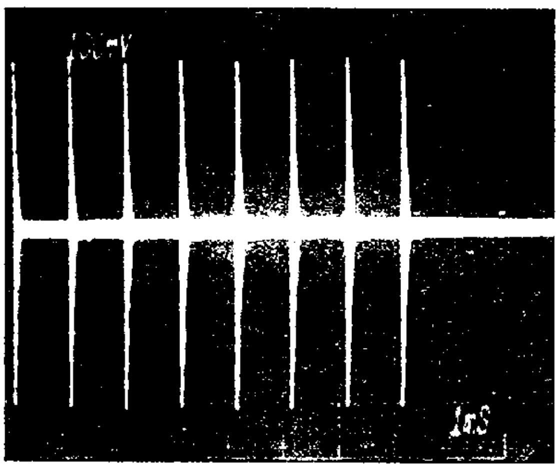
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center	SIGNAL: PSYN Module TP1 (Brown). (2nd MPT) x1 Probe.	TRIGGER: (+) External
ETA SETTING: 4.4		
AMPLITUDE: Adjustable by Transmitter Drive Adjust on front panel. PGEN setting 56787530. Shape & Amp. will vary.	TRIGGER: PGEN SCOPE TRIGGER jack w/ 2nd MPT selected	MODE: Delayed Sweep
		HORIZONTAL: 10 us/Div (Main Sweep 0.2 ms/Div)
		VERTICAL: 1.0 v/Div

Figure 5.34. Transmitter Drive Waveform (2nd MPT)



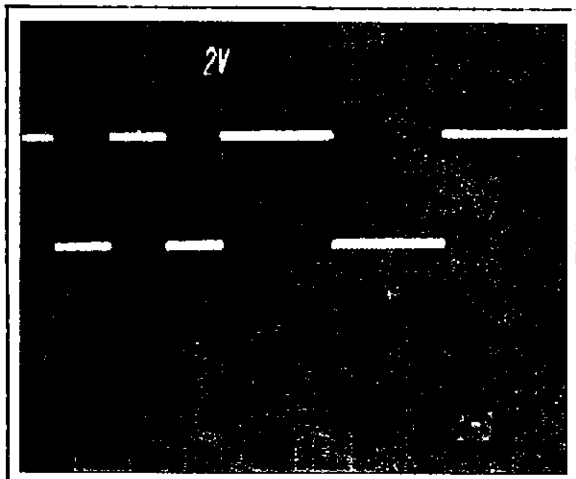
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center	SIGNAL: PSYN Module TP2 (Red). (3rd MPT) x1 Probe.	TRIGGER: (+) External
ETA SETTING: 4.4		MODE: Delayed Sweep
AMPLITUDE: Adjustable by Transmitter Drive Adjust on front panel. PGEN setting 56787530. Shape & Amp. will vary.	TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	HORIZONTAL: 10 us/Div (Main Sweep 0.2 ms/Div)
		VERTICAL: 100 mv/Div

Figure 5.35. Transmitter Drive Waveform (1st MPT)



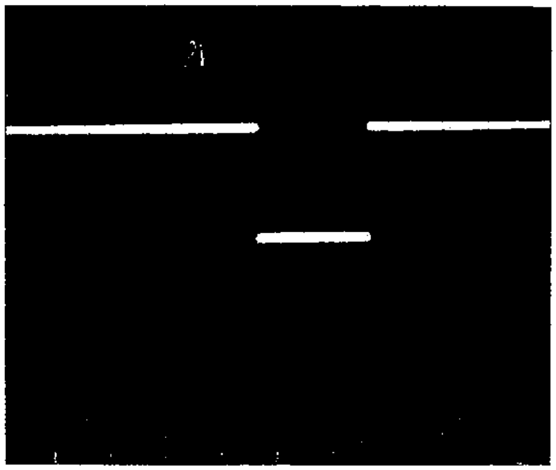
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center	SIGNAL: TRANSMITTER DRIVE jack. Coaxial Cable.	TRIGGER: (+) External
		MODE: Main Sweep
Waveform is for Secondary Station.	TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	HORIZONTAL: 1 ms/Div
		VERTICAL: 100 mv/Div

Figure 5.36. Transmitter Drive Waveform



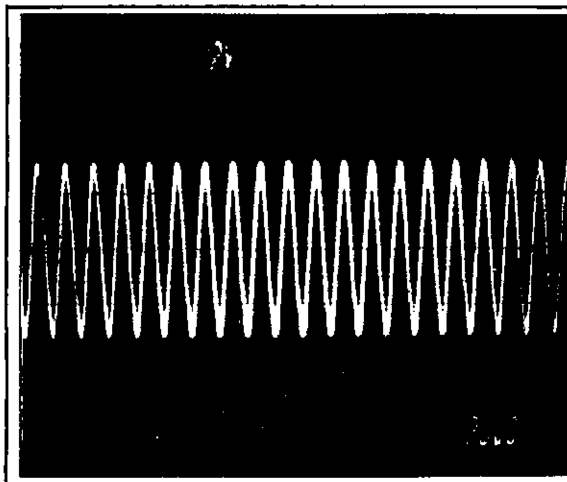
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center	SIGNAL: PSYN Module TP3 (Orange). x1 Probe.	TRIGGER: (+) External
		MODE: Main Sweep
Waveform is for Secondary Station.	TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	HORIZONTAL: 1 ms/Div
		VERTICAL: 2.0 v/Div

Figure 5.37. Phase Code Waveform (Positive Slope Triggered)



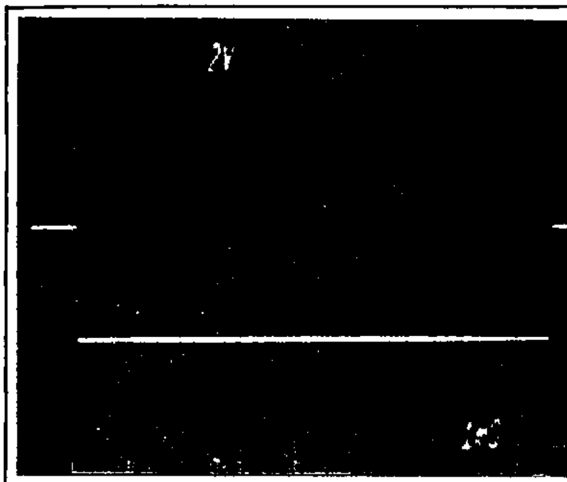
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: PSYN Module TP3 (Orange). x1 Probe. TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	TRIGGER: (-) External MODE: Main Sweep HORIZONTAL: 1 ms/Div VERTICAL: 2.0 v/Div

Figure 5.38. Phase Code Waveform (Negative Slope Triggered)



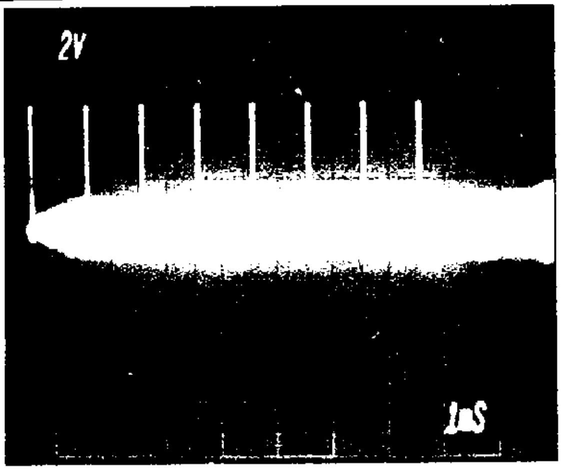
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: PCON Module TP2 (Red). x1 Probe. TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	TRIGGER: (+) External MODE: Main Sweep HORIZONTAL: 20 us/Div VERTICAL: 2.0 v/Div

Figure 5.39. 100 kHz Input



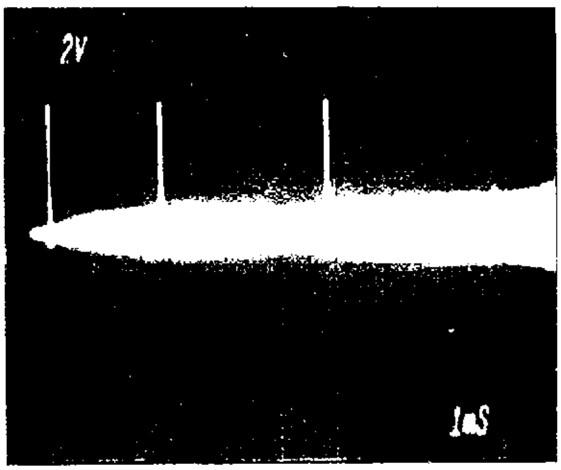
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: PCON Module TP4 (Yellow). x1 Probe. TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	TRIGGER: (+) External MODE: Delayed Sweep HORIZONTAL: 1 ms/Div (Main Sweep 20 ms/Div) VERTICAL: 2.0 v/Div

Figure 5.40. Local Interval



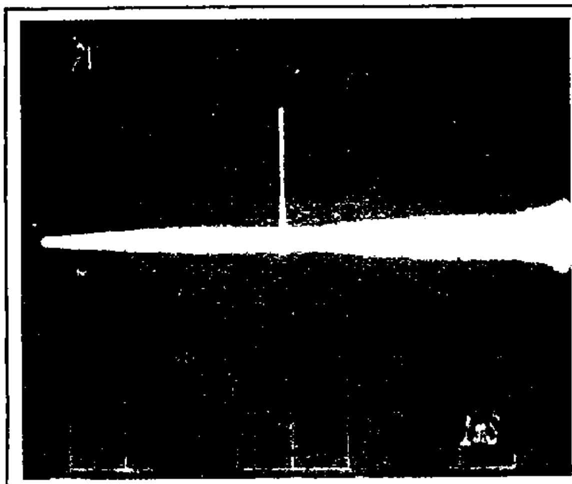
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center Waveform shown for Secondary Station. Master Station has nine MPTs.	SIGNAL: PCON Module TP5 (Green). x1 Probe. TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected	TRIGGER: (+) External MODE: Main Sweep HORIZONTAL: 1 ms/Div VERTICAL: 2.0 v/Div

Figure 5.41. MPTs



COMMENTS	SOURCE	SETTINGS
GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: PCON Module TP8 (Gray). x1 Probe. TRIGGER: Stby Timer TP4 (Yellow) F Module	TRIGGER: (-) External MODE: Main Sweep HORIZONTAL: 1 ms/Div VERTICAL: 2.0 v/Div

Figure 5.42. Phase Code Reset Waveform (Negative Slope Triggered)



COMMENTS	SOURCE	SETTINGS
GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: PCON Module TP8 (Gray). x1 Probe. TRIGGER: Stby Timer TP4 (Yellow) F Module	TRIGGER: (+) External MODE: Main Sweep HORIZONTAL: 1 ms/Div VERTICAL: 2.0 v/Div

Figure 5.43. Phase Code Reset Waveform (Positive Slope Triggered)

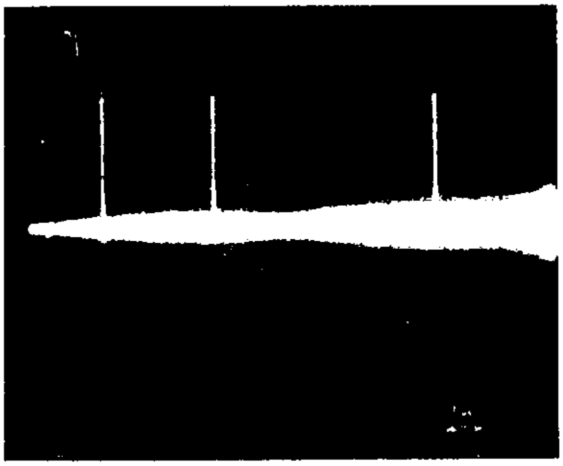
	COMMENTS	SOURCE	SETTINGS
	GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: PCON Module TP9 (White). x1 Probe. TRIGGER: Stby Timer TP4 (Yellow) F Module	TRIGGER: (-) External MODE: Main Sweep HORIZONTAL: 1 ms/Div VERTICAL: 2.0 v/Div

Figure 5.44. Phase Code Set Waveform (Negative Slope Triggered)

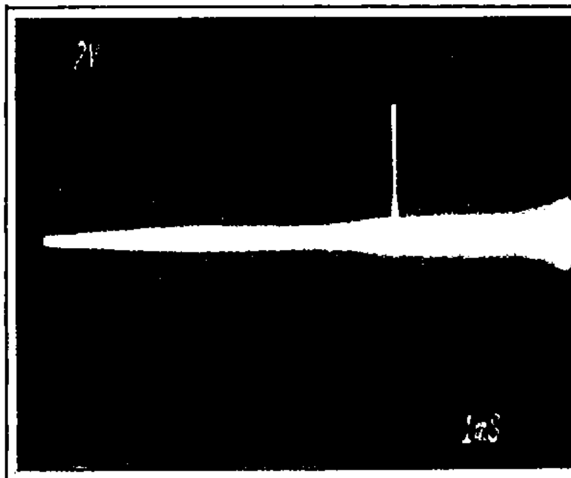
	COMMENTS	SOURCE	SETTINGS
	GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: PCON Module TP9 (White). x1 Probe. TRIGGER: Stby Timer TP4 (Yellow) F Module	TRIGGER: (+) External MODE: Main Sweep HORIZONTAL: 1 ms/Div VERTICAL: 2.0 v/Div

Figure 5.45. Phase Code Set Waveform (Positive Slope Triggered)

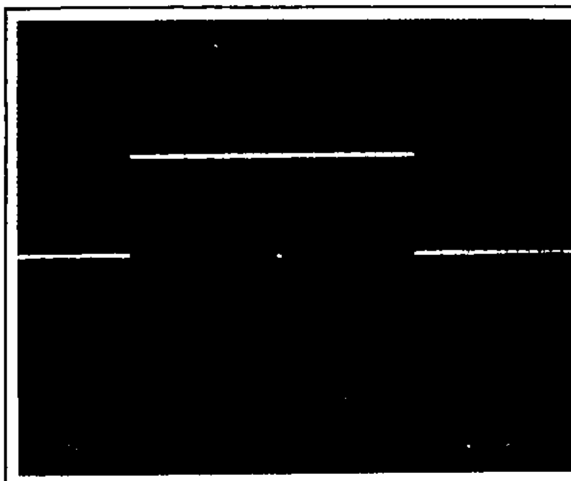
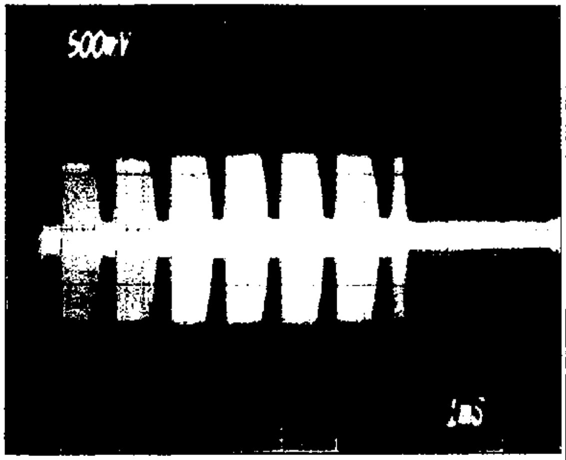
	COMMENTS	SOURCE	SETTINGS
	GROUND REF: Center Waveform is for Secondary Station.	SIGNAL: GR DROOP Module TP1 (Brown). x1 Probe. TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected.	TRIGGER: (+) External MODE: Delayed Sweep HORIZONTAL: 100 us/Div (Main Sweep 0.2 ms/Div) VERTICAL: 2.0 v/Div

Figure 5.46. Gate-H Waveform



COMMENTS	SOURCE	SETTINGS
GROUND REF: Center	SIGNAL: GR DROOP Module TP3 (Orange). x1 Probe.	TRIGGER: (+) External
		MODE: Main Sweep
	TRIGGER: PGEN SCOPE TRIGGER jack w/ 1st MPT selected.	HORIZONTAL: 1 ms/Div
		VERTICAL: 500 mv/Div

Figure 5.47. 100 kHz AM Tail

5.3.3 Adjustments and repair. If the following adjustments cannot be performed on the module involved, refer to the appropriate troubleshooting guide (paragraph 5.3.1) for instructions. If the module is not listed in the troubleshooting chart, replace the module as directed by E/GICP instructions.

5.3.3.1 Transmitter Coupler Control. Table 5.1 lists the voltage limits of both power supplies of the TCC. The TCC power supply adjustments are as follows (see Figure 5.12 for adjustment locations):

Table 5.1. TCC Power Supply Voltage Limits

POWER SUPPLY	NOMINAL VOLTAGE	UPPER LIMIT	LOWER LIMIT
PS1	5.0 Volts -15.0 Volts +15.0 Volts	5.25 Volts -15.5 Volts +15.5 Volts	4.75 Volts -14.5 Volts +14.5 Volts
PS2	+24.0 Volts	+24.5 Volts	+23.5 Volts

a. For PS1-Type AN-3005-AM:

(1) Measure the voltage between pin 2 and ground. Adjust the +15V control on the power supply for a nominal +15 VDC.

(2) Measure the voltage between pin 3 and ground. Adjust the -15V control on the power supply for a nominal -15 VDC.

(3) Measure the voltage between pin 12 and ground. Adjust the +5V control on the power supply for a nominal +5 VDC.

(4) Measure the AC ripple on pins 2, 3, and 12. If the AC ripple is more than 1.4 mV on pin 12, or more than 2.8 mV on pin 2 or 3, replace the power supply, and recheck the adjustments.

b. For PS2-Type OEM-2B24-1:

(1) Measure the voltage between the positive terminal post and ground. Adjust R8 for a nominal +24 VDC.

(2) If the power supply cannot be adjusted, or if the AC ripple is in excess of 4.2 mV replace the power supply, and recheck the adjustments.

5.3.3.2 Electrical Pulse Analyzer. The following are adjustment procedures for the PS1 Power Supply and Clip Attenuator module:

> CAUTION
>
> These procedures require the partial removal of the EPA from the rack. Cables are still attached to the rear of the EPA.

a. Refer to paragraph 5.3.3.1.a for the adjustment procedures for the PS1 Power Supply. PS2 +5V Power Supply is not adjustable or repairable.

b. DPM Calibration (R6 of Clip Attenuator module):

(1) Partially remove the chassis from the cabinet to permit access to the interior via the top panel. Leave all input/output cables connected to the EPA.

(2) Set the MODE SELECT switch to the PULSE NUMBER position, and the SAMPLE NUMBER switch to 100.

(3) Disable the cycle compensation loop by jumpering TP2 (Orange) to TP6 (Black) on the M Card(s) of the operate timer(s).

> CAUTION
>
> If TP2 (Orange) on the M Card is not jumpered to ground, timing shifts due to the cycle compensation loop may occur.

(4) Remove the chassis cover from the EPA.

> **WARNING**
>
> Hazardous voltages are present in the RF return cable.

(5) Locate and disconnect the keyed twin-axial connector in the Current Transformer cable (as close to the Current Transformer as possible).

(6) Using a 100 ohm 5%, 1/2W resistor and a calibrated oscilloscope, measure the zero-to-peak voltage of the first pulse of the transmitted pulse group. Ensure that the resistor is placed across the plus and minus pins of the twin-axial connector (refer to Figure 2.20). If the twin-axial cable was disconnected in the transmitter building, use the Transmitter Scope Trigger for the external trigger to the oscilloscope. If the cable was disconnected in the timer room, use the PGEN Scope Trigger.

(7) Remove the resistor and reconnect the twin-axial connector.

(8) Adjust the potentiometer (R6) (refer to Figure 5.14 for the location of R6) until the pulse peak reading on the EPA display is the same as the value (±1 volt) as obtained in step (6). Since the volt/ampere ratio of the Current Transformer (Pearson Model #1705) is 1/10, the peak current on the antenna may be obtained by multiplying this reading by ten.

(9) Replace the top cover on the EPA and re-install. Do not perform this step, if proceeding directly to the Clip Attenuator Gate adjustment.

(10) Re-enable the cycle compensation loop by removing the jumper(s) between TP2 (Orange) and TP6 (Black) on the M Card(s) of the operate timers.

c. Clip Attenuator Gate adjustment (R10 of the Clip Attenuator module):

(1) On Channel A of the oscilloscope, monitor the Sample Gate at J3, on the EPA front panel. If the Sample Gate is not present, refer to paragraph 5.3.1.4.

(2) Place the MODE SELECT switch (S2) in the HALF CYCLE NUMBER position. Adjust the SAMPLE NUMBER switch (S3) to position 1 for the pulse number and positions 08 for the half-cycle number.

(3) Remove the chassis mounting screws and pull the EPA out so that it protrudes from the cabinet. Remove the top cover of the chassis. This step was done if the DPM was just calibrated.

(4) On Channel B of the oscilloscope, monitor the Clip Attenuator Gate on the white test point (TP1) (refer to Figure 5.14) on the Clip Attenuator module.

(5) Adjust R10 on the Clip Attenuator module so that the sample gate overlaps with the leading edge of the Clip Attenuator Gate (refer to Figure 2.19.a).

(6) Monitor only the Clip Attenuator Gate and adjust R10 so that X=Y (refer to Figure 2.19.b).

5.3.3.3 Pulse Generator. Refer to paragraph 5.3.3.1 for the adjustments of the PGEN power supply. Paragraph 2.6.5 contains the adjustments for the W0678-19B/GR DROOP module. The following steps are the checks that can be performed on the front panel multi-section switches.

a. Remove the power to the Pulse Generator.

b. Remove all printed circuit modules.

c. Measure the resistance across pins 4 and 6 (ground) of the individual switch-section connector. Refer to Figure 5.48 for the connector pin location and numbering. With the switch-section in position 0, 2, 4, 6, or 8, the resistance should be 100k ohms or greater. With the switch-section in position 1, 3, 5, 7, or 9, the resistance should be 800 ohms or less.

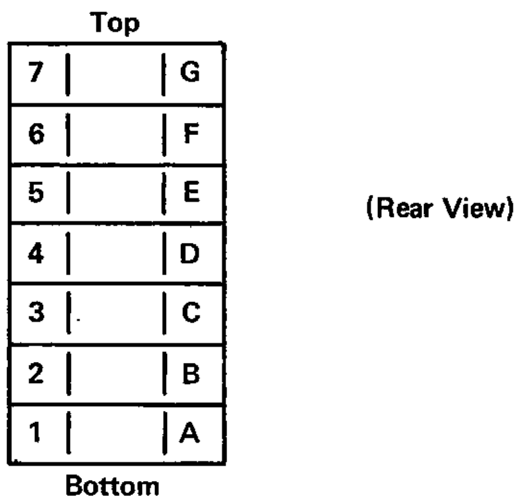


Figure 5.48. Individual Switch Section Connector Diagram

d. Move the positive lead to pin 3. With the switch-section in position 0, 1, 4, 5, 8, or 9, the resistance should be 100k ohms or greater. With the switch-section in position 2, 3, 6, or 7, the resistance should be 800 ohms or less.

e. Move the positive lead to pin 2. With the switch-section in position 0, 1, 2, 3, 8, or 9, the resistance should be 100k ohms or greater. With the switch-section in position 4, 5, 6, or 7, the resistance should be 800 ohms or less.

f. Move the positive lead to pin 1. With the switch-section in position 0, 1, 2, 3, 4, 5, 6, or 7, the resistance should be 100k ohms or greater. With the switch-section in position 8 or 9, the resistance should be 800 ohms or less.

g. Repeat steps c-f for all 23 sections of S2 (PULSE SYNTHESIZER) and S3 (DROOP).

CHAPTER 6

PARTS LIST

6.1 Introduction. Table 6.1 lists all of the major components of the Transmitter Control Set. Table 6.2 provides the parts listing of each unit of the Transmitter Control Set. Table 6.3 lists the five digit manufacturer's code and the respective manufacturer.

Table 6.1. TCS, Reference Designations

UNIT	ASSEMBLY OR SUBASSEMBLY	REF DESIG
CY-7523/FPN-60	ELECTRICAL EQUIPMENT CABINET	1
SA-2063/FPN-60	SWITCH ASSEMBLY	1A1
C-9888/FPN-60	TRANSMITTER COUPLER CONTROL Chassis and Panel Assembly W0678-5/XMTR CON Transmitter Control Module W0678-6/XMTR CON DVR Transmitter Control Driver Module W0678-13/Relay Assembly Type AN-3005-AM Power Supply (PS1) Type OEM-2B24-1 Power Supply (PS2)	1A2
TS-3550/FPN	ELECTRICAL PULSE ANALYZER Chassis and Panel Assembly W0678-3A/GATCON Gate Control Module W0678-4/PK DET Peak Detector Module W0678-18C/ECD ECD Module W0678-11A/CLP ATTN Clip Attenuator Module Digital Panel Meter Type AN-3005-AM Power Supply (PS1) Type UPM-5/1000B Power Supply (PS2)	1A3
SG-1099/FPN-60	PULSE GENERATOR Chassis and Panel Assembly W0678-1/PSYN Pulse Synthesizer Module W0678-19B/GR DROOP Group Droop Module W0678-20/GR DROOP Group Droop Module W0678-2/PCON Pulse Control Module Type AN-3005-AM Power Supply	1A4-1A7
SB-4156/FPN-60	WAVEFORM PANEL	1A8
J-3353/FPN-60	INTERFACE UNIT	1A9
	EPA JUNCTION BOX	1A10
	TCC JUNCTION BOX	1A11

Table 6.2. Parts List

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
1	CY-7523/FPN-60 Electrical Equipment Cabinet	74156	PC-5213 CGV
J1	POWER STRIP	74156	PS-52
TB1	TERMINAL BLOCK, 10 Terminal	75382	602-10
1A1	SA-2063/FPN-60 Switch Assembly		
S1	SWITCH, SPST, Normally Closed	04009	OBA3
S2	Same as S1		
1A2	C-9888/FPN-60 Transmitter Coupler Control		
A1	W0678-5/XMTR CON, TRANSMITTER CONTROL PC Module		
A2	W0678-6/XMTR CON DVR, TRANSMITTER CONTROL DRIVER PC Module		
C1	CAPACITOR, 1 uf, 200 VDC	80114	2DF-M1
C2	Same as C1		
C3	Same as C1		
C4	Same as C1		
CR1	DIODE, Silicon	15238	1N914A
CR2	Same as CR1		
CR3	Same as CR1		
CR4	Same as CR1		
CR5	Same as CR1		
CR6	Same as CR1		
CR7	DIODE, Silicon	15238	1N4005
DS1A	LAMP, Incandescent, 28 VDC	71744	CM387
DS1B	Same as DS1A		
DS1C	Same as DS1A		
DS1D	Same as DS1A		
DS2A	Same as DS1A		
DS2B	Same as DS1A		
DS2C	Same as DS1A		
DS2D	Same as DS1A		
DS3A	Same as DS1A		
DS3B	Same as DS1A		
DS3C	Same as DS1A		
DS3D	Same as DS1A		
DS4A	Same as DS1A		
DS4B	Same as DS1A		
DS4C	Same as DS1A		
DS4D	Same as DS1A		
DS5A	Same as DS1A		
DS5B	Same as DS1A		
DS5C	Same as DS1A		
DS5D	Same as DS1A		
DS6A	Same as DS1A		
DS6B	Same as DS1A		
DS6C	Same as DS1A		
DS6D	Same as DS1A		

Table 6.2. Parts List (Continued)

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
DS7A	Same as DS1A		
DS7B	Same as DS1A		
DS7C	Same as DS1A		
DS7D	Same as DS1A		
DS8A	Same as DS1A		
DS8B	Same as DS1A		
DS8C	Same as DS1A		
DS8D	Same as DS1A		
DS9A	Same as DS1A		
DS9B	Same as DS1A		
DS9C	Same as DS1A		
DS9D	Same as DS1A		
J1	CONNECTOR, Receptacle, Box Mounting Flange	02660	MS3102A22-14P
J2	CONNECTOR, Receptacle, Panel	02660	26-4401-24P
J3	CONNECTOR, Receptacle, BNC Bulkhead	02660	UG-1094/U
J4	Same as J3	02660	31-010
K1	RELAY, 4PDT, 24 VDC	77342	KHS-17011-24
K2	RELAY, Latching, 4PDT, 24 VDC	77342	K8P17D
K3	Same as K1		
K4	RELAY, 4PDT, 120 VAC	77342	KHS-17A11-120
K5	Same as K4		
K6	Same as K4		
K7	Same as K4		
LS1	SONALERT WARBLER	06124	SC-628W
MP1	CARD GUIDE, Nylon	23880	1650F
MP2	Same as MP1		
MP3	Same as MP1		
MP4	Same as MP1		
PS1	POWER SUPPLY, +5VDC, ±15VDC, with	31814	AN-3005-AM
PS1F1	FUSE, Slo-Blo, 1 Amp, 125 Volt, 3 AG	75915	313001
PS2	POWER SUPPLY, 24VDC	24429	OEM-2B24-1
S1	SWITCH ASSEMBLY, (Amber) with	96182	10EA1C1J3L (A)N1R1V13
S1A	CONTACT ASSEMBLY, Gold Contacts, Momentary Action, and	96182	10EF10
S1B	SWITCH COVER	96182	10E534
S2	SWITCH ASSEMBLY, (Yellow) with	96182	10EA1C1J3L (Y)N1R1V14
S2A	CONTACT ASSEMBLY, Gold Contacts, Momentary Action, and	96182	10EF10
S2B	SWITCH Cover	96182	10534
S3	SWITCH, Pushbutton, Miniature, SPST	70255	MSPS-103C
S4	SWITCH ASSEMBLY	96182	10EA1C2F3J1 (A)L1N1R13
XA1	CONNECTOR, Edge, 86 Pin	00779	67015-6
XA2	Same as XA1		
XDS1	LAMP ASSEMBLY, (Green)	96182	10EA2C1J3L (G)N1R1V13
XDS2	LAMP ASSEMBLY, (Green, White)	96182	10EA2C1J3L (GW)N2R1V16

Table 6.2. Parts List (Continued)

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
XDS3	LAMP ASSEMBLY, (Yellow)	96182	10EA2C1J3L (Y)N1R1V14
XDS4	Same as XDS2		
XDS5	LAMP ASSEMBLY, (Red)	96182	10EA2C1J3L (R)N2R1V17
XDS6	LAMP ASSEMBLY, (Red)	96182	10EA2C1J3L (R)N1R1V13
XK1	SOCKET, Relay, with Retaining Clips	77342	9KH1
XK2	SOCKET, Relay	77342	77-M1P20
XK3	Same as XK2		
XK4	Same as XK2		
XK5	Same as XK2		
XK6	Same as XK2		
XK7	Same as XK2		
XPS1	CONNECTOR, Edge, 30 Pin with	05574	2VK15D/1-1
XPS1A	KEY, Polarizing	05574	091-0024-000
1A3	TS-3550/FPN Electrical Pulse Analyzer		
A1	W0678-3A/GATCON, GATE CONTROL PC Module		
A2	W0678-18C/ECD, ECD PC Module		
A3	W0678-4/PK DET, PEAK DETECTOR PC Module		
A4	W0678-11A/CLP ATTN, CLIP ATTENUATOR PC Module		
CR1	DIODE, Silicon	15238	1N914
DS1	DIODE, Light Emitting, Yellow	50522	MV-5353
DS2	DIODE, Light Emitting, Green	50522	MV-5253
DS3	Same as DS2		
DS4	Same as DS2		
J1	CONNECTOR, Receptacle, BNC Bulkhead	02660	UG-1094/U
J2	Same as J1		
J3	Same as J1		
J4	Same as J1		
J5	Same as J1		
J6	CONNECTOR, Receptacle, Panel	02660	26-4401-24P
J7	CONNECTOR, Receptacle, Panel	02660	26-4401-24S
J8	Same as J1		
J9	Same as J1		
J10	CONNECTOR, Receptacle, Box Mounting Flange	02660	MS3112E8-3P
J11	Same as J1		
J12	Same as J1		
J13	Same as J1		
M1	METER, Digital, Panel Mounting	50721	DM-2000-B
MP1	CARD GUIDE, Nylon	23880	1650F
MP2	Same as MP1		
MP3	Same as MP1		
MP4	Same as MP1		

Table 6.2. Parts List (Continued)

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
MP5	Same as MP1		
MP6	Same as MP1		
PS1	POWER SUPPLY, +5VDC, ±15VDC, with	31814	AN-3005-AM
PS1F1	Fuse, Slo-Blo, 1 Amp, 125 Volt, 3 AG	75915	313001
PS2	POWER SUPPLY, 5VDC	50721	UPM-5/1000B
R1	RESISTOR, Variable, 1K , 1/2W	12697	RV6LAYSA102A
S1	SWITCH, Toggle, Miniature, SPDT	70255	MST-105D
S2	Same as S1		
S3	DIGI SWITCH ASSEMBLY, 3 Section BCD	07126	N3-U-238
S5	Same as S1		
S6	SWITCH, Toggle, Miniature, DPDT	70255	JMT-221
TB1	BARRIER STRIP, 10 Terminal	75382	600A-10
XA1	CONNECTOR, Edge, 86 Pin	00779	67015-6
XA2	Same as XA1		
XA3	Same as XA1		
XA4	CONNECTOR, Edge, 10 Pin, Double Readout	71785	251-15-30-160
XM1	CONNECTOR, Edge, 36 Pin	05574	3VH18/1JN-5
XPS1	CONNECTOR, Edge, 30 Pin, with	05574	2VK15D/1-1
XPS1A	KEY, Polarizing	05574	091-0024-000
XPS2	MATING SOCKET	50721	MS-7
XS3-A	CONNECTOR, Edge, 10 Pin, Single Readout	71785	251-10-30-170
XS3-B	Same as XS3-A		
XS3-C	Same as XS3-A		
1A4-1A7	SG-1099/FPN-60 Pulse Generator		
A1	W0678-1/PSYN, PULSE SYNTHESIZER PC Module		
A2	W0678-19B/GR DROOP, GROUP DROOP PC Module		
	W0678-20/GR DROOP, GROUP DROOP PC Module		
A3	W0678-2/PCON, PULSE CONTROL PC Module		
DS1	DIODE, Light Emitting, Green	50522	MV-5253
DS2	DIODE, Light Emitting, Red	50522	MV-5253
J1	CONNECTOR, Receptacle, BNC Bulkhead	02660	UG-1094/U
J2	Same as J1		
J3	Same as J1		
J4	Same as J1		
J5	CONNECTOR, Receptacle, Twinax	02660	UG-422/U
J6	Same as J5		
J7	CONNECTOR, Receptacle, Panel	02660	26-4401-24P
MP1	CARD GUIDE, Nylon	23880	1650F
MP2	Same as MP1		
MP3	Same as MP1		
MP4	Same as MP1		
MP5	Same as MP1		
MP6	Same as MP1		

Table 6.2. Parts List (Continued)

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
PS1	POWER SUPPLY, +5VDC, ±15VDC, with	31814	AN-3005-AM
PS1F1	Fuse, Slo-Blo, 1 Amp, 125 Volt, 3 AG	75915	313001
R1	RESISTOR, Variable, 50 K	32997	2735-1-502M
R2	RESISTOR, Variable, 2.5 K , with	12697	G2JA-2500
	DIAL	32997	H-510-2
S1	SWITCH, Toggle, Miniature, SPDT	70255	MST-105D
S2	DIGISWITCH ASSEMBLY, less switches, and diodes	07126	7882/107-16
S3	DIGISWITCH ASSEMBLY, less switches, and diodes	07126	7882/107-7
XA1	CONNECTOR, Edge, 86 Pin	00779	67015-6
XA2	Same as XA1		
XA3	Same as XA1		
XPS1	CONNECTOR, Edge, 30 Pin, with	05574	2VK15D/1-1
XPS1A	KEY, Polarizing	05574	091-0024-000
XS2-1	CONNECTOR, Edge, 6 Pin	71785	600-4PC7
XS2-2	Same as XS2-1		
XS2-3	Same as XS2-1		
XS2-4	Same as XS2-1		
XS2-5	Same as XS2-1		
XS2-6	Same as XS2-1		
XS2-7	Same as XS2-1		
XS2-8	Same as XS2-1		
XS2-9	Same as XS2-1		
XS2-10	Same as XS2-1		
XS2-11	Same as XS2-1		
XS2-12	Same as XS2-1		
XS2-13	Same as XS2-1		
XS2-14	Same as XS2-1		
XS2-15	Same as XS2-1		
XS2-16	Same as XS2-1		
XS3-1	Same as XS2-1		
XS3-2	Same as XS2-1		
XS3-3	Same as XS2-1		
XS3-4	Same as XS2-1		
XS3-5	Same as XS2-1		
XS3-6	Same as XS2-1		
XS3-7	Same as XS2-1		
1A8	SB-4156/FPN-60 Waveform Panel		
J1	CONNECTOR, Receptacle	02660	UG492A/U
J2	Same as J1		
J3	Same as J1		
J4	Same as J1		
J5	CONNECTOR, Receptacle	02660	M39012
J6	Same as J1		
J7	CONNECTOR, Receptacle, BNC Twinax	02660	31-223
S1	MICROSWITCH, DPDT	09353	8C3011A
XJ7	BRACKET	02660	21-000274868

Table 6.2. Parts List (Continued)

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
1A9	J-3353/FPN-60 Interface Unit		
J1	CONNECTOR, Receptacle, Twinax	02660	UG-422/U
J2	Same as J1		
J3	Same as J1		
J4	Same as J1		
J5	Same as J1		
J6	CONNECTOR, Receptacle, BNC	02660	UG-1094/U
J7	Same as J6		
J8	Same as J1		
J9	Same as J1		
J10	Same as J1		
J11	Same as J1		
J12	Same as J1		
J13	Same as J6		
J14	Same as J6		
J15	CONNECTOR, Receptacle, Panel	02660	26-4401-24P
J16	Same as J15		
J17	Same as J15		
J18	Same as J15		
J19	Same as J15		
J20	CONNECTOR, Receptacle, Panel	02660	26-4401-24S
J21	Same as J15		
J22	Same as J15		
J23	CONNECTOR, Receptacle, Box Mounting	71468	MS3102A22-14S
J24	CONNECTOR, Receptacle, Box Mounting	71468	MS3122E22-55S
J25	Same as J1		
J26	Same as J1		
J27	Same as J1		
J28	Same as J1		
J29	Same as J1		
J30	Same as J1		
J31	Same as J1		
J32	Same as J6		
J33	Same as J1		
J34	Same as J6		
J35	Same as J1		
J36	Same as J1		
J37	Same as J1		
J38	Same as J1		
R1	RESISTOR, 51 , 1/4W, 5%	01121	RC07GF510J
R2	Same as R1		
R3	Same as R1		
R4	Same as R1		
R5	Same as R1		
R6	Same as R1		
R7	Same as R1		
R8	Same as R1		
R9	Same as R1		
R10	Same as R1		
R11	RESISTOR, 680 , 1/4W, 5%	01121	RC07GF681J
R12	Same as R11		

Table 6.2. Parts List (Continued)

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
R13	RESISTOR, 180 , 1/4W, 5%	01121	RC07GF181J
R14	Same as R13		
R15	Same as R11		
R16	Same as R11		
R17	Same as R11		
R18	RESISTOR, 75 , 1/4W, 5%	01121	RC07GF750J
R19	Same as R13		
R20	Same as R11		
R21	Same as R11		
R22	Same as R11		
R23	Same as R18		
R24	Same as R1		
R25	Same as R1		
R26	Same as R1		
R27	Same as R1		
R28	Same as R13		
R29	Same as R13		
R30	Same as R13		
R31	Same as R13		
R32	Same as R13		
R33	Same as R13		
R34	Same as R11		
R35	Same as R11		
R36	Same as R13		
R37	Same as R11		
R38	Same as R11		
R39	Same as R11		
R40	Same as R18		
R41	Same as R13		
R42	Same as R11		
R43	Same as R11		
R44	Same as R11		
R45	Same as R18		
R46	Same as R11		
R47	Same as R11		
T1	POWER DIVIDER COMBINER	32252	R-HJ-702
T2	Same as T1		
T3	Same as T1		
T4	Same as T1		
T5	Same as T1		
T6	Same as T1		
T7	TRANSFORMER	98330	MB812
T8	Same as T7		
TB1	TERMINAL BOARD	75382	601-18
TB2	Same as TB1		
TB3	TERMINAL BOARD	91833	15514
TB4	Same as TB3		
XT1	SOCKET	05574	VB8-10A49-3
XT2	Same as XT1		
XT3	Same as XT1		
XT4	Same as XT1		

Table 6.2. Parts List (Continued)

REF SYM	NAME AND DESCRIPTION	MFR OR SOURCE	MFR's DATA
XT5	Same as XT1		
XT6	Same as XT1		
1A10	EPA Junction Box		
J1	CONNECTOR, Receptacle, Panel	02660	26-4401-24S
R1	RESISTOR, 51 , 1/4W, 5%	01121	RC07GF510J
1A11	TCC Junction Box		
J1	CONNECTOR, Receptacle, Panel	02660	26-4401-24P
R1	RESISTOR, 51 , 1/4W, 5%	01121	RC07GF510J

Table 6.3. Table of Manufacturers

00779	AMP, INC. P.O. Box 3608 Harrisburg, PA 17105
01121	Allen-Bradley Co. 1201 S. 2nd St. Milwaukee, WI 53204
02660	Bunker Ramo Corp. Amphenol Connector Div. 2801 S. 25th Ave. Broadview, IL 60153
04009	Crouse-Hinds Arrow Hart, Inc. Arrow Hart Div. 103 Hawthorne St. Hartford, CT 06105
05574	Viking Connectors, Inc. 21001 Nordhoff St. Chatsworth, CA 91311
06124	Mallory Timers Co. Div. of Mallory PR & Co., Inc. 3029 E. Washington St. Indianapolis, IN 46206
07126	The Digitran Co. 855 S. Arroyo Parkway Pasadena, CA 91105
09353	C and K Components, Inc. 103 Morse St. Watertown, MA 02172
12697	Clarostat Mfg. Co., Inc. Lower Washington St. Dover, NH 03820
15238	ITT Semiconductors 500 Broadway Lawrence, MA 01841
23880	Stanford Applied Eng., Inc. 340 Martin Ave. Santa Clara, CA 95050
24429	Powertec, Inc. 9168 Desoto Ave. Chatsworth, CA 91311

Table 6.3. Table of Manufacturers (Continued)

31814	Analogic Corp. Audubon Rd. Wakefield, MA 01880
32252	Olektron, Inc. 6 Chase Ave. Dudley, MA 01570
32997	Bourns Inc. Trimpot Products Div. 1200 Columbia Ave. Riverside, CA 92507
50522	Monsanto Co. Electronic Special Products 3400 Millview Ave. Palo Alto, CA 94303
50721	Datel Systems, Inc. 11 Cabot Blvd. Canton, MA 02021
70255	Alco Controls Div. Emerson Electric Co. 11911 Adie Rd. P.O. Box 12700 St. Loius, MO 70255
71468	ITT Cannon Electric 666 E. Dyer Rd. Santa Ana, CA 92702
71744	Chicago Miniature/Drake 4433 Ravenswood Ave. Chicago, IL 60640
71785	TRW Cinch Connectors 1501 Morse Ave. Chicago, IL 60007
74156	Par-Metals Products 1260 Atlantic Ave. Brooklyn, NY 11219
75382	Kulka Electric Corp. 633 S. Fulton Ave. Mt. Vernon, NY 10550
75915	Littlefuse, Inc. 800 E. Northwest Highway Des Plaines, IL 60016

Table 6.3. Table of Manufacturers (Continued)

77342	AMF Inc. Potter and Brumfield Div. 200 Richland Creek Dr. Princeton, IN 47670
80114	Sprague Products Co. 481 Marshall St. North Adams, MA 01247
91833	Keystone Electronics Corp. 49 Bleecher St. New York, NY 10012
96182	Master Specialties Co. 1640 Morovia Costa Mesa, CA 92627
98330	Polyphase Instrument Co. E. Fourth St. Bridgeport, PA 19475

CHAPTER 7

DIAGRAMS AND SCHEMATICS

7.1 Diagrams and Schematics. This chapter contains all diagrams and schematics.

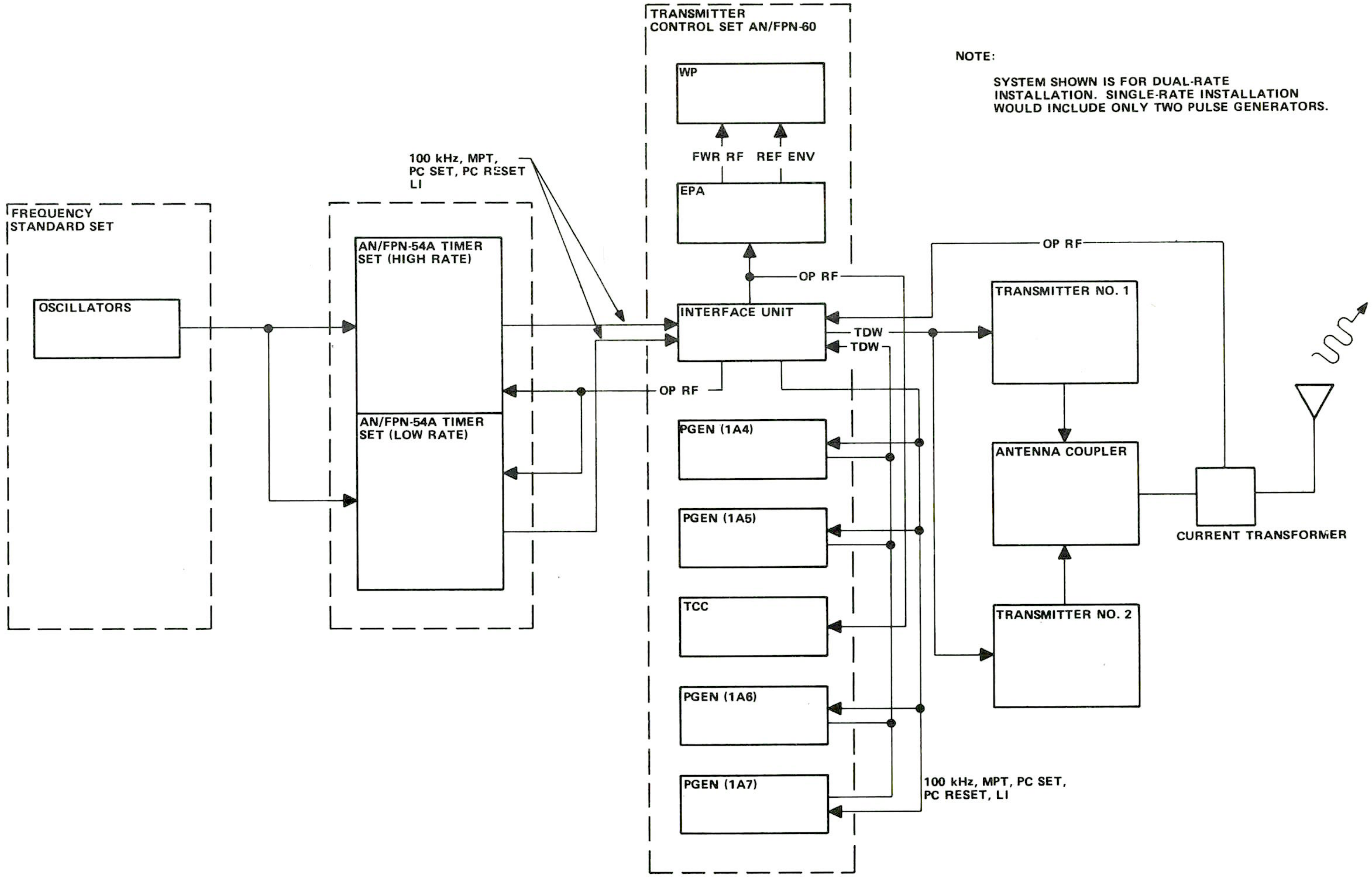


Figure 7.1. Loran-C System Block Diagram

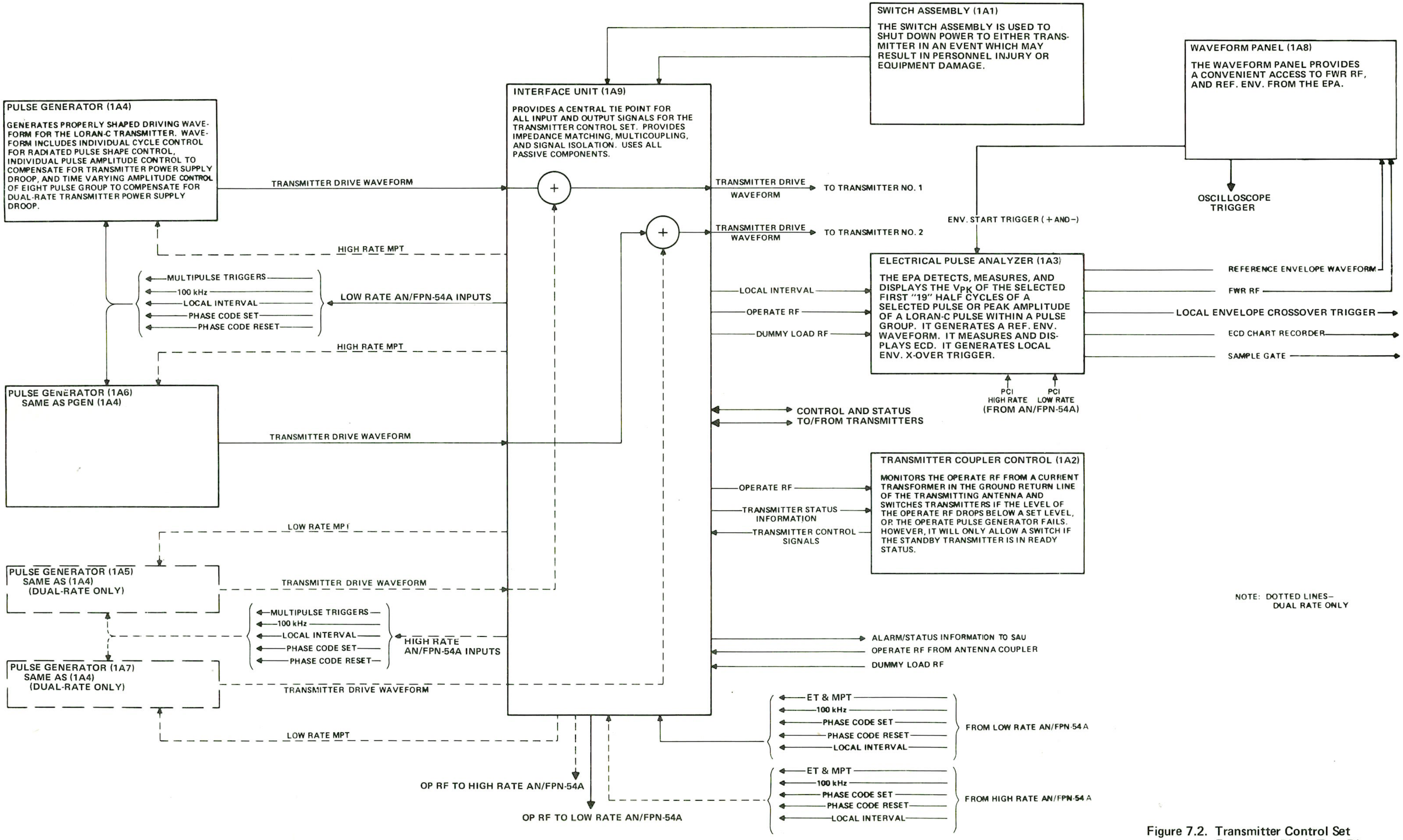
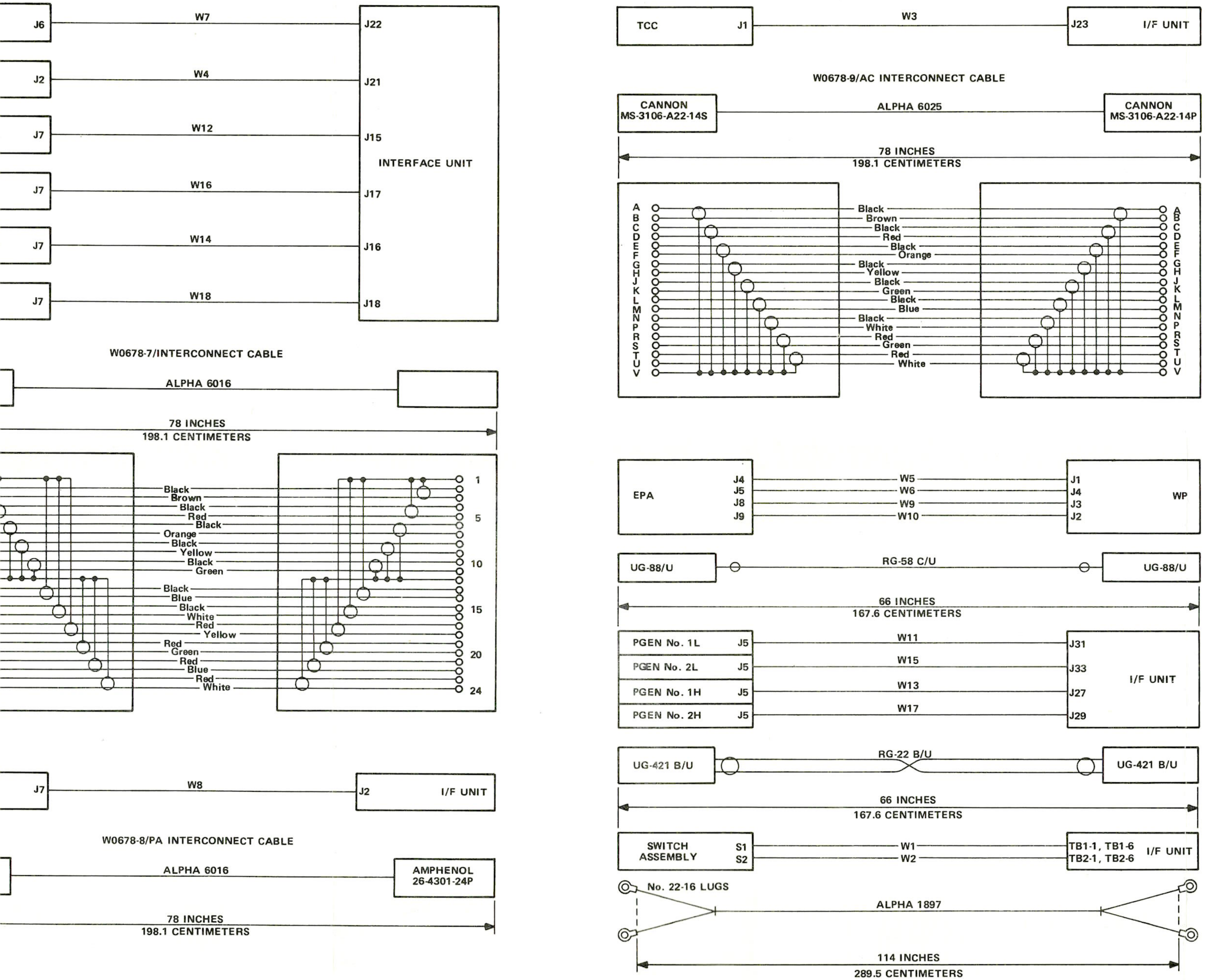


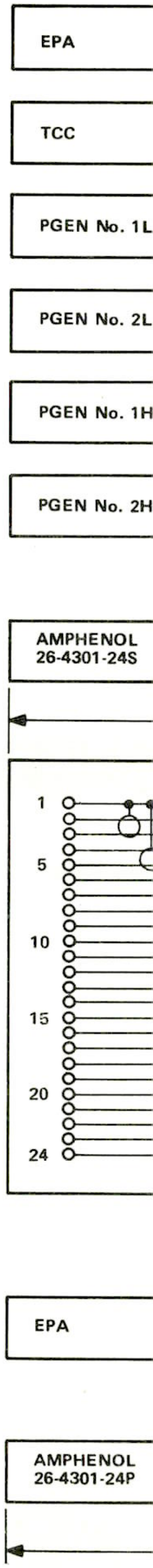
Figure 7.2. Transmitter Control Set Functional Block Text Diagram

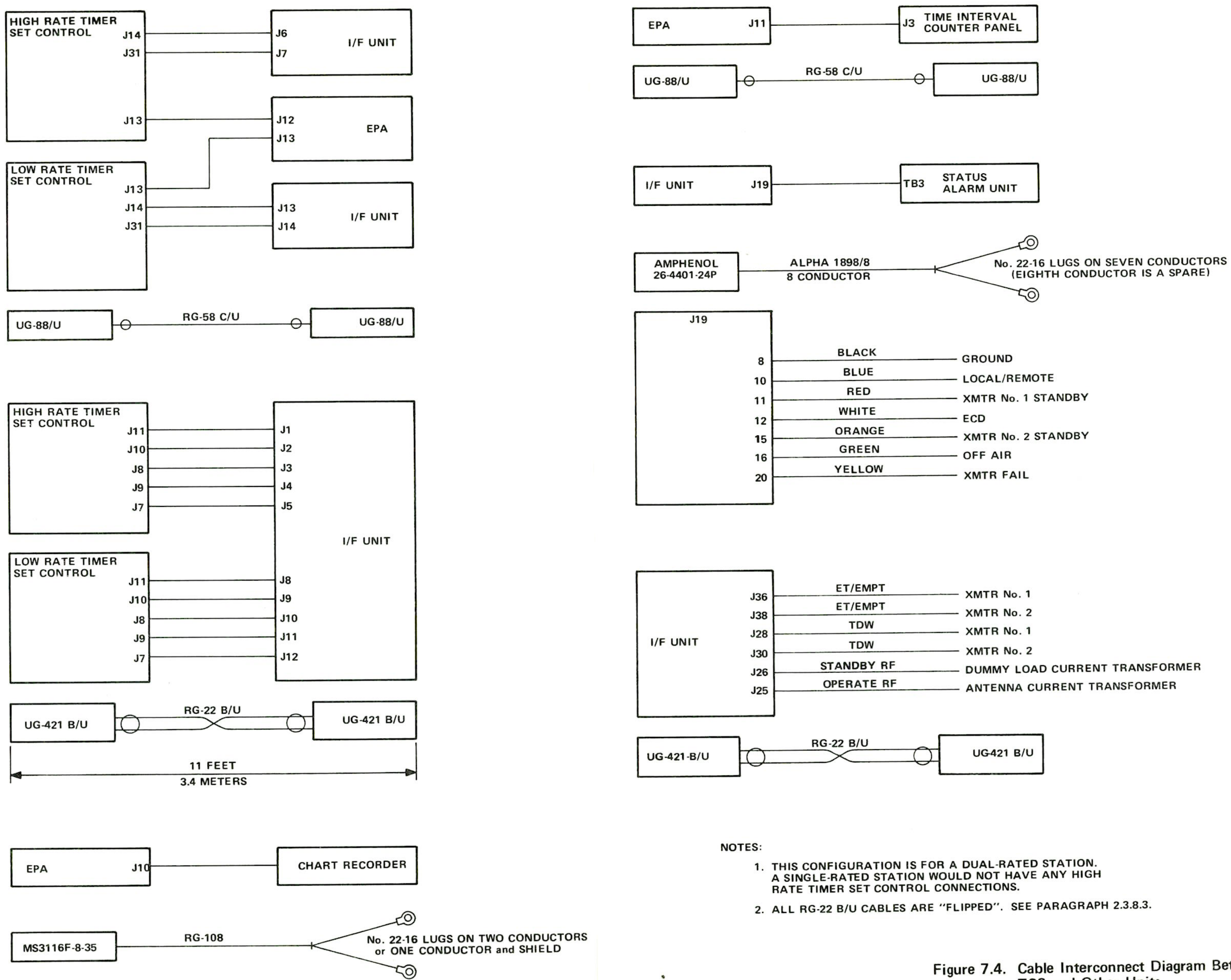


NOTES:

1. THIS CONFIGURATION FOR A DUAL-RATED STATION. A SINGLE-RATED STATION WOULD NOT HAVE PGEN'S 1A5 and 1A7, and CABLES W13, W14, W17, and W18.
2. W11, W13, W15, and W17 ARE "FLIPPED". SEE PARAGRAPH 2.3.8.3.

Figure 7.3. TCS Internal Cable Interconnect Diagram

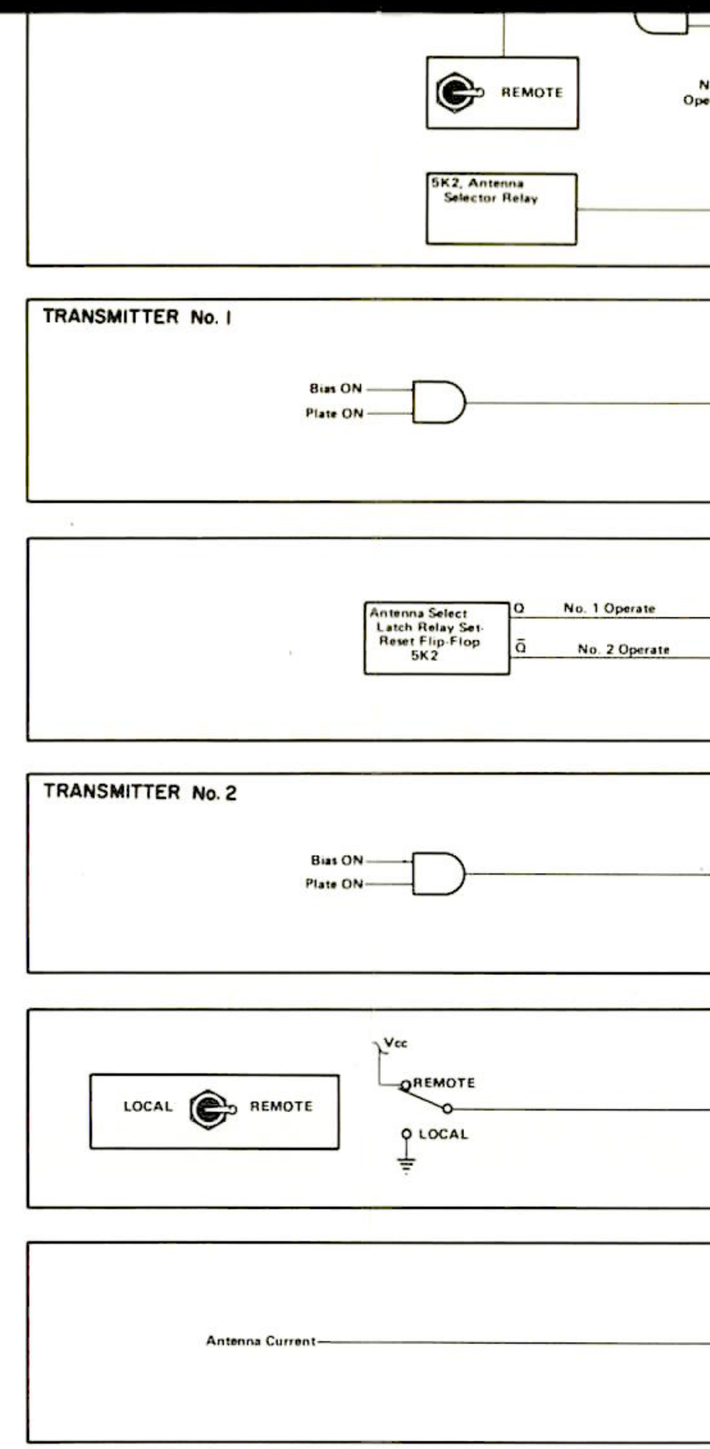

EPA
TCC
PGEN No. 1L
PGEN No. 2L
PGEN No. 1H
PGEN No. 2H
AMPHENOL
26-4301-24S
1
5
10
15
20
24
EPA
AMPHENOL
26-4301-24P



NOTES:

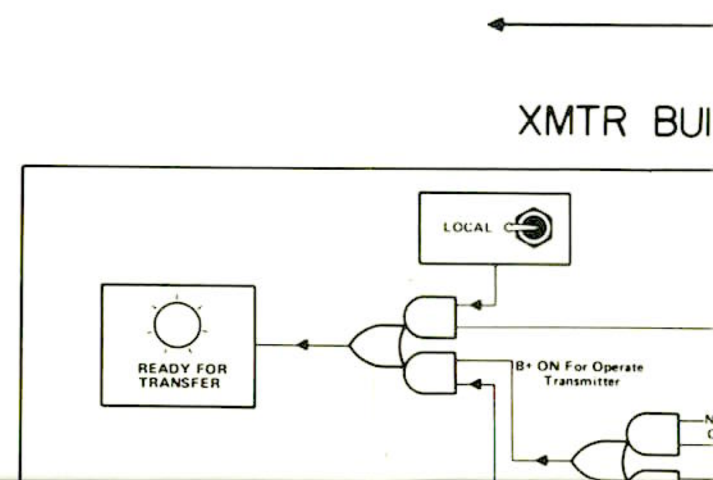
1. THIS CONFIGURATION IS FOR A DUAL-RATED STATION. A SINGLE-RATED STATION WOULD NOT HAVE ANY HIGH RATE TIMER SET CONTROL CONNECTIONS.
2. ALL RG-22 B/U CABLES ARE "FLIPPED". SEE PARAGRAPH 2.3.8.3.

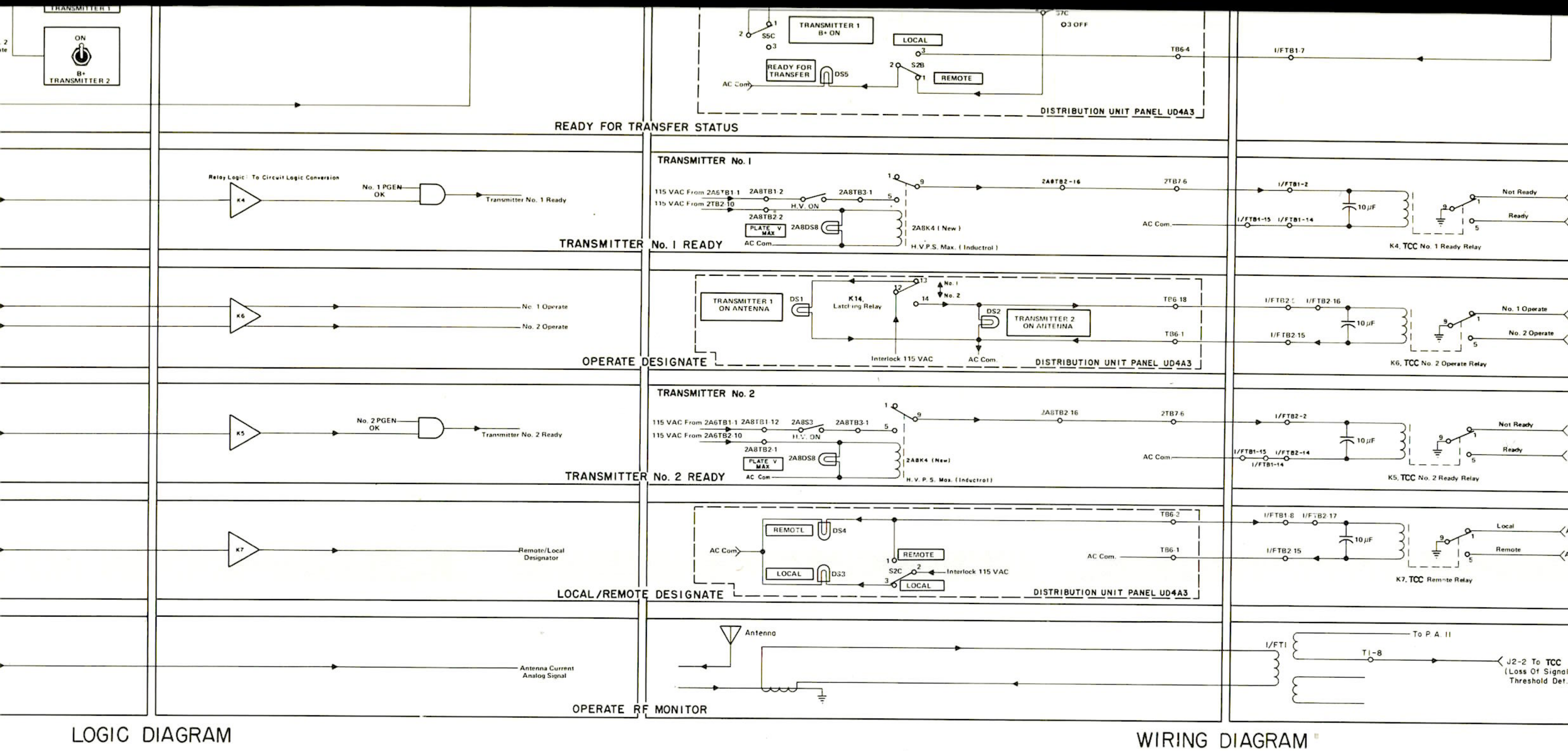
Figure 7.4. Cable Interconnect Diagram Between TCS and Other Units



REMOTE
5K2, Antenna Selector Relay
TRANSMITTER No. 1
Bias ON
Plate ON
Antenna Select Latch Relay Set-Reset Flip-Flop 5K2
Q
No. 1 Operate
Q̄
No. 2 Operate
TRANSMITTER No. 2
Bias ON
Plate ON
LOCAL
REMOTE
Vcc
REMOTE
LOCAL
Antenna Current

XMTR BUI

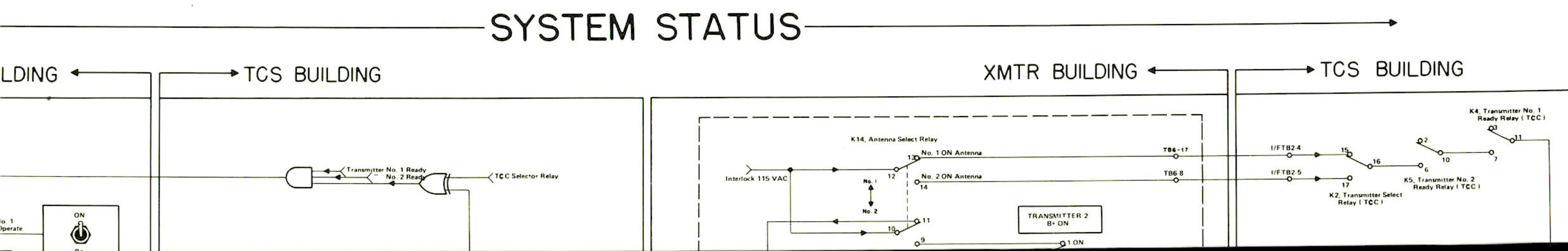


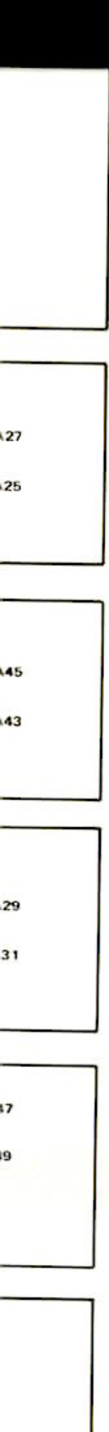


NOTES:

1. ALL RELAYS SHOWN IN DE-ENERGIZED STATE. (NORMALLY CLOSED POSITION).
2. LATCHING RELAYS 4A3K14 AND (TCC) K2 ARE IN TRANSMITTER No. 1 OPERATE POSITION.

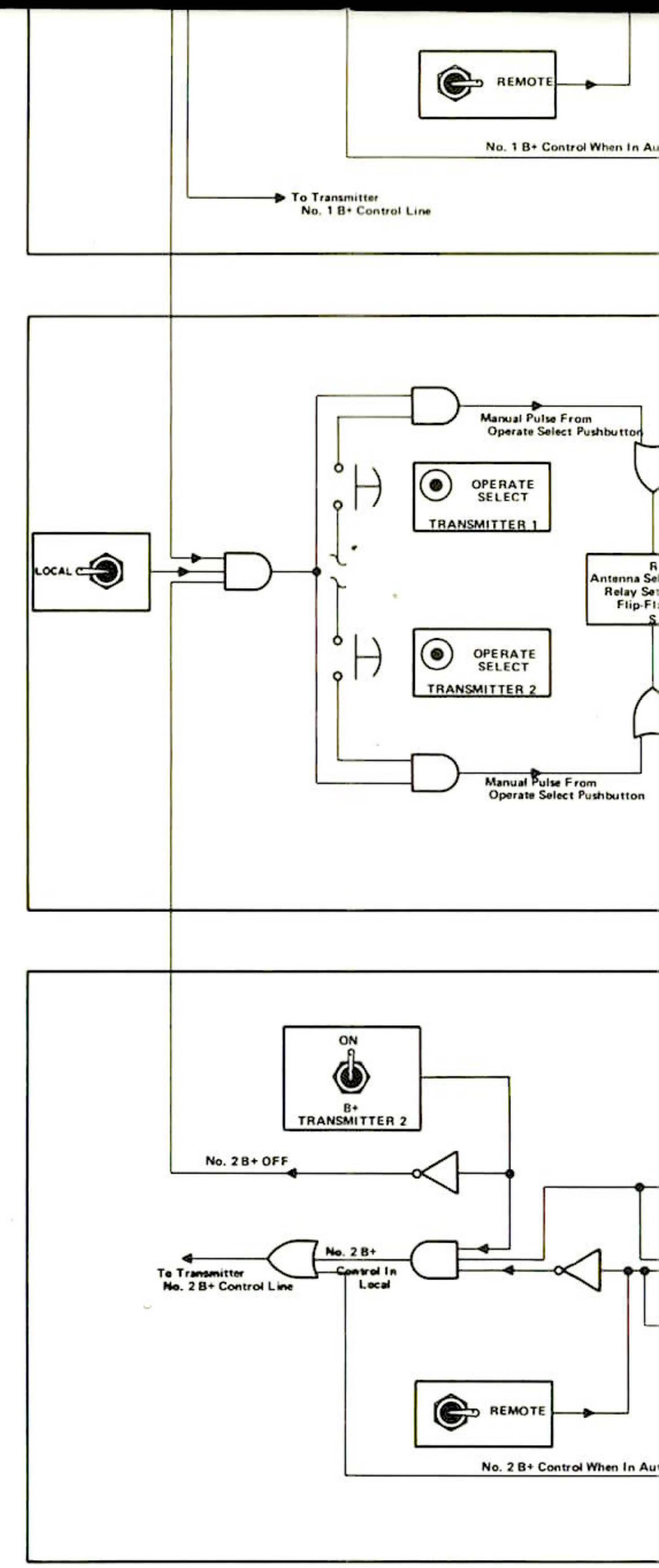
Figure 7.5. Transmitter/TCC System Control Logic Flow Diagram Connected To AN/FPN-39/TCC System Status Wiring D


SYSTEM STATUS
LDING
TCS BUILDING
XMTR BUILDING
TCS BUILDING
o. 1
Operate
ON
B+
Transmitter No. 1 Ready
" No. 2 Ready
TCC Selector Relay
K14, Antenna Select Relay
No. 1 ON Antenna
No. 2 ON Antenna
Interlock 115 VAC
No. 1
No. 2
TB6-17
TB6 8
TRANSMITTER 2
B+ ON
1 ON
I/FTB2-4
I/FTB2-5
K2, Transmitter Select
Relay (TCC)
K5, Transmitter No. 2
Ready Relay (TCC)
K4, Transmitter No. 1
Ready Relay (TCC)

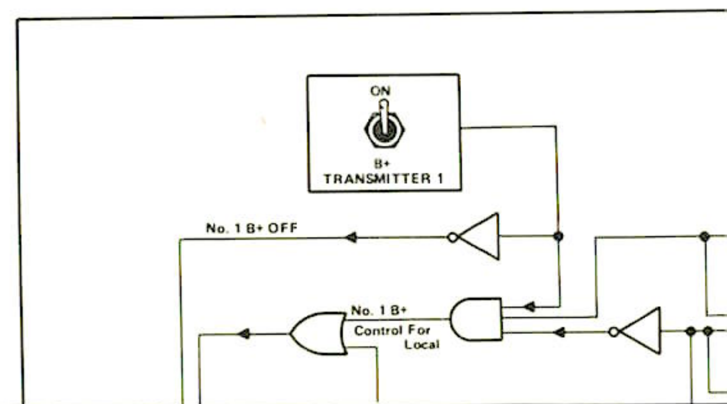


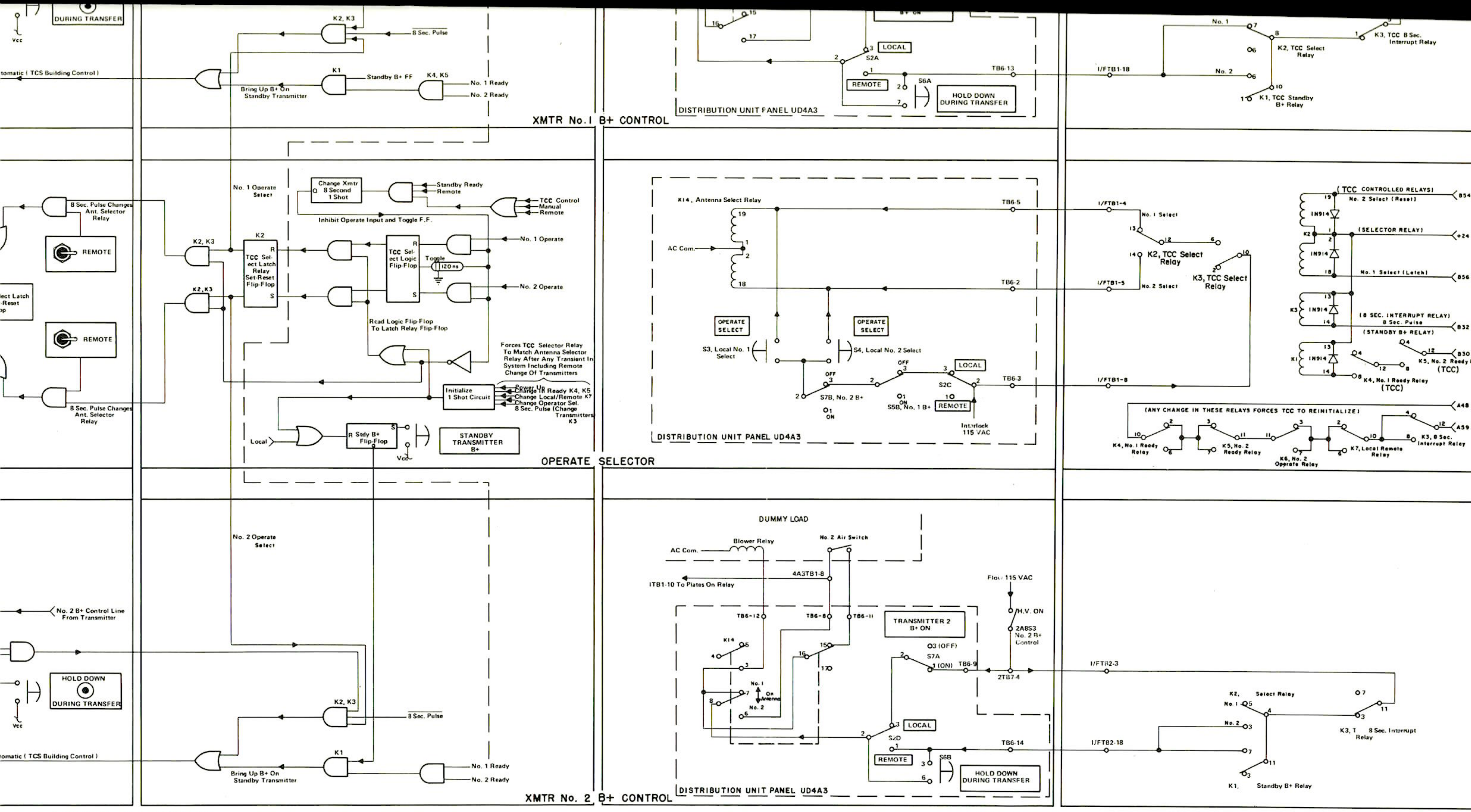
Diagram

7.12


REMOTE
To Transmitter No. 1 B+ Control Line
LOCAL
Manual Pulse From Operate Select Pushbutton
OPERATE SELECT
TRANSMITTER 1
OPERATE SELECT
TRANSMITTER 2
Manual Pulse From Operate Select Pushbutton
ON
B+
TRANSMITTER 2
No. 2 B+ OFF
No. 2 B+ Control In Local
To Transmitter No. 2 B+ Control Line
REMOTE

XMTR BUILD





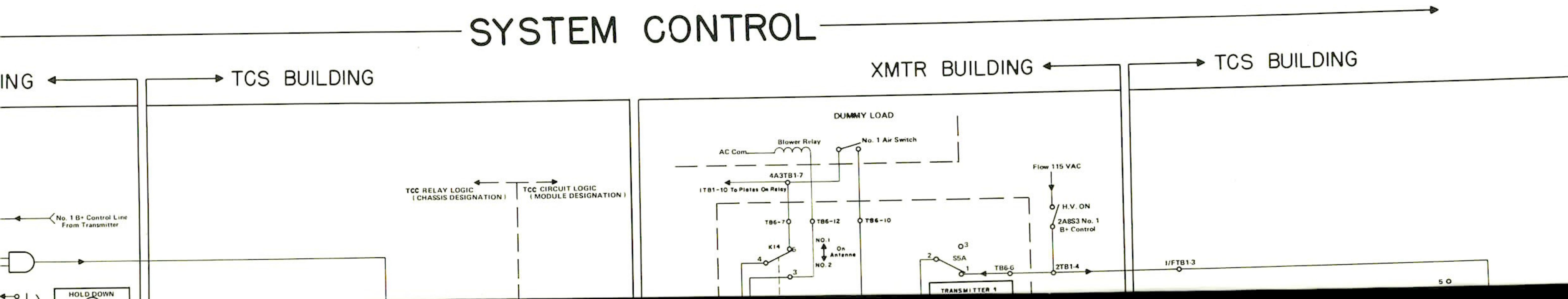
LOGIC DIAGRAM

WIRING DIAGRAM

NOTES:

1. ALL RELAYS SHOWN IN DE-ENERGIZED STATE. (NORMALLY CLOSED POSITION).
2. LATCHING RELAYS 4A3K14 AND (TCC) K2 ARE IN TRANSMITTER No. 1 OPERATE POSITION.

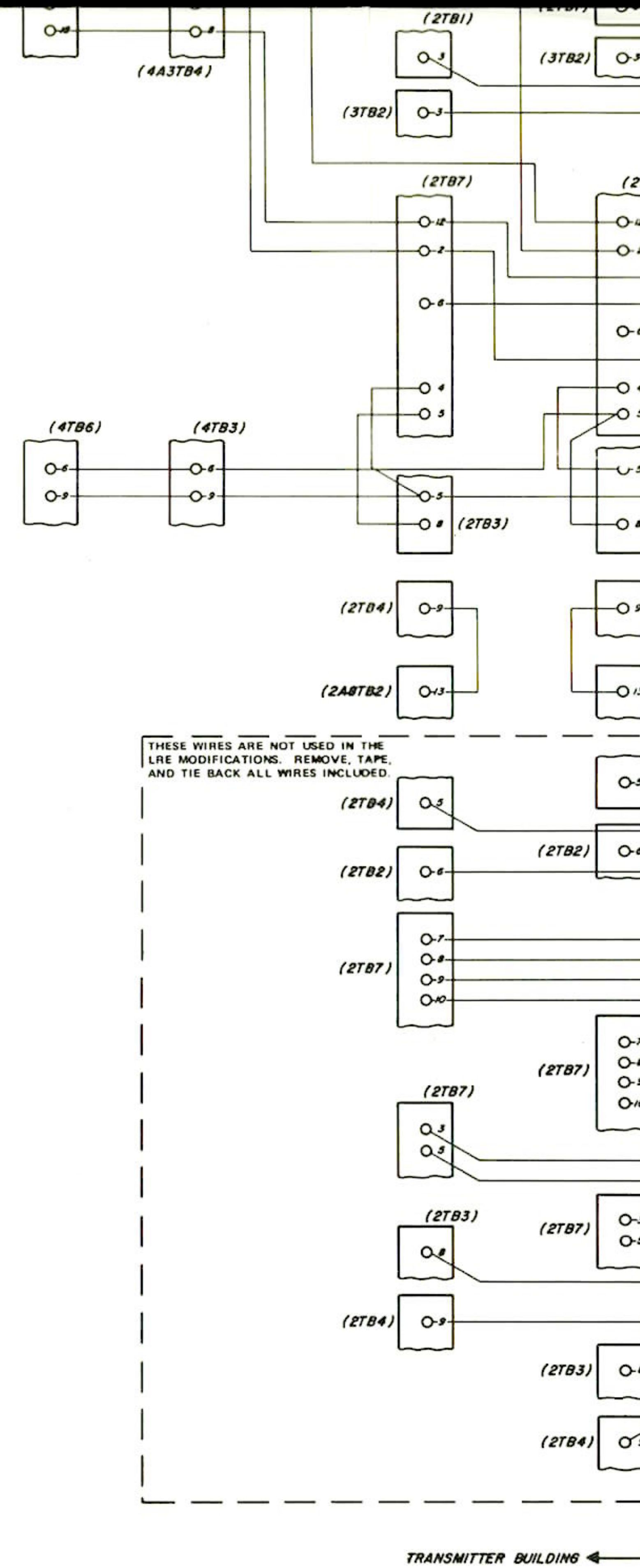
Figure 7.6. Transmitter/TCC System Control Logic Flow Diagram Connected To AN/FPN-39/TCC System Control Wiring Di

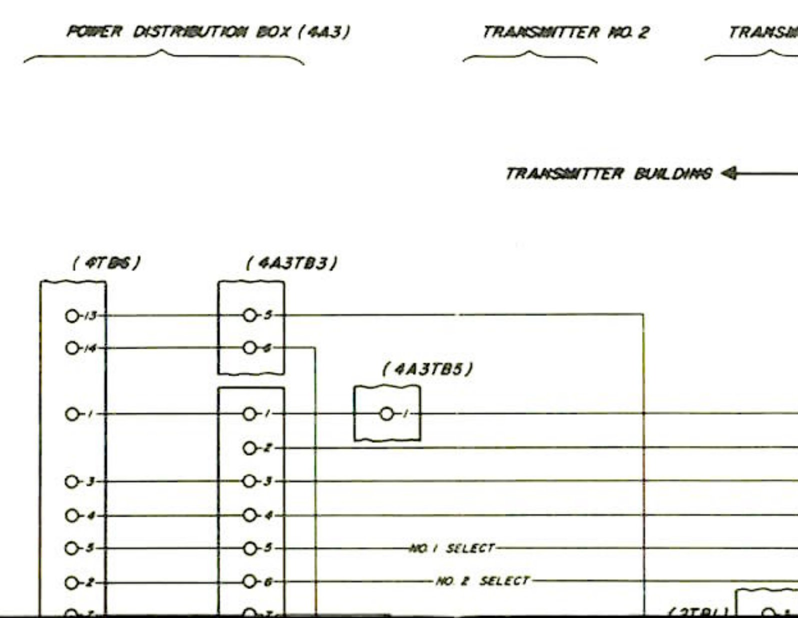


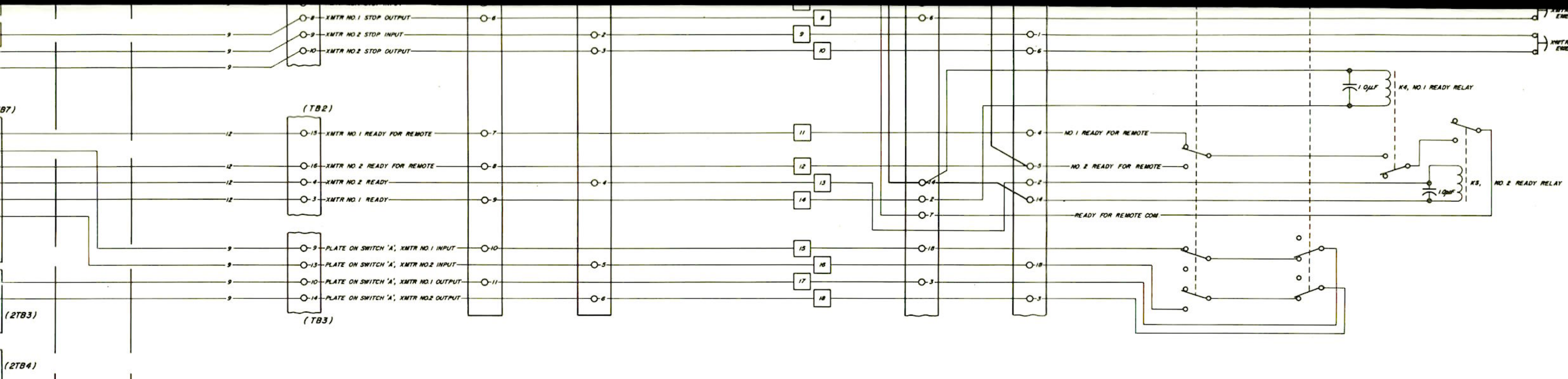
SYSTEM CONTROL
ING
TCS BUILDING
XMTR BUILDING
TCS BUILDING
No. 1 B+ Control Line
From Transmitter
HOLD DOWN
TCC RELAY LOGIC
(CHASSIS DESIGNATION)
TCC CIRCUIT LOGIC
(MODULE DESIGNATION)
DUMMY LOAD
AC Com
Blower Relay
No. 1 Air Switch
4A3TB1-7
1TB1-10 To Plates On Relay
TB6-7
TB6-12
TB6-10
K14
NO. 1
On
Antenna
NO. 2
Flow 115 VAC
H.V. ON
2A8S3 No. 1
B+ Control
S5A
TB6-6
2TB1-4
TRANSMITTER 1
1/FTB1-3
5 0

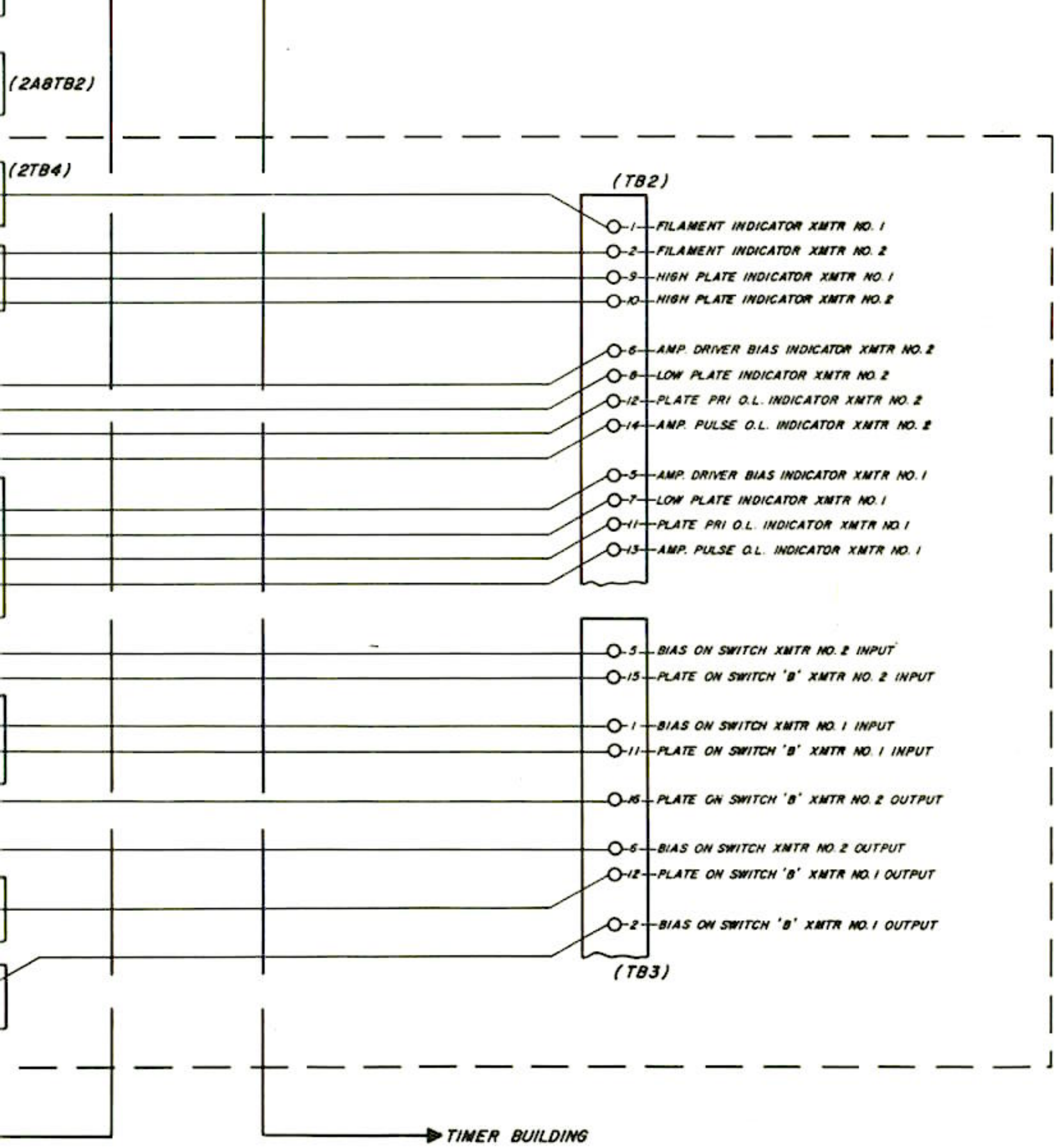
agram

.14


(4A3TB4)
(2TB1)
(3TB2)
(3TB2)
(2TB7)
(4TB6)
(4TB3)
(2TB3)
(2TB4)
(2A8TB2)
THESE WIRES ARE NOT USED IN THE LRE MODIFICATIONS. REMOVE, TAPE, AND TIE BACK ALL WIRES INCLUDED.
(2TB4)
(2TB2)
(2TB2)
(2TB7)
(2TB7)
(2TB7)
(2TB3)
(2TB7)
(2TB4)
(2TB3)
(2TB4)
TRANSMITTER BUILDING


POWER DISTRIBUTION BOX (4A3)
TRANSMITTER NO. 2
TRANSMITTER BUILDING
(4TB6)
(4A3TB3)
(4A3TB5)
NO. 1 SELECT
NO. 2 SELECT





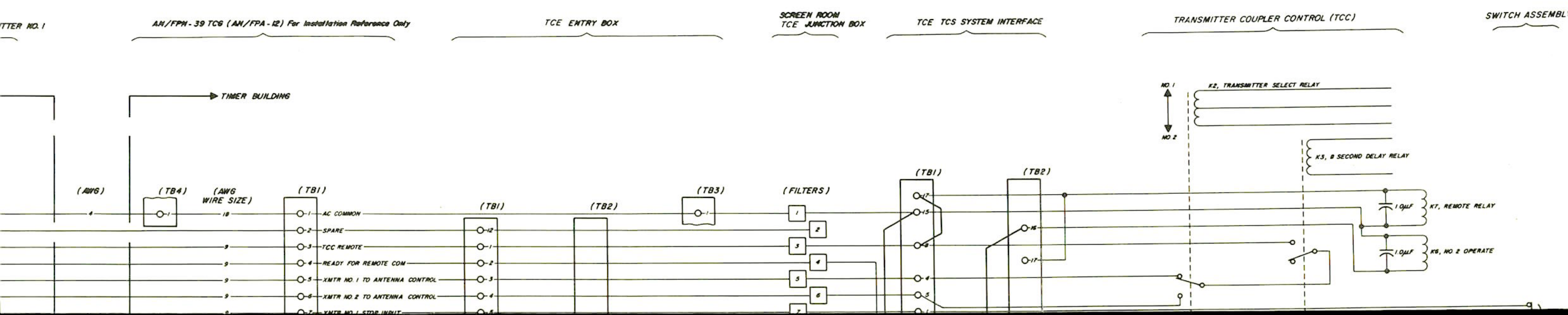
NOTES:

1. THE FOLLOWING JUMPER CONNECTIONS ARE REQUIRED FOR ALL LRE/39 INSTALLATIONS
   A. TCS SYSTEM INTERFACE UNIT
      1. TB1-8 TO TB1-17
      2. TB1-14 TO TB1-15
      3. TB1-14 TO TB2-14
      4. TB2-5 TO TB2-16
   B. DISTRIBUTION UNIT
      1. NONE

2. THE TCC WIRING SECTION IS SHOWN CONNECTED DIRECTLY TO THE SYSTEM INTERFACE FOR ILLUSTRATION PURPOSES ONLY.

3. ALL RELAYS ARE SHOWN IN THE DEENERGIZED POSITION. TRANSMITTER SELECT SWITCH S2 AND TCC RELAY K2 ARE SHOWN IN TRANSMITTER NO. 1 TO ANTENNA.

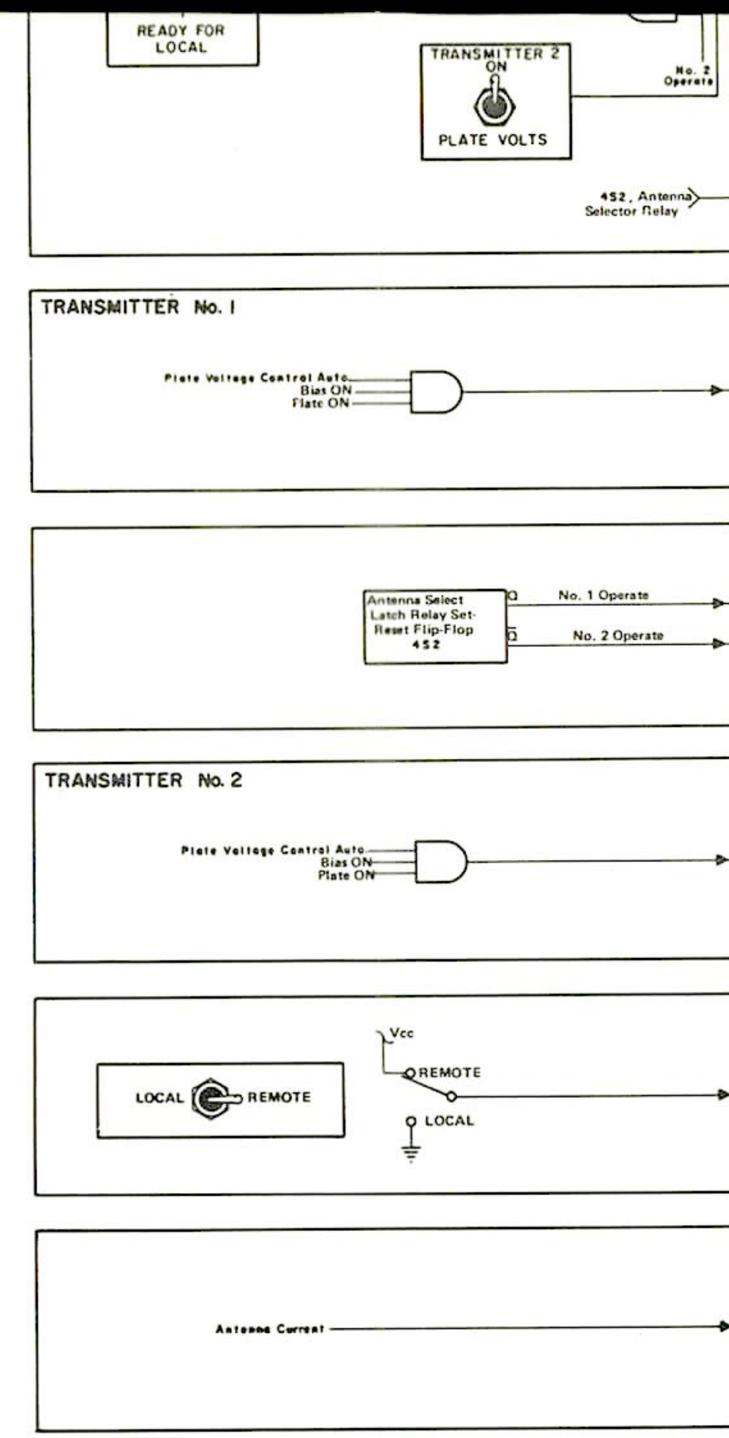
Figure 7.7. Interconnect Diagram For Transmitter Contr
LRE/AN/FPN-39 For Automatic Remote Co

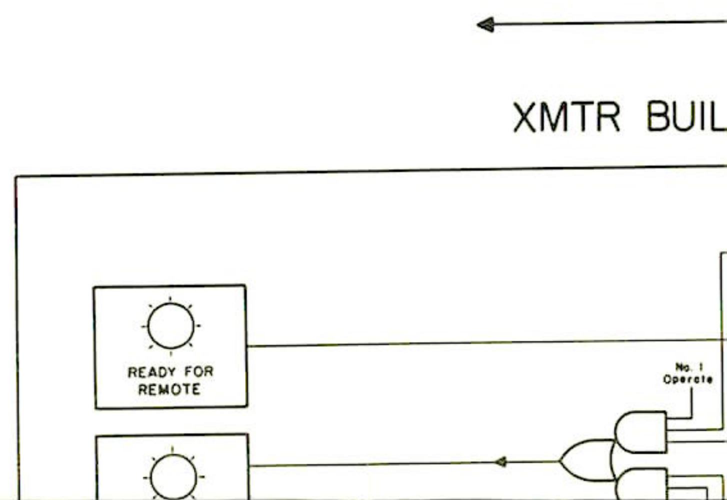


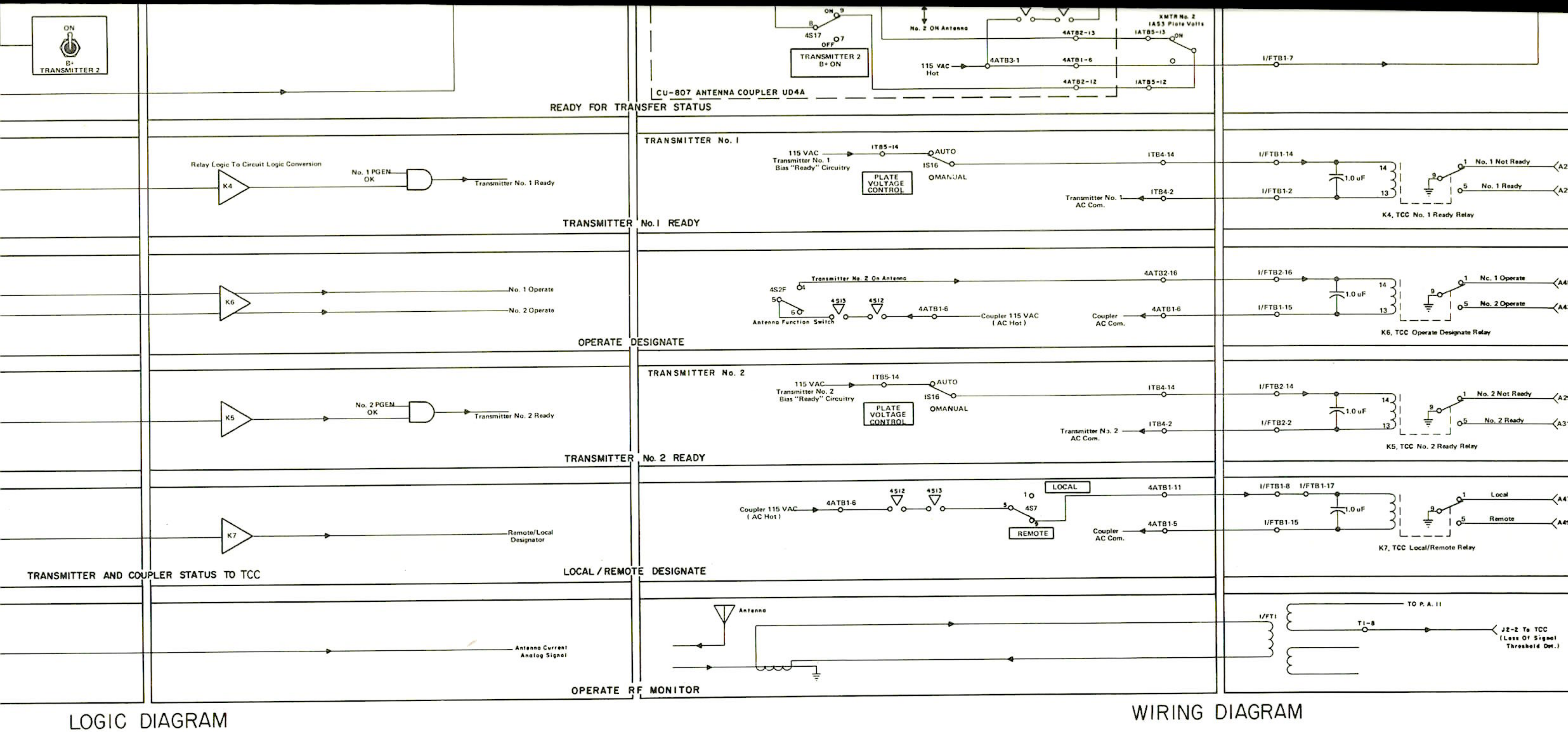
TTER NO. 1
AN/FPN-39 TCG (AN/FPA-12) For Installation Reference Only
TCE ENTRY BOX
SCREEN ROOM
TCE JUNCTION BOX
TCE TCS SYSTEM INTERFACE
TRANSMITTER COUPLER CONTROL (TCC)
SWITCH ASSEMBL
TIMER BUILDING
(AWG)
(TB4)
(AWG
WIRE SIZE)
(TB1)
AC COMMON
SPARE
TCC REMOTE
READY FOR REMOTE COM
XMTR NO. 1 TO ANTENNA CONTROL
XMTR NO. 2 TO ANTENNA CONTROL
(TB1)
(TB2)
(TB3)
(FILTERS)
(TB1)
(TB2)
NO. 1
NO. 2
K2, TRANSMITTER SELECT RELAY
K3, 8 SECOND DELAY RELAY
K7, REMOTE RELAY
K6, NO 2 OPERATE
1.0μF
1.0μF

...GENCY STOP

NO. 2
...GENCY STOP


READY FOR LOCAL
TRANSMITTER 2 ON
PLATE VOLTS
No. 2 Operate
452, Antenna Selector Relay
TRANSMITTER No. 1
Plate Voltage Control Auto
Bias ON
Plate ON
Antenna Select Latch Relay Set-Reset Flip-Flop 452
No. 1 Operate
No. 2 Operate
TRANSMITTER No. 2
Plate Voltage Control Auto
Bias ON
Plate ON
LOCAL
REMOTE
Vcc
REMOTE
LOCAL
Antenna Current

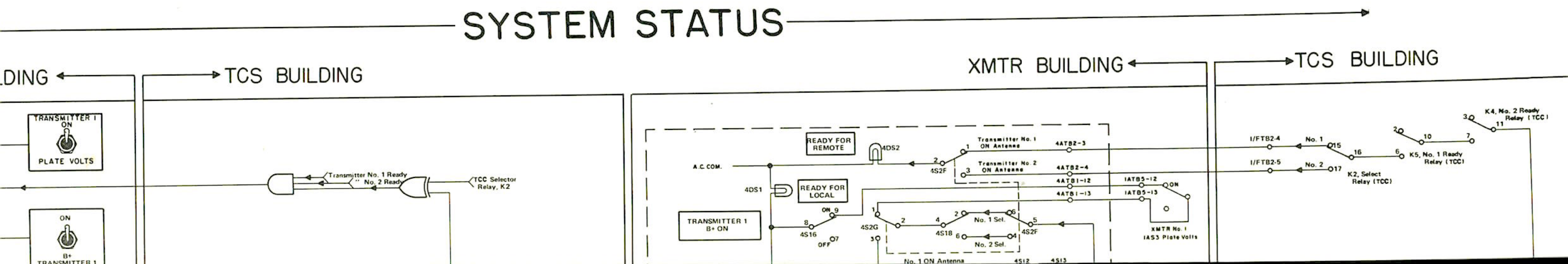

XMTR BUIL
READY FOR REMOTE
No. 1 Operate



NOTES:

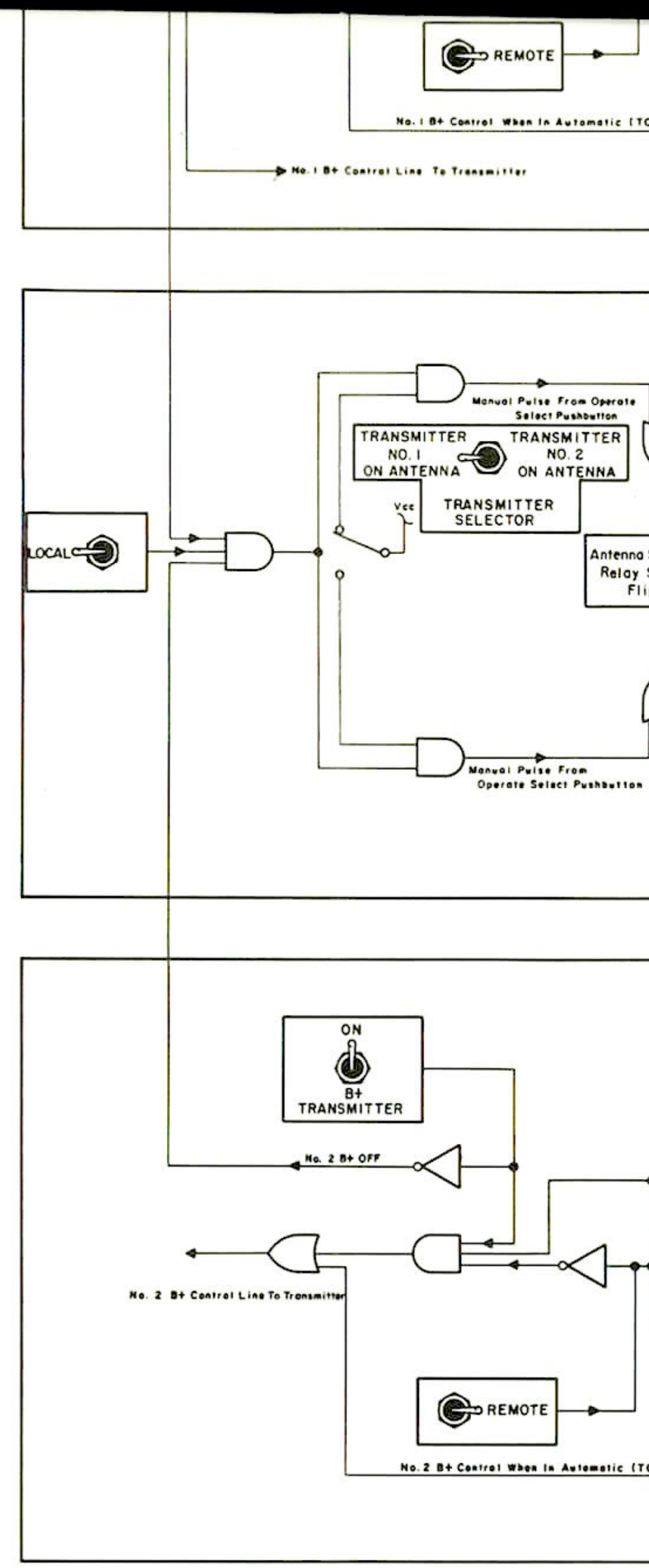
1. ALL RELAYS SHOWN IN DE-ENERGIZED STATE. (NORMALLY CLOSED POSITION).
2. LEDEX SWITCH 452 AND (TCC) K2 ARE IN TRANSMITTER No. 1 OPERATE POSITION.

Figure 7.8. Transmitter/TCC System Status Logic Flow Diagram Connected To AN/FPN-42/TCC System Status Wiring Dia

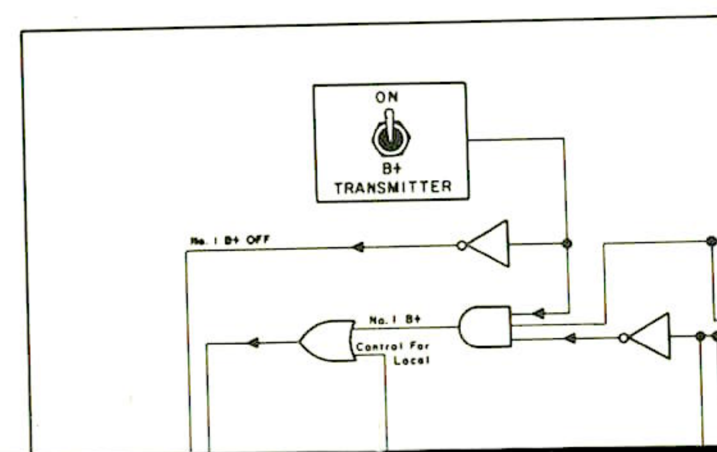


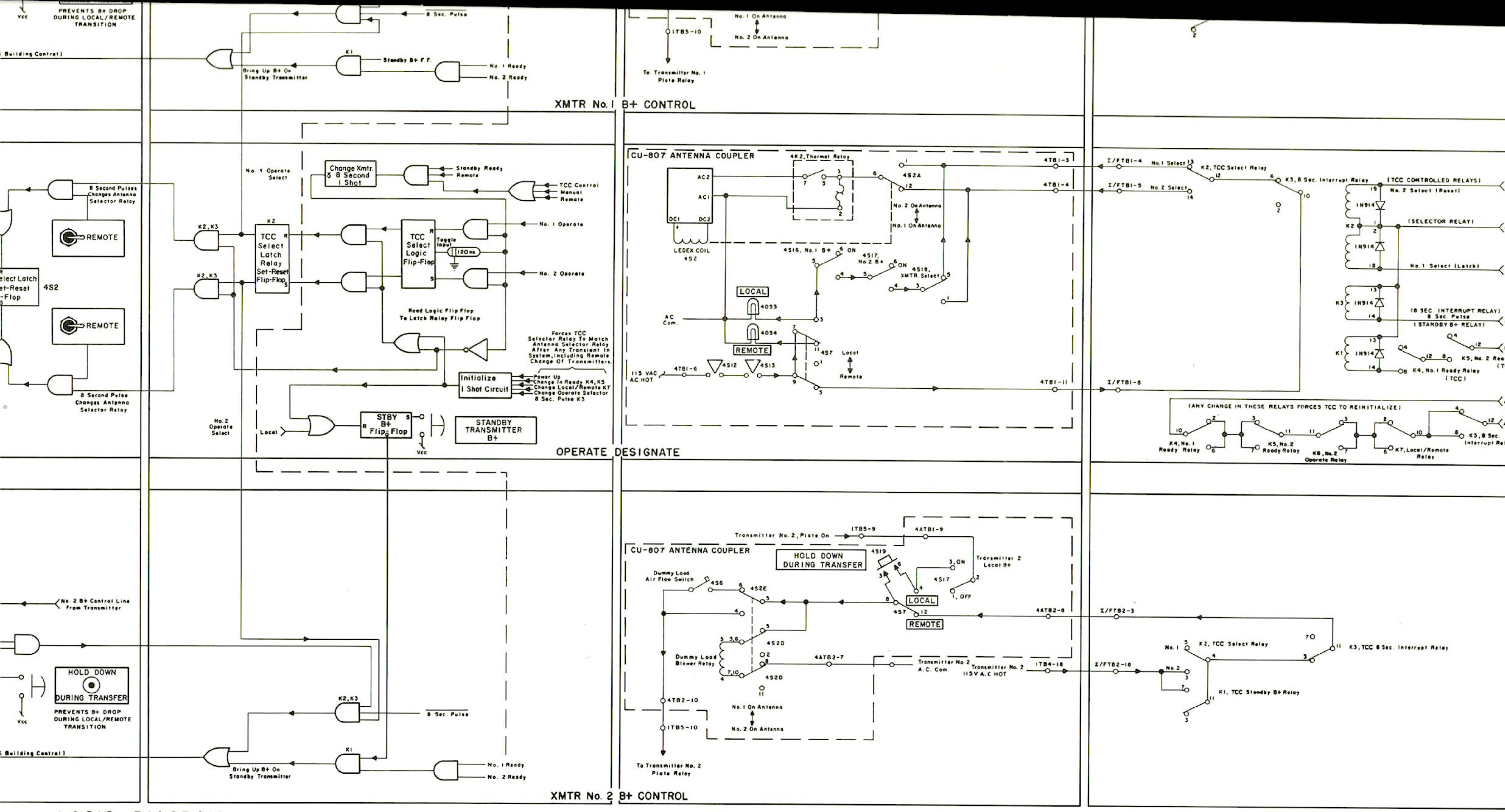
SYSTEM STATUS
LDING
TCS BUILDING
XMTR BUILDING
TCS BUILDING
TRANSMITTER 1 ON
PLATE VOLTS
ON
B+ TRANSMITTER 1
Transmitter No. 1 Ready
" No. 2 Ready
TCC Selector Relay, K2
READY FOR REMOTE
4DS2
A.C. COM.
4DS1
READY FOR LOCAL
TRANSMITTER 1 B+ ON
4S16
OFF
4S2F
4S2G
4S18
No. 1 Sel.
No. 2 Sel.
No. 1 ON Antenna
Transmitter No. 1 ON Antenna
Transmitter No. 2 ON Antenna
4ATB2-3
4ATB2-4
4ATB1-12
4ATB1-13
1ATB5-12
1ATB5-13
4S12
4S13
XMTR No. 1
1AS3 Plate Volts
I/FTB2-4
I/FTB2-5
No. 1
No. 2
K2, Select Relay (TCC)
K5, No. 1 Ready Relay (TCC)
K4, No. 2 Ready Relay (TCC)

gram


REMOTE
No. 1 B+ Control When In Automatic (TCS
No. 1 B+ Control Line To Transmitter
LOCAL
Manual Pulse From Operate Select Pushbutton
TRANSMITTER NO. 1 ON ANTENNA
TRANSMITTER NO. 2 ON ANTENNA
TRANSMITTER SELECTOR
Vcc
Antenna S
Relay S
Flip
Manual Pulse From Operate Select Pushbutton
ON
B+ TRANSMITTER
No. 2 B+ OFF
No. 2 B+ Control Line To Transmitter
REMOTE
No. 2 B+ Control When In Automatic (TCS

XMTR BUILD





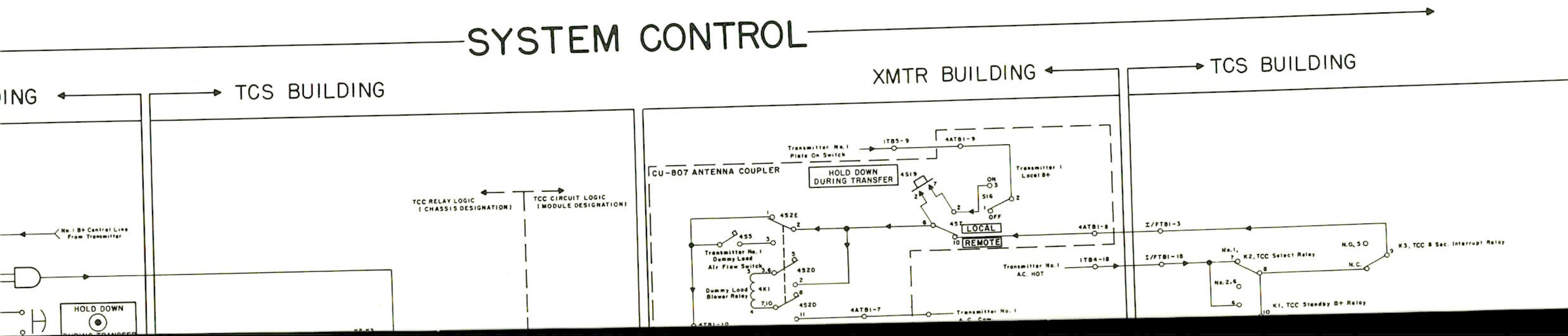
LOGIC DIAGRAM

NOTES:

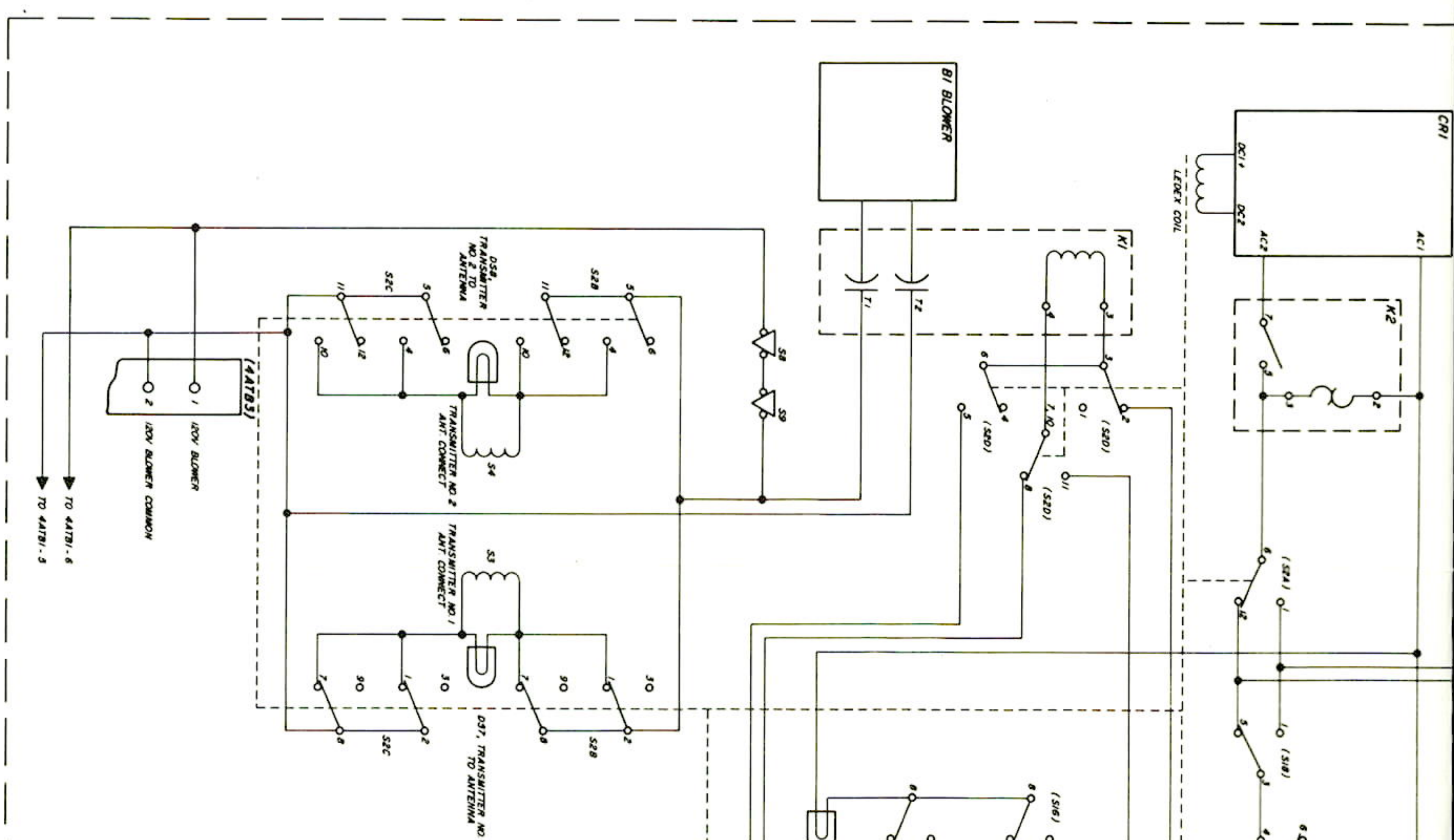
1. ALL RELAYS SHOWN IN DE-ENERGIZED STATE. (NORMALLY CLOSED POSITION).
2. LEDEX SWITCH 4S2 AND (TCC) LATCHING RELAY K2 ARE IN TRANSMITTER No. 1 OPERATE POSITION.

WIRING DIAGRAM

Figure 7.9. Transmitter/TCC System Control Logic Flow Diagram Connected To AN/FPN-42/TCC System Control Wiring Di


SYSTEM CONTROL
TCS BUILDING
XMTR BUILDING
TCS BUILDING
TCC RELAY LOGIC (CHASSIS DESIGNATION)
TCC CIRCUIT LOGIC (MODULE DESIGNATION)
No. 1 B+ Control Line From Transmitter
HOLD DOWN
CU-807 ANTENNA COUPLER
HOLD DOWN DURING TRANSFER
Transmitter No. 1 Plate On Switch
Transmitter 1 Local B+
LOCAL
REMOTE
Transmitter No. 1 Dummy Load Air Flow Switch
Dummy Load Blower Relay
Transmitter No. 1 A.C. HOT
K2, TCC Select Relay
K1, TCC Standby B+ Relay
K3, TCC 8 Sec. Interrupt Relay

agram
0


B1 BLOWER
CR1
K1
K2
LOCK COIL
(4A1TB3)
120V BLOWER
120V BLOWER COMMON
TO 4A1TB1-6
TO 4A1TB1-5
DS8, TRANSMITTER NO 2 TO ANTENNA
TRANSMITTER NO 2 ANT CONNECT
S4
TRANSMITTER NO 1 ANT CONNECT
S3
DS7, TRANSMITTER NO 1 TO ANTENNA
S2C
S2B
S8
S9

(CU-807) FPN-42 ANTENNA COUPLER (Prefix All Designations With 4A)

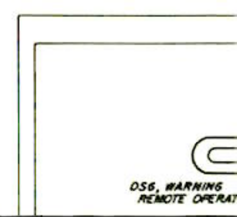
SWITCH FUNCTIONS	
S1	METER
S2	LEDEX, TRANSMITTER SELECTOR
S3	TRANSMITTER NO 1 ANT CONNECT
S4	TRANSMITTER NO 2 ANT CONNECT
S5	AIR FLOW, TRANSMITTER NO 1
S6	AIR FLOW, TRANSMITTER NO 2
S7	LOCAL / REMOTE
S8	INTERLOCK
S9	"
S10	"
S11	"
S12	"
S13	"
S14	"
S15	"
S16	TRANSMITTER NO 1 B+
S17	TRANSMITTER NO 2 B+
S18	TRANSMITTER TO ANTENNA
S19	HOLD DOWN DURING TRANSFER

NOTES

1 THE FOLLOWING J
FOR ALL LRE/42
SYSTEM INTERFAC
1 J8TB1 - 8 TO

2 THE TCC WIRING
THE SYSTEM INTE

3 ALL RELAYS ARE
TRANSMITTER SE
TO ANTENNA



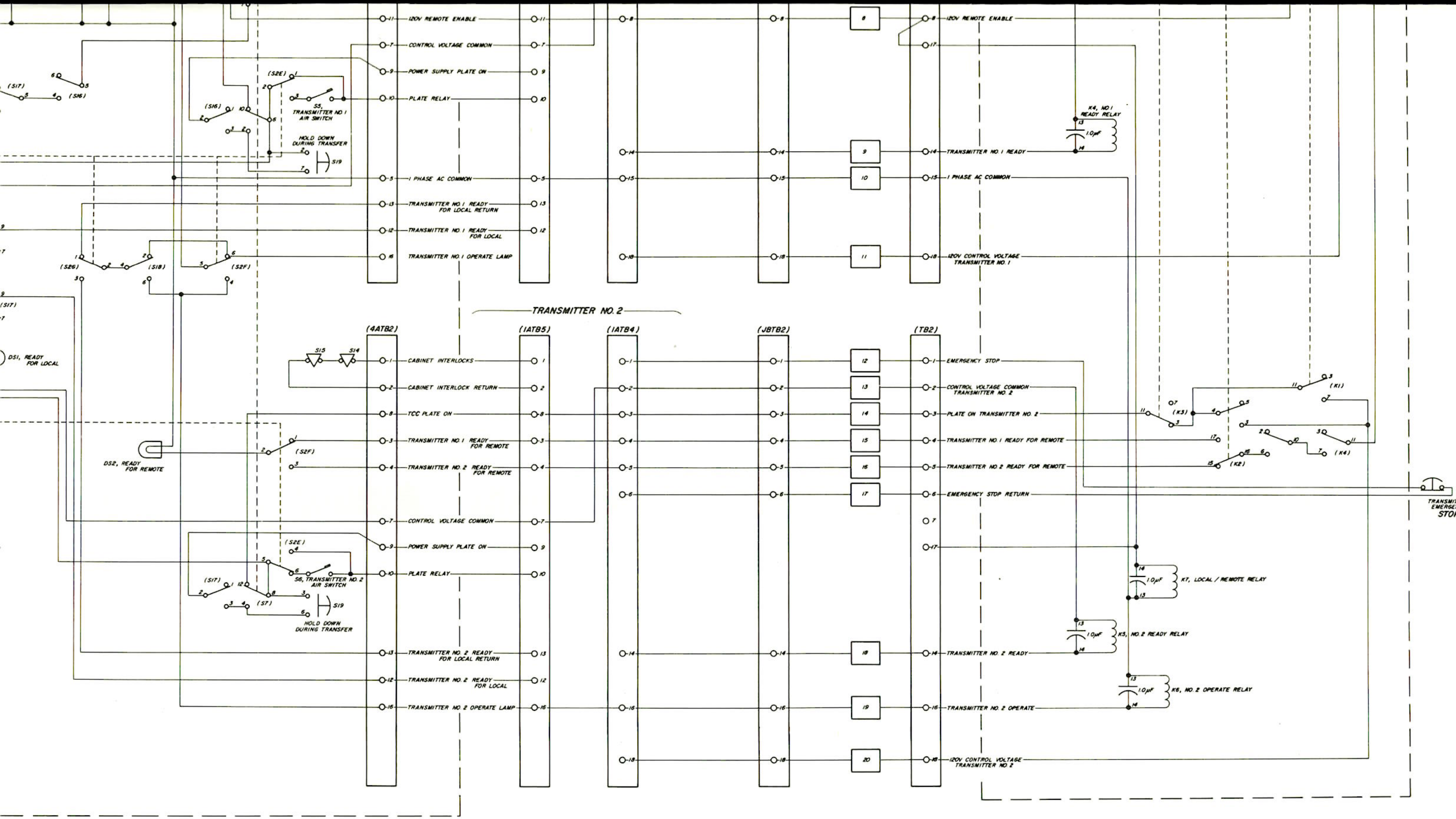
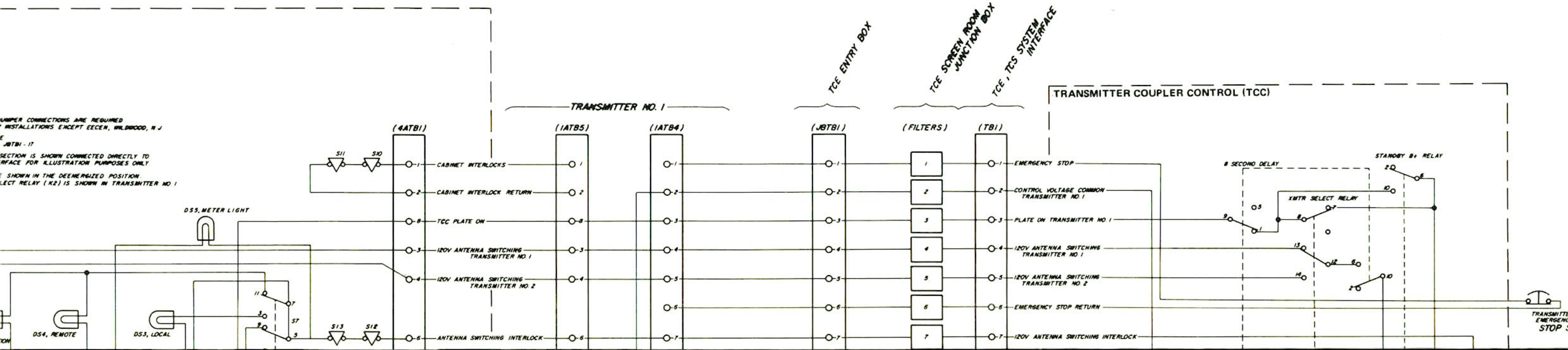


Figure 7.10. Interconnect Diagram For LRE/AN/FPN-42 Transmit
Set For Automatic Remote Control


TRANSMITTER NO. 1
TCE ENTRY BOX
TCE SCREEN ROOM JUNCTION BOX
TCE, TCS SYSTEM INTERFACE
TRANSMITTER COUPLER CONTROL (TCC)
(4ATB1)
(1ATB5)
(1ATB4)
(JBTB1)
(FILTERS)
(TB1)
CABINET INTERLOCKS
CABINET INTERLOCK RETURN
TCC PLATE ON
120V ANTENNA SWITCHING TRANSMITTER NO 1
120V ANTENNA SWITCHING TRANSMITTER NO 2
ANTENNA SWITCHING INTERLOCK
EMERGENCY STOP
CONTROL VOLTAGE COMMON TRANSMITTER NO 1
PLATE ON TRANSMITTER NO 1
EMERGENCY STOP RETURN
120V ANTENNA SWITCHING INTERLOCK
DS5, METER LIGHT
DS4, REMOTE
DS3, LOCAL
S11
S10
S13
S12
S7
8 SECOND DELAY
XMTR SELECT RELAY
STANDBY B+ RELAY
TRANSMITTER EMERGENCY STOP

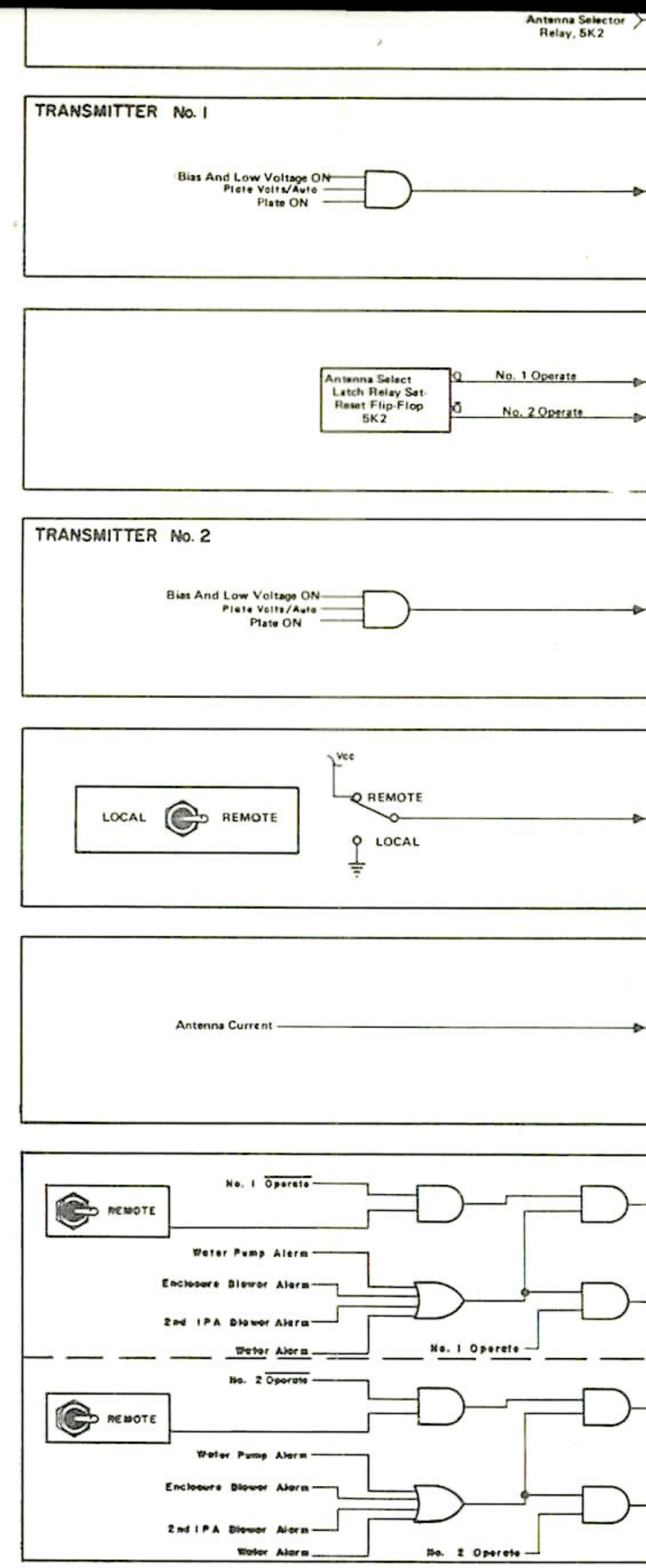
ER NO 2
CY
SWITCH

tter

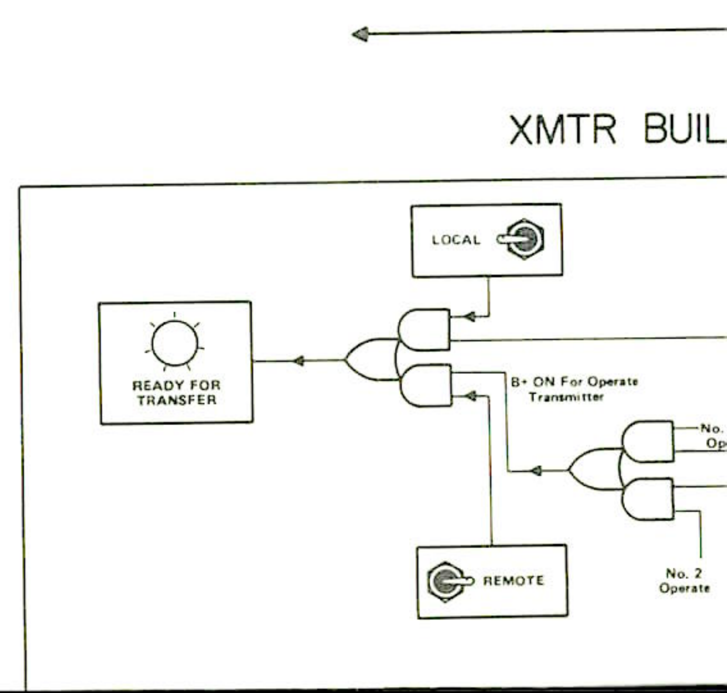
22

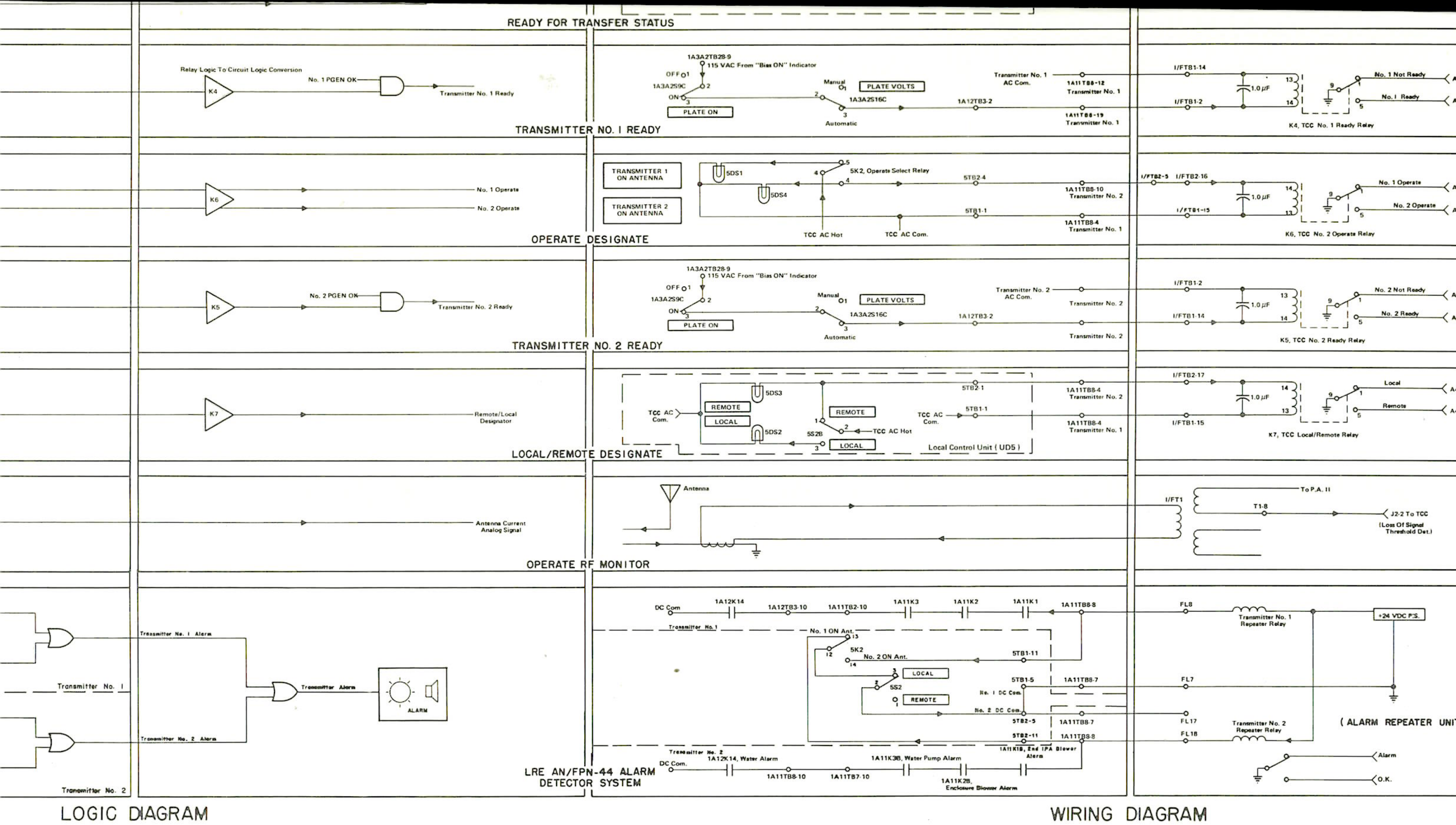
ER NO 1

SWITCH


Antenna Selector Relay, 5K2
TRANSMITTER No. I
Bias And Low Voltage ON
Plate Volts/Auto
Plate ON
Antenna Select Latch Relay Set-Reset Flip-Flop 5K2
No. 1 Operate
No. 2 Operate
TRANSMITTER No. 2
Bias And Low Voltage ON
Plate Volts/Auto
Plate ON
LOCAL
REMOTE
Vcc
REMOTE
LOCAL
Antenna Current
REMOTE
No. 1 Operate
Water Pump Alarm
Enclosure Blower Alarm
2nd I P A Blower Alarm
Water Alarm
No. 1 Operate
REMOTE
No. 2 Operate
Water Pump Alarm
Enclosure Blower Alarm
2nd I P A Blower Alarm
Water Alarm
No. 2 Operate

XMTR BUIL

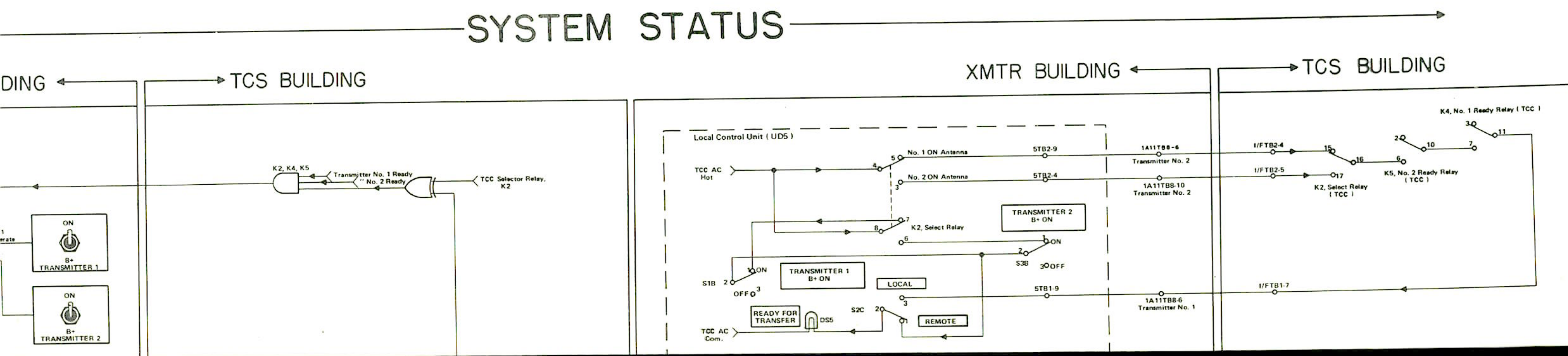

LOCAL
READY FOR TRANSFER
B+ ON For Operate Transmitter
No.
Op
No. 2 Operate
REMOTE



NOTES:

1. ALL RELAYS SHOWN IN DE-ENERGIZED STATE. (NORMALLY CLOSED POSITION).
2. LATCHING RELAYS 5K2 AND (TCC) K2 ARE IN TRANSMITTER No. 1 POSITION.

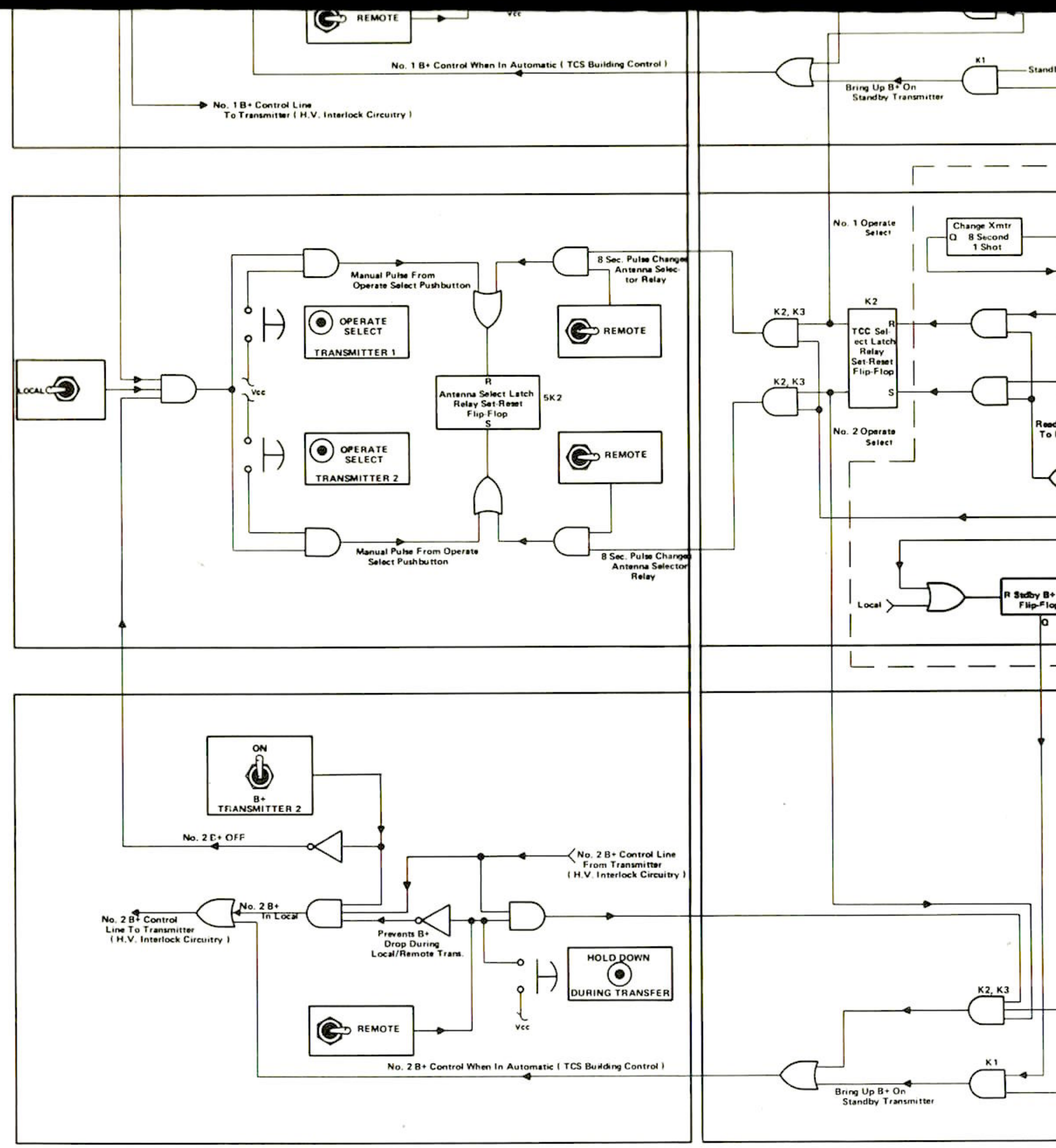
Figure 7.11. Transmitter/TCC System Status Logic Flow Diagram Connected To AN/FPN-44/TCC System Status Wiring Dia



SYSTEM STATUS
DING
TCS BUILDING
XMTR BUILDING
TCS BUILDING
ON
B+
TRANSMITTER 1
ON
B+
TRANSMITTER 2
K2, K4, K5
Transmitter No. 1 Ready
" No. 2 Ready
TCC Selector Relay, K2
Local Control Unit (UD5)
TCC AC Hot
No. 1 ON Antenna
No. 2 ON Antenna
K2, Select Relay
TRANSMITTER 2 B+ ON
S3B
ON
OFF
S1B
ON
OFF
TRANSMITTER 1 B+ ON
LOCAL
READY FOR TRANSFER
DS5
S2C
REMOTE
TCC AC Com.
5TB2-9
5TB2-4
5TB1-9
1A11TB8-6
Transmitter No. 2
1A11TB8-10
Transmitter No. 2
1A11TB8-6
Transmitter No. 1
I/FTB2-4
I/FTB2-5
I/FTB1-7
K2, Select Relay (TCC)
K5, No. 2 Ready Relay (TCC)
K4, No. 1 Ready Relay (TCC)

gram

24

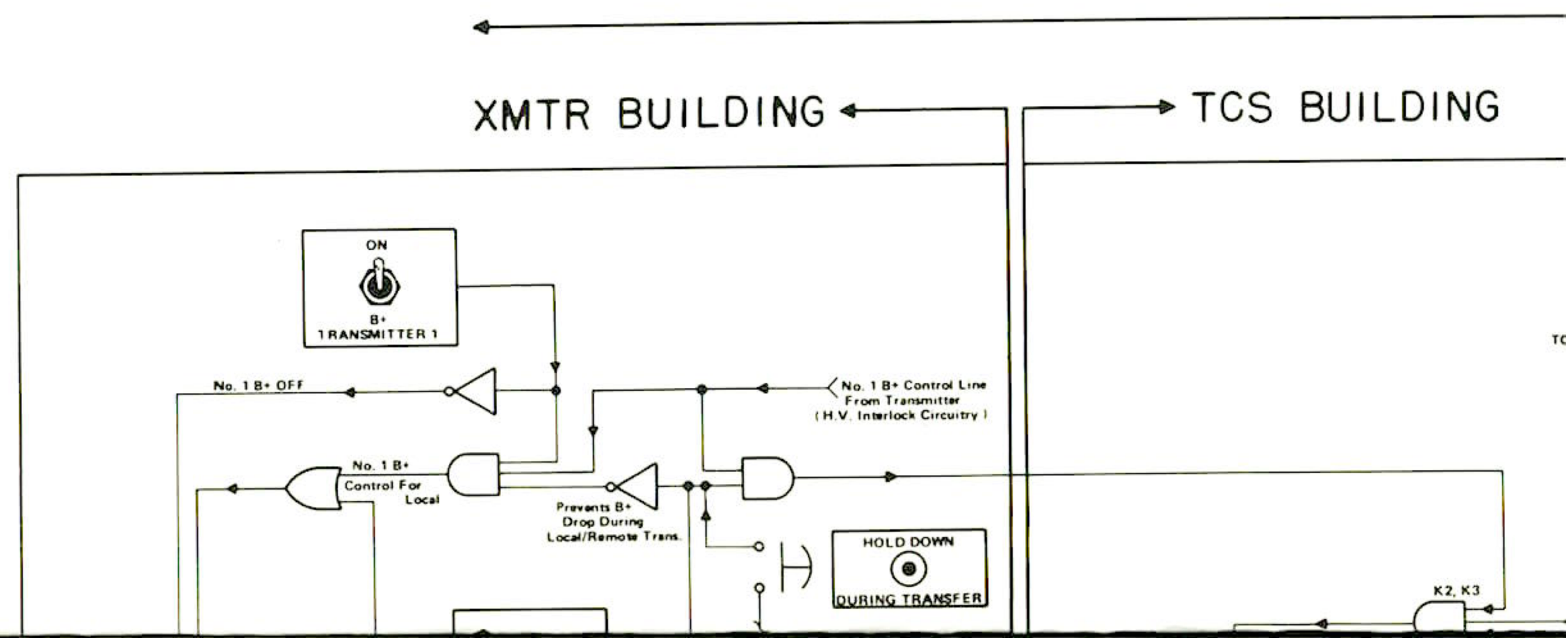


LOGIC DIAGRAM

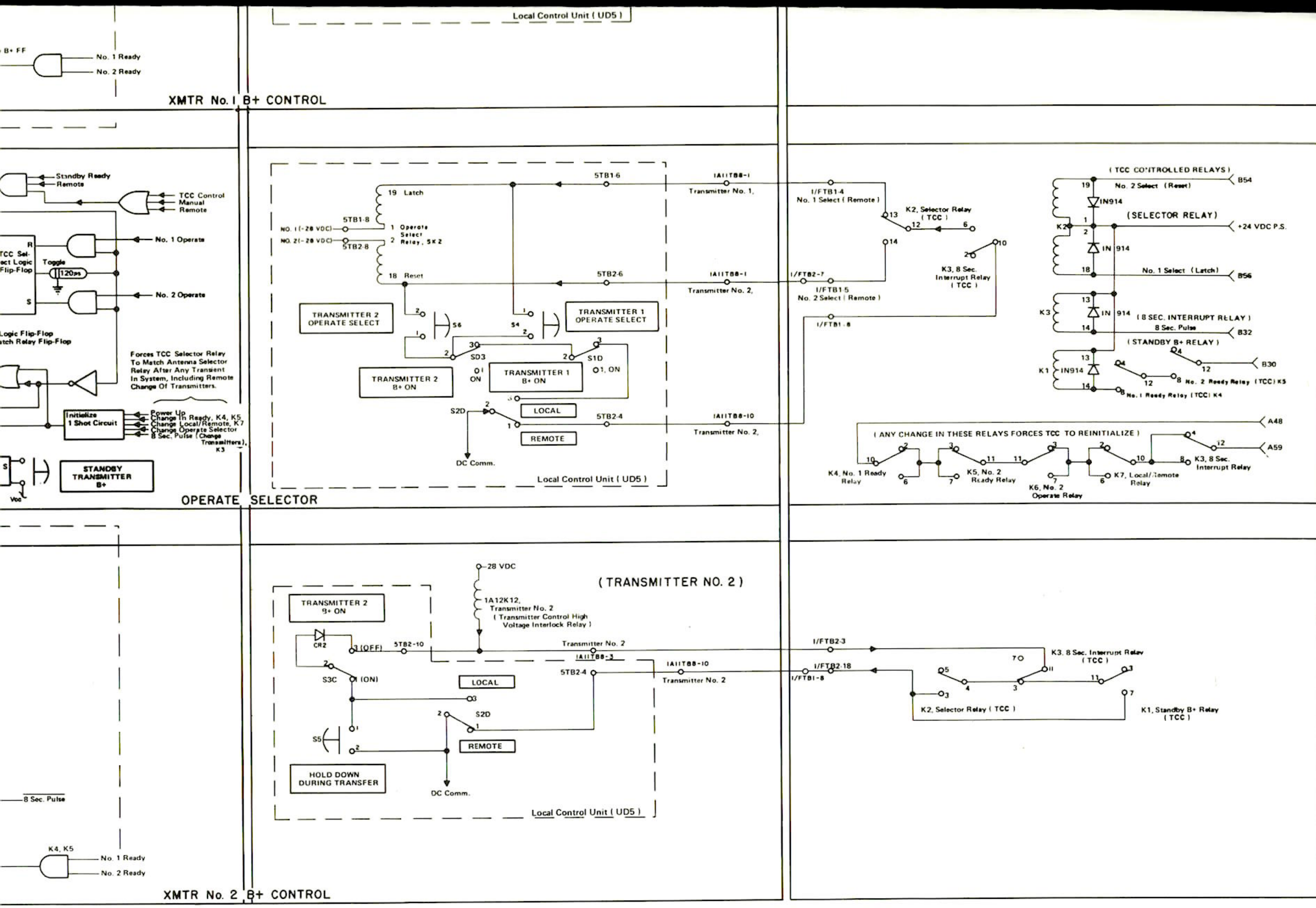
NOTES:

1. ALL REL

2. LATCHIN



XMTR BUILDING
TCS BUILDING
ON
B+
TRANSMITTER 1
No. 1 B+ OFF
No. 1 B+ Control Line
From Transmitter
(H.V. Interlock Circuitry)
No. 1 B+
Control For
Local
Prevents B+
Drop During
Local/Remote Trans.
HOLD DOWN
DURING TRANSFER
K2, K3

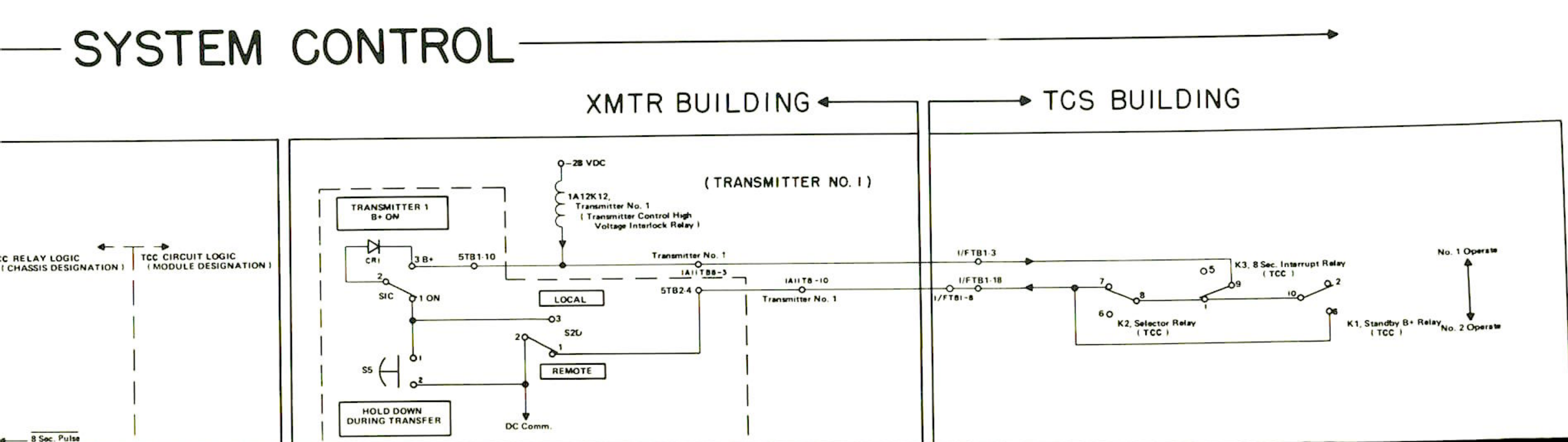


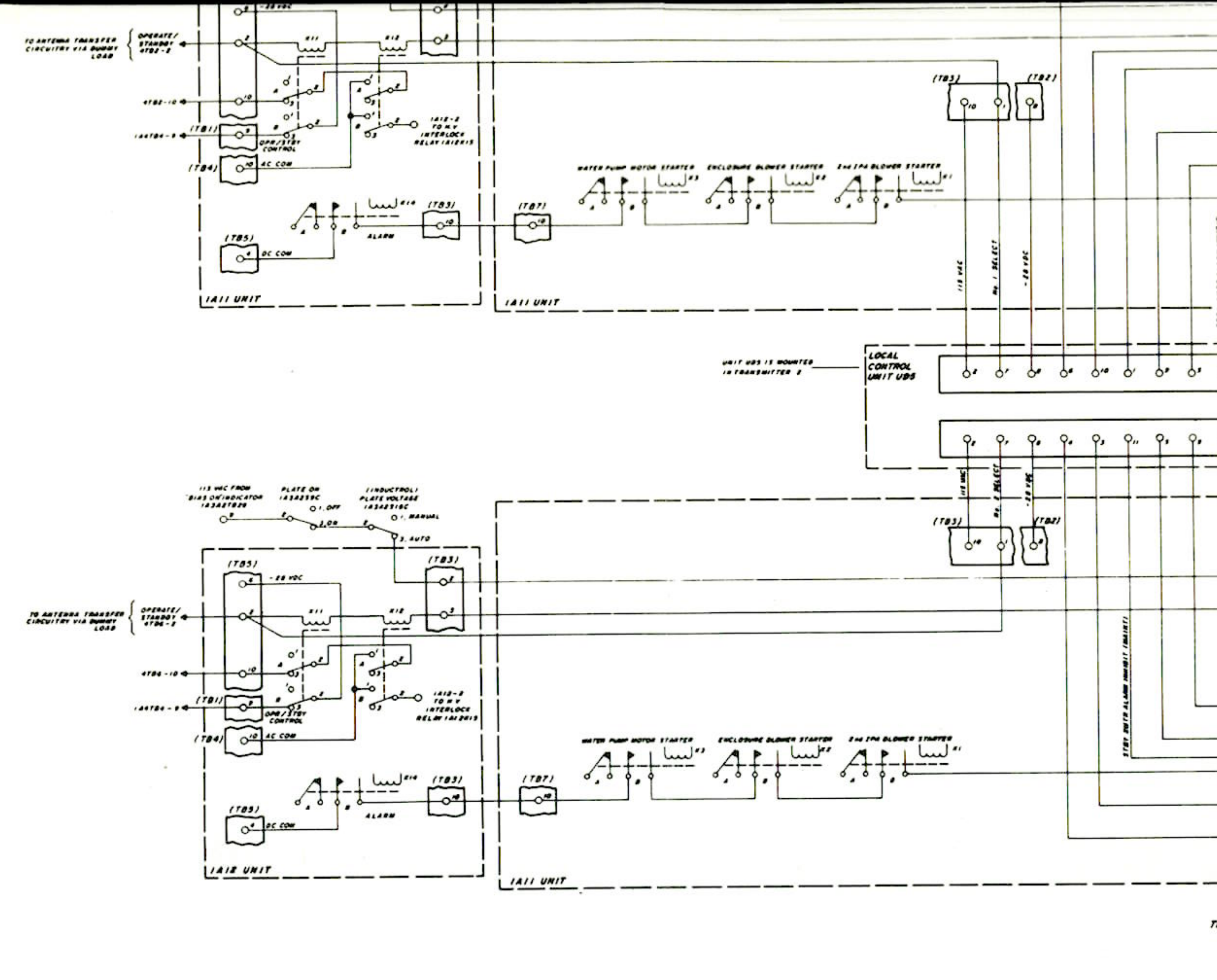
WIRING DIAGRAM

...AYS SHOWN IN DE-ENERGIZED STATE. (NORMALLY CLOSED POSITION).

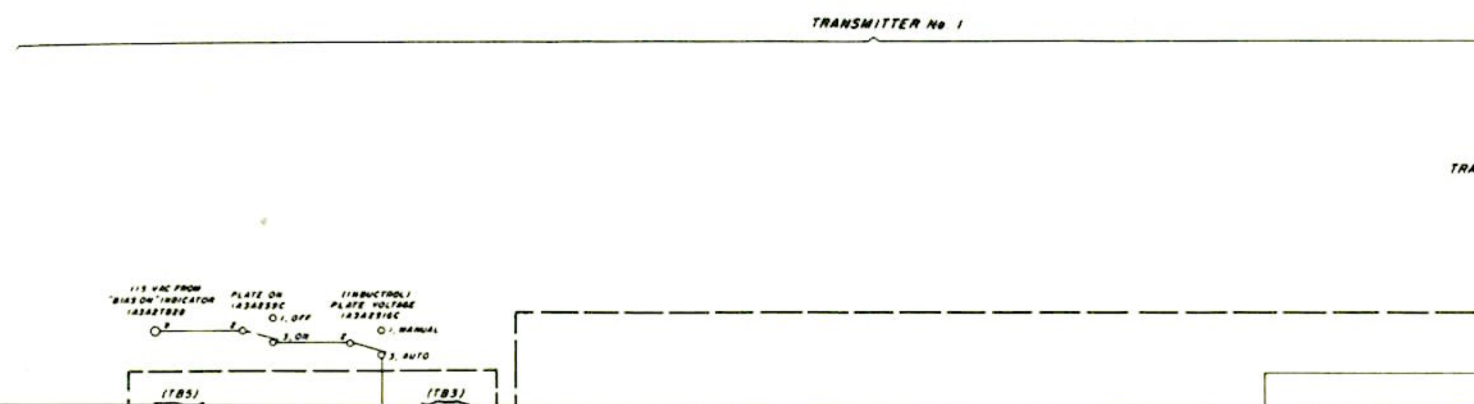
...NG RELAYS 5K2 AND (TCC) K2 ARE IN TRANSMITTER No. 1 OPERATE POSITION.

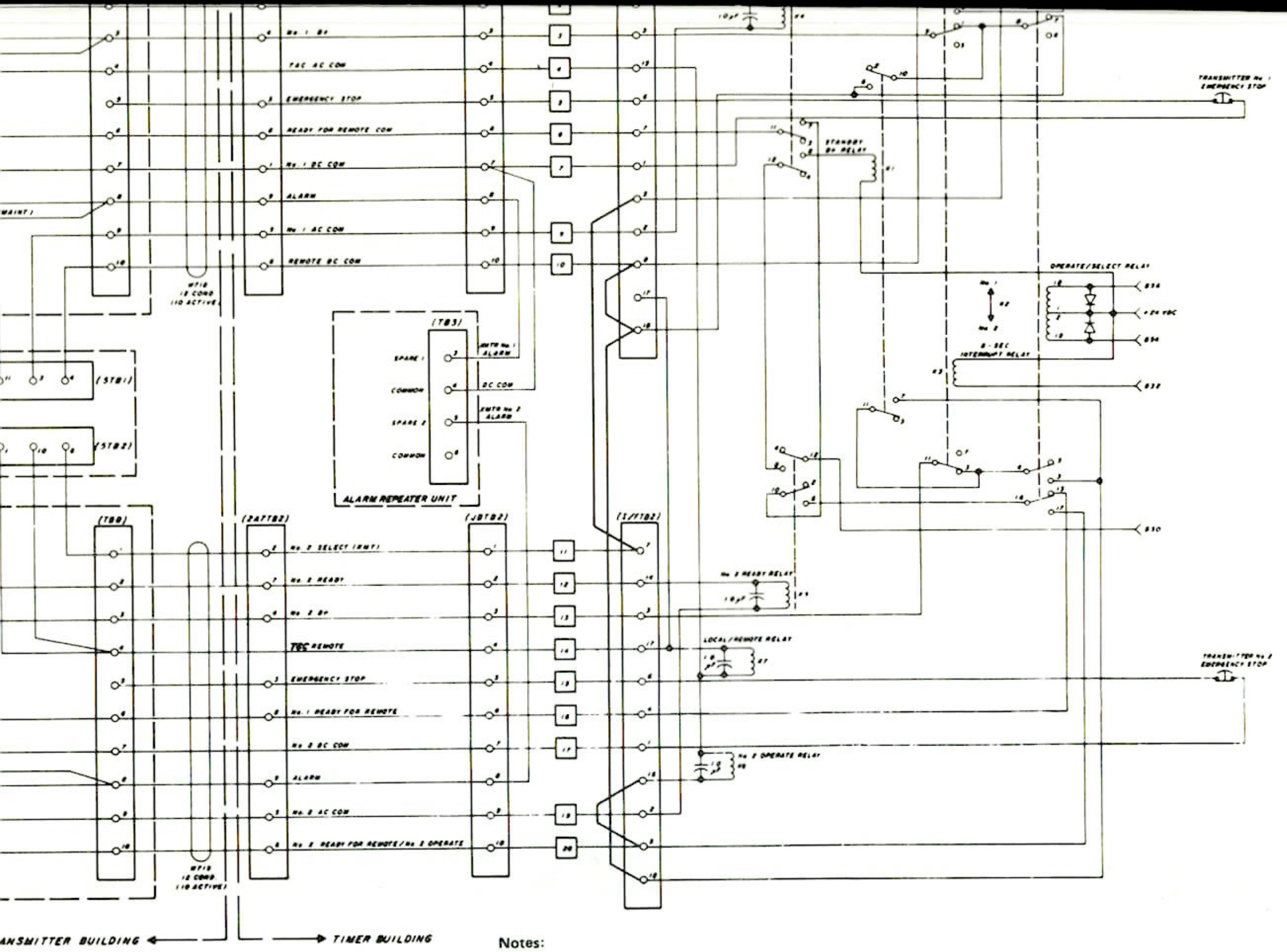
Figure 7.12. Transmitter/TCC System Control Logic Flow Diagram Connected To AN/FPN-44/TCC System Control Wiring Diagram


SYSTEM CONTROL
XMTR BUILDING
TCS BUILDING
(TRANSMITTER NO. 1)
TCC RELAY LOGIC (CHASSIS DESIGNATION)
TCC CIRCUIT LOGIC (MODULE DESIGNATION)
8 Sec. Pulse
TRANSMITTER 1 B+ ON
CR1
3 B+
S1C
1 ON
5TB1-10
-28 VDC
1A12K12, Transmitter No. 1 (Transmitter Control High Voltage Interlock Relay)
Transmitter No. 1
1A11TB8-3
LOCAL
5TB2-4
1A11TB-10
Transmitter No. 1
S2D
REMOTE
S5
HOLD DOWN DURING TRANSFER
DC Comm.
1/FTB1-3
1/FTB1-18
1/FTB1-8
K2, Selector Relay (TCC)
K3, 8 Sec. Interrupt Relay (TCC)
K1, Standby B+ Relay (TCC)
No. 1 Operate
No. 2 Operate



TRANSMITTER No. 2

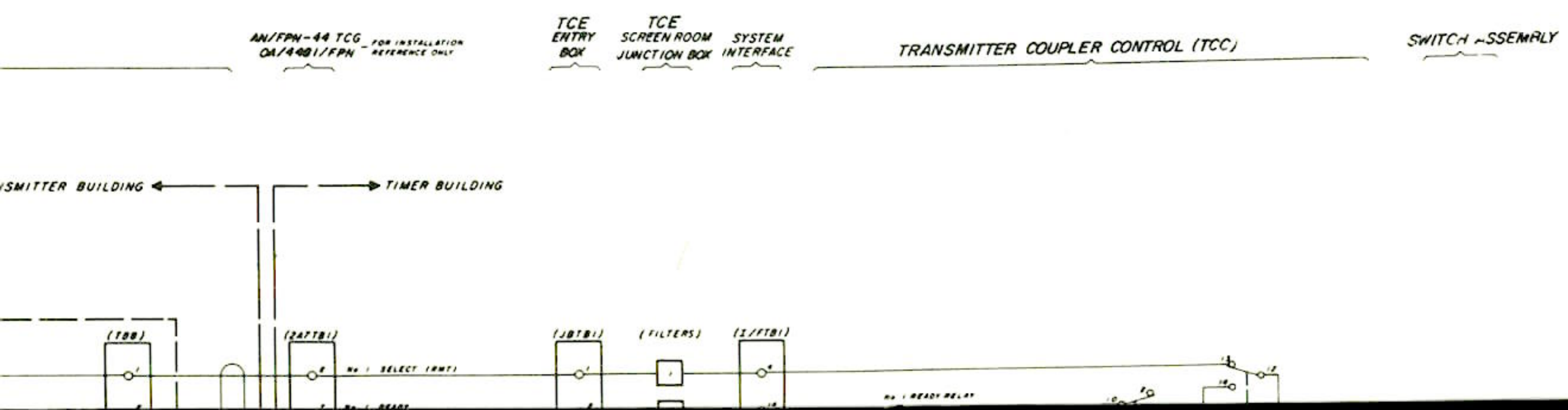

TRANSMITTER No 1
115 VAC FROM "BIAS ON" INDICATOR 1A3A2TB2B
PLATE ON 1A3A2S3C
1, OFF
3, ON
(INDUCTROL) PLATE VOLTAGE 1A3A2S16C
1, MANUAL
3, AUTO
(TB5)
(TB3)

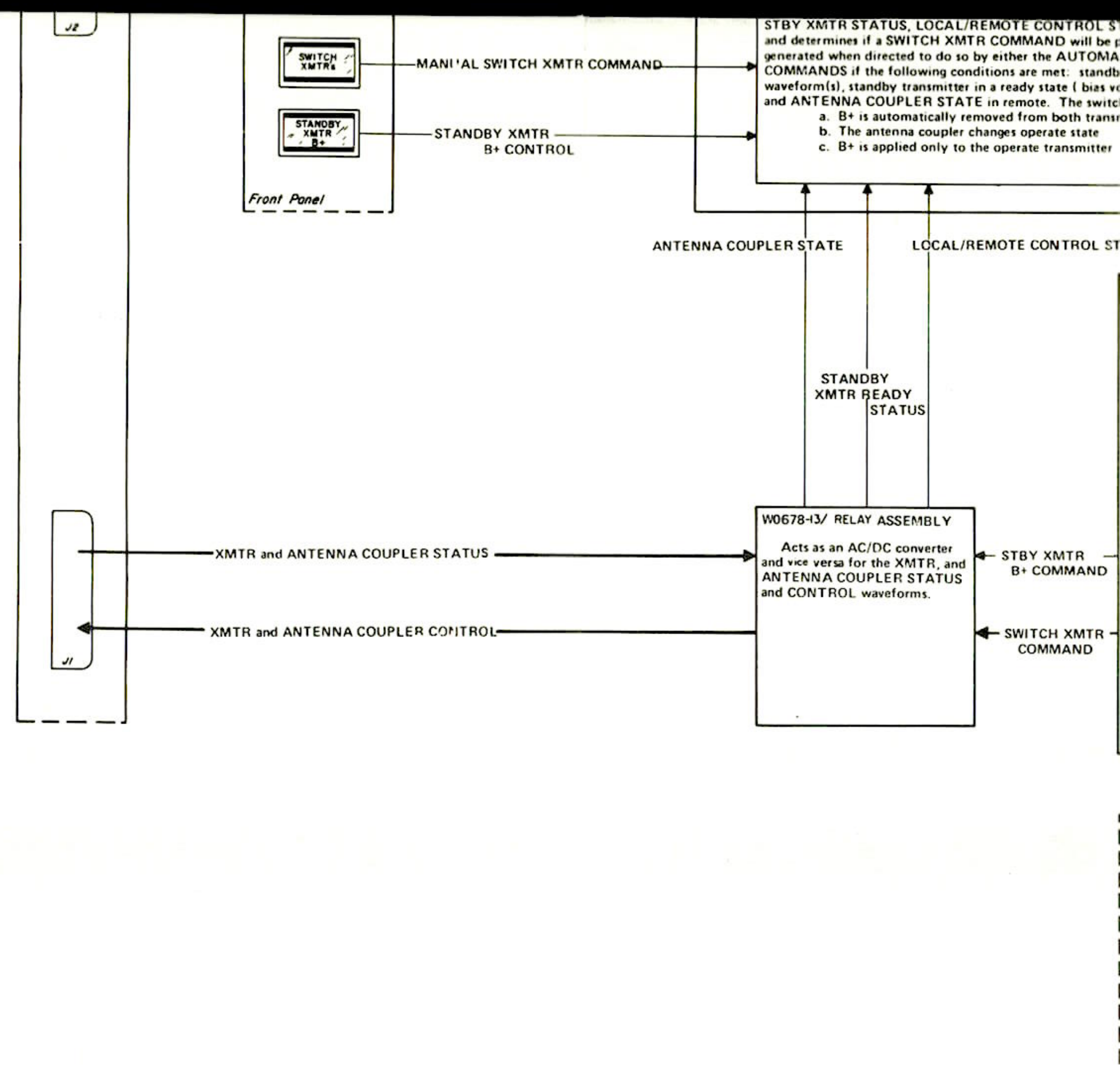


Notes:

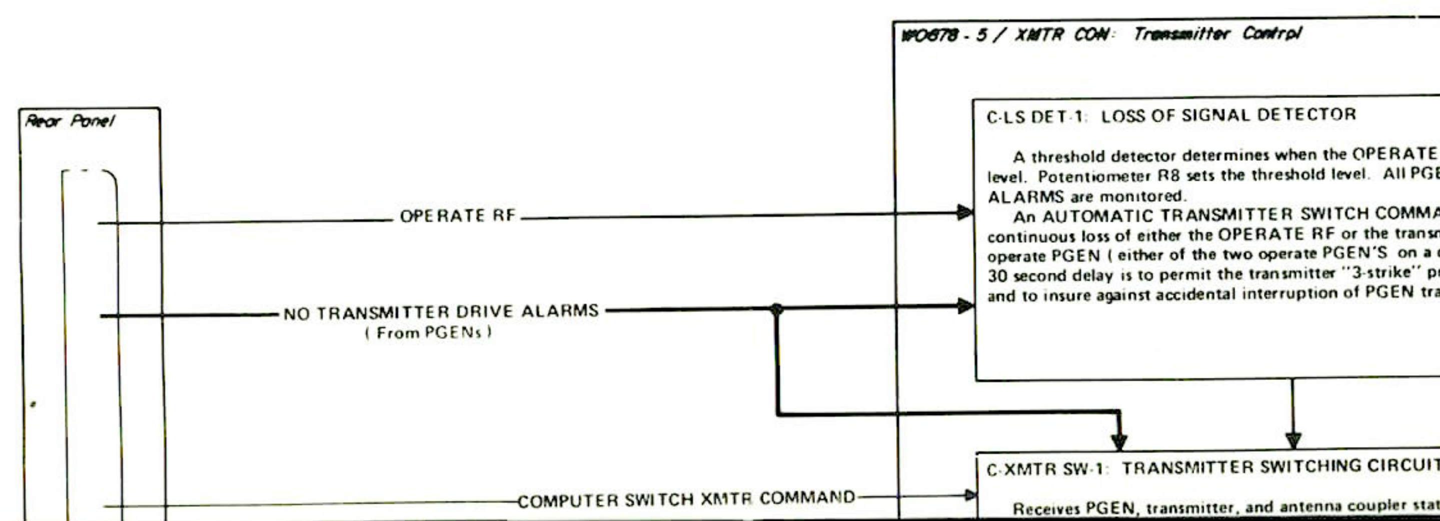
1. The Following Jumper Connections Are Required For All LRE-44 Installations Except EECEN , Wildwood, N.J.
   A. TCS System Interface Unit
      1. TB1-8 to TB1-18
      2. TB1-5 to TB2-7
      3. TB1-18 to TB2-18
      4. TB2-16 to TB2-5
2. The TCC Wiring Section Is Shown Connected Directly To The System Interface For Illustration Purposes Only.
3. All Relays Shown In De-energized Position. TCC Relay K2 Is Shown In Transmitter 1 Operate.

Figure 7.13. Interconnect Diagram For LRE/AN/FPN-44 Transmitter Set For Automatic Remote Control


AN/FPN-44 TCG
OA/4481/FPN
FOR INSTALLATION REFERENCE ONLY
TCE
ENTRY
BOX
TCE
SCREEN ROOM
JUNCTION BOX
SYSTEM
INTERFACE
TRANSMITTER COUPLER CONTROL (TCC)
SWITCH ASSEMBLY
SMITTER BUILDING
TIMER BUILDING
(TB8)
(2A7TB1)
(JBTB1)
(FILTERS)
(1/FTB1)



J2
SWITCH XMTRs
STANDBY XMTR B+
Front Panel
MANUAL SWITCH XMTR COMMAND
STANDBY XMTR B+ CONTROL
STBY XMTR STATUS, LOCAL/REMOTE CONTROL S
and determines if a SWITCH XMTR COMMAND will be
generated when directed to do so by either the AUTOMA
COMMANDS if the following conditions are met: standb
waveform(s), standby transmitter in a ready state (bias v
and ANTENNA COUPLER STATE in remote. The switc
a. B+ is automatically removed from both trans
b. The antenna coupler changes operate state
c. B+ is applied only to the operate transmitter
ANTENNA COUPLER STATE
LOCAL/REMOTE CONTROL ST
STANDBY XMTR READY STATUS
J1
XMTR and ANTENNA COUPLER STATUS
XMTR and ANTENNA COUPLER CONTROL
W0678-13/ RELAY ASSEMBLY
Acts as an AC/DC converter and vice versa for the XMTR, and ANTENNA COUPLER STATUS and CONTROL waveforms.
STBY XMTR B+ COMMAND
SWITCH XMTR COMMAND

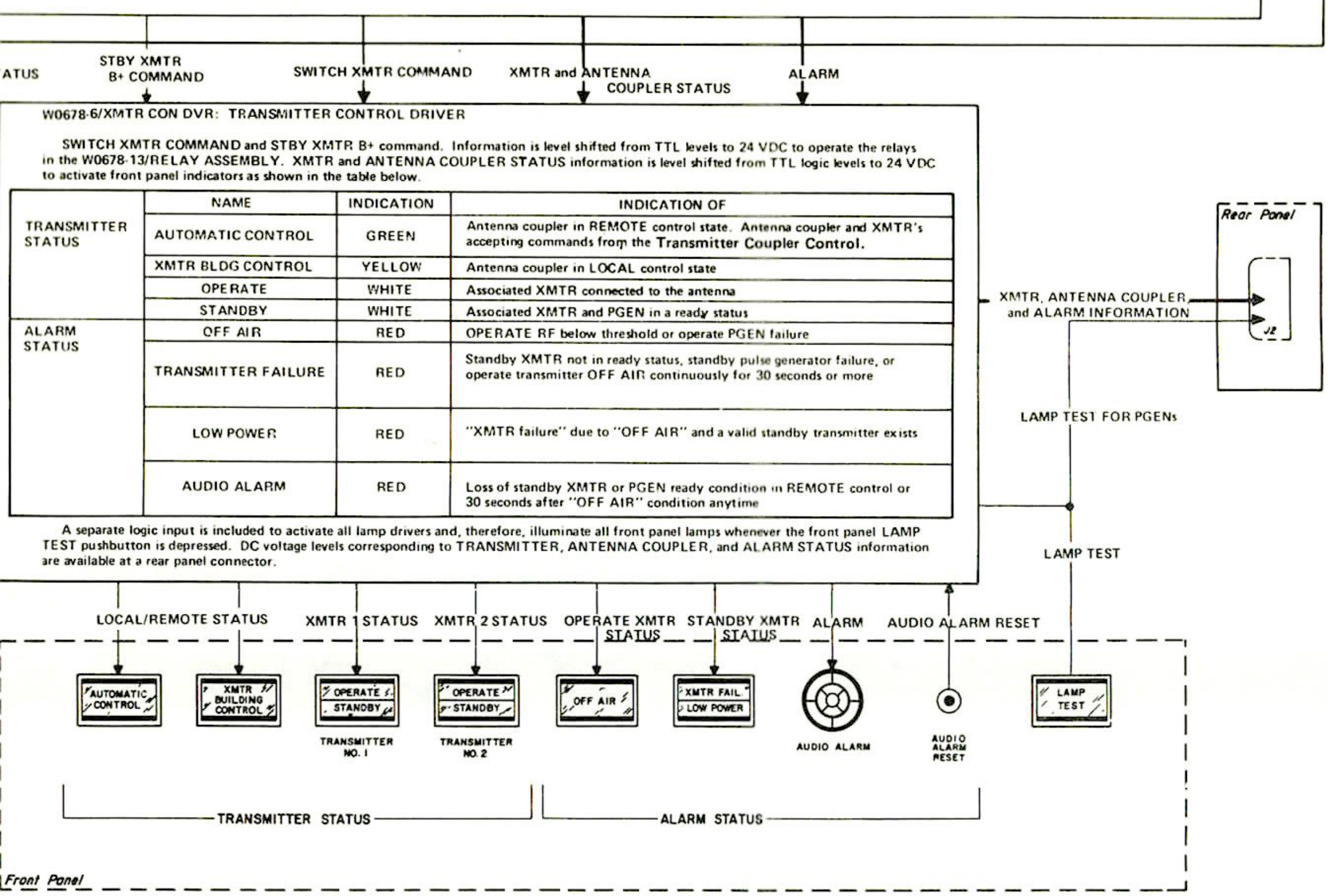


Rear Panel
OPERATE RF
NO TRANSMITTER DRIVE ALARMS
(From PGENs)
COMPUTER SWITCH XMTR COMMAND
WO678 - 5 / XMTR CON: Transmitter Control
C-LS DET-1: LOSS OF SIGNAL DETECTOR
A threshold detector determines when the OPERATE
level. Potentiometer R8 sets the threshold level. All PGE
ALARMS are monitored.
An AUTOMATIC TRANSMITTER SWITCH COMMA
continuous loss of either the OPERATE RF or the transm
operate PGEN (either of the two operate PGEN'S on a d
30 second delay is to permit the transmitter "3-strike" pr
and to insure against accidental interruption of PGEN tra
C-XMTR SW-1: TRANSMITTER SWITCHING CIRCUIT
Receives PGEN, transmitter, and antenna coupler statu

ATUS, and NO TRANSMITTER DRIVE ALARMS)
ermitted. A SWITCH XMTR COMMAND is
TIC, COMPUTER, or MANUAL SWITCH XMTR
y pulse generator(s) providing transmitter drive
ltage energized and plate inductrol in automatic),
hing sequence is as follows:
nitters

pushbutton switch. This provision is only available when transmitter control is in automatic.

Transmitter, antenna coupler, and PGEN status information is provided to the W0678-6/XMTR CON DVR for front panel display. This status information is also used to logically decide when and alarm condition exists. ALARM information is provided to the W0678-6/XMTR CON DVR for subsequent front panel visual and audio presentation.



W0678-6/XMTR CON DVR: TRANSMITTER CONTROL DRIVER

SWITCH XMTR COMMAND and STBY XMTR B+ command. Information is level shifted from TTL levels to 24 VDC to operate the relays in the W0678-13/RELAY ASSEMBLY. XMTR and ANTENNA COUPLER STATUS information is level shifted from TTL logic levels to 24 VDC to activate front panel indicators as shown in the table below.

	NAME	INDICATION	INDICATION OF
TRANSMITTER STATUS	AUTOMATIC CONTROL	GREEN	Antenna coupler in REMOTE control state. Antenna coupler and XMTR's accepting commands from the Transmitter Coupler Control.
	XMTR BLDG CONTROL	YELLOW	Antenna coupler in LOCAL control state
	OPERATE	WHITE	Associated XMTR connected to the antenna
	STANDBY	WHITE	Associated XMTR and PGEN in a ready status
ALARM STATUS	OFF AIR	RED	OPERATE RF below threshold or operate PGEN failure
	TRANSMITTER FAILURE	RED	Standby XMTR not in ready status, standby pulse generator failure, or operate transmitter OFF AIR continuously for 30 seconds or more
	LOW POWER	RED	"XMTR failure" due to "OFF AIR" and a valid standby transmitter exists
	AUDIO ALARM	RED	Loss of standby XMTR or PGEN ready condition in REMOTE control or 30 seconds after "OFF AIR" condition anytime

A separate logic input is included to activate all lamp drivers and, therefore, illuminate all front panel lamps whenever the front panel LAMP TEST pushbutton is depressed. DC voltage levels corresponding to TRANSMITTER, ANTENNA COUPLER, and ALARM STATUS information are available at a rear panel connector.

Figure 7.14. Transmitter Coupler Control Functional Block Text Diagram

RF falls below a prescribed
N NO TRANSMITTER DRIVE

ND is initiated after 30 seconds
itter drive waveform from the
ual rate LORSTA). This
tection feature to be expended
smitter drive waveform.

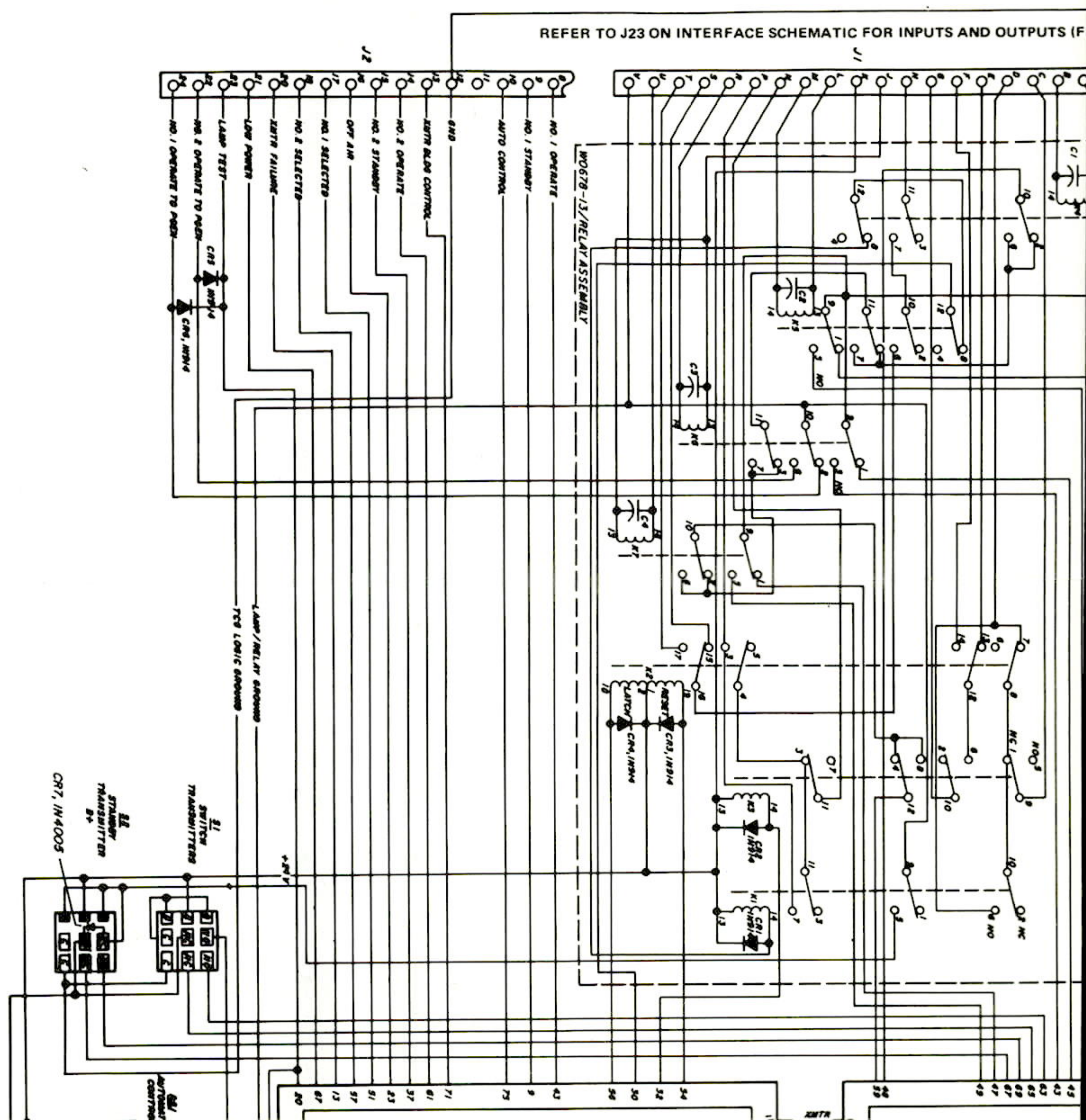
R8

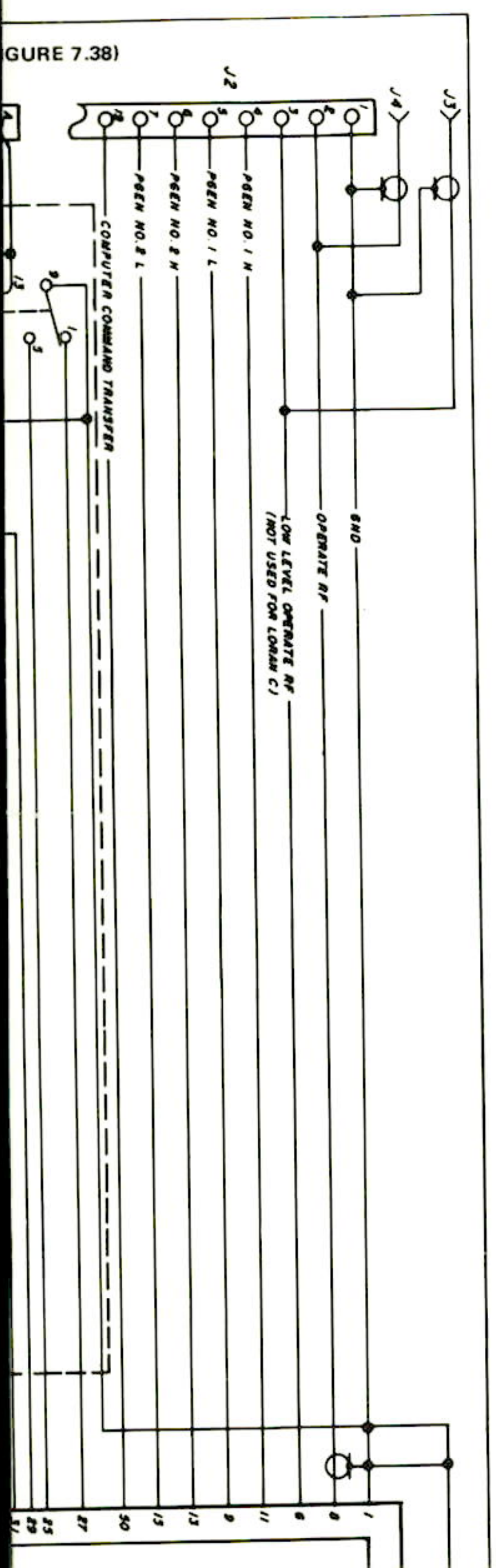
Threshold Detector Level Adjust

RY

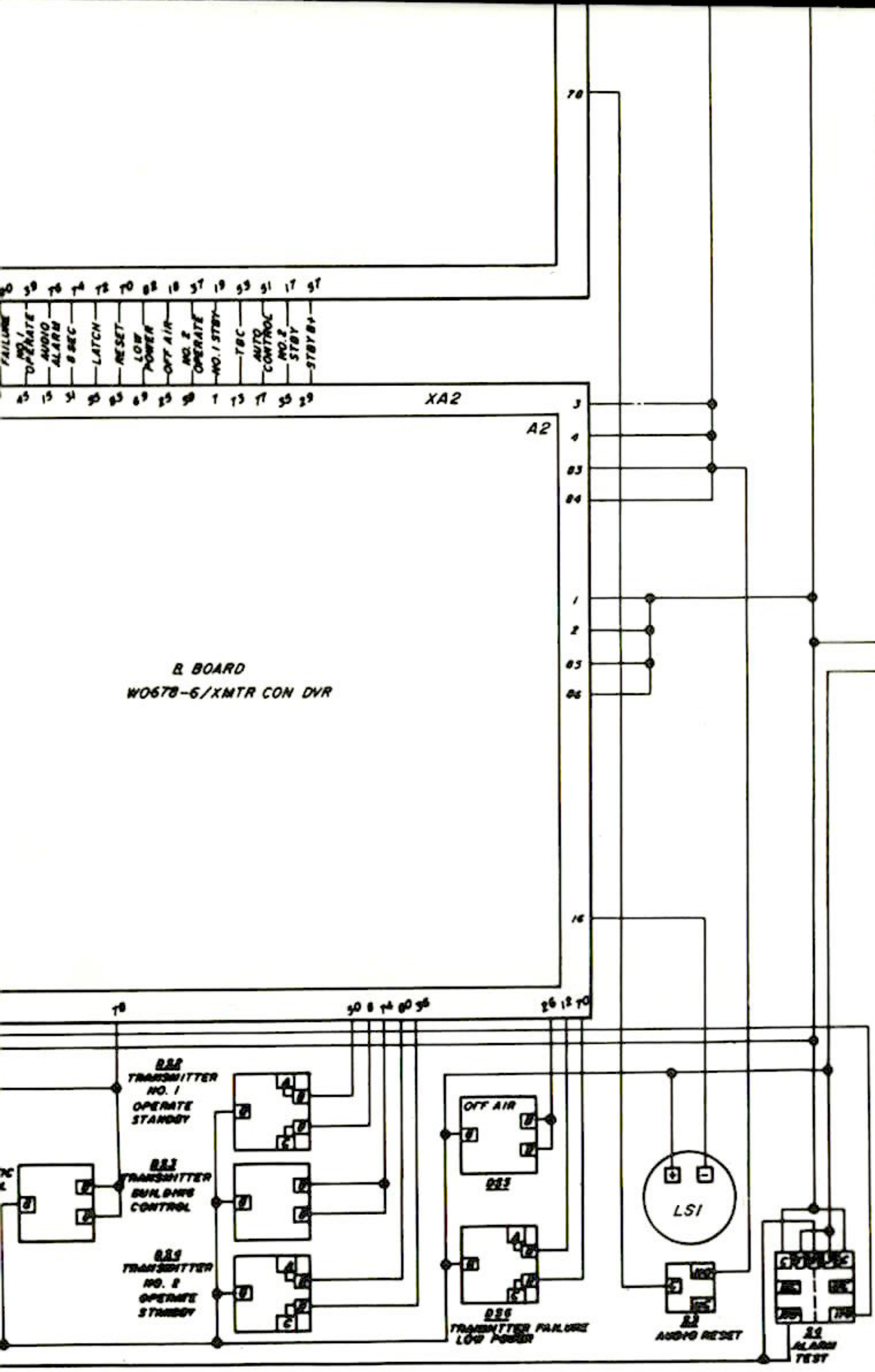
s information (ANTENNA COUPLER STATE,

Provisions are incorporated to permit activating the standby transmitter's B+ voltage from a front pane.


REFER TO J23 ON INTERFACE SCHEMATIC FOR INPUTS AND OUTPUTS (F
J2
J1
NO. 1 OPERATE TO PSEN
NO. 2 OPERATE TO PSEN
LAMP TEST
LOW POWER
XMTR FAILURE
NO. 2 SELECTED
NO. 1 SELECTED
OFF AIR
NO. 2 STANDBY
NO. 2 OPERATE
XMTR BLDG CONTROL
GND
AUTO CONTROL
NO. 1 STANDBY
NO. 1 OPERATE
W0678-13/RELAY ASSEMBLY
LAMP / RELAY GROUND
TCU LOGIC GROUND
CR7, 1N4005
XMTR



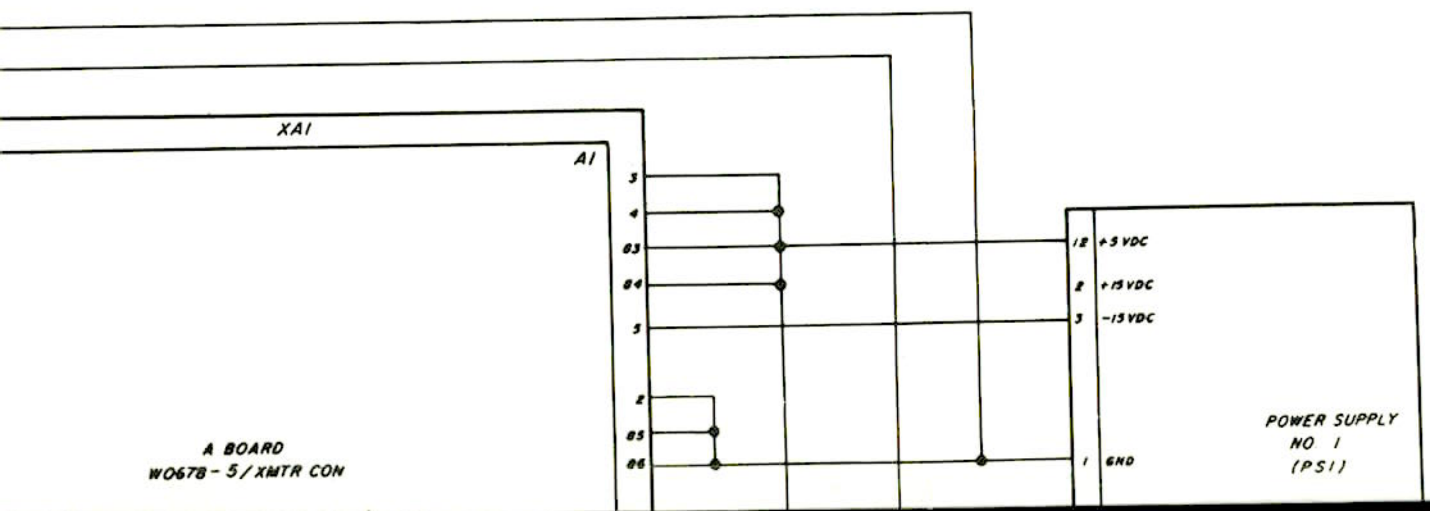
GURE 7.38)
J2
J4
J3
PGEN NO. 1 H
PGEN NO. 1 L
PGEN NO. 2 H
PGEN NO. 2 L
COMPUTER COMMAND TRANSFER
GND
OPERATE RF
LOW LEVEL OPERATE RF
(NOT USED FOR LORAN C)



NOTE:

ALL RELAYS ARE SHOWN NORMALLY DE-ENERGIZED.

Figure 7.15. Transmitter Coupler Control Wiring Diagram


XA1
A1
3
4
83
84
5
2
85
86
12 +5 VDC
2 +15 VDC
3 -15 VDC
1 GND
A BOARD
W0678-5/XMTR CON
POWER SUPPLY
NO 1
(PS1)

PART LOCATION INDEX

REF. DESIG.	LOCATION	REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	5C	L1	1B	R40	1A
C2	6C			R41	1A
C3	5C	R1	5C	R42	1A
C4	2B	R2	6C	R43	1B
C5	3E	R3	2B	R44	1B
C6	3A	R4	6C	R45	7A
C7	3B	R5	1C	R46	7A
C8	3E	R6	3A	R47	6E
C9	3B	R7	3B	R48	3B
C10	3A	R8	2B	R49	2B
C11	6A	R9	3B	R50	2C
C12	2B	R10	3A	R51	3B
C13	2B	R11	4B		
C14	5B	R12	2A	TP1	2A
C15	4B	R13	2A	TP2	2A
C16	3E	R14	6A	TP3	4B
C17	4D	R15	3C	TP4	3C
C18	1B	R16	4D	TP5	6E
C19	5D	R17	4D	TP6	7A
C20	4C	R18	2B	TP7	7A
C21	5D	R19	1B	TP8	6A
C22	5B	R20	5B	TP9	3E
C23	3E	R21	5B		
C24	3E	R22	1B	U1	6C
C25	1C	R23	6A	U2	2C
C26	3B	R24	5D	U3	3B
C27	2B	R25	5C	U4	3B
C28	2E	R26	4E	U5	5B,5C,6B
C29	3E	R27	4E	U6	3D,4C,4D
C30	3C	R28	1E	U7	3B,4C,4D,6A
C31	3B	R29	1E	U8	4B,4C,4D
C32	3B	R30	2D	U9	2B
		R31	1D	U10	6A
CR1	5C	R32	1D	U11	5E,6A
CR2	2C	R33	1C	U12	3C,4D,5A
CR3	2B	R34	1C	U13	3C,4B
CR4	5D	R35	1D	U14	2A,3C
CR5	5B	R36	1D	U15	5B,5C,5D
CR6	5D	R37	1D	U16	2D,2E,4E
CR7	5C	R38	1C	U17	2C,2D
CR8	1B	R39	1A	U18	2C,2D
				U19	1A,4C

B

C

D

E

A

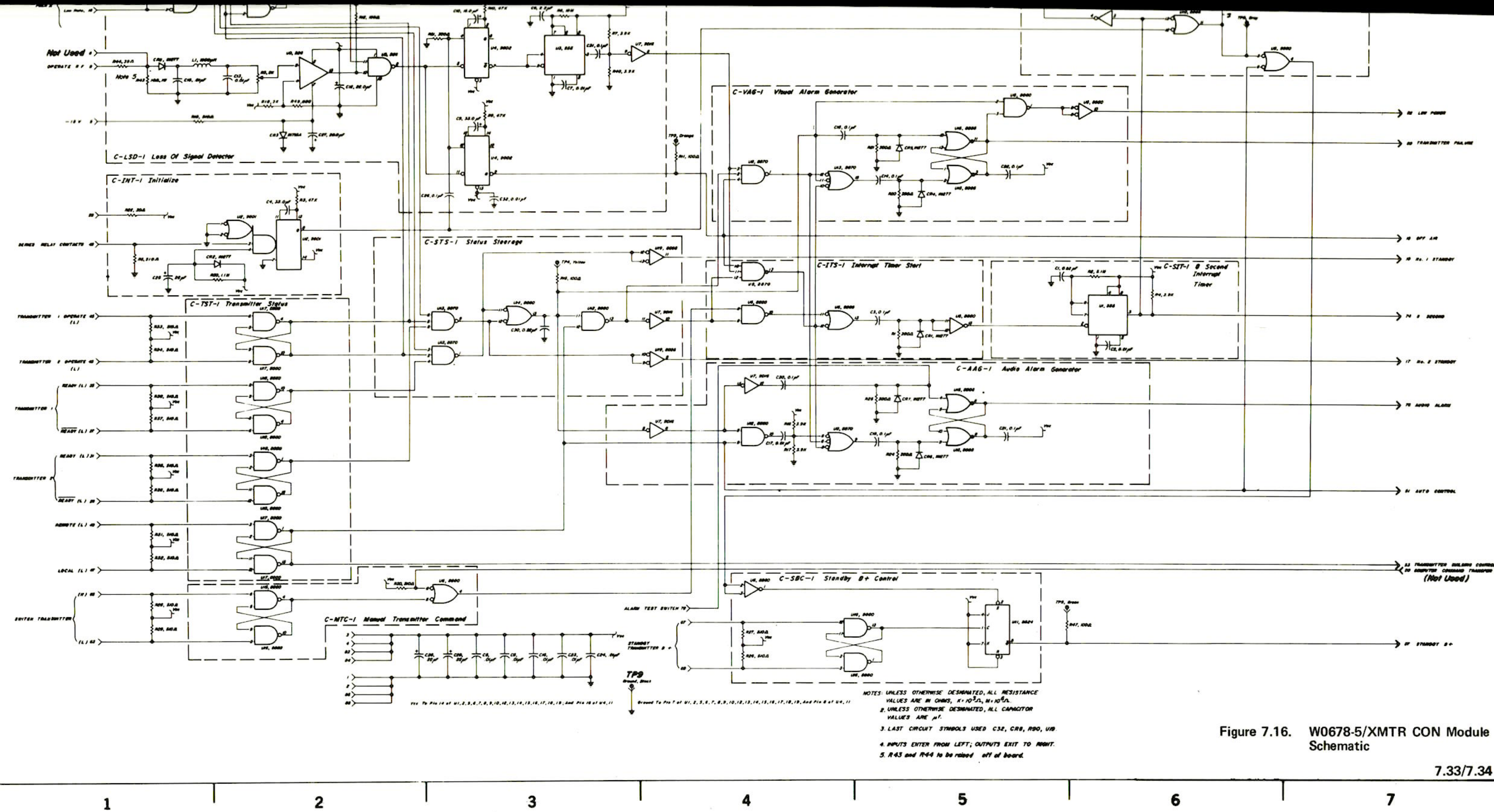
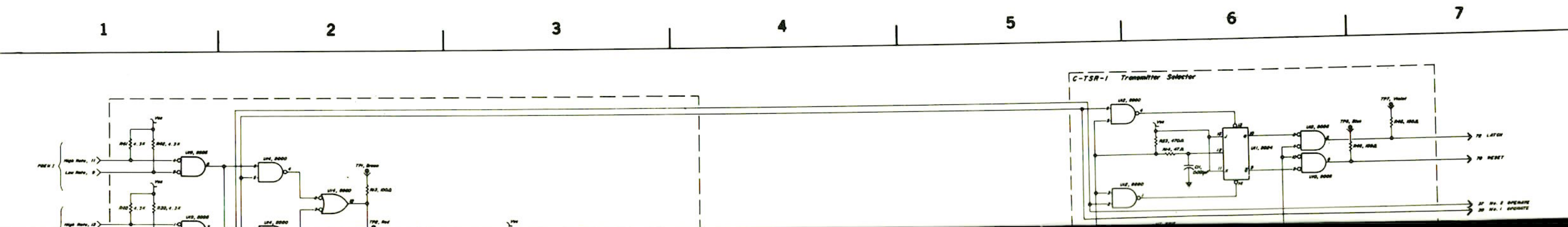


Figure 7.16. W0678-5/XMTR CON Module Schematic


1
2
3
4
5
6
7
C-TSR-1 Transmitter Selector

E D C B

REF. DESIG.	LOCATION
R43	6D
R44	6D
R45	2C
R46	3C
R47	3C
R48	4B
R49	7B
R50	3B
R51	6A
TP1	7A
TP2	6A
TP3	6A
TP4	4A
TP5	3A
TP6	3A
TP7	2A
TP8	2A
TP9	1A
U1	2B
U2	3B
U3	4B
U4	6B
U5	2B
U6	3B
U7	4B
U8	5B
U9	6B
U10	2C
U11	3C
U12	4C
U13	5C
U14	6C
U15	2D
U16	3D
U17	4D
U18	5D
U19	6D

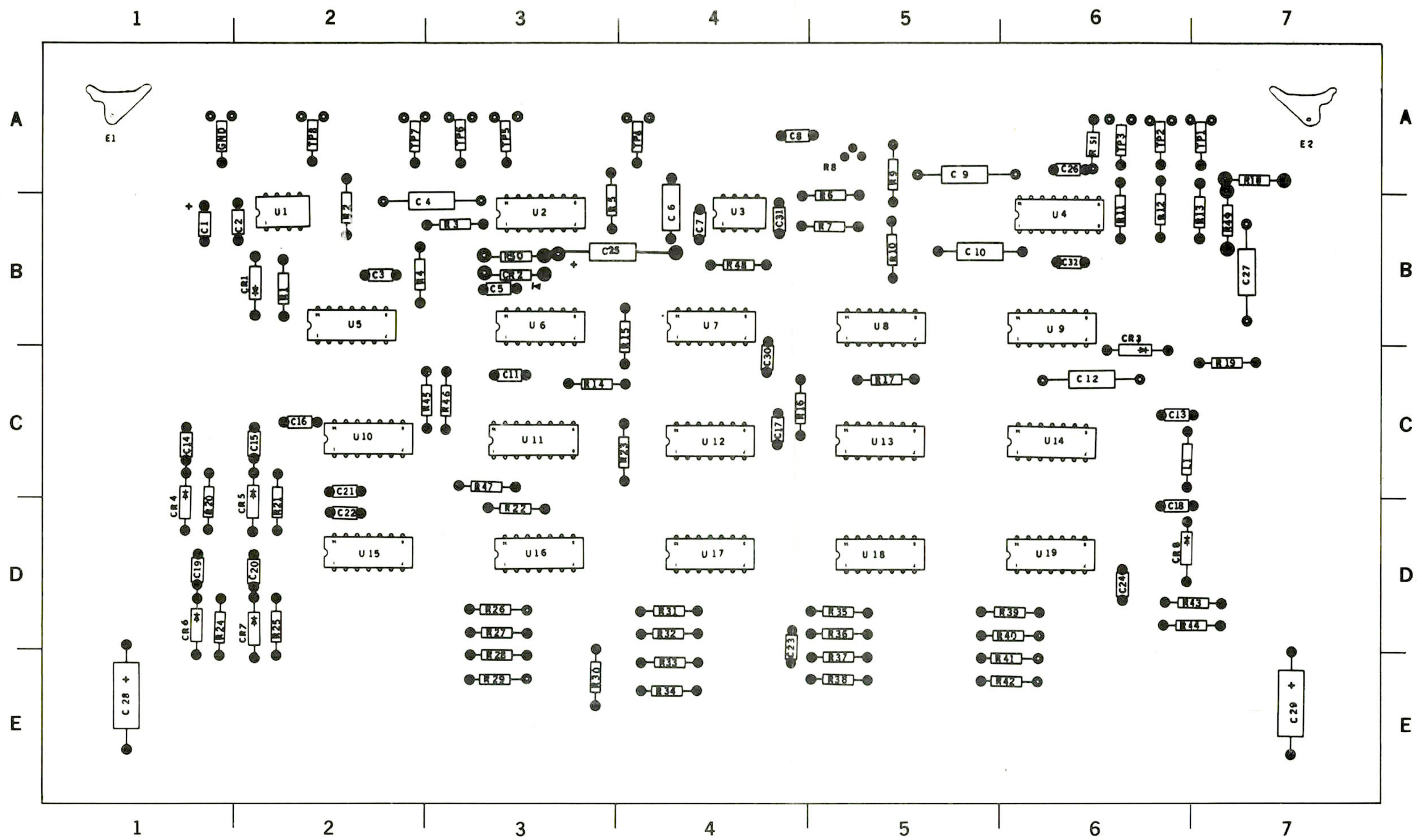


Figure 7.17. W0678-5/XMTR CON Module Parts Locator

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	1B	L1	6C
C2	2B		
C3	2B	R1	2B
C4	2B	R2	2B
C5	3B	R3	3B
C6	4B	R4	2B
C7	4B	R5	3B
C8	4A	R6	5B
C9	5A	R7	5B
C10	5B	R8	5A
C11	3C	R9	5A
C12	6C	R10	5B
C13	6C	R11	6B
C14	1C	R12	6B
C15	2C	R13	7B
C16	2C	R14	3C
C17	4C	R15	4B
C18	6D	R16	4C
C19	1D	R17	5C
C20	2D	R18	7A
C21	2C	R19	7C
C22	2D	R20	1D
C23	4D	R21	2D
C24	6D	R22	3D
C25	3B	R23	4C
C26	6A	R24	1D
C27	7B	R25	2D
C28	1E	R26	3D
C29	7E	R27	3D
C30	4C	R28	3E
C31	4B	R29	3E
C32	6B	R30	3E
		R31	4D
CR1	2B	R32	4D
CR2	3B	R33	4E
CR3	6C	R34	4E
CR4	1D	R35	5D
CR5	2D	R36	5D
CR6	1D	R37	5E
CR7	2D	R38	5E
CR8	6D	R39	6D
		R40	6D
E1	1A	R41	6E
E2	7A	R42	6E

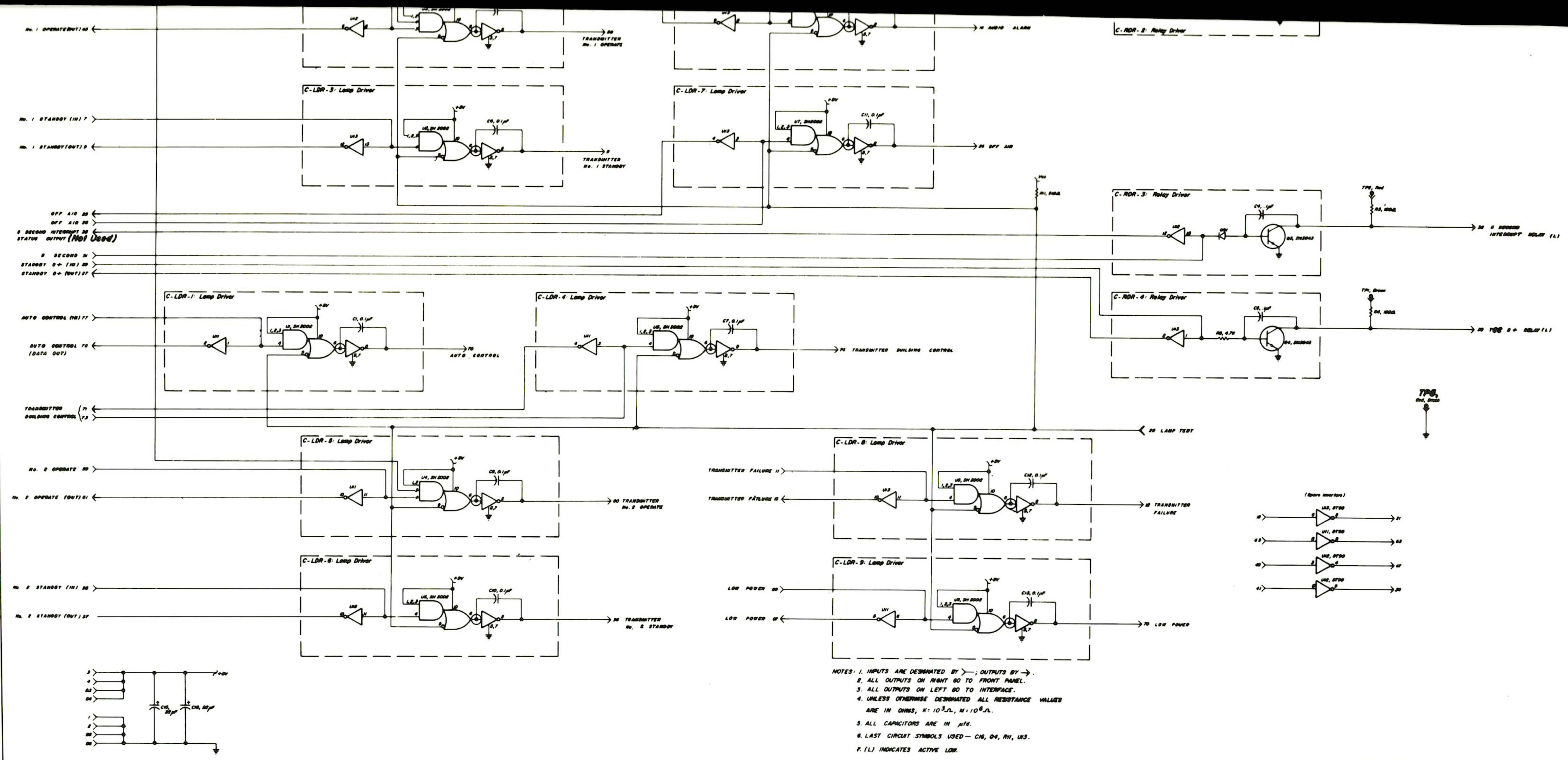
C2	6A
C3	6A
C4	6B
C5	6C
C6	3B
C7	4C
C8	3D
C9	3A
C10	3D
C11	4B
C12	5D
C13	5D
C14	4A
C15	1E
C16	1E
CR1	6C
Q1	6A
Q2	6A
Q3	6C
Q4	6C
R1	7A
R2	7A
R3	7B
R4	7C
R5	6A
R6	6A
R7	NOT USED
R8	6C
R9	6A
R10	6A
R11	5B
TP1	7C
TP2	7B
TP3	7A
TP4	7A
TP5	7C
U1	2C
U2	2B
U3	3C
U4	2D
U5	2A
U6	2D
U7	4B
U8	5D
U9	5D
U10	4A
U11	1C,2D,3C,4D,6A,6D
U12	2B,2D,6A,6C,6D
U13	2B,4A,4B,4D,6C,6D

B

C

D

E



NOTES: 1. INPUTS ARE DESIGNATED BY ≻—; OUTPUTS BY →.
2. ALL OUTPUTS ON RIGHT GO TO FRONT PANEL.
3. ALL OUTPUTS ON LEFT GO TO INTERFACE.
4. UNLESS OTHERWISE DESIGNATED ALL RESISTANCE VALUES ARE IN OHMS, $K = 10^3\Omega$, $M = 10^6\Omega$.
5. ALL CAPACITORS ARE IN μfd.
6. LAST CIRCUIT SYMBOLS USED — C16, Q4, R11, U13.
7. (L) INDICATES ACTIVE LOW.

Figure 7.18. W0678-6/XMTR CON DVR Module Schematic

B

C

D

E

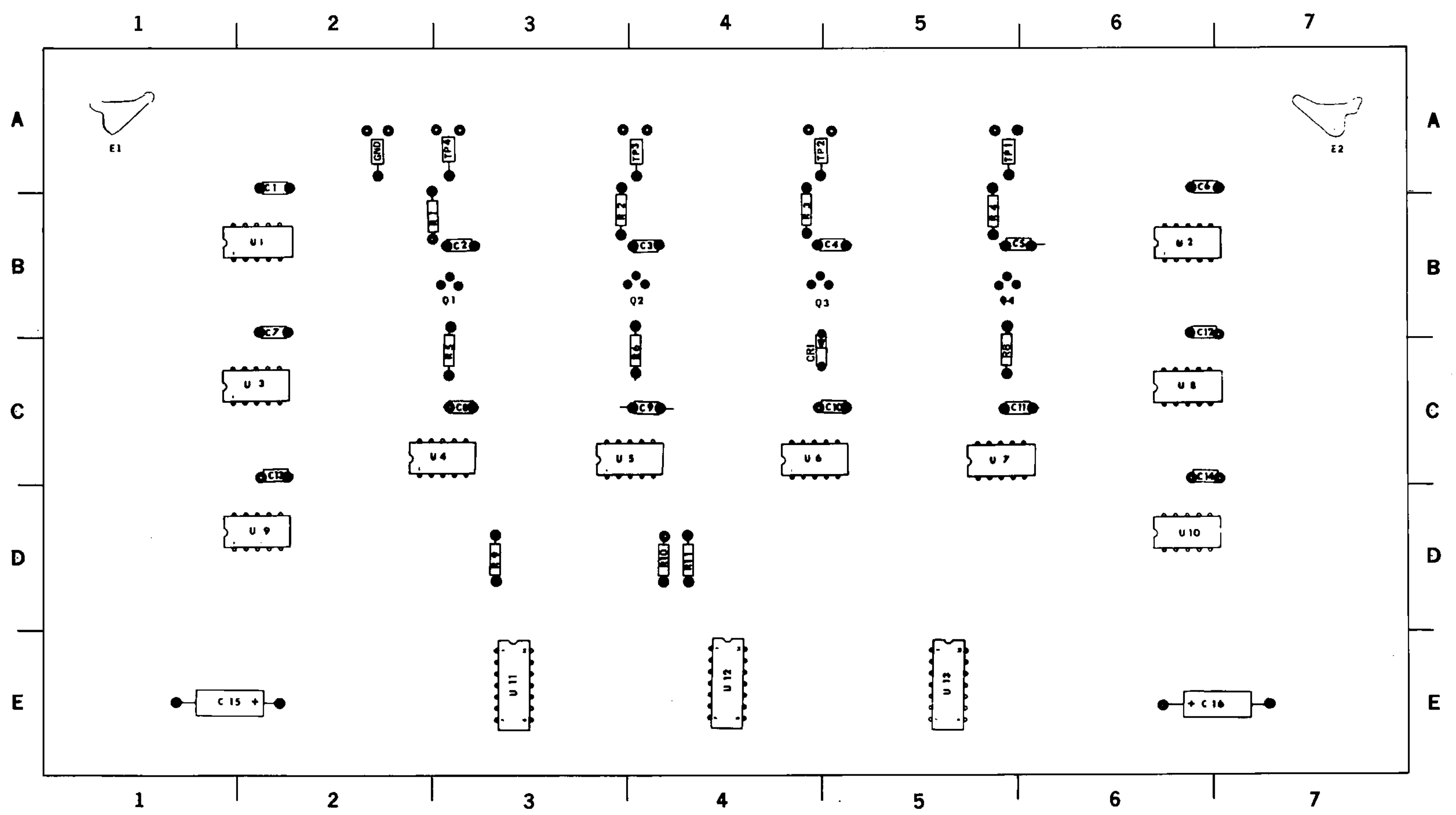
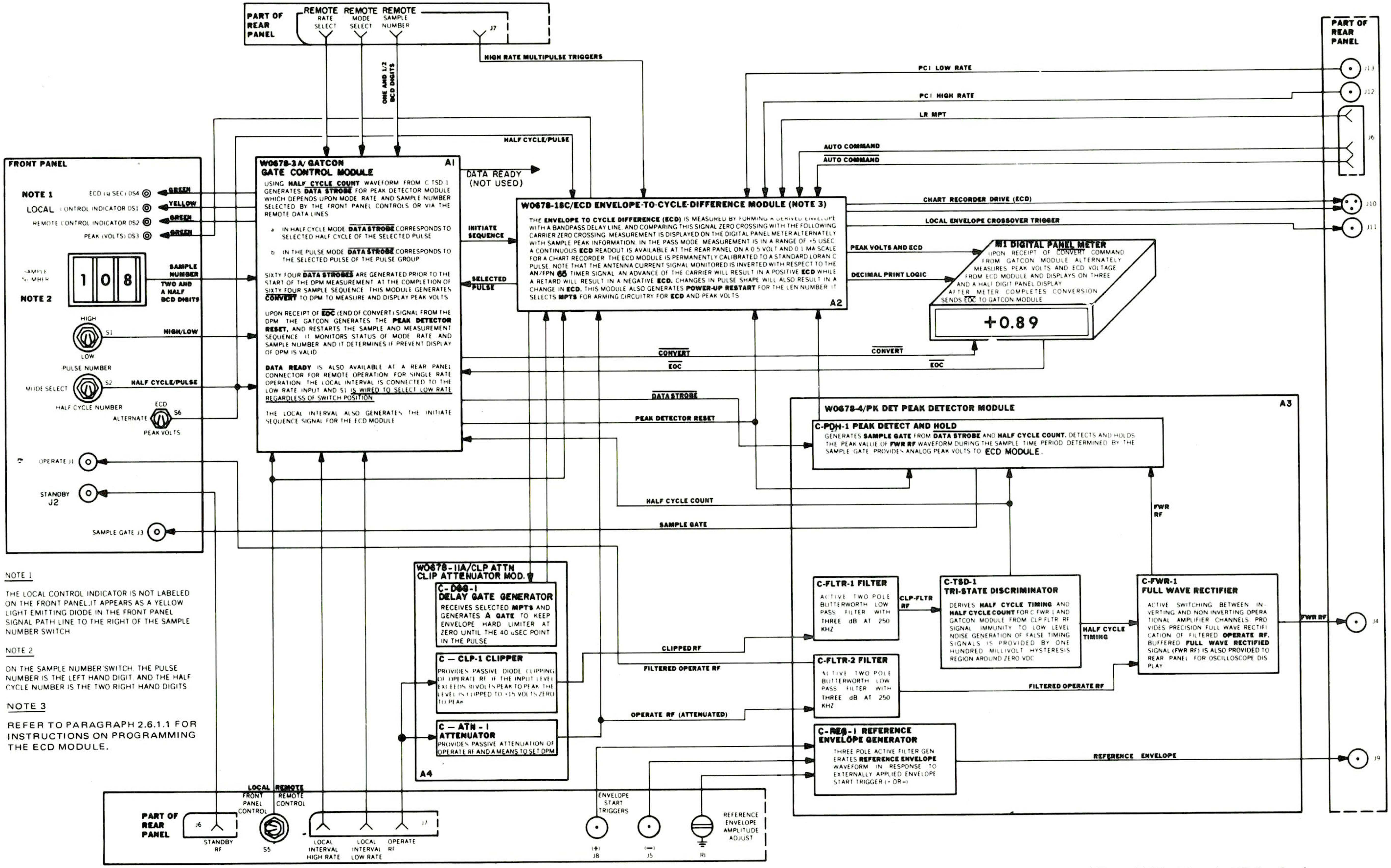


Figure 7.19. W0678-6/XMTR CON DVR Module Parts Locator



NOTE 1

THE LOCAL CONTROL INDICATOR IS NOT LABELED ON THE FRONT PANEL,IT APPEARS AS A YELLOW LIGHT EMITTING DIODE IN THE FRONT PANEL SIGNAL PATH LINE TO THE RIGHT OF THE SAMPLE NUMBER SWITCH

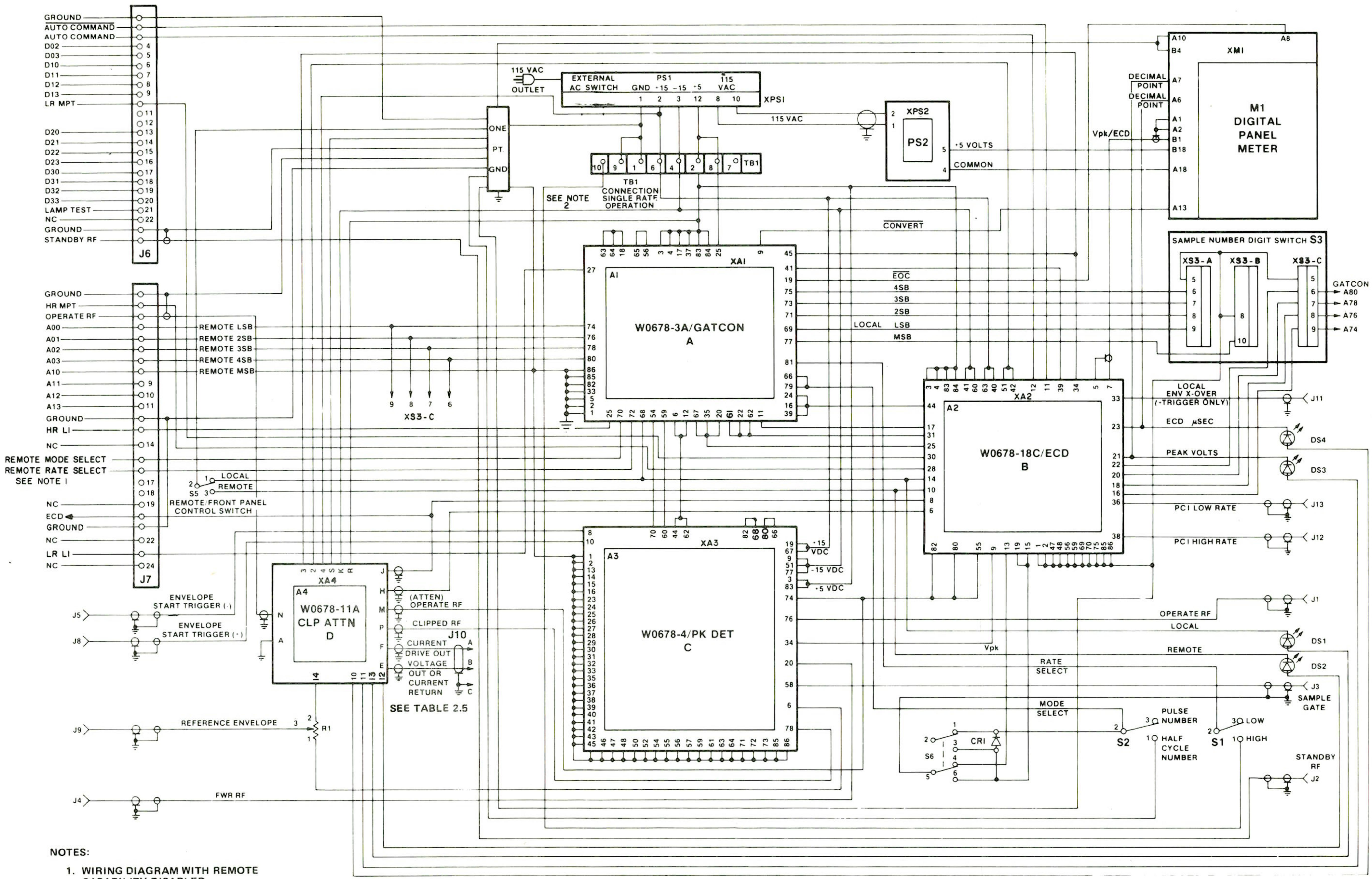
NOTE 2

ON THE SAMPLE NUMBER SWITCH THE PULSE NUMBER IS THE LEFT HAND DIGIT AND THE HALF CYCLE NUMBER IS THE TWO RIGHT HAND DIGITS

NOTE 3

REFER TO PARAGRAPH 2.6.1.1 FOR INSTRUCTIONS ON PROGRAMMING THE ECD MODULE.

Figure 7.20. Electrical Pulse Analyzer Functional Block Text Diagram



NOTES:

1. WIRING DIAGRAM WITH REMOTE CAPABILITY DISABLED.
2. FOR DUAL-RATE CONNECTIONS OF TB1, REFER TO PARAGRAPH 2.6.1.2.

Figure 7.21. Electrical Pulse Analyzer Wiring Diagram

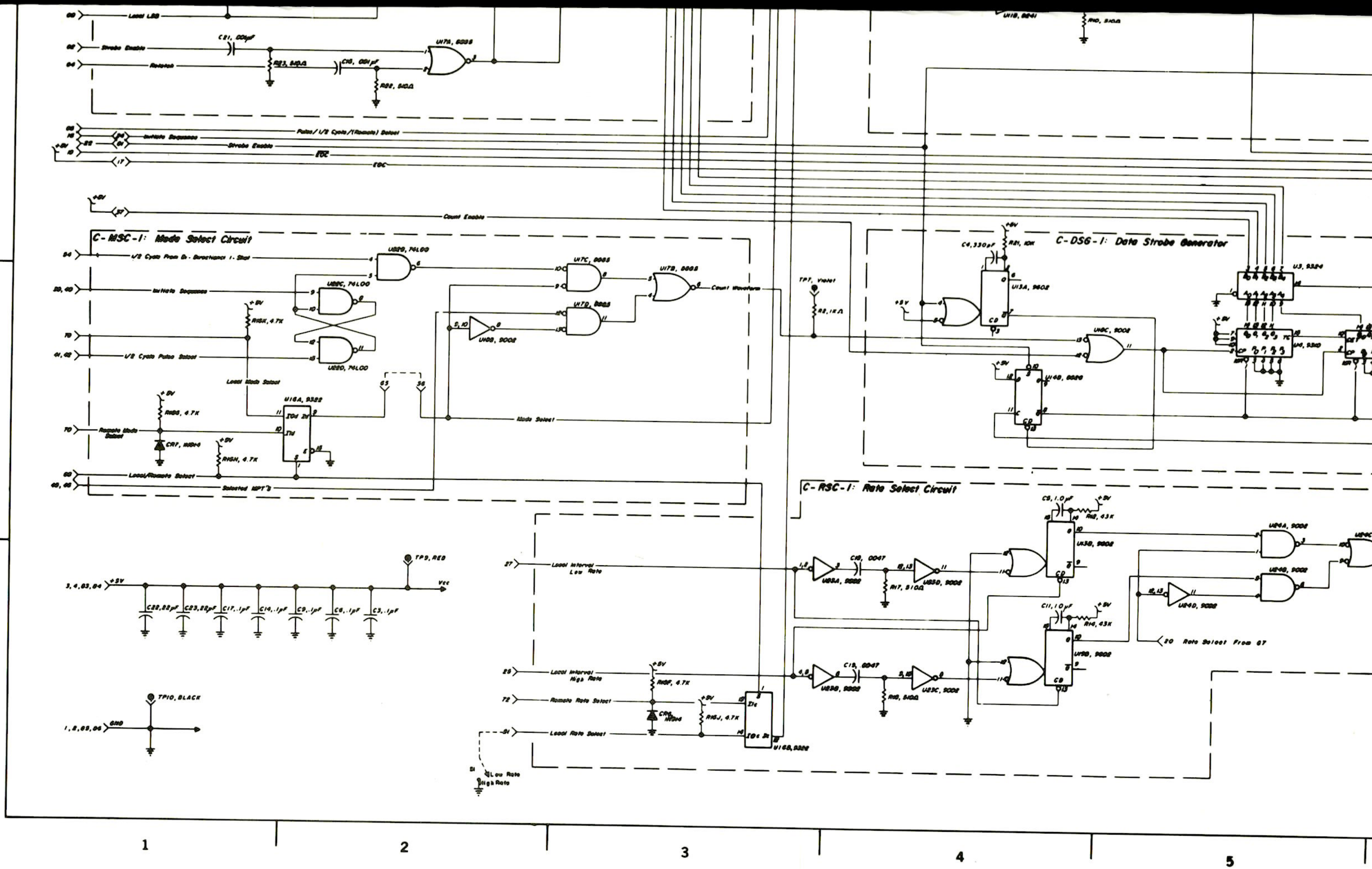
C14	1E	TP1	8B
C15	2C	TP2	8A
C16	NOT USED	TP3	6D
C17	1E	TP4	7C
C18	4E	TP5	8B
C19	4E	TP6	3A
C20	6C	TP7	3D
C21	1C	TP8	7C
C22	1E	TP9	2E
C23	1E	TP10	1E
C24	NOT USED		
C25	7A	U1	2A
		U2	3A
CR1	1A	U3	5C
CR2	1A	U4	5D
CR3	1A	U5	5A
CR4	1B	U6	4A
CR5	1B	U7	6B
CR6	3E	U8	2A
CR7	1D	U9	2A
		U10	5B,6D
R1	7C	U11	4B,5B
R2	3D	U12	5D
R3	3A	U13	4D
R4	8B	U14	4D,5B
R5	7C	U15	7A,7B
R6	6D	U16	2D,3E
R7	6A	U17	2C,3D
R8	8A	U18	2D,4D
R9	8B	U19	4E,6A
R10	4C	U20	5B,6B,6E
R11	4B	U21	6C
R12	4D	U22	2D
R13	6A	U23	3E,4E
R14	4E	U24	5D,5E
R15	6C	U25	7A,7B

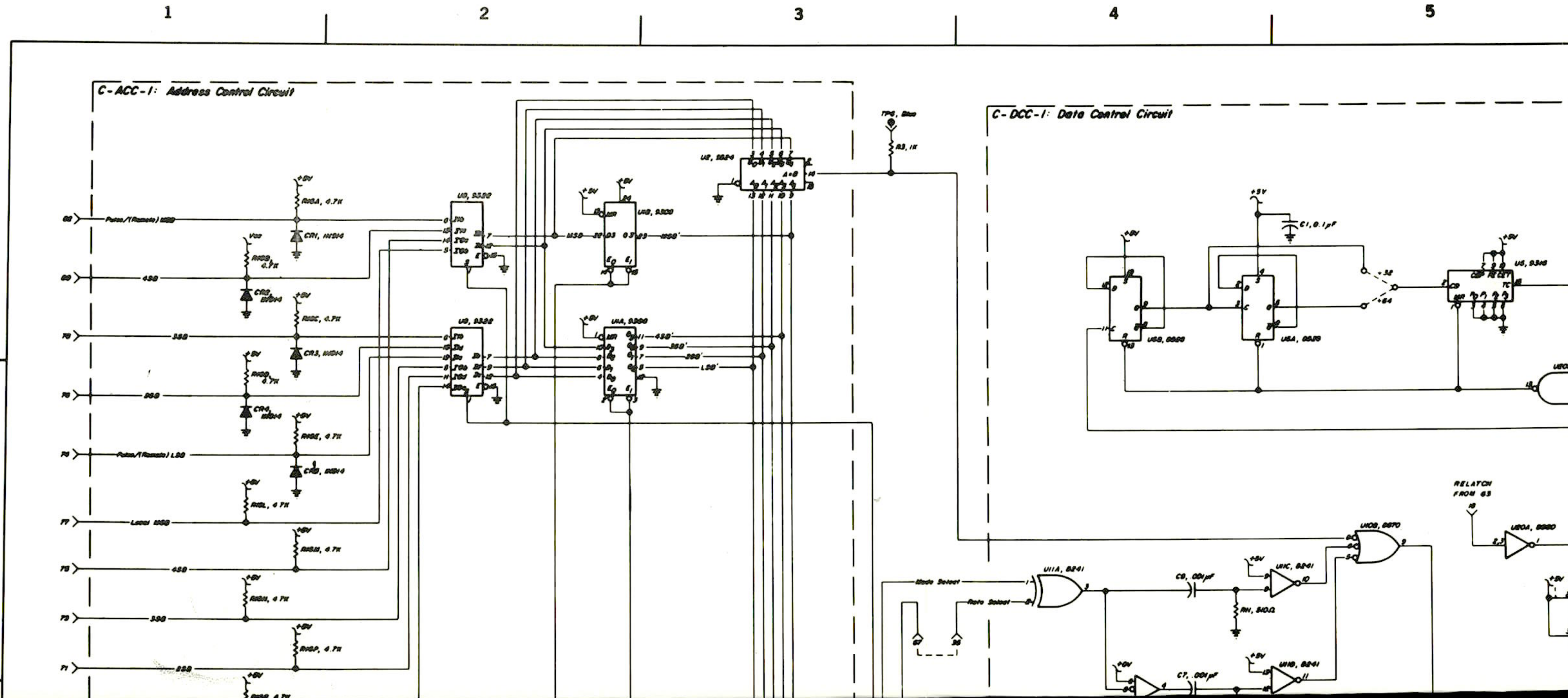
C

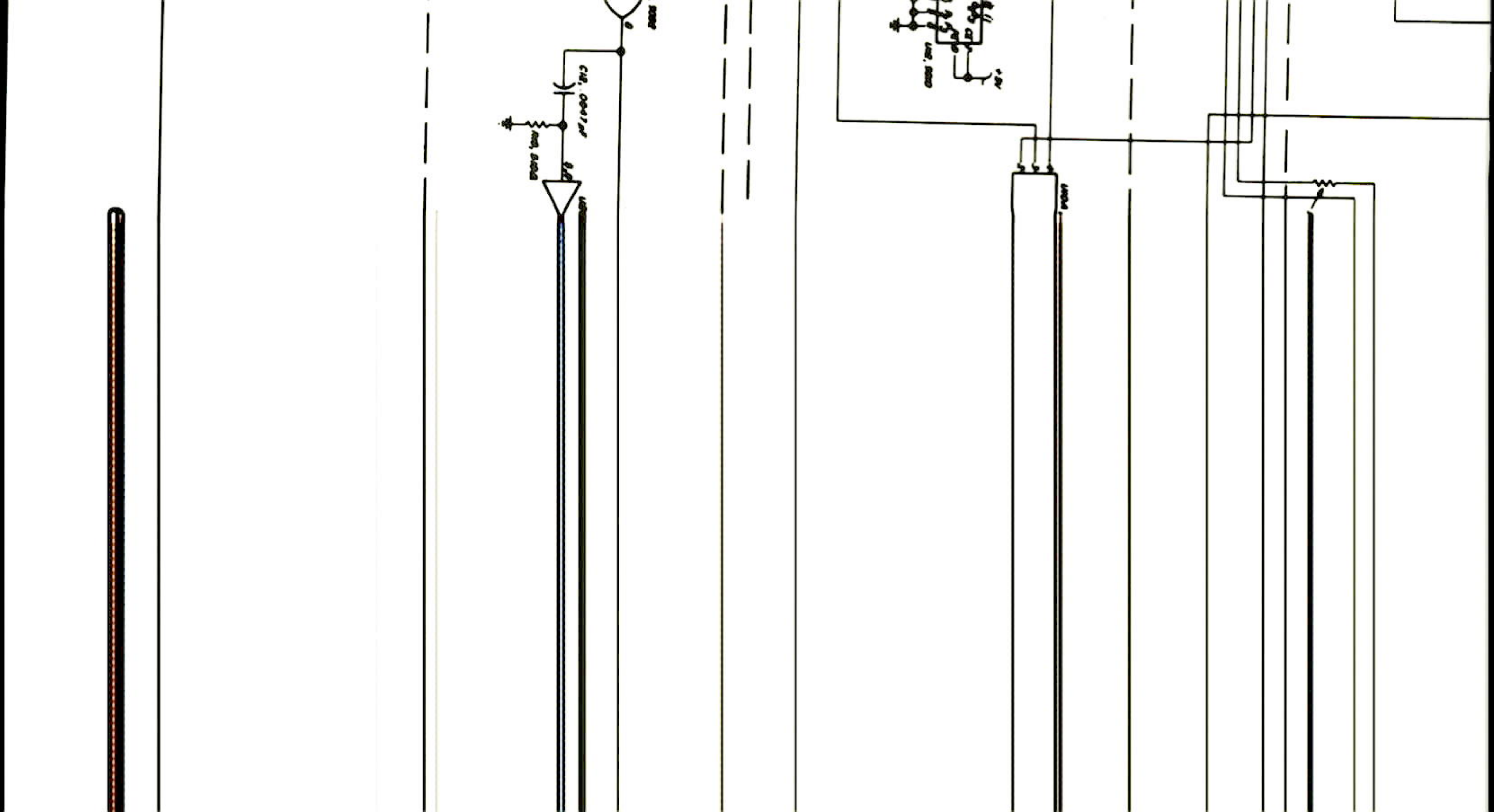
D

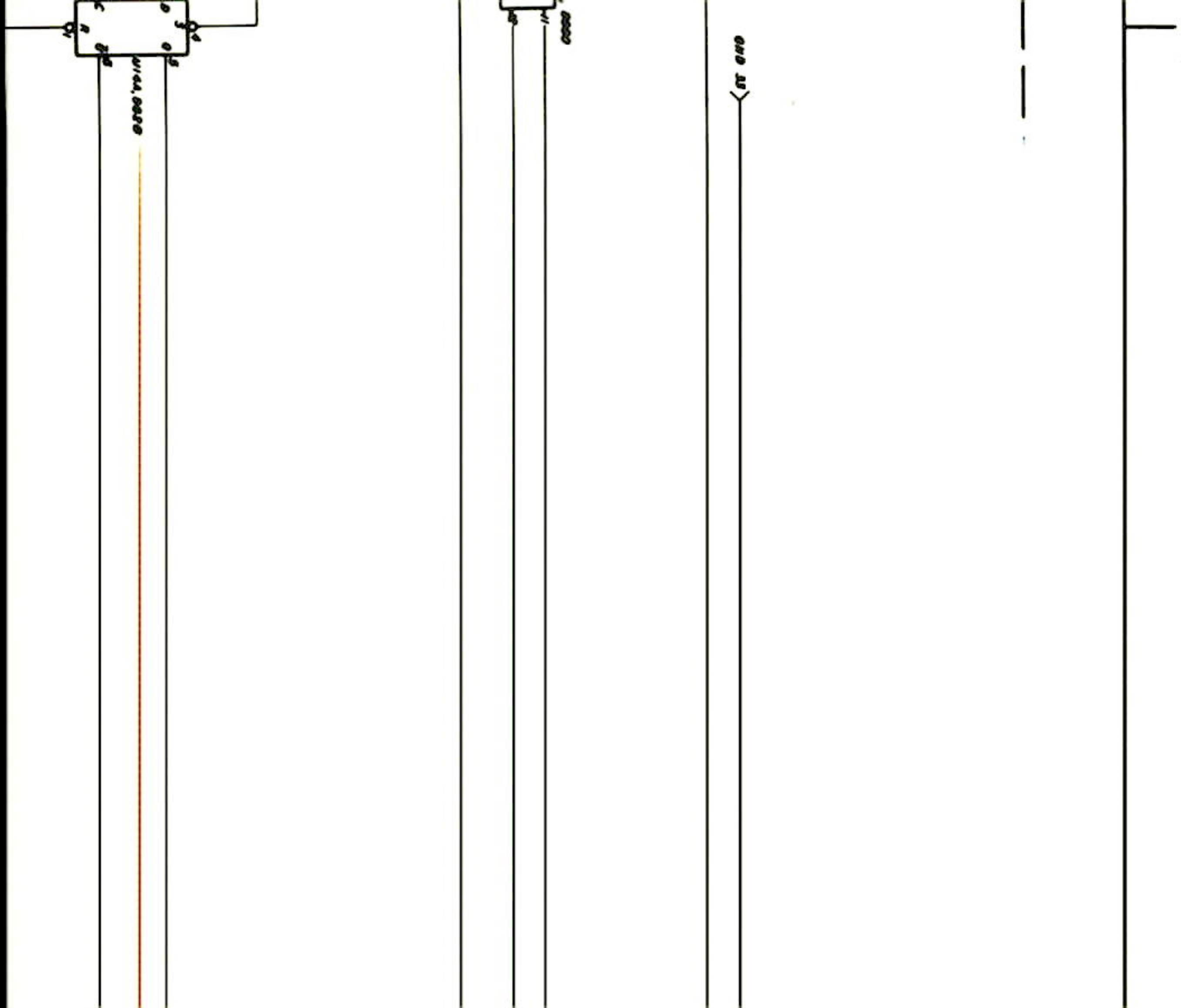
E

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	5A	R16	1A,1B,1C,1D
C2	6A	R17	4E
C3	2E	R18	4E
C4	4C	R19	6E
C5	4D	R20	6C
C6	2E	R21	4C
C7	4B	R22	2C
C8	4B	R23	1C
C9	2E	R24	NOT USED
C10	6A	R25	6C
C11	4E	R26	7A
C12	6E	R27	7A
C13	6C		


C-MSC-1: Mode Select Circuit
C-DSG-1: Data Strobe Generator
C-RSC-1: Rate Select Circuit
Count Enable
Count Waveform
Mode Select
Local Mode Select
Local/Remote Select
Selected MPT's
Initiate Sequence
Strobe Enable
Pulse/1/2 Cycle/(Remote) Select
EOC
Local Interval Low Rate
Local Interval High Rate
Remote Rate Select
Local Rate Select
Rate Select From 67
Low Rate
High Rate
TP9, RED
TP10, BLACK
TP7, Violet
Vcc
GND
U16A, 9322
U16B, 9322
U3, 9324
U4, 9310
1
2
3
4
5


1
2
3
4
5
C-ACC-1: Address Control Circuit
C-DCC-1: Data Control Circuit
Pulse/(Remote) MSB
Pulse/(Remote) LSB
Local MSB
U2, 9324
U3, 9322
U9, 9322
U1A, 9300
U1B, 9300
U5B, 8828
U5A, 8828
U6, 9316
U11A, 8241
U11C, 8241
U11B, 8241
U10B, 8870
U20A, 8880
TP6, Blue
R3, 1K
C1, 0.1µF
C6, .001µF
C7, .001µF
R11, 510Ω
Mode Select
Rate Select
RELATCH FROM 63
+5V





C14	1E	TP1	8B
C15	2C	TP2	8A
C16	NOT USED	TP3	6D
C17	1E	TP4	7C
C18	4E	TP5	8B
C19	4E	TP6	3A
C20	6C	TP7	3D
C21	1C	TP8	7C
C22	1E	TP9	2E
C23	1E	TP10	1E
C24	NOT USED		
C25	7A	U1	2A
		U2	3A
CR1	1A	U3	5C
CR2	1A	U4	5D
CR3	1A	U5	5A
CR4	1B	U6	4A
CR5	1B	U7	6B
CR6	3E	U8	2A
CR7	1D	U9	2A
		U10	5B,6D
R1	7C	U11	4B,5B
R2	3D	U12	5D
R3	3A	U13	4D
R4	8B	U14	4D,5B
R5	7C	U15	7A,7B
R6	6D	U16	2D,3E
R7	6A	U17	2C,3D
R8	8A	U18	2D,4D
R9	8B	U19	4E,6A
R10	4C	U20	5B,6B,6E
R11	4B	U21	6C
R12	4D	U22	2D
R13	6A	U23	3E,4E
R14	4E	U24	5D,5E
R15	6C	U25	7A,7B

C

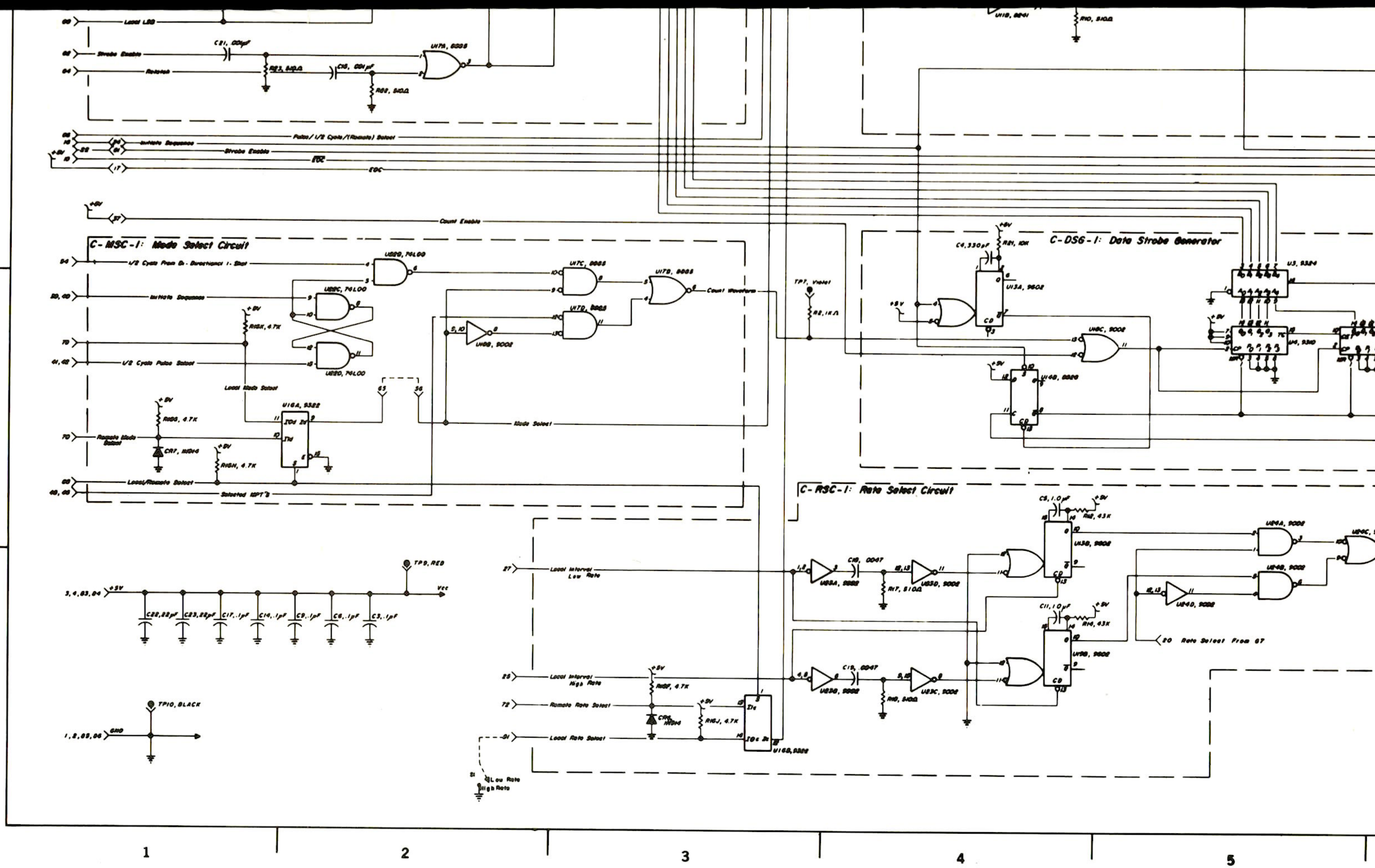
D

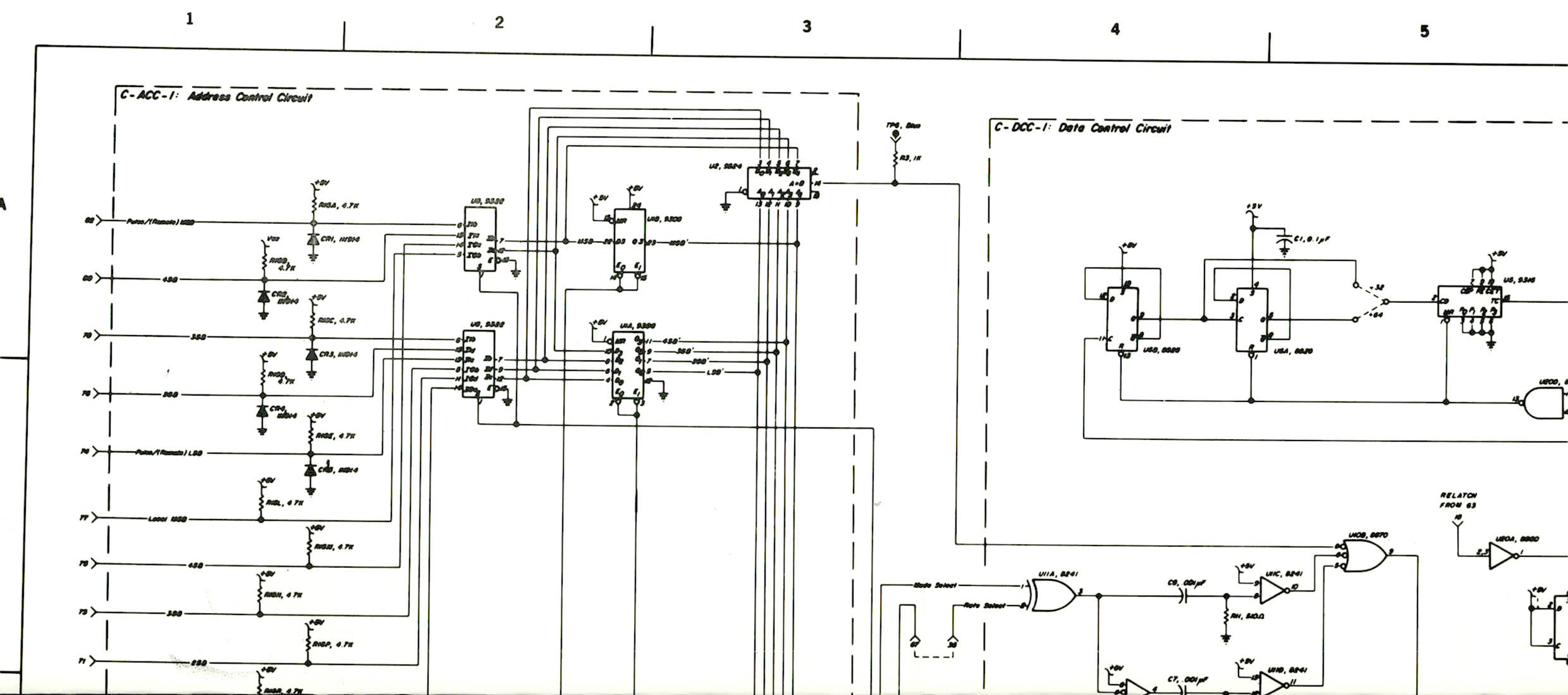
E

PART LOCATION INDEX

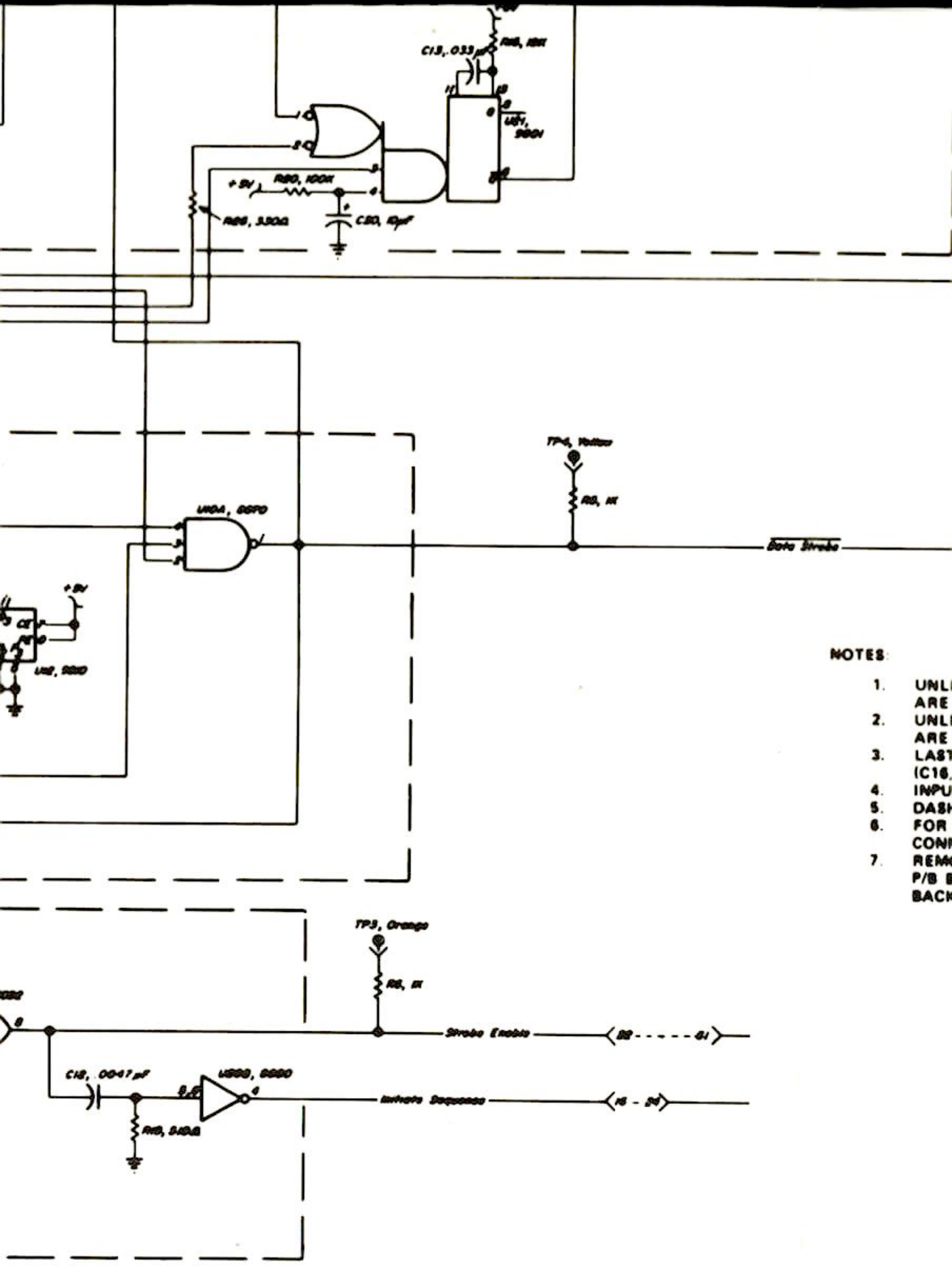
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	5A	R16	1A,1B,1C,1D
C2	6A	R17	4E
C3	2E	R18	4E
C4	4C	R19	6E
C5	4D	R20	6C
C6	2E	R21	4C
C7	4B	R22	2C
C8	4B	R23	1C
C9	2E	R24	NOT USED
C10	6A	R25	6C
C11	4E	R26	7A
C12	6E	R27	7A
C13	6C		

B


C-MSC-1: Mode Select Circuit
C-DSG-1: Data Strobe Generator
C-RSC-1: Rate Select Circuit
Strobe Enable
Initiate Sequence
Count Enable
1/2 Cycle Pulse Select
Local Mode Select
Remote Mode Select
Local/Remote Select
Mode Select
Count Waveform
Local Interval Low Rate
Local Interval High Rate
Remote Rate Select
Local Rate Select
Rate Select From 67
Low Rate
High Rate
TP9, RED
TP10, BLACK
TP7, Violet
Vcc
GND
1
2
3
4
5



1
2
3
4
5
C-ACC-1: Address Control Circuit
C-DCC-1: Data Control Circuit
RELATCH FROM 63
Mode Select
Rate Select
Local MSB

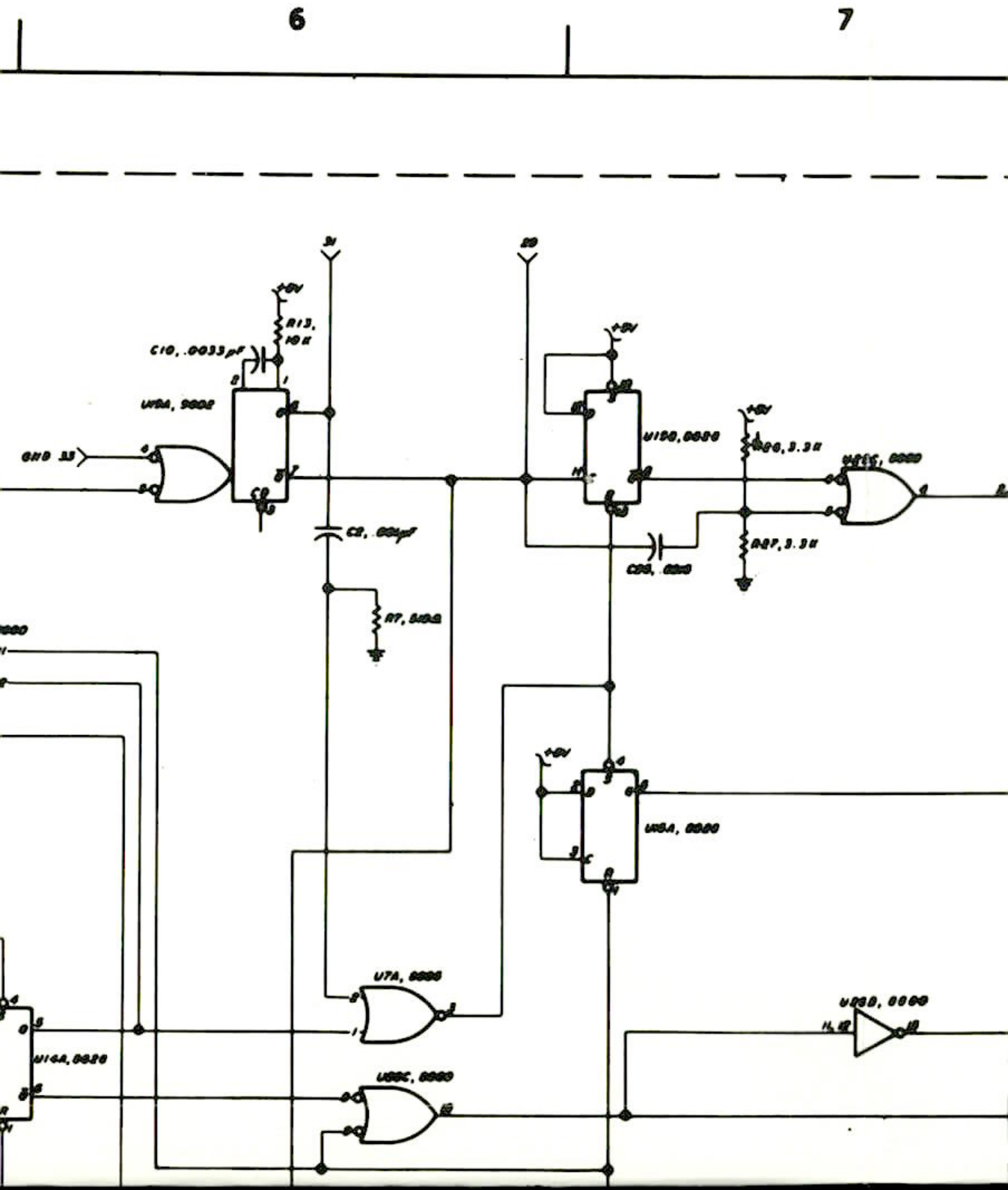


NOTES:

1. UNL
ARE
2. UNL
ARE
3. LAST
(C16,
4. INPU
5. DASH
6. FOR
CONI
7. REMO
P/B E
BACK

6

7


6
7
31
29
+5V
R13,
10K
C10, .0033pF
U9A, 9602
GND 33
C2, .001µF
R7, 510Ω
R27, 3.3K
U7A, 8886
U14A, 8828

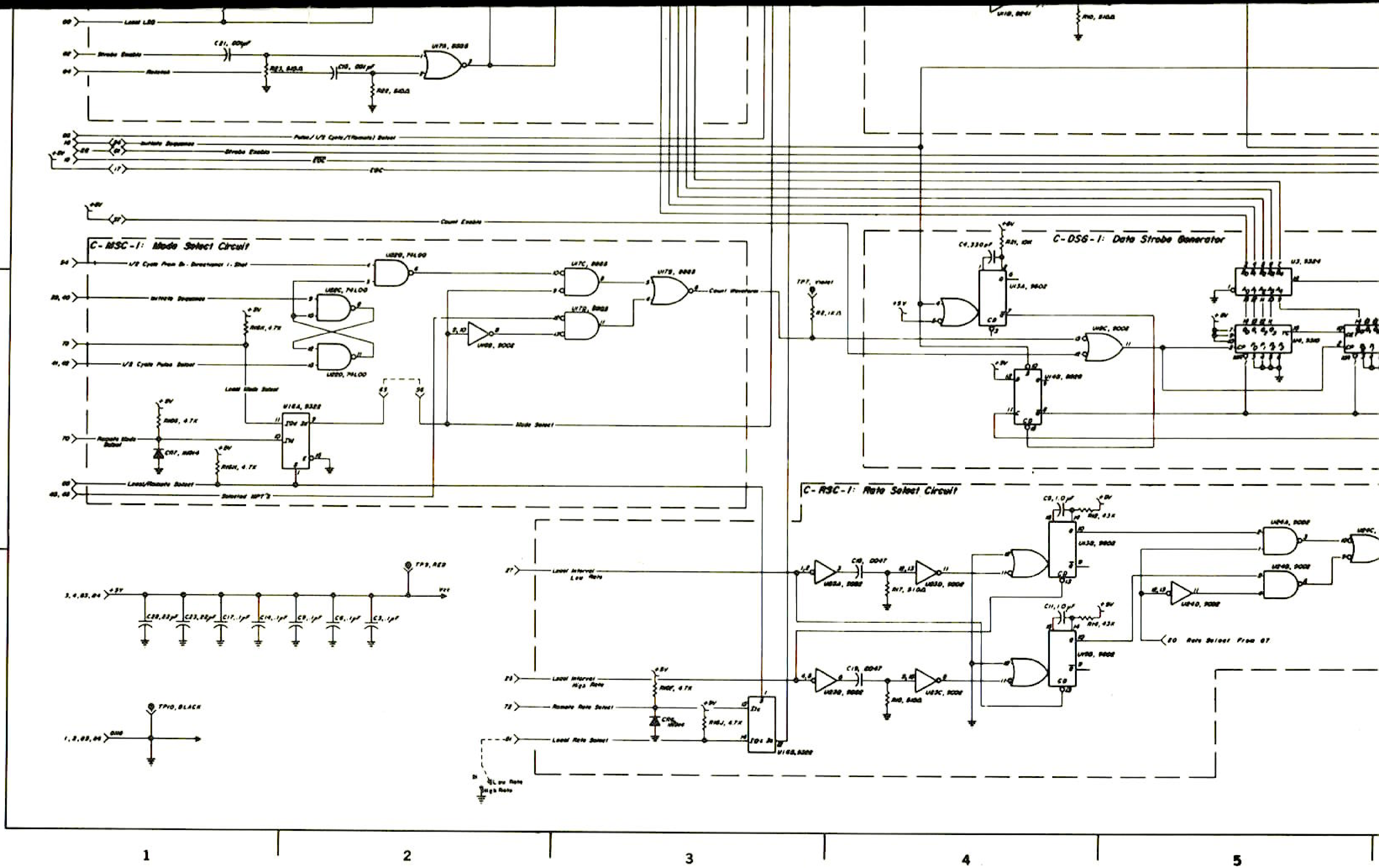
C14	1E	TP1	8B
C15	2C	TP2	8A
C16	NOT USED	TP3	8D
C17	1E	TP4	7C
C18	4E	TP5	8B
C19	4E	TP6	3A
C20	6C	TP7	3D
C21	1C	TP8	7C
C22	1E	TP9	2E
C23	1E	TP10	1E
C24	NOT USED		
C25	7A	U1	2A
		U2	3A
CR1	1A	U3	5C
CR2	1A	U4	5D
CR3	1A	U5	5A
CR4	1B	U6	4A
CR5	1B	U7	6B
CR6	3E	U8	2A
CR7	1D	U9	2A
		U10	5B,6D
R1	7C	U11	4B,5B
R2	3D	U12	5D
R3	3A	U13	4D
R4	8B	U14	4D,5B
R5	7C	U15	7A,7B
R6	6D	U16	2D,3E
R7	6A	U17	2C,3D
R8	8A	U18	2D,4D
R9	8B	U19	4E,6A
R10	4C	U20	5B,6B,6E
R11	4B	U21	6C
R12	4D	U22	2D
R13	6A	U23	3E,4E
R14	4E	U24	5D,5E
R15	6C	U25	7A,7B

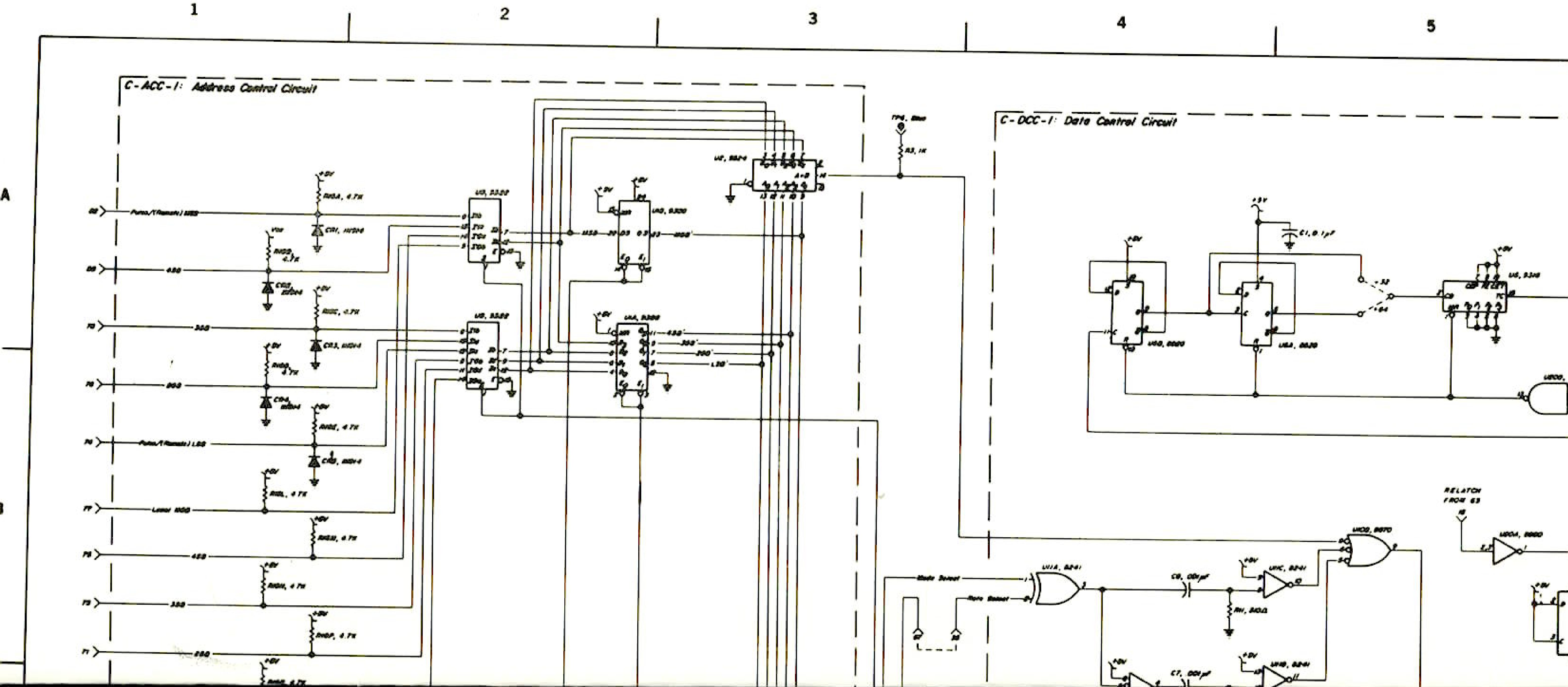
C

D

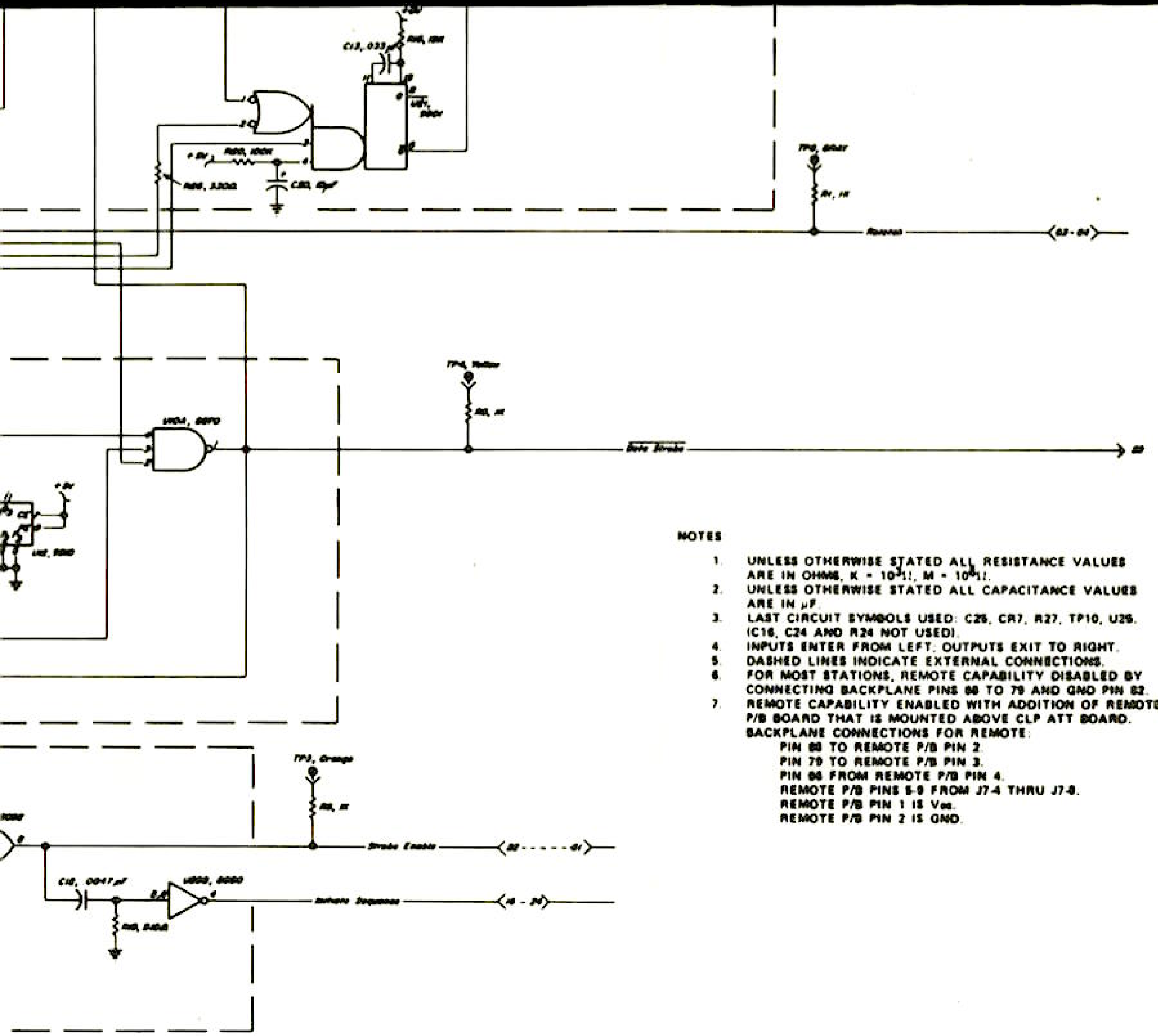
E

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	5A	R16	1A,1B,1C,1D
C2	6A	R17	4E
C3	2E	R18	4E
C4	4C	R19	6E
C5	4D	R20	6C
C6	2E	R21	4C
C7	4B	R22	2C
C8	4B	R23	1C
C9	2E	R24	NOT USED
C10	6A	R25	6C
C11	4E	R26	7A
C12	6E	R27	7A
C13	6C		


C-MSC-1: Mode Select Circuit
C-DSG-1: Data Strobe Generator
C-RSC-1: Rate Select Circuit
Count Enable
Mode Select
Count Waveform
Initiate Sequence
Strobe Enable
Local Interval Low Rate
Local Interval High Rate
Remote Rate Select
Local Rate Select
Local/Remote Select
Rate Select From 67
TP9, RED
TP10, BLACK
TP7, Violet
1
2
3
4
5



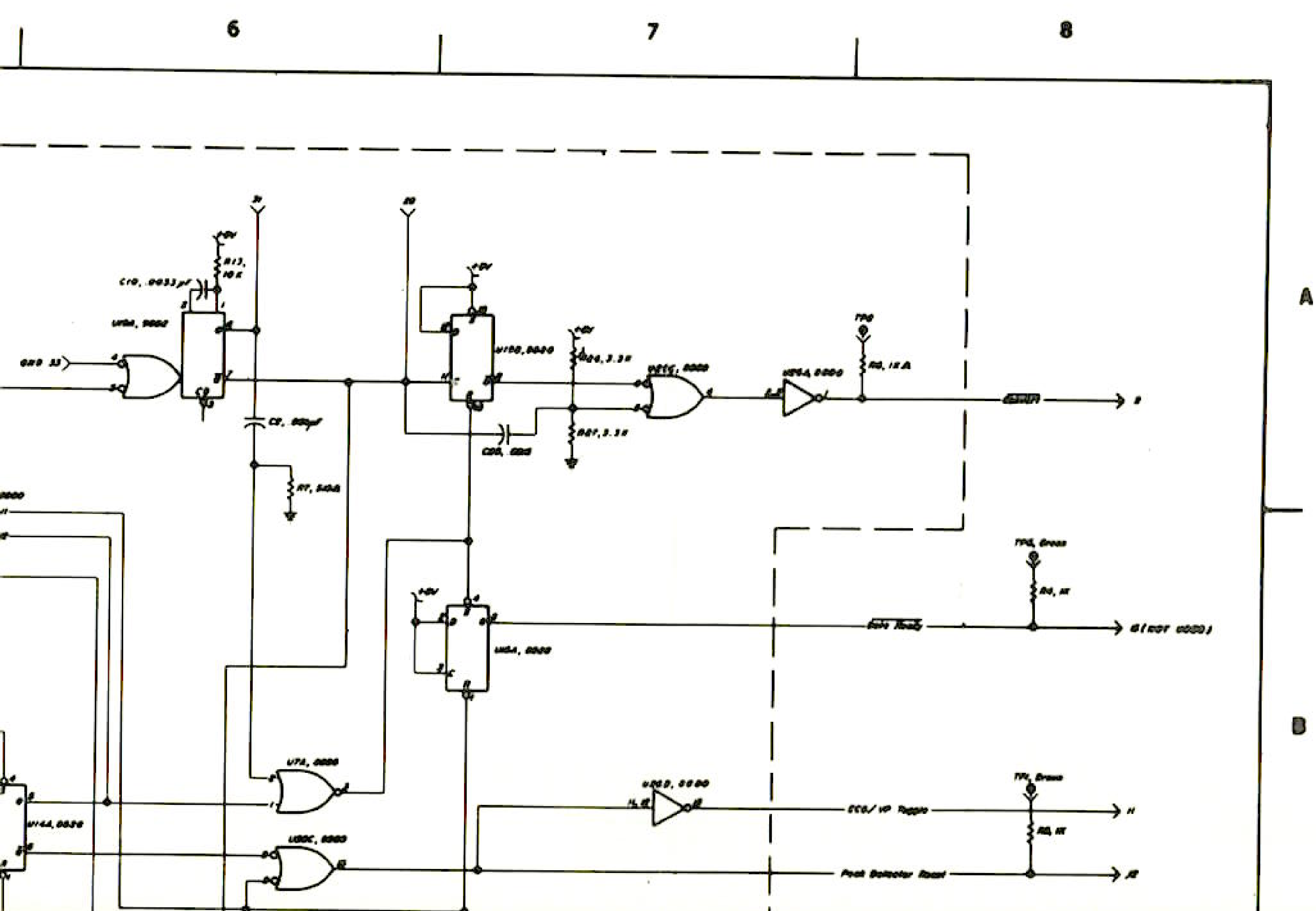
1
2
3
4
5
A
C-ACC-1: Address Control Circuit
C-DCC-1: Data Control Circuit
RELATCH FROM 63



NOTES

1. UNLESS OTHERWISE STATED ALL RESISTANCE VALUES ARE IN OHMS, K = $10^3\Omega$, M = $10^6\Omega$.
2. UNLESS OTHERWISE STATED ALL CAPACITANCE VALUES ARE IN μF.
3. LAST CIRCUIT SYMBOLS USED: C25, CR7, R27, TP10, U25. (C16, C24 AND R24 NOT USED).
4. INPUTS ENTER FROM LEFT; OUTPUTS EXIT TO RIGHT.
5. DASHED LINES INDICATE EXTERNAL CONNECTIONS.
6. FOR MOST STATIONS, REMOTE CAPABILITY DISABLED BY CONNECTING BACKPLANE PINS 68 TO 79 AND GND PIN 82.
7. REMOTE CAPABILITY ENABLED WITH ADDITION OF REMOTE P/B BOARD THAT IS MOUNTED ABOVE CLP ATT BOARD. BACKPLANE CONNECTIONS FOR REMOTE:
   PIN 68 TO REMOTE P/B PIN 2.
   PIN 79 TO REMOTE P/B PIN 3.
   PIN 66 FROM REMOTE P/B PIN 4.
   REMOTE P/B PINS 5-9 FROM J7-4 THRU J7-8.
   REMOTE P/B PIN 1 IS V_{cc}.
   REMOTE P/B PIN 2 IS GND.

Figure 7.22. W0678-3A/GAT CON Module Schematic



6
7
8
A
B
C10, .0033µf
R13, 10K
C8, 680pf
R7, 540Ω
CDD, .005
R26, 3.3K
R27, 3.3K
R8, 1K
R9, 1K
U19A, 8000
U72, 8000
U69C, 8000
U104, 8020
U64, 8020
ECG/VP Toggle
Peak Detector Reset

CATION
7C
2D
5D
5D
6D
6D
5C
4D
4E
T USED
6D
7D
7D
7A
6A
5A
4A
4A
3A
3A
2A
2A
1A
1B
3B
3B
4B
5B
5B
6B
2C
3C
3C
4C
4B
5C
6B
6B
3D
4D
4D
5C
6C
6C
4D
5D
6D
6D

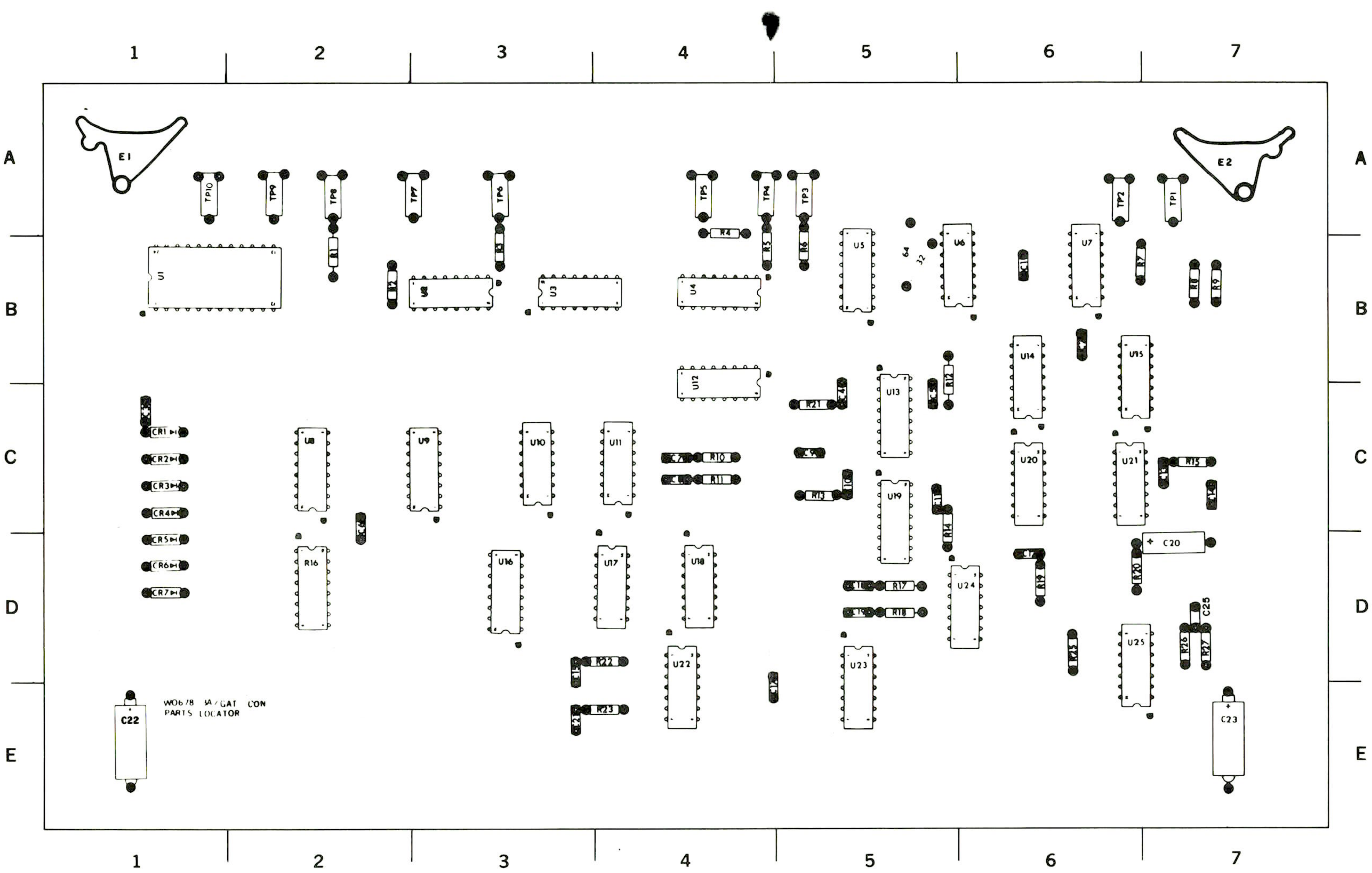


Figure 7.23. W0678-3A/GATCON Module Parts Locator

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LO
C1	6B	R15	
C2	6B	R16	
C3	1C	R17	
C4	5C	R18	
C5	5C	R19	
C6	2C	R20	
C7	4C	R21	
C8	4C	R22	
C9	5C	R23	
C10	5C	R24	NO
C11	5C	R25	
C12	6D	R26	
C13	7C	R27	
C14	7C		
C15	3D	TP1	
C16	NOT USED	TP2	
C17	4E	TP3	
C18	5D	TP4	
C19	5D	TP5	
C20	7D	TP6	
C21	3E	TP7	
C22	1E	TP8	
C23	7E	TP9	
C24	NOT USED	TP10	
C25	7D		
		U1	
CR1	1C	U2	
CR2	1C	U3	
CR3	1C	U4	
CR4	1C	U5	
CR5	1D	U6	
CR6	1D	U7	
CR7	1D	U8	
		U9	
E1	1A	U10	
E2	7A	U11	
		U12	
R1	2B	U13	
R2	2B	U14	
R3	3B	U15	
R4	4A	U16	
R5	4B	U17	
R6	5B	U18	
R7	6B	U19	
R8	7B	U20	
R9	7B	U21	
R10	4C	U22	
R11	4C	U23	
R12	5B	U24	
R13	5C	U25	
R14	5C		

C20	6A	R3	4B	R64	3D
C21	6B	R4	5A	R65	2E
C22	1A	R5	6A	R66	2E
C23	2A	R6	3B	R67	2E
C24	6D	R7	5C	R68	1D
C25	6C	R8	6C	R69	1D
C26	7D	R9	6C	R70	2C
C27	2A	R10	6C	R71	1C
C28	4E	R11	6C		
C29	2A	R12	6C	TP1	6C
C30	4E	R13	6C	TP2	1C
C31	NOT USED	R14	3D	TP3	5C
C32	NOT USED	R15	3A	TP4	2C
C33	NOT USED	R16	4A	TP5	3D
C34	1E	R17	4B	TP6	6A
C35	5D	R18	5A	TP7	5A
C36	7D	R19	2B	TP8	3B
C37	1B	R20	6A	TP9	3A
C38	1C	R21	2B	TP10	2A
C39	3E	R22	4B		
C40	8D	R23	4B	U1	3A
C41	8D	R24	5C	U2	4A
C42	3E	R25	6D	U3	4B,4C
C43	3E	R26	5C	U4	6C
C44	3E	R27	6D	U5	2A
C45	6D	R28	6C	U6	2B,6A
C46	4B	R29	6D	U7	1C,2C
C47	3E	R30	6D	U8	1A
C48	1E	R31	7D	U9	7C,7D
C49	1D	R32	3A	U10	2C,5C
C50	1D	R33	2A	U11	6D,7D
C51	7D	R34	1A	U12	7D
C52	7E	R35	2B	U13	5D
		R36	5C	U14	8D
CR1	6C	R37	1A	U15	8D
CR2	NOT USED	R38	1A	U16	2C
CR3	NOT USED	R39	1A	U17	1C,1E,2D
CR4	7D	R40	6D	U18	2D
CR5	4C	R41	1A	U19	2D
CR6	5B	R42	1A	U20	1E
CR7	1A	R43	1B	U21	1D
CR8	1A	R44	1B		

C

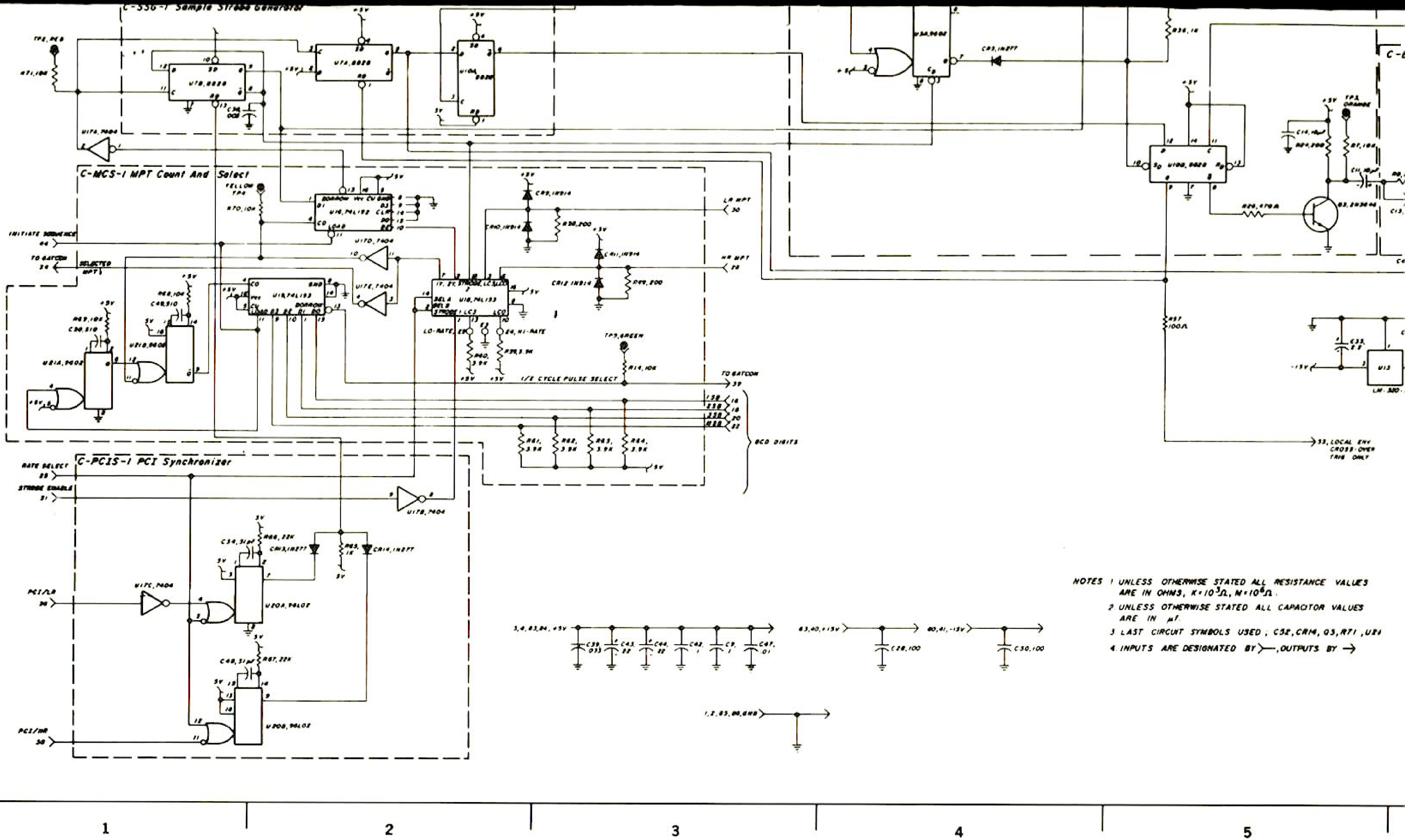
D

E

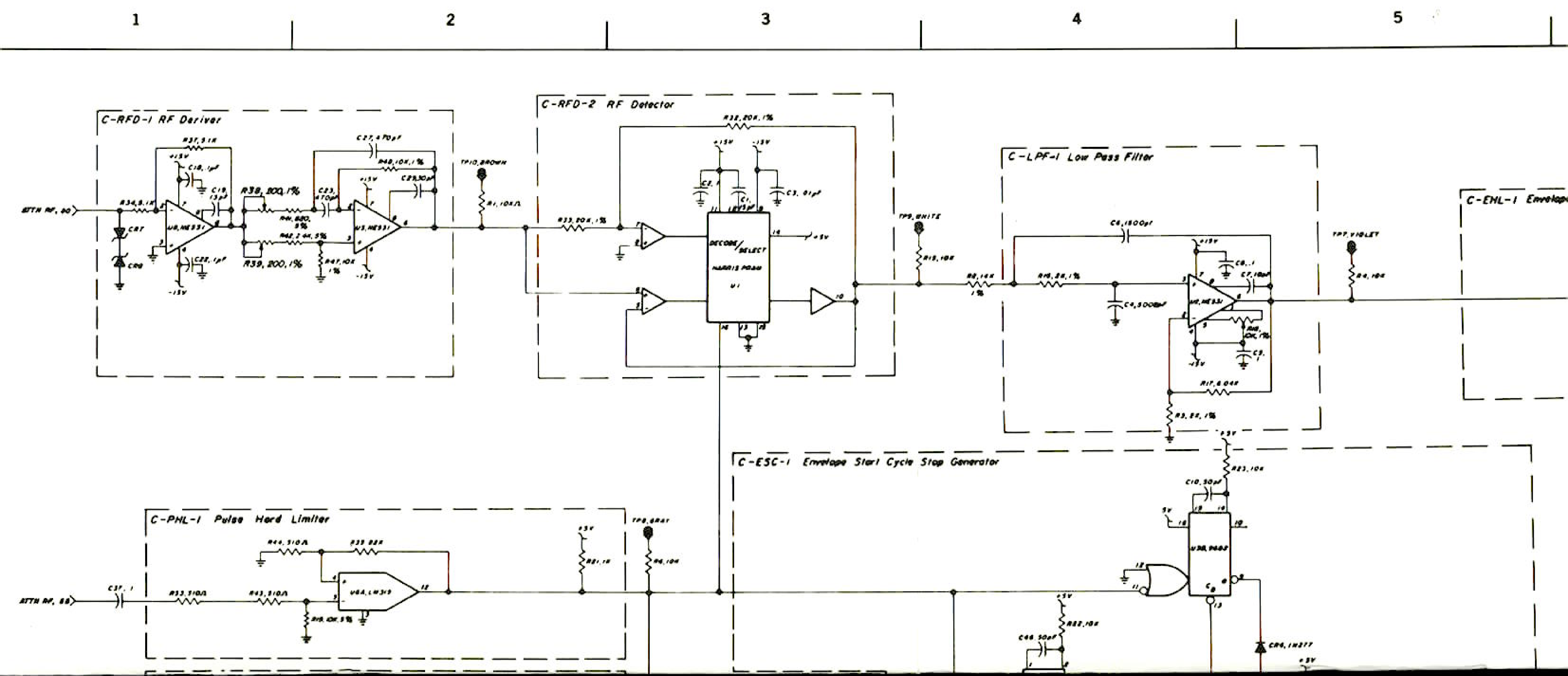
PART LOCATION INDEX					
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	3A	CR9	2C	R45	NOT USED
C2	3A	CR10	2C	R46	NOT USED
C3	3A	CR11	3C	R47	2A
C4	4A	CR12	3D	R48	2A
C5	5B	CR13	2E	R49	3D
C6	4A	CR14	2E	R50	7D
C7	5A			R51	8D
C8	4A	E1	NOT USED	R52	NOT USED
C9	3E	E2	NOT USED	R53	1B
C10	4B	E3	2D	R54	6E
C11	5C	E4	2D	R55	8D
C12	NOT USED	E5	2D	R56	8D
C13	6C			R57	5D
C14	5C	Q1	6C	R58	3C
C15	6D	Q2	6D	R59	2D
C16	7D	Q3	5C	R60	2D
C17	7D			R61	2D
C18	1A	R1	2A	R62	3D
C19	1A	R2	4A	R63	3D

A

B



NOTES
1. UNLESS OTHERWISE STATED ALL RESISTANCE VALUES ARE IN OHMS, $K = 10^3\Omega$, $M = 10^6\Omega$.
2. UNLESS OTHERWISE STATED ALL CAPACITOR VALUES ARE IN μf.
3. LAST CIRCUIT SYMBOLS USED ; C52, CR14, Q3, R71, U24
4. INPUTS ARE DESIGNATED BY ≻—, OUTPUTS BY →


1
2
3
4
5
C-RFD-1 RF Deriver
C-RFD-2 RF Detector
C-LPF-1 Low Pass Filter
C-EHL-1 Envelope
C-ESC-1 Envelope Start Cycle Stop Generator
C-PHL-1 Pulse Hard Limiter
ATTN RF, 90
ATTN RF, 88
R39, 200, 1%
R38, 200, 1%
TP10, BROWN
TP9, WHITE
TP7, VIOLET
TP8, GRAY
DECODE/SELECT
HARRIS PROM
U1

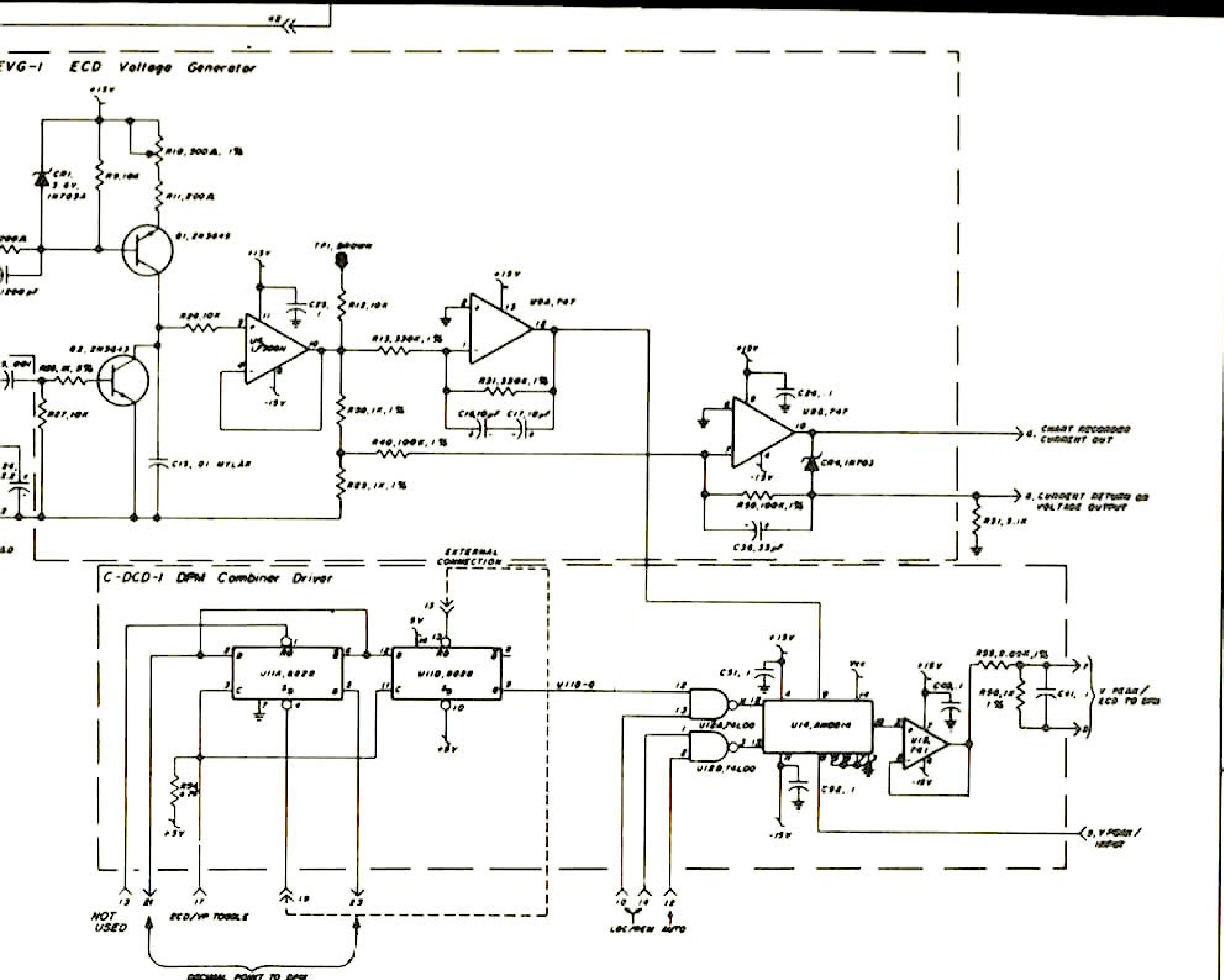
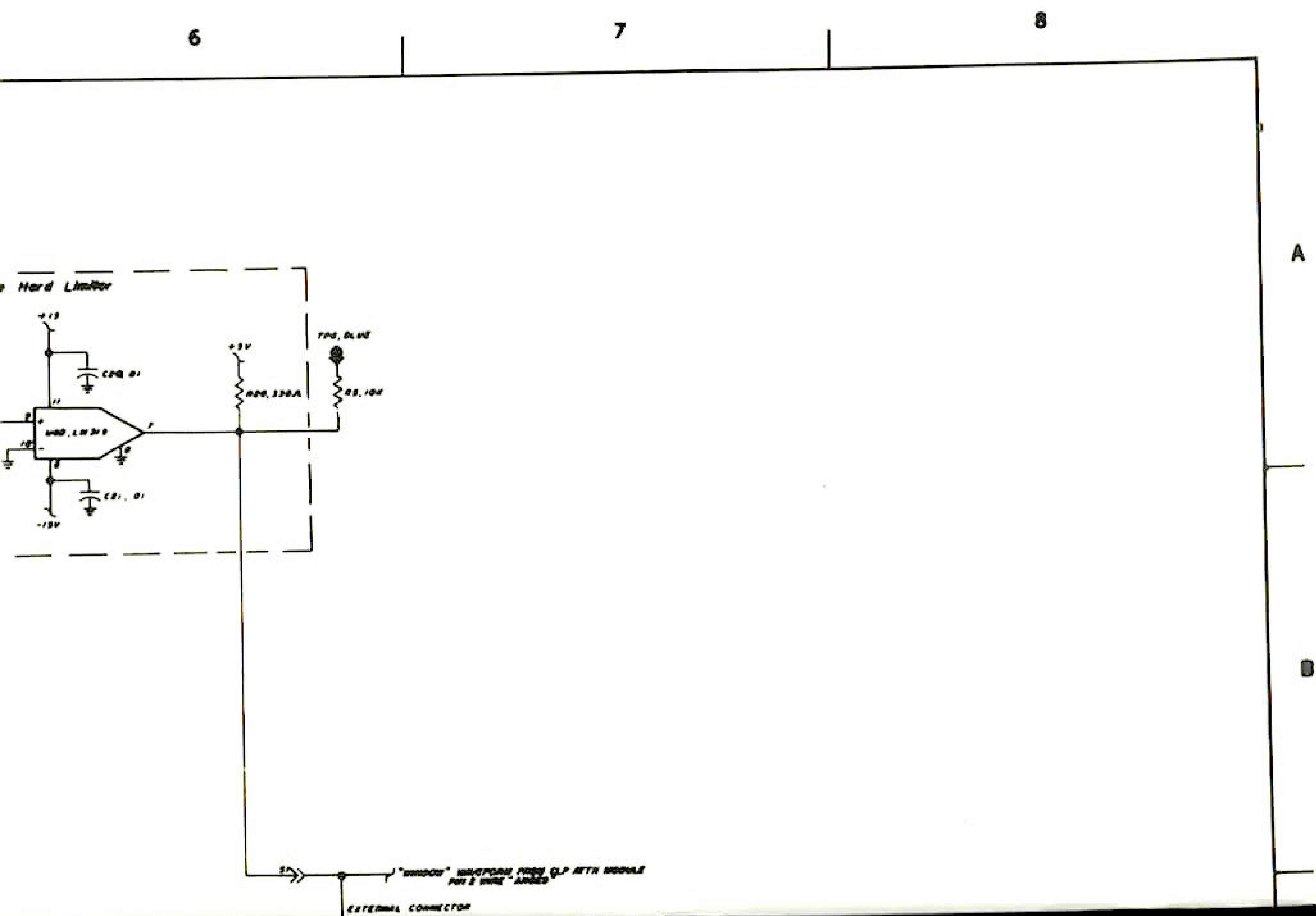


Figure 7.24. W0678-18C/ECD Module Schematic


6
7
8
A
B
Hard Limiter
+15
C20, .01
C21, .01
-15V
+5V
R20, 330Ω
TP6, BLUE
EXTERNAL CONNECTOR

	LOCATION	REF. DESIG.	LOCATION
	5B	TP1	6A
	6B	TP2	5A
	4A	TP3	4A
	6B	TP4	4A
	6B	TP5	3A
	6B	TP6	3A
	7B	TP7	3A
	7B	TP8	2A
	1B	TP9	2A
	1B	TP10	1A
	1D		
	3C	U1	1B
	4B	U2	2B
	1C	U3	4B
	1A	U4	7A
	2C	U5	2C
	7C	U6	3C
	1C	U7	4C
	2C	U8	1D
	3D	U9	7B
	3C	U10	4C
	NOT USED	U11	6D
	NOT USED	U12	6D
	2C	U13	6C
	2C	U14	6D
	5D	U15	6C
	7C	U16	5B
	7C	U17	5B
	NOT USED	U18	5C
	3D	U19	5D
	6D	U20	4D
	7D	U21	6C
	7D		
	4E		
	4D		
	5C		
	5D		
	5D		
	5D		
	5D		
	6D		
	4E		
	4D		
	4D		
	6C		
	6C		
	4A		
	5A		

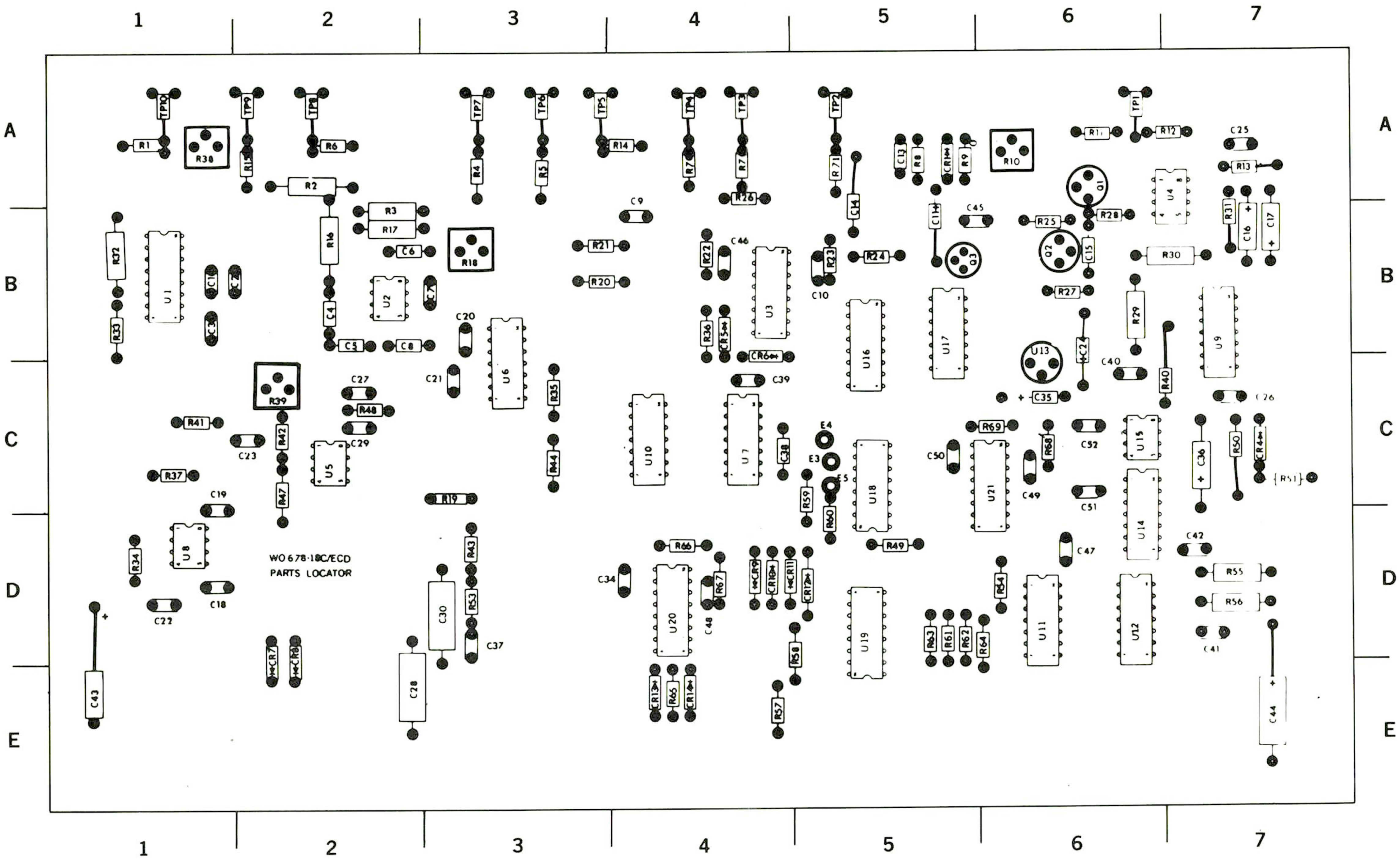


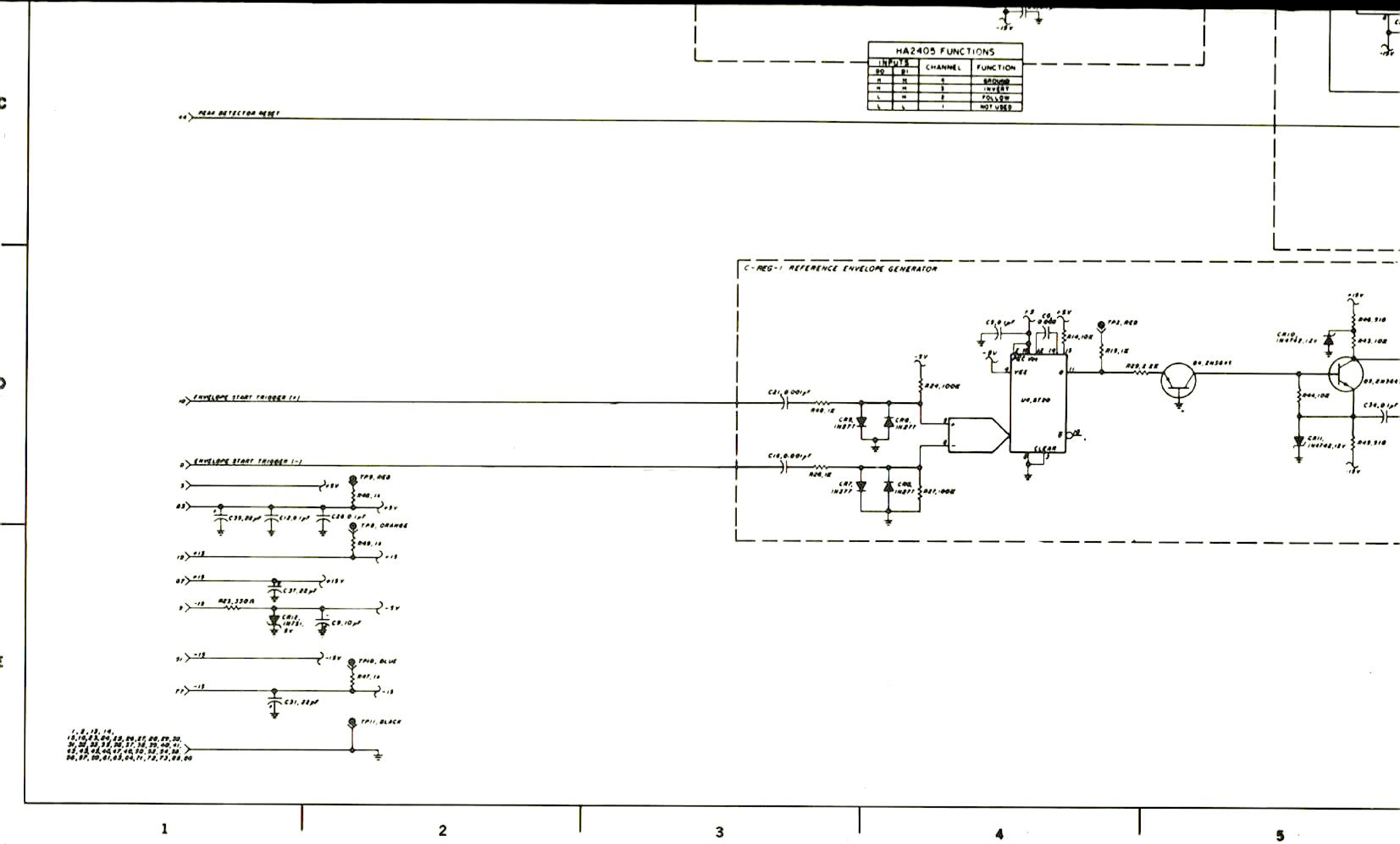
Figure 7.25. W0678-18C/ECD Module Parts Locator

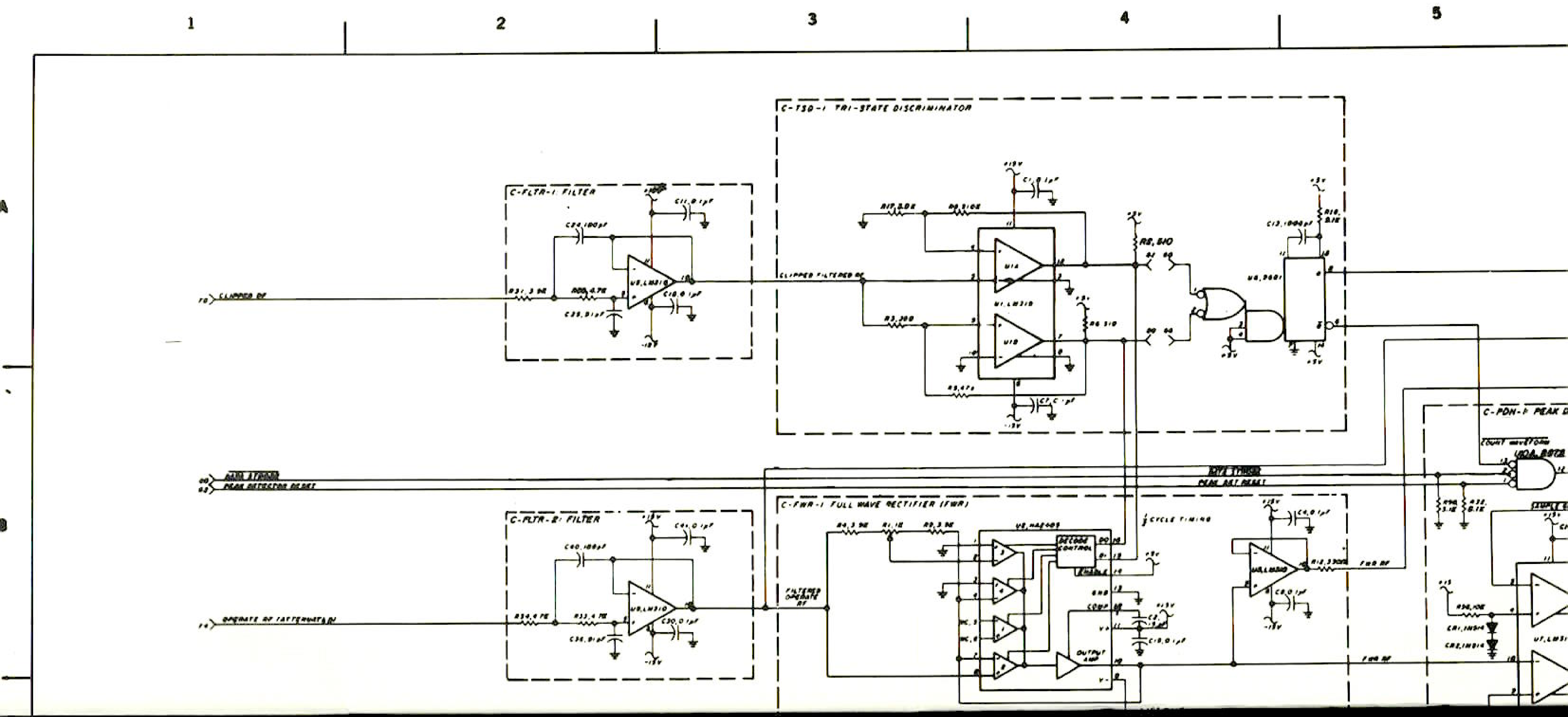
PART LOCATION INDEX

REF. DESIG.	LOCATION	REF. DESIG.	LOCATION	REF. DESIG
C1	1B	CR1	5A	R24
C2	1B	CR2	NOT USED	R25
C3	1B	CR3	NOT USED	R26
C4	2B	CR4	7C	R27
C5	2B	CR5	4B	R28
C6	2B	CR6	4B	R29
C7	3B	CR7	2D	R30
C8	2B	CR8	2D	R31
C9	4B	CR9	4D	R32
C10	5B	CR10	4D	R33
C11	5B	CR11	4D	R34
C12	NOT USED	CR12	5D	R35
C13	5A	CR13	4E	R36
C14	5B	CR14	4E	R37
C15	6B			R38
C16	7B	E1	NOT USED	R39
C17	7B	E2	NOT USED	R40
C18	1D	E3	5C	R41
C19	1C	E4	5C	R42
C20	3B	E5	5C	R43
C21	3C			R44
C22	1D	Q1	6A	R45
C23	2C	Q2	6B	R46
C24	6B	Q3	5B	R47
C25	7A			R48
C26	7C	R1	1A	R49
C27	2C	R2	2A	R50
C28	2E	R3	2B	R51
C29	2C	R4	3A	R52
C30	3D	R5	3A	R53
C31	NOT USED	R6	2A	R54
C32	NOT USED	R7	4A	R55
C33	NOT USED	R8	5A	R56
C34	4D	R9	5A	R57
C35	6C	R10	6A	R58
C36	7C	R11	6A	R59
C37	3D	R12	7A	R60
C38	4C	R13	7A	R61
C39	4C	R14	4A	R62
C40	6C	R15	2A	R63
C41	7D	R16	2B	R64
C42	7D	R17	2B	R65
C43	1E	R18	3B	R66
C44	7E	R19	3C	R67
C45	5B	R20	3B	R68
C46	4B	R21	3B	R69
C47	6D	R22	4B	R70
C48	4D	R23	5B	R71
C49	6C			
C50	5C			
C51	6C			
C52	6C			

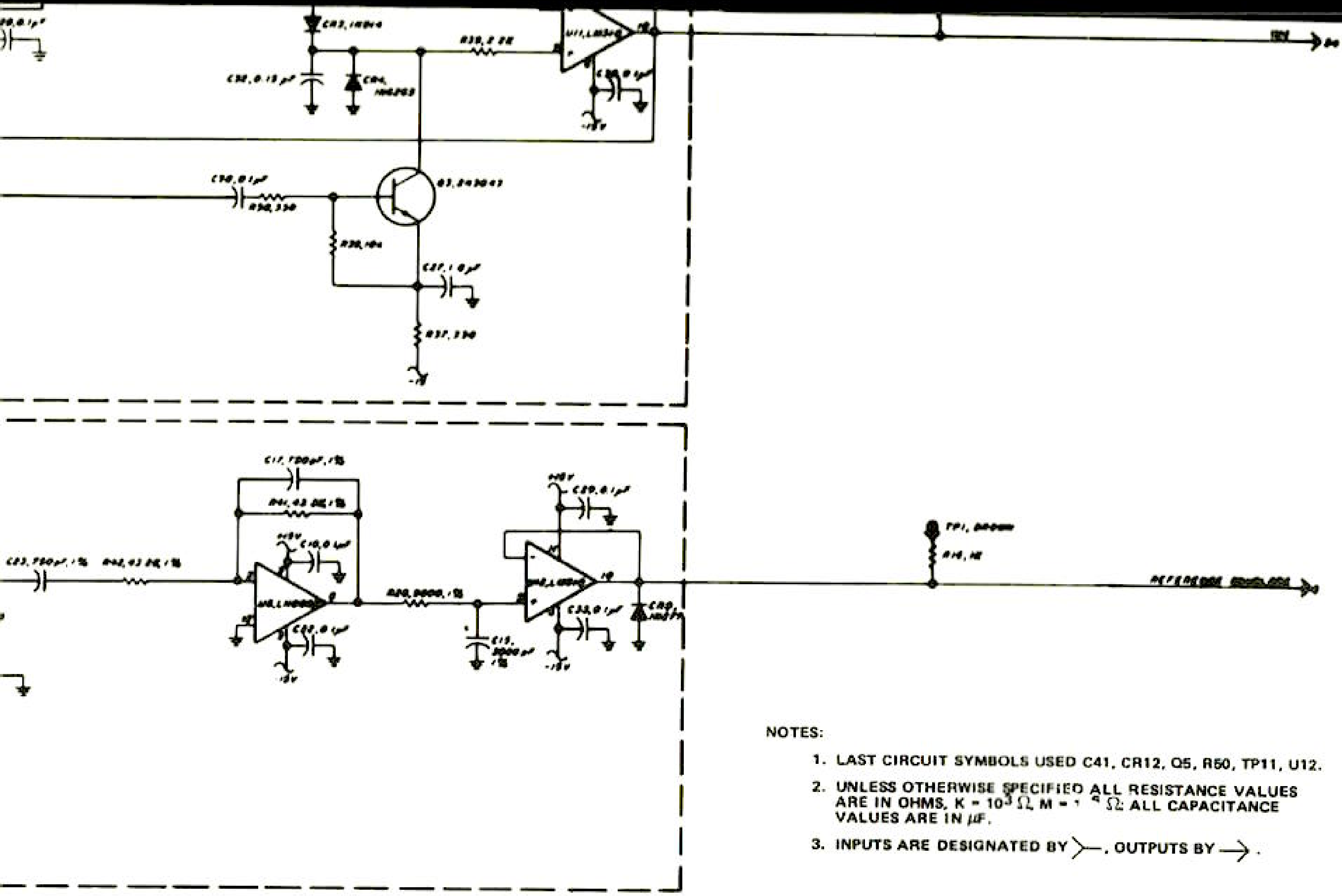
C18	3A	R12	5B	TP2	4D
C19	4B	R13	7C	TP3	7C
C20	6C	R14	4D	TP4	7A
C21	3D	R15	4D	TP5	7B
C22	6D	R16	7D	TP6	7A
C23	6D	R17	3A	TP7	7A
C24	2A	R18	5A	TP8	2E
C25	2A	R19	6B	TP9	2D
C26	2D	R20	6B	TP10	2E
C27	6C	R21	6B	TP11	2E
C28	7B	R22	6B		
C29	7D	R23	6C	U1	4A
C30	3B	R24	4D	U2	4B
C31	1E	R25	1E	U3	4B
C32	6C	R26	3D	U4	4D
C33	7D	R27	4D	U5	2A
C34	6D	R28	6D	U6	4A
C35	1D	R29	4D	U7	5B
C36	2B	R30	2A	U8	6D
C37	1E	R31	2A	U9	2B
C38	6C	R32	5B	U10	5B,6B
C39	7C	R33	2B	U11	7C
C40	2B	R34	2B	U12	7D
C41	3B	R35	6C		
CR1	5B				
CR2	5B				
CR3	6C				
CR4	6C				
CR5	3D				
CR6	4D				
CR7	3D				
CR8	4D				
CR9	7D				
CR10	5D				
CR11	5D				
CR12	1E				

PART LOCATION INDEX					
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	4A	Q1	6B	R36	6B
C2	4B	Q2	6B	R37	6C
C3	4C	Q3	6C	R38	6C
C4	5B	Q4	5D	R39	6C
C5	4D	Q5	5D	R40	3D
C6	4D			R41	6D
C7	4B	R1	3B	R42	6D
C8	5B	R2	4A	R43	5D
C9	2E	R3	3A	R44	5D
C10	6D	R4	3B	R45	5D
C11	3A	R5	3B	R46	5D
C12	1D	R6	4A	R47	2E
C13	5A	R7	7A	R48	2D
C14	5B	R8	3A	R49	2E
C15	6D	R9	3B	R50	5B
C16	3D	R10	7A		
C17	6D	R11	7B	TP1	7D


HA2405 FUNCTIONS
INPUTS
CHANNEL
FUNCTION
GROUND
INVERT
FOLLOW
NOT USED
PEAK DETECTOR RESET
C-REG-1 REFERENCE ENVELOPE GENERATOR
ENVELOPE START TRIGGER (+)
ENVELOPE START TRIGGER (-)
1
2
3
4
5



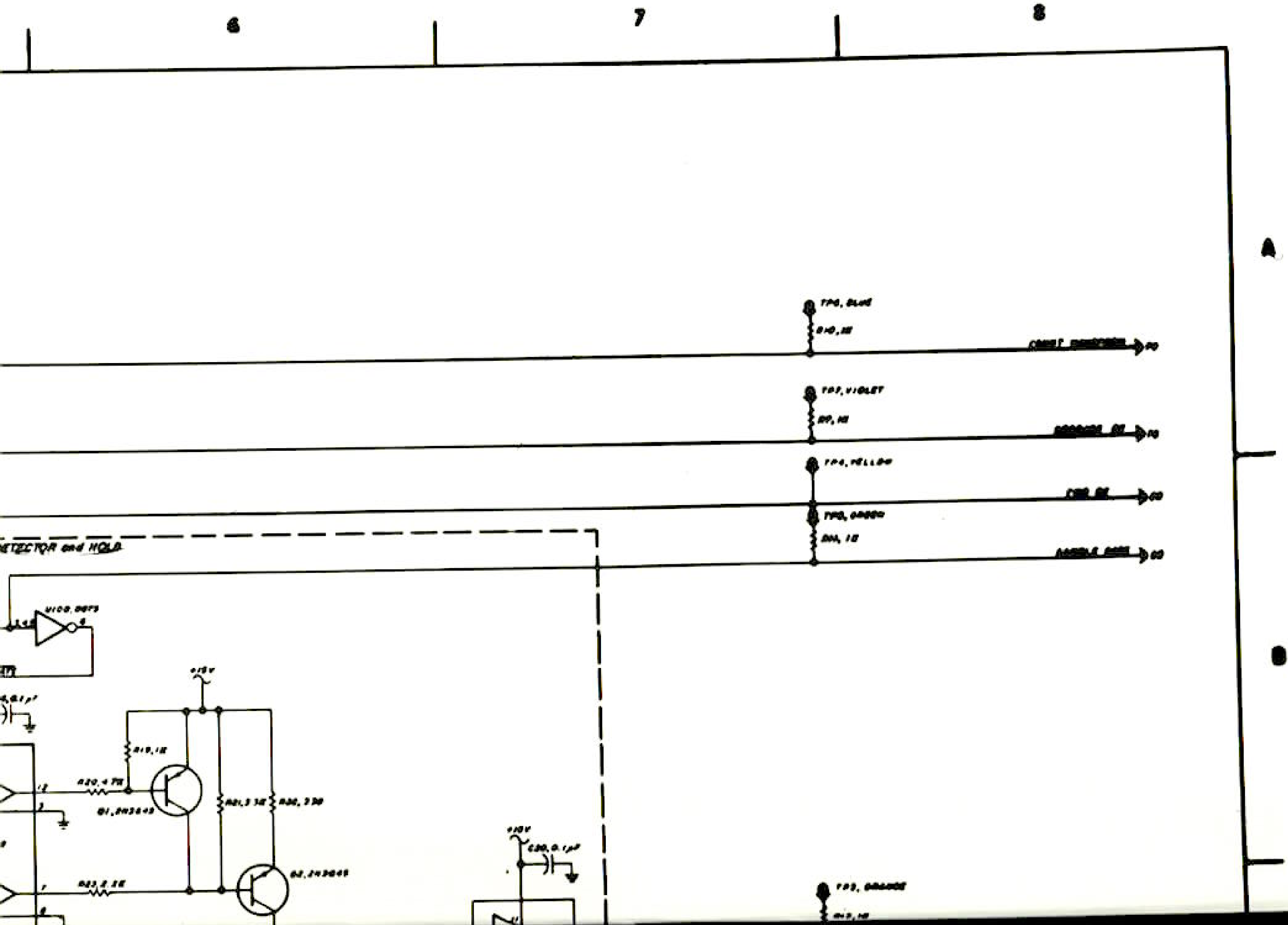
1
2
3
4
5
A
B
C-FLTR-1 FILTER
C-FLTR-2 FILTER
C-TSD-1 TRI-STATE DISCRIMINATOR
C-FWR-1 FULL WAVE RECTIFIER (FWR)
C-PDH-1 PEAK D
CLIPPED RF
OPERATE RF (ATTENUATED)
CLIPPED FILTERED RF
FILTERED OPERATE RF
DATA STROBE
PEAK DETECTOR RESET
PEAK DET RESET
DECODE CONTROL
ENABLE
OUTPUT AMP
FWR RF
R8, 510
U1, LM319
U5, LM319
U2, HA2405
U6, 9601
U4, LM310
1/2 CYCLE TIMING
COUNT WAVEFORM
U10A, 8873



NOTES:

1. LAST CIRCUIT SYMBOLS USED C41, CR12, Q5, R50, TP11, U12.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS, K = 10^3 Ω, M = 10^6 Ω; ALL CAPACITANCE VALUES ARE IN μF.
3. INPUTS ARE DESIGNATED BY ≻—, OUTPUTS BY —≻.

Figure 7.26. W0678-4/PK DET Module Schematic


6
7
8
A
B
TP6, BLUE
TP7, VIOLET
TP4, YELLOW
TP5, GREEN
TP3, ORANGE
DETECTOR and HOLD

REF. DESIG.	LOCATION
R46	6D
R47	3B
R48	3B
R49	3A
R50	3E
TP1	6A
TP2	6A
TP3	5A
TP4	5A
TP5	4A
TP6	4A
TP7	4A
TP8	3A
TP9	3A
TP10	3A
TP11	1A
U1	2B
U2	3B
U3	5B
U4	6B
U5	2C
U6	3C
U7	5C
U8	6C
U9	2D
U10	3D
U11	5D
U12	6D

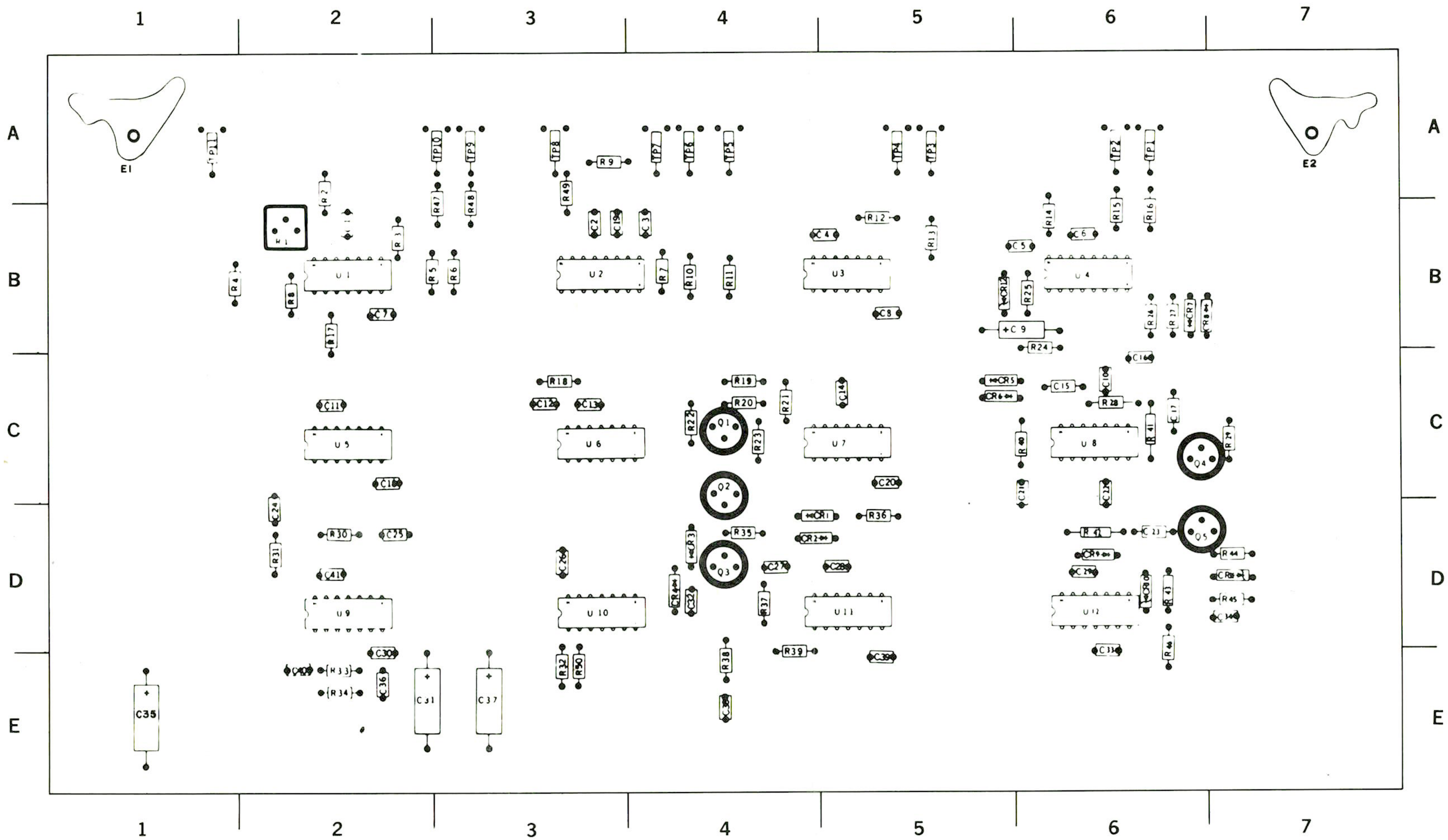
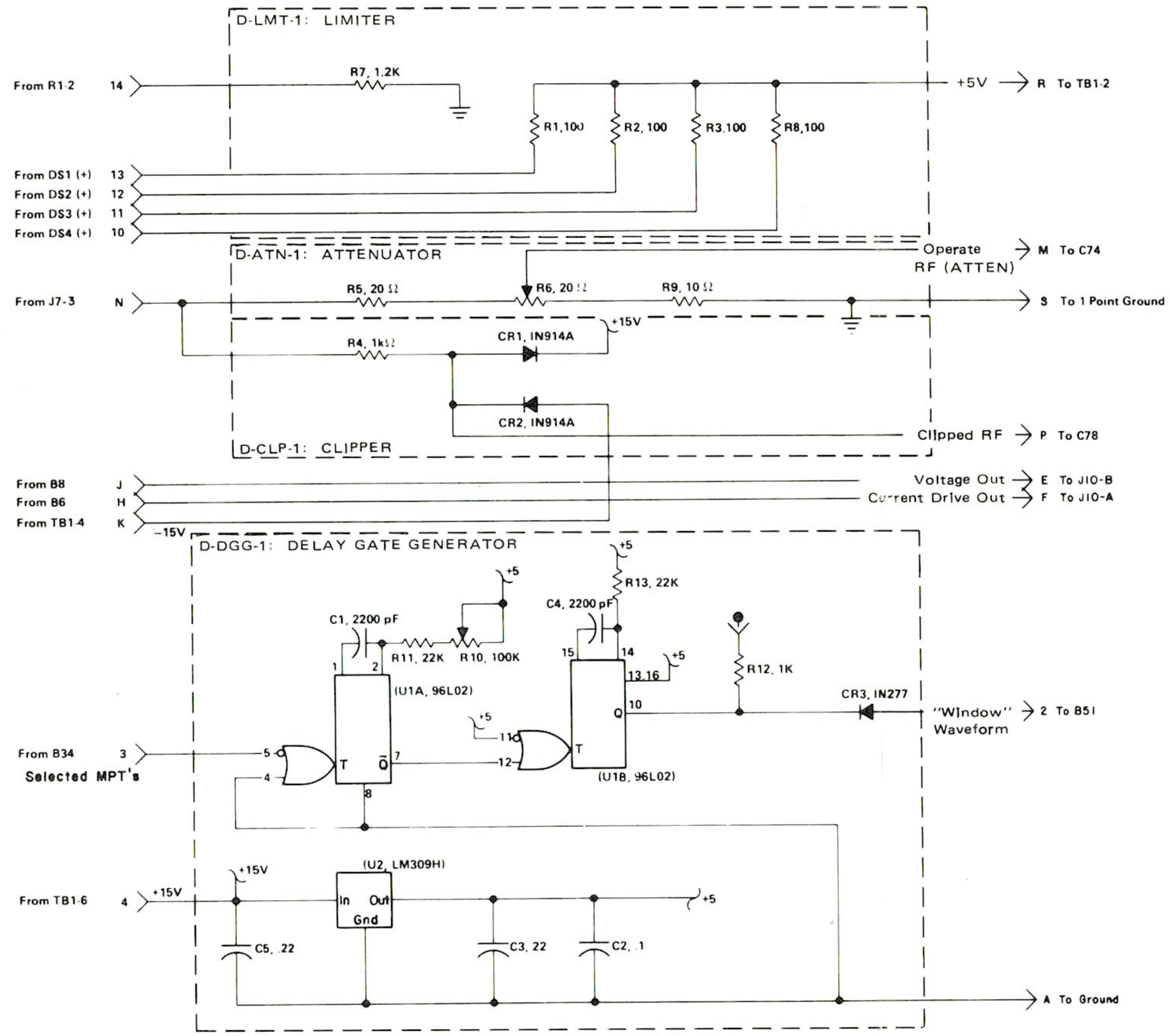


Figure 7.27. W0678-4/PK DET Module Parts Locator

PART LOCATION INDEX

REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	2B	E1	1A
C2	3B	E2	7A
C3	4B		
C4	5B	Q1	4C
C5	6B	Q2	4C
C6	6B	Q3	4D
C7	2B	Q4	6C
C8	5B	Q5	6D
C9	6B		
C10	6C	R1	2B
C11	2C	R2	2A
C12	3C	R3	2B
C13	3C	R4	1B
C14	5C	R5	2B
C15	6C	R6	3B
C16	6C	R7	4B
C17	6C	R8	2B
C18	2C	R9	3A
C19	3B	R10	4B
C20	5C	R11	4B
C21	6C	R12	5B
C22	6C	R13	5B
C23	6D	R14	6B
C24	2D	R15	6B
C25	2D	R16	6B
C26	3D	R17	2B
C27	4D	R18	3C
C28	5D	R19	4C
C29	6D	R20	4C
C30	2E	R21	4C
C31	2E	R22	4C
C32	4D	R23	4C
C33	6E	R24	6B
C34	7D	R25	6B
C35	1E	R26	6B
C36	2E	R27	6B
C37	3E	R28	6C
C38	4E	R29	7C
C39	5E	R30	2D
C40	2E	R31	2D
C41	2D	R32	3E
		R33	2E
CR1	4D	R34	2E
CR2	4D	R35	4D
CR3	4D	R36	5D
CR4	4D	R37	4D
CR5	5C	R38	4E
CR6	5C	R39	4E
CR7	6B	R40	6C
CR8	6B	R41	6C
CR9	6D	R42	6D
CR10	6D	R43	6D
CR11	7D	R44	7D
CR12	5B	R45	7D



Notes:

1. All resistors in ohms, K = 10^3 Ω
2. Unless otherwise specified, all capacitance values in μF.
3. Last circuit symbols used: C5, U2, R13, CR3, TP1.
4. Inputs enter from the left. Outputs exit from right.

Figure 7.28. W0678-11A/CLP ATTN Module Schematic

PART LOCATION INDEX	
REF. DESIG.	LOCATION
C1	2C
C2	3C
C3	2C
C4	3C
C5	2C
CR1	2B
CR2	2B
CR3	3C
R1	2A
R2	3A
R3	3A
R4	2B
R5	2B
R6	2B
R7	2A
R8	3A
R9	3B
R10	2C
R11	2C
R12	3C
R13	3B
TP1	3C
U1	2C,3C
U2	2C

A

B

C

D

PART LOCATION INDEX	
REF. DESIG.	LOCATION
C1	2A
C2	2B
C3	2B
C4	1B
C5	1B
CR1	2C
CR2	2C
CR3	2B
R1	1C
R2	1D
R3	1D
R4	1C
R5	2C
R6	3C
R7	1D
R8	1D
R9	2D
R10	3A
R11	2A
R12	3B
R13	2B
TP1	3B
U1	1A
U2	1B

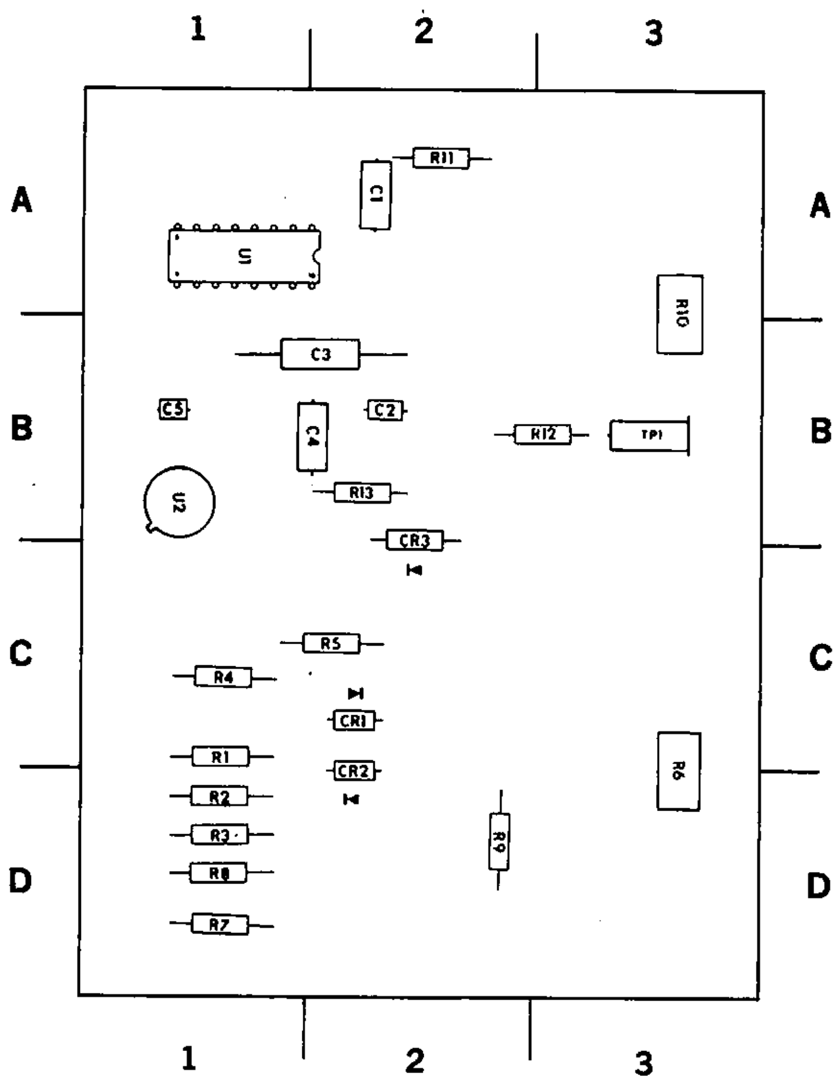
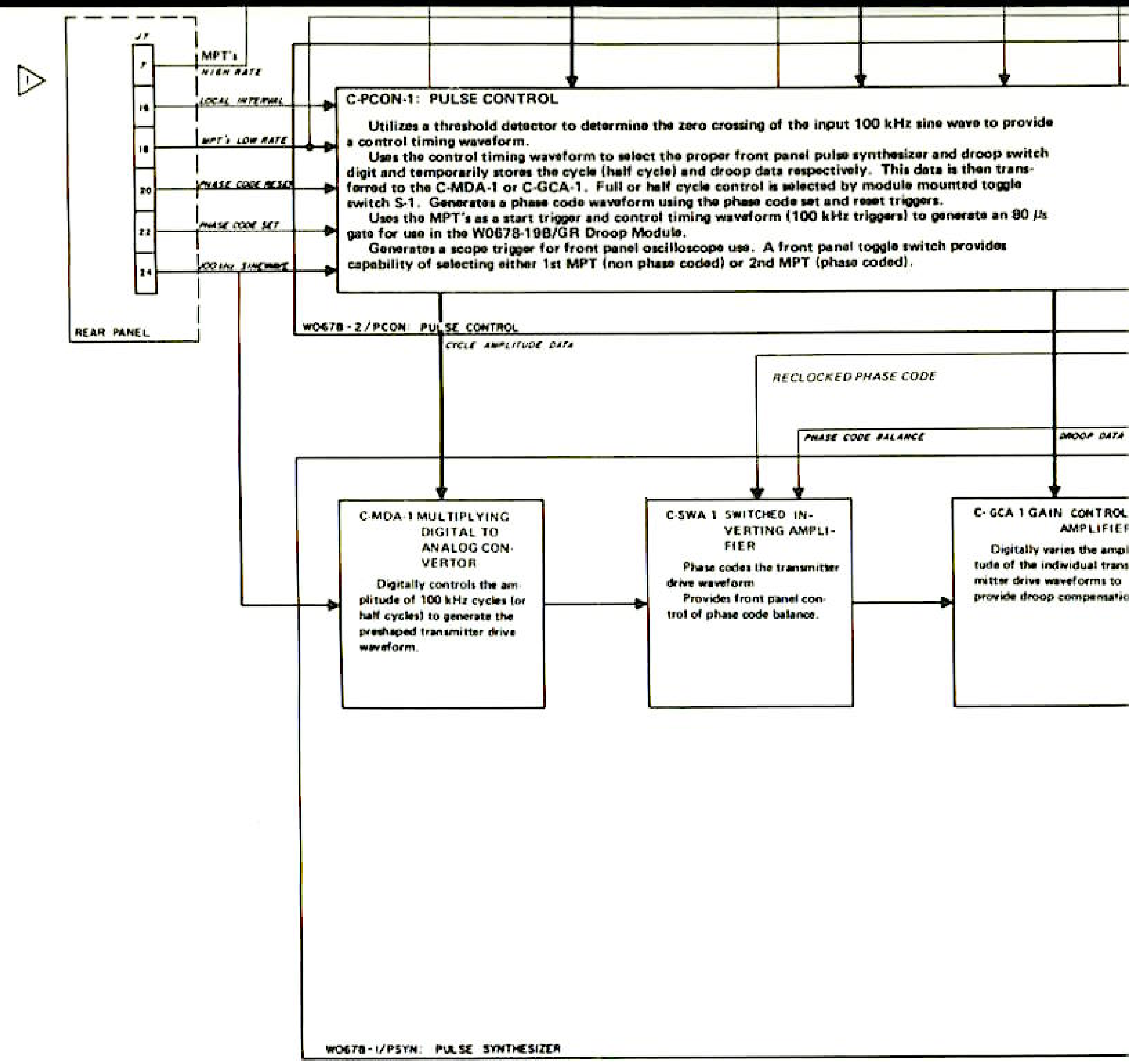
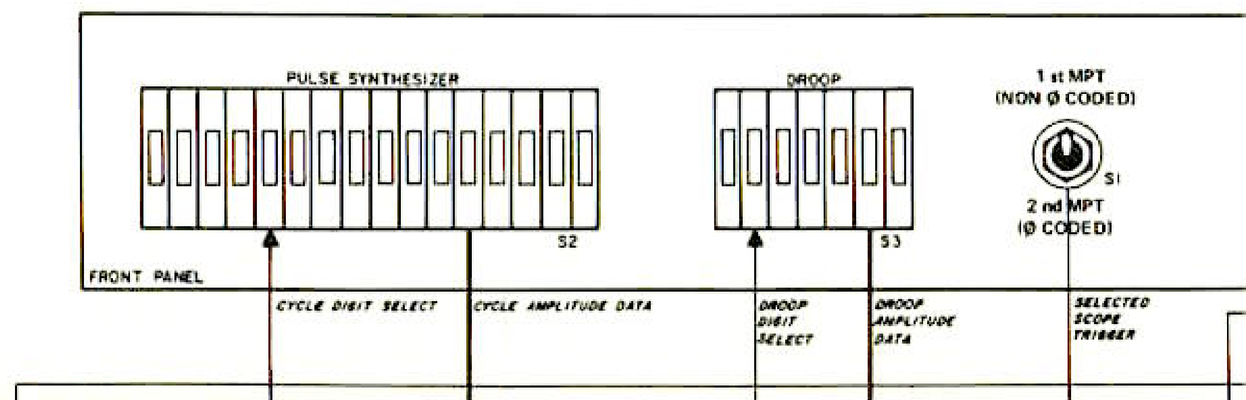


Figure 7.29. **W0678-11A/CLP ATTN Module Parts Locator**



J7
MPT's HIGH RATE
LOCAL INTERNAL
MPT's LOW RATE
PHASE CODE RESET
PHASE CODE SET
100 kHz SINEWAVE
REAR PANEL
C-PCON-1: PULSE CONTROL
Utilizes a threshold detector to determine the zero crossing of the input 100 kHz sine wave to provide a control timing waveform.
Uses the control timing waveform to select the proper front panel pulse synthesizer and droop switch digit and temporarily stores the cycle (half cycle) and droop data respectively. This data is then transferred to the C-MDA-1 or C-GCA-1. Full or half cycle control is selected by module mounted toggle switch S-1. Generates a phase code waveform using the phase code set and reset triggers.
Uses the MPT's as a start trigger and control timing waveform (100 kHz triggers) to generate an 80 μs gate for use in the W0678-19B/GR Droop Module.
Generates a scope trigger for front panel oscilloscope use. A front panel toggle switch provides capability of selecting either 1st MPT (non phase coded) or 2nd MPT (phase coded).
W0678-2/PCON: PULSE CONTROL
CYCLE AMPLITUDE DATA
RECLOCKED PHASE CODE
PHASE CODE BALANCE
DROOP DATA
C-MDA-1 MULTIPLYING DIGITAL TO ANALOG CONVERTOR
Digitally controls the amplitude of 100 kHz cycles (or half cycles) to generate the preshaped transmitter drive waveform.
C-SWA 1 SWITCHED INVERTING AMPLIFIER
Phase codes the transmitter drive waveform
Provides front panel control of phase code balance.
C-GCA 1 GAIN CONTROL AMPLIFIER
Digitally varies the ampli tude of the individual trans mitter drive waveforms to provide droop compensatio
W0678-1/PSYN: PULSE SYNTHESIZER



PULSE SYNTHESIZER
S2
DROOP
S3
1 st MPT
(NON Ø CODED)
S1
2 nd MPT
(Ø CODED)
FRONT PANEL
CYCLE DIGIT SELECT
CYCLE AMPLITUDE DATA
DROOP DIGIT SELECT
DROOP AMPLITUDE DATA
SELECTED SCOPE TRIGGER

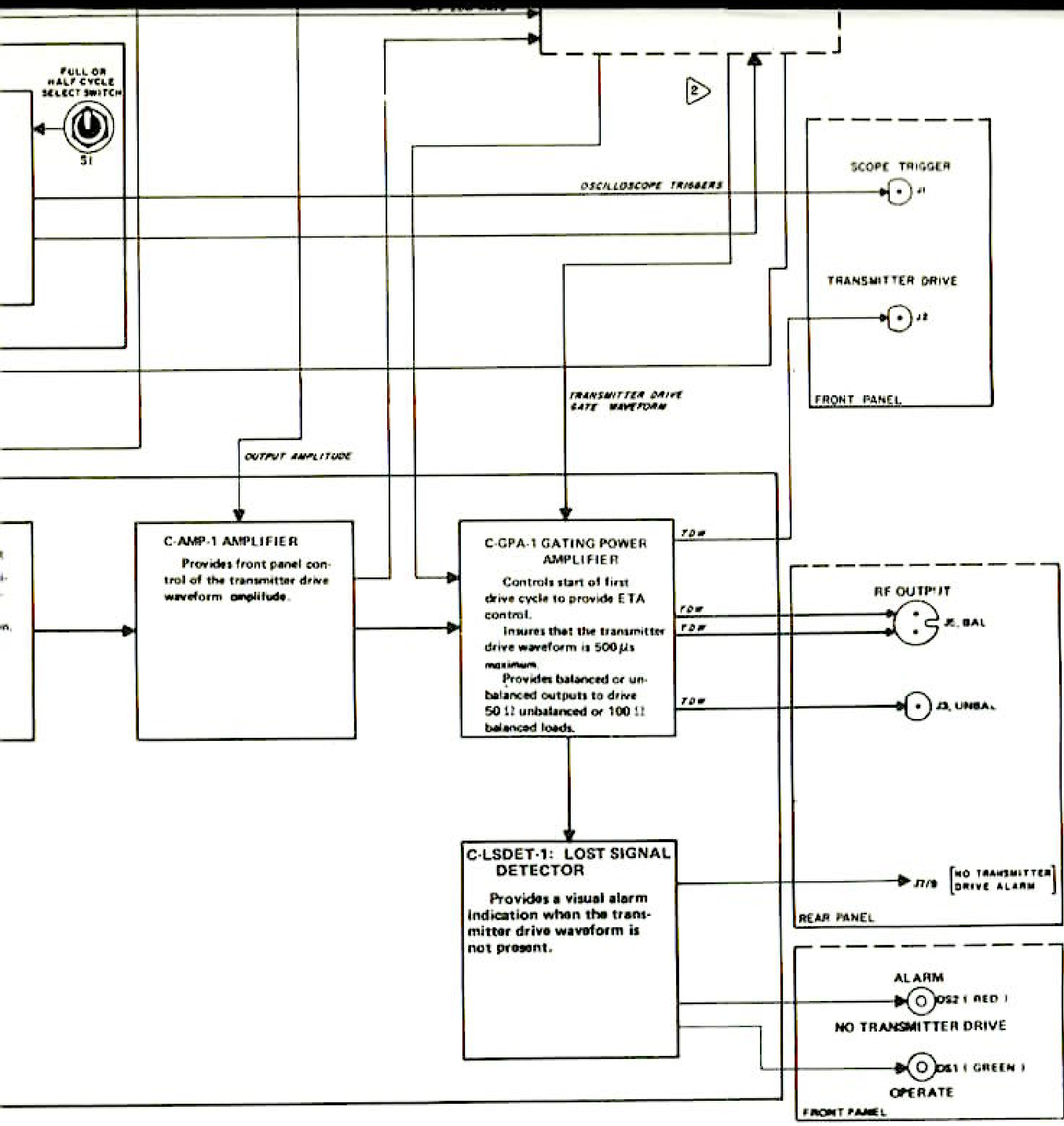
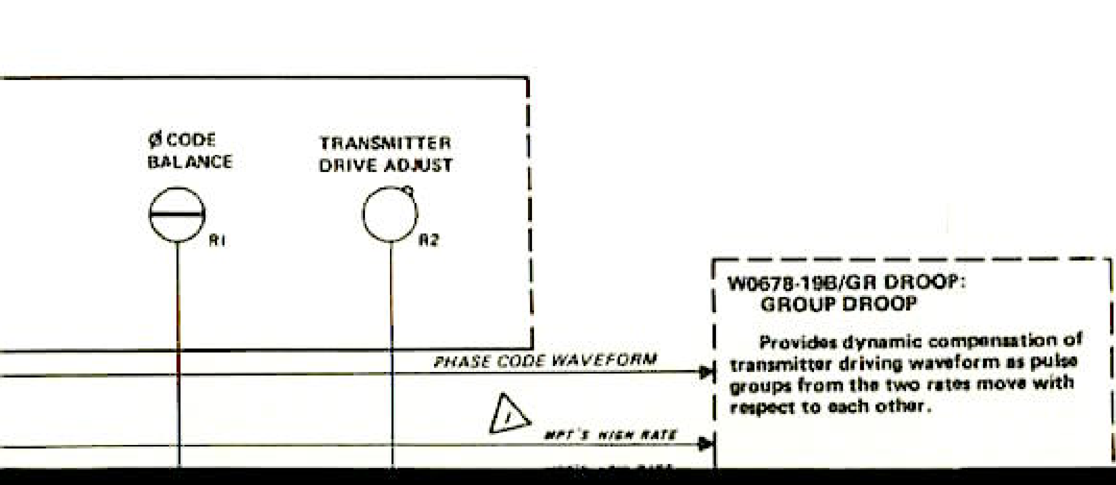
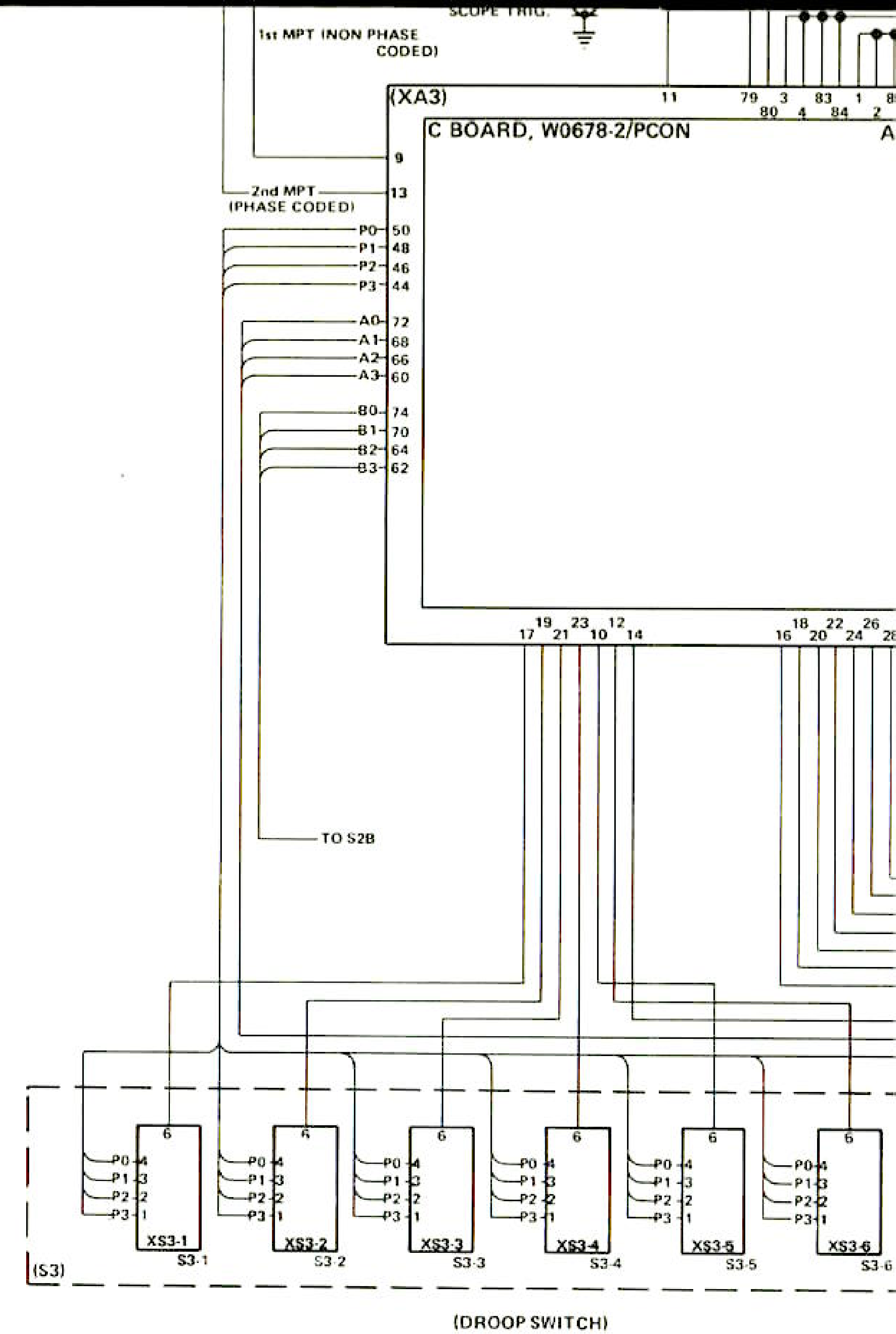


Figure 7.30. Pulse Generator
Functional Block Text Diagram

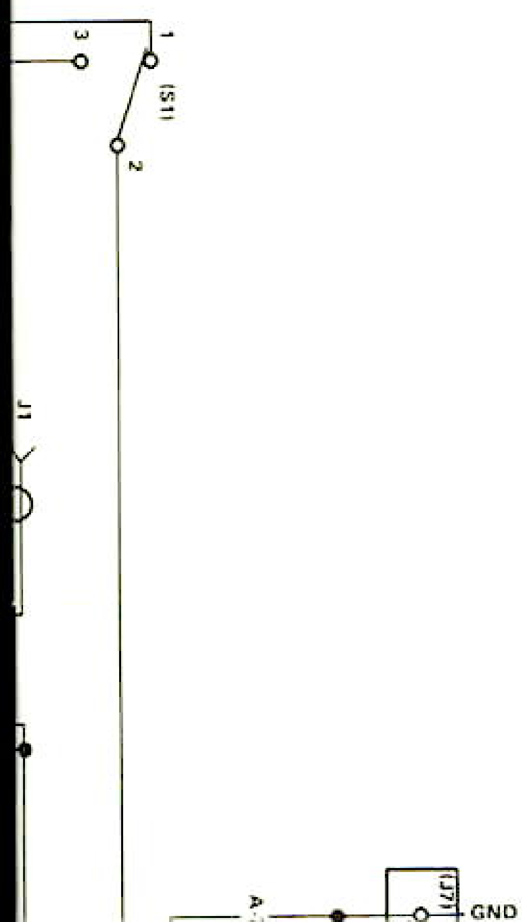


NOTES:

1. AT DUAL-RATED STATIONS THE HIGH RATE PGEN's (PGEN 1H & 2H) WILL HAVE LOW RATE MPT's ON J7-7 AND HIGH RATE MPT's J7-18.
2. DASHED LINE IS DUAL-RATE OPERATION ONLY. REMOVE JUMPER FOR DUAL-RATE OPERATION.



1st MPT (NON PHASE CODED)
(XA3)
C BOARD, W0678-2/PCON
2nd MPT (PHASE CODED)
P0 50
P1 48
P2 46
P3 44
A0 72
A1 68
A2 66
A3 60
B0 74
B1 70
B2 64
B3 62
TO S2B
(S3)
XS3-1
S3-1
XS3-2
S3-2
XS3-3
S3-3
XS3-4
S3-4
XS3-5
S3-5
XS3-6
S3-6
(DROOP SWITCH)


(S1)
J1
(J7)
GND

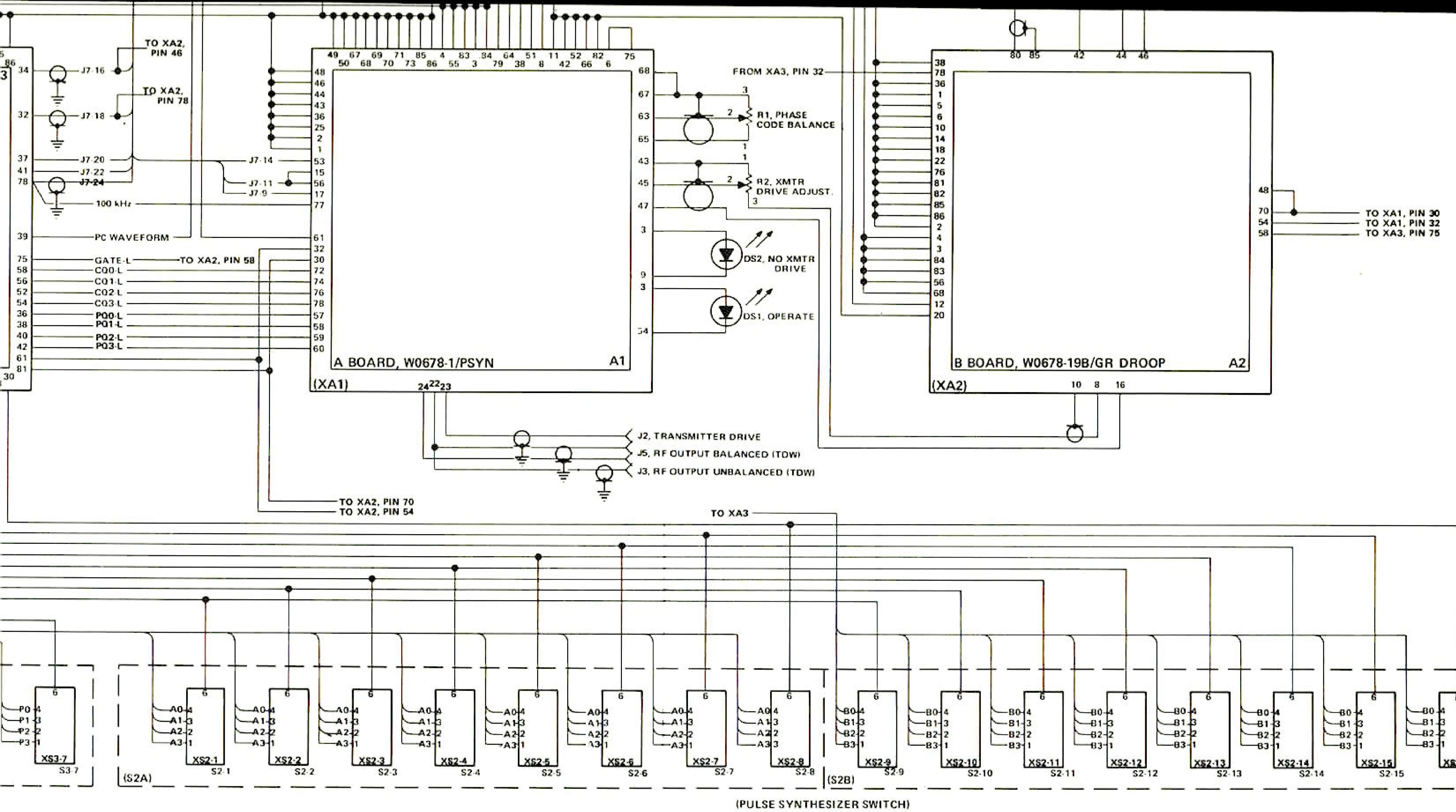
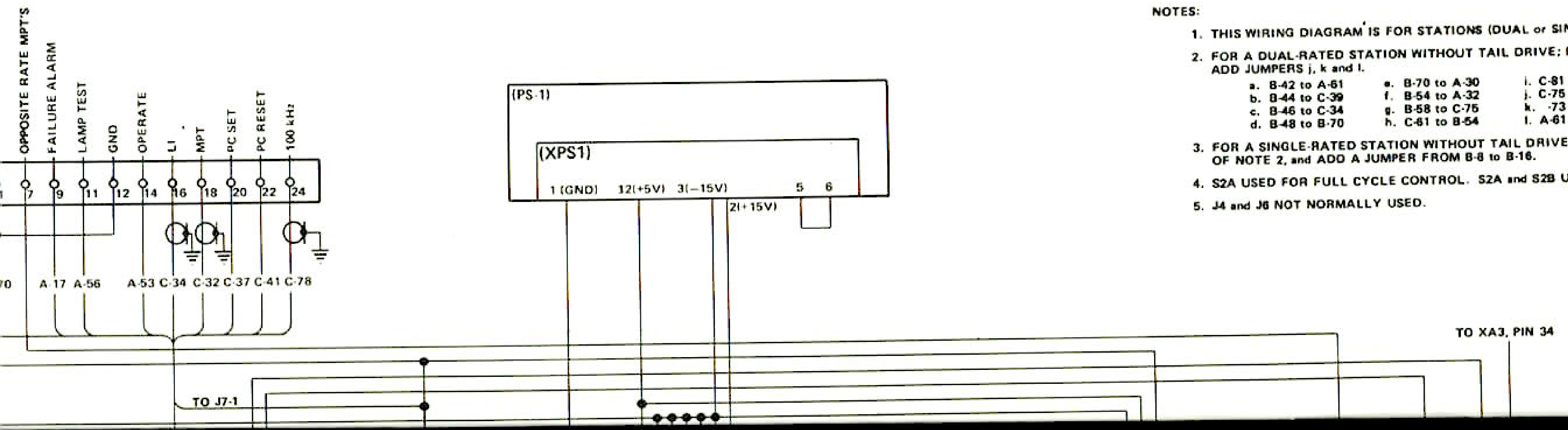


Figure 7.31. Pulse Generator Wiring Dia

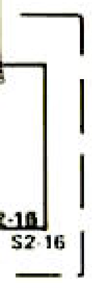


NOTES:

1. THIS WIRING DIAGRAM IS FOR STATIONS (DUAL or SINGLE-RATED) WITH TAIL DRIVE.
2. FOR A DUAL-RATED STATION WITHOUT TAIL DRIVE; REMOVE JUMPERS a - i, and ADD JUMPERS j, k and l.

a. B-42 to A-61	e. B-70 to A-30	i. C-81 to A-30
b. B-44 to C-39	f. B-54 to A-32	j. C-75 to A-32
c. B-46 to C-34	g. B-58 to C-75	k. -73 to A-30
d. B-48 to B-70	h. C-61 to B-54	l. A-61 to C-39

3. FOR A SINGLE-RATED STATION WITHOUT TAIL DRIVE, PERFORM THE INSTRUCTIONS OF NOTE 2, and ADD A JUMPER FROM B-8 to B-16.
4. S2A USED FOR FULL CYCLE CONTROL. S2A and S2B USED FOR HALF-CYCLE CONTROL.
5. J4 and J6 NOT NORMALLY USED.



gram

8/7.84

C2	5B	C57	4C	R31	3D
C3	6B	C58	4D	R32	3D
C4	5B	C59	4C	R33	3D
C5	6B	C60	4D	R34	5C
C6	2C	C61	3D	R35	5D
C7	6C			R36	1D
C8	7C	CR1	NOT USED	R37	4B
C9	4B	CR2	7D	R38	3E
C10	5B	CR3	NOT USED	R39	1D
C11	4B	CR4	2D	R40	5C
C12	6E	CR5	3E	R41	5D
C13	7E	CR6	7D	R42	2E
C14	2C	CR7	2E	R43	3E
C15	3D	CR8	2E	R44	2E
C16	3D	CR9	2E	R45	3A
C17	5E	CR10	7D	R46	2A
C18	6C			R47	3A
C19	5C	L1	4C	R48	7D
C20	3B	L2	4D	R49	2E
C21	3B			R50	2E
C22	3A	Q1	2D	R51	2E
C23	3B	Q2	2D	R52	2E
C24	3B	Q3	6C	R53	2D
C25	6B			R54	3A
C26	4B	R1	5B	R55	3D
C27	1C	R2	4B	R56	3D
C28	2C	R3	2C	R57	7C
C29	NOT USED	R4	2C,2D	R58	6C
C30	1C	R5	2C	R59	2D
C31	2D	R6	6C		
C32	6C	R7	7D	TP1	4C
C33	5C	R8	4B	TP2	4D
C34	5D	R9	4B	TP3	4B
C35	1D	R10	4B		
C36	5E	R11	4B	U1	5B
C37	6B	R12	6C	U2	4B
C38	3A	R13	4C	U3	2C
C39	3E	R14	4D	U4	7C
C40	1D	R15	1C	U5	6C
C41	5E	R16	2C	U6	7C
C42	5E	R17	2C	U7	1C
C43	4C	R18	4B	U8	1C
C44	4C	R19	3B	U9	3B
C45	4D	R20	3B	U10	4B
C46	4D	R21	4B	U11	1D
C47	4E	R22	1C	U12	2D
C48	3A	R23	2C	U13	3D
C49	3A	R24	2D	U14	5C
C50	3A	R25	2C	U15	3B
C51	2E	R26	5C	U16	1D
C52	5E	R27	5C	U17	4C
C53	4E	R28	5D	U18	4D
C54	3A	R29	4B	U19	3A
C55	2E				

B

C

D

E

PART LOCATION INDEX					
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	5B	C56	3D	R30	2D

A

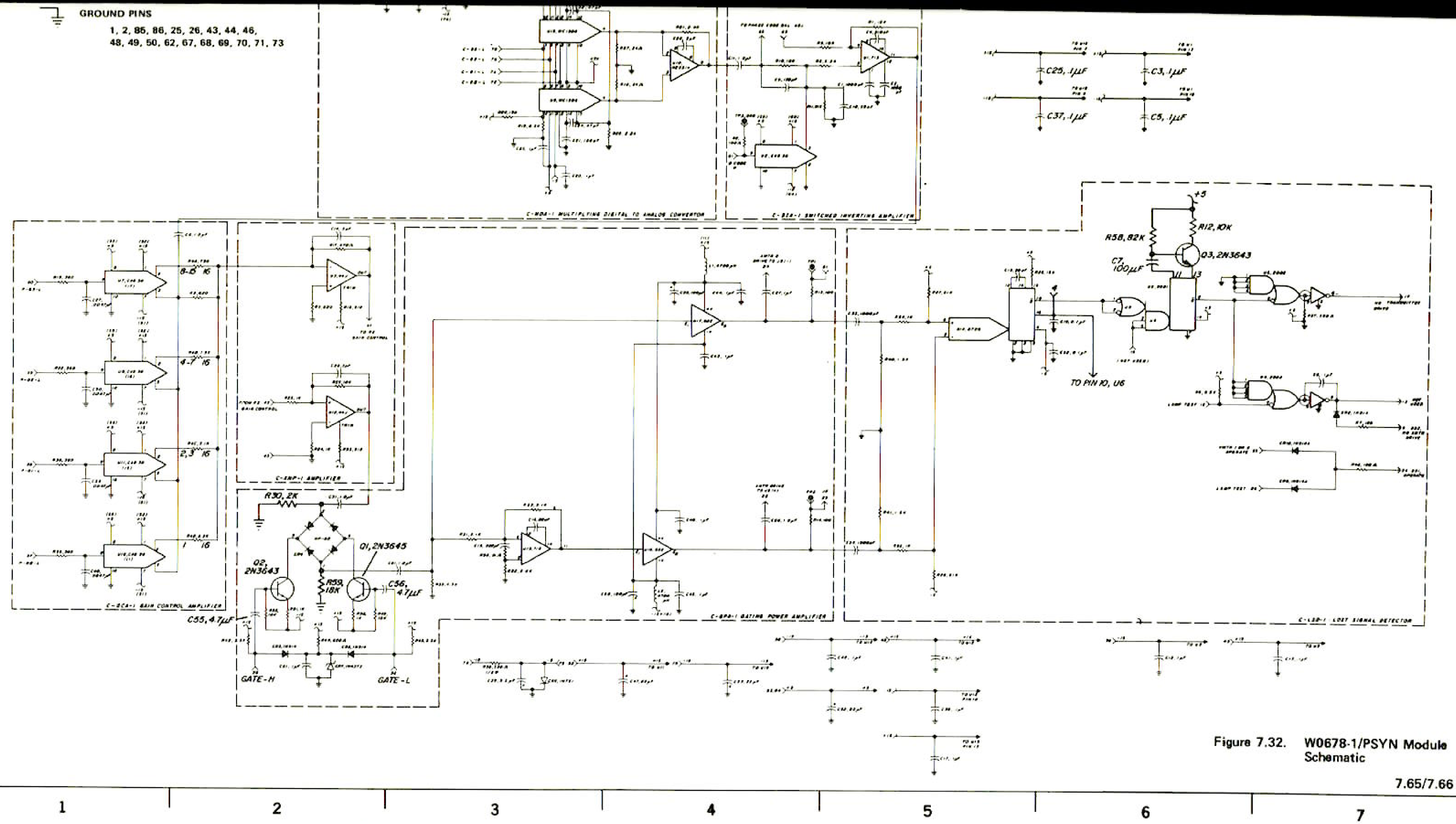
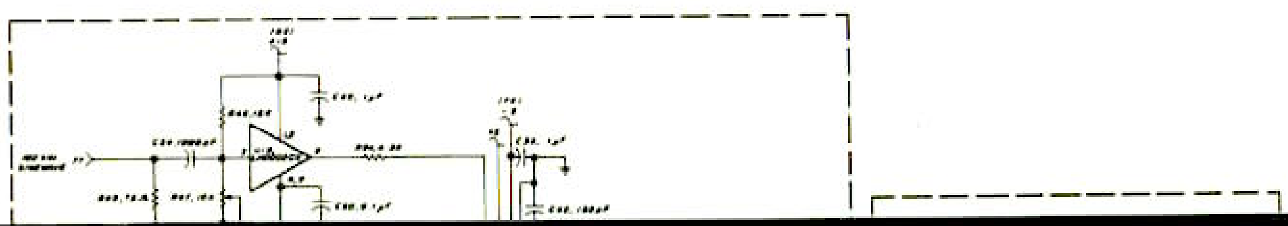


Figure 7.32. W0678-1/PSYN Module Schematic

1 2 3 4 5 6 7



NOTES:

1. UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS, K = $10^3\Omega$, M = $10^6\Omega$.
2. ALL CAPACITOR VALUES ARE IN μF UNLESS OTHERWISE SPECIFIED.
3. LAST CIRCUIT SYMBOLS USED: C61, CR10, Q3, R59, U19. NOT USED: CR3, C29.
4. INPUTS ARE DESIGNATED BY ≻— ; OUTPUTS BY ⟶ H = ACTIVE HIGH, L = ACTIVE LOW

B

C

D

E

A

REF. DESIG.	LOCATION
R30	5C
R31	5C
R32	5C
R33	5B
R34	7C
R35	7C
R36	3C
R37	2D
R38	3D
R39	3D
R40	7D
R41	7D
R42	5D
R43	5D
R44	5D
R45	2E
R46	2E
R47	2E
R48	3E
R49	4E
R50	4E
R51	4E
R52	4E
R53	4D
R54	1D
R55	5D
R56	5C
R57	6B
R58	5B
R59	5D
TP1	6A
TP2	6A
TP3	3A
TP4	2A
U1	2B
U2	2B
U3	4B
U4	6B
U5	5B
U6	6B
U7	3B
U8	3C
U9	1C
U10	2C
U11	3C
U12	4C
U13	5C
U14	6C
U15	1D
U16	3D
U17	6D
U18	6D
U19	1E

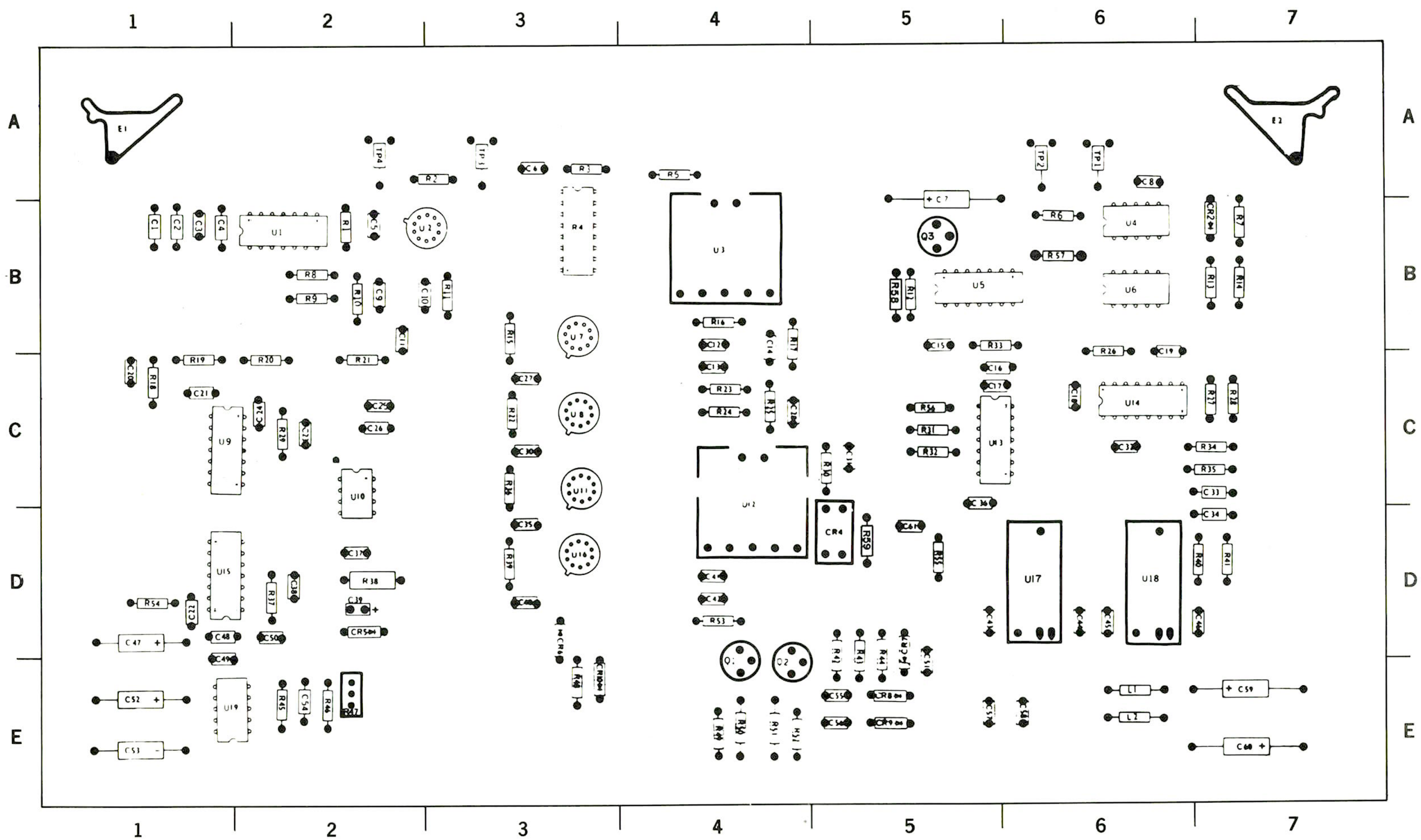


Figure 7.33. W0678-1/PSYN Module Parts Locator

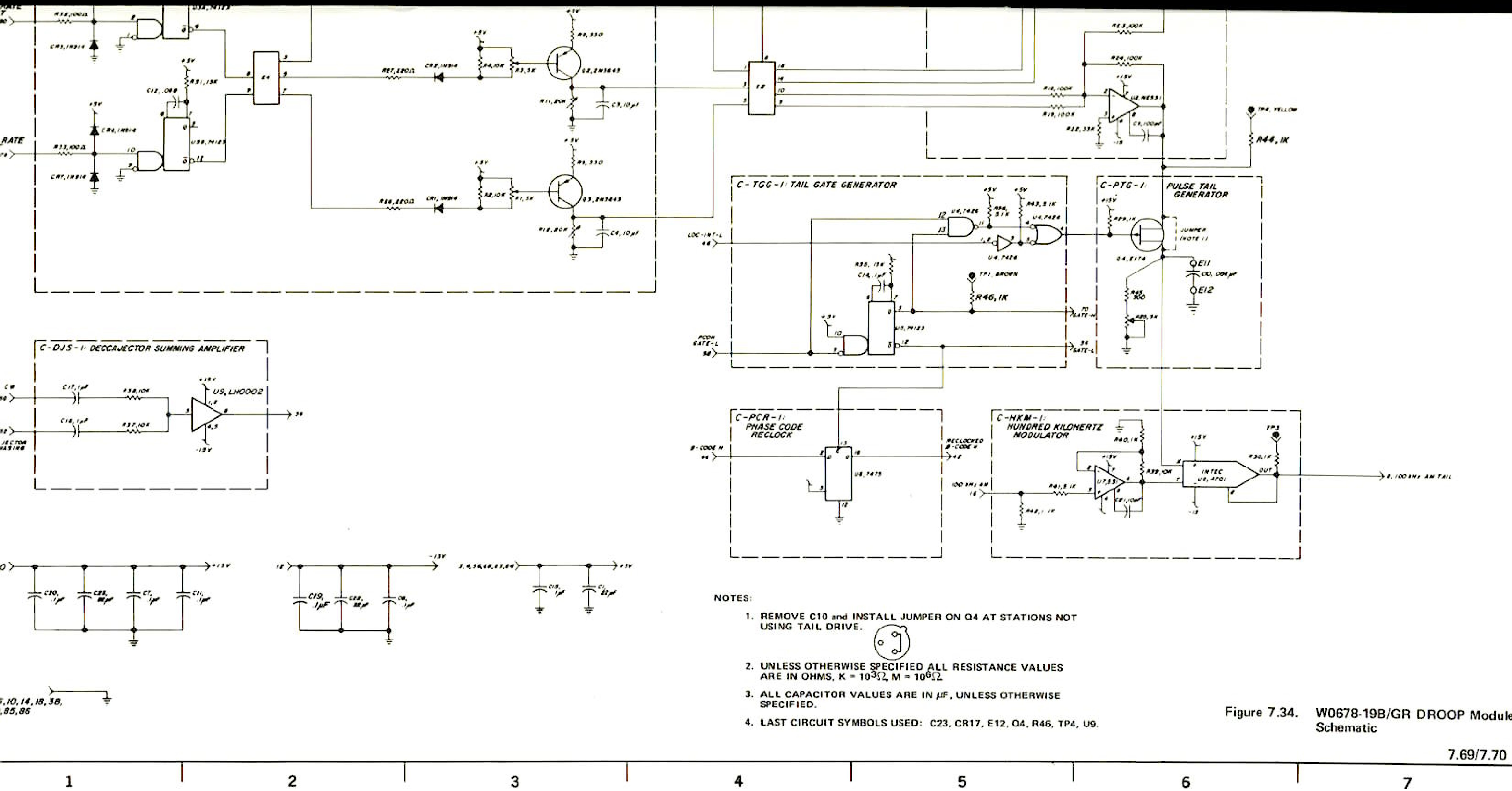
PART LOCATION INDEX

REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	1B	C57	5E
C2	1B	C58	6E
C3	1B	C59	7E
C4	1B	C60	7E
C5	2B	C61	5D
C6	3A		
C7	5A	CR1	NOT USED
C8	6A	CR2	7B
C9	2B	CR3	NOT USED
C10	2B	CR4	5D
C11	2B	CR5	2D
C12	4B	CR6	3D
C13	4C	CR7	5D
C14	4B	CR8	5E
C15	5B	CR9	5E
C16	5C	CR10	3E
C17	2D		
C18	6C	E1	1A
C19	6B	E2	7A
C20	1C		
C21	1C	L1	6E
C22	1D	L2	6E
C23	2C		
C24	2C	Q1	4E
C25	2C	Q2	4E
C26	2C	Q3	5B
C27	3C		
C28	4C	R1	2B
C29	NOT USED	R2	3A
C30	3C	R3	3A
C31	5C	R4	3B
C32	6C	R5	4A
C33	7C	R6	6B
C34	7D	R7	7B
C35	3D	R8	2B
C36	5C	R9	2B
C37	2D	R10	2B
C38	2D	R11	3B
C39	2D	R12	5B
C40	3D	R13	7B
C41	4D	R14	7B
C42	4D	R15	3B
C43	5D	R16	4B
C44	6D	R17	4B
C45	6D	R18	1C
C46	7D	R19	1C
C47	1D	R20	2C
C48	1D	R21	2C
C49	1E	R22	3C
C50	2D	R23	4C
C51	5D	R24	4C
C52	1E	R25	4C
C53	1E	R26	6B
C54	2E	R27	7C
C55	5E	R28	7C
C56	5E	R29	2C

C5	5A	R5	3A
C6	2E	R6	3A
C7	1E	R7	3A
C8	6A	R8	3A
C9	6B	R9	3B
C10	6C	R10	3A
C11	2E	R11	3B
C12	1B	R12	3C
C13	1A	R13	5A
C14	5C	R14	5A
C15	3E	R15	5A
C16	1D	R16	5A
C17	1C	R17	5A
C18	NOT USED	R18	5B
C19	2E	R19	5B
C20	1E	R20	6A
C21	6D	R21	6A
C22	2E	R22	6B
C23	1E	R23	6A
		R24	6B
CR1	3B	R25	6C
CR2	3B	R26	2B
CR3	3A	R27	2B
CR4	1A	R28	2A
CR5	1B	R29	6B
CR6	1B	R30	6D
CR7	1B	R31	2B
		R32	1A
E1	NOT USED	R33	1B
E2	4B	R34	2A
E3	NOT USED	R35	5C
E4	2B	R36	5B
E5	NOT USED	R37	1D
E6	NOT USED	R38	1C
E7	NOT USED	R39	6D
E8	NOT USED	R40	6D
E9	NOT USED	R41	5D
E10	NOT USED	R42	5D
E11	6C	R43	5B
E12	6C	R44	6B
		R45	6C
Q1	3A	R46	5C
Q2	3B		
Q3	3B	TP1	5C
Q4	6C	TP2	NOT USED
		TP3	6D
		TP4	6B
		U1	6A
		U2	6B
		U3	1A,1B
		U4	5C
		U5	5C
		U6	4D
		U7	6D
		U8	6D
		U9	2C

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	3E	R1	3B
C2	3A	R2	3B
C3	3B	R3	3B
C4	3C	R4	3B

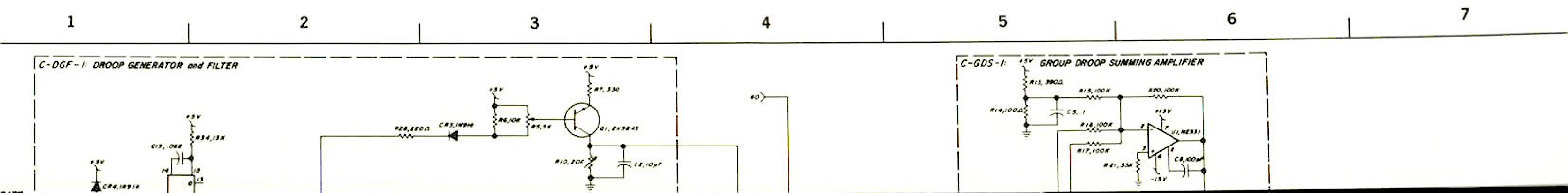
A



NOTES:

1. REMOVE C10 and INSTALL JUMPER ON Q4 AT STATIONS NOT USING TAIL DRIVE.
2. UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS, K = $10^3\Omega$, M = $10^6\Omega$
3. ALL CAPACITOR VALUES ARE IN μF, UNLESS OTHERWISE SPECIFIED.
4. LAST CIRCUIT SYMBOLS USED: C23, CR17, E12, Q4, R46, TP4, U9.

Figure 7.34. W0678-19B/GR DROOP Module Schematic


1
2
3
4
5
6
7
C-DGF-1: DROOP GENERATOR and FILTER
+5V
R7, 330
Q1, 2N5843
R10, 20K
C2, 10pF
R28, 220Ω
C-GDS-1: GROUP DROOP SUMMING AMPLIFIER
R13, 390Ω
R14, 100Ω
C5, .1
R15, 100K
R20, 100K
R16, 100K
R17, 100K
+15V
-15V

B

C

D

E

CATION
2A
2B
2A
2B
2A
2B
3B
3B
3B
4A
4A
4A
4B
5A
5B
5B
5B
5B
5B
5A
5B
5C
5B
5B
6A
2C
2C
2C
5C
6C
1E
2E
2E
2D
3E
3D
4E
5E
5C
5C
5E
5E
3D
6B
6B
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6A
6A
5B
5B
2D
3C
3D
4D
5D
6D
4D

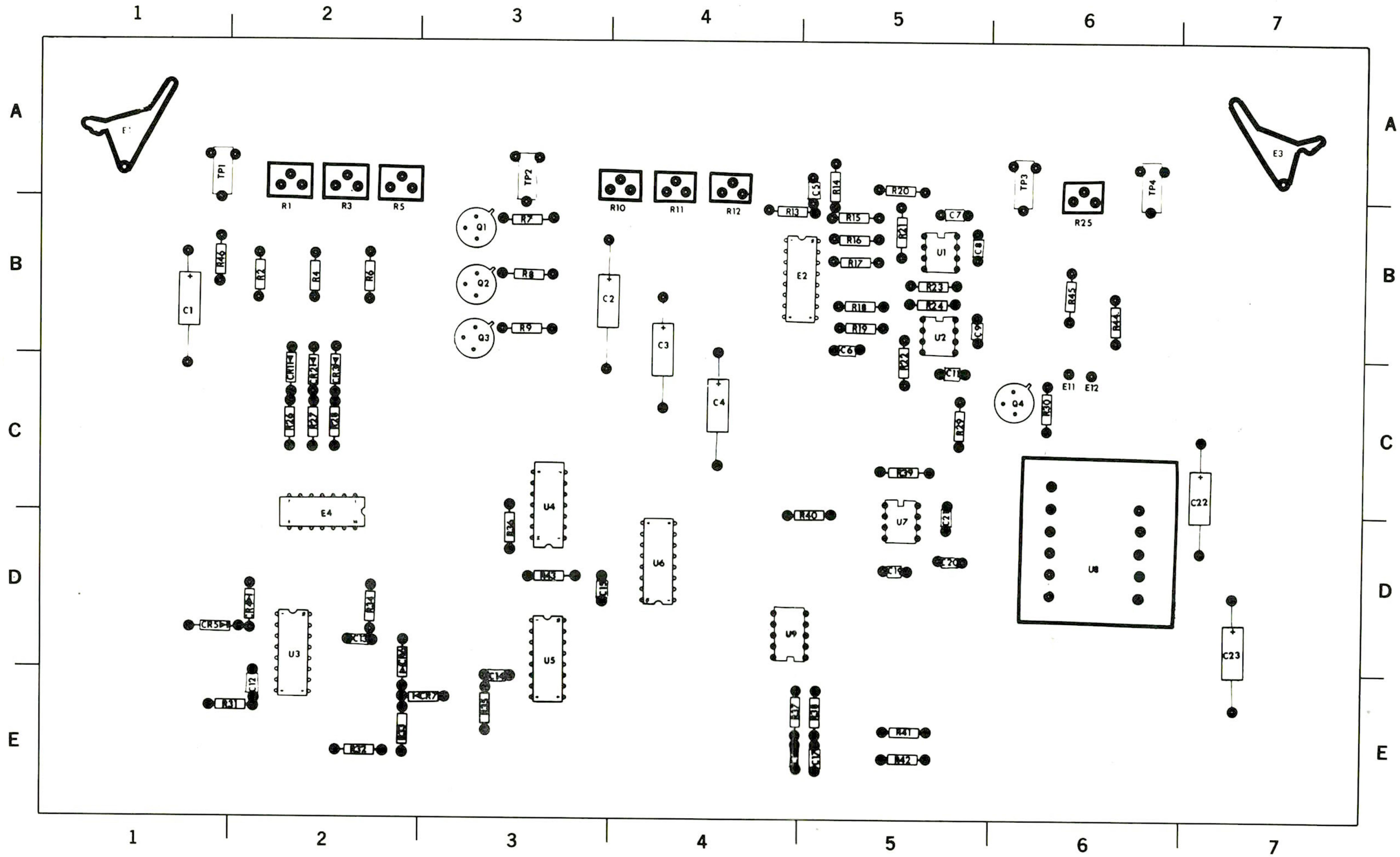


Figure 7.35. W0678-19B/GR DROOP Module Parts Locator

PART LOCATION INDEX

REF. DESIG.	LOCATION	REF. DESIG.	LO
C1	1B	R1	
C2	3B	R2	
C3	4B	R3	
C4	4C	R4	
C5	5A	R5	
C6	5B	R6	
C7	5B	R7	
C8	5B	R8	
C9	5B	R9	
C10	NOT USED	R10	
C11	5C	R11	
C12	2E	R12	
C13	2D	R13	
C14	3E	R14	
C15	3D	R15	
C16	4E	R16	
C17	5E	R17	
C18	NOT USED	R18	
C19	5D	R19	
C20	5D	R20	
C21	5D	R21	
C22	7C	R22	
C23	7D	R23	
		R24	
CR1	2C	R25	
CR2	2C	R26	
CR3	2C	R27	
CR4	2D	R28	
CR5	1D	R29	
CR6	2D	R30	
CR7	3E	R31	
		R32	
E1	1A	R33	
E2	4B	R34	
E3	7A	R35	
E4	2C	R36	
E5	NOT USED	R37	
E6	NOT USED	R38	
E7	NOT USED	R39	
E8	NOT USED	R40	
E9	NOT USED	R41	
E10	NOT USED	R42	
E11	6C	R43	
E12	6C	R44	
		R45	
Q1	3B	R46	
Q2	3B		
Q3	3B	TP1	
Q4	6C	TP2	
		TP3	
		TP4	
		U1	
		U2	
		U3	
		U4	
		U5	
		U6	
		U7	
		U8	
		U9	

REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	1B	R15	4E
C2	2C	R16	5D
C3	2B	R17	5D
C4	7C	R18	3E
C5	7B	R19	6C
C6	7C	R20	6C
C7	1C	R21	2D,2E
C8	2C	R22	2D,4D
C9	2C	R23	6C
C10	2C	R24	2B
C11	2C	R25	3C
C12	2B	R26	4A
C13	1C		
		S1	5C
CR1	2B		
CR2	2B	TP1	1C
CR3	2A	TP2	1B
CR4	2C	TP3	3E
CR5	1C	TP4	1A
CR6	2A	TP5	2C
CR7	6D	TP6	7B
CR8	6D	TP7	4E
CR9	6D	TP8	5C
CR10	6D	TP9	5D
CR11	1C		
CR12	6B	U1	2B
CR13	6B	U2	3A,3B
CR14	4A	U3	2A,2C,4B
CR15	3A	U4	4C,5B,5C
		U5	4C
R1	1B	U6	2D
R2	2C	U7	3E
R3	1A	U8	5B
R4	1B	U9	5B
R5	1B	U10	6D
R6	2B	U11	3C,4B
R7	2B	U12	2E
R8	5C	U13	2D
R9	4C	U14	4D,4E
R10	5D	U15	4E
R11	5D	U16	6B
R12	1B	U17	6B
R13	2A	U18	6C
R14	1C		

B

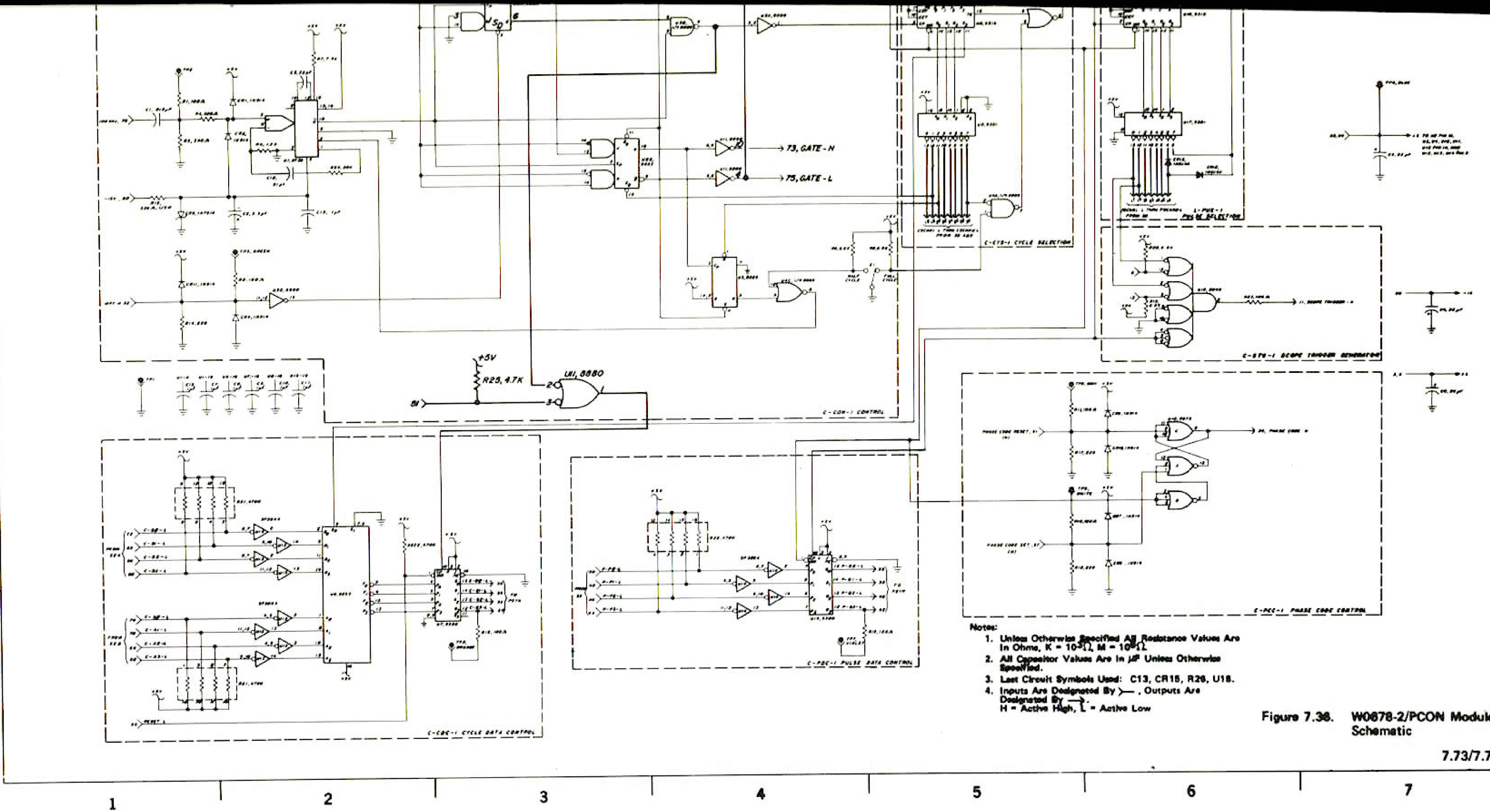
C

D

E

PART LOCATION INDEX

A

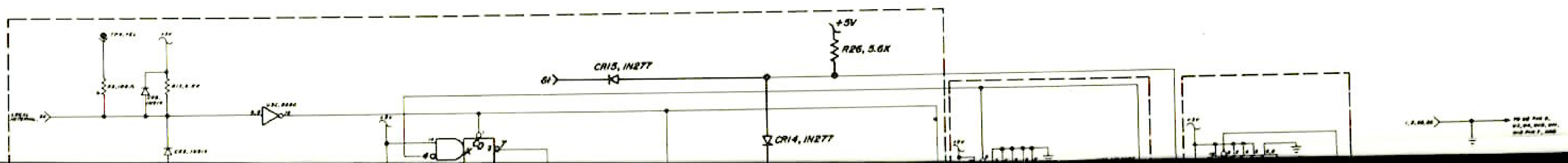


Notes:

1. Unless Otherwise Specified All Resistance Values Are In Ohms, K = $10^3 \Omega$, M = $10^6 \Omega$.
2. All Capacitor Values Are in µF Unless Otherwise Specified.
3. Last Circuit Symbols Used: C13, CR15, R26, U18.
4. Inputs Are Designated By ⟩—, Outputs Are Designated By —⟩.
H = Active High, L = Active Low

Figure 7.36. W0678-2/PCON Module Schematic

1 2 3 4 5 6 7



B

C

D

E

4

➤

ATION
5C
6C
7C
2C
6D
6D
2D
4D
6E
2A
1E
2D
5B
1A
2A
2A
3A
3A
4A
5A
6A
6A
2B
3B
4B
4B
5B
2C
2C
4C
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6C
1D
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2D
3D
4D
5C
5D
6D

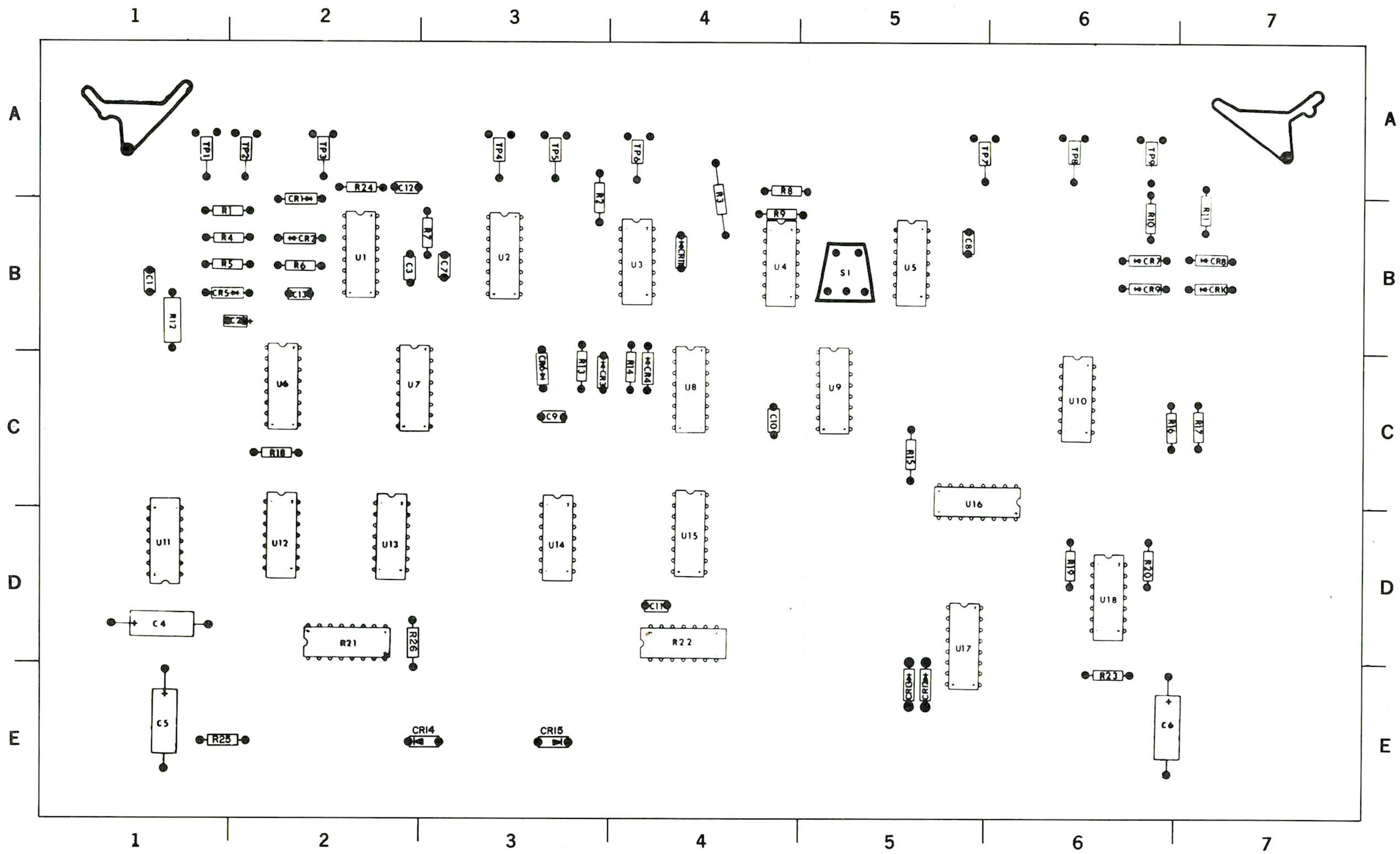
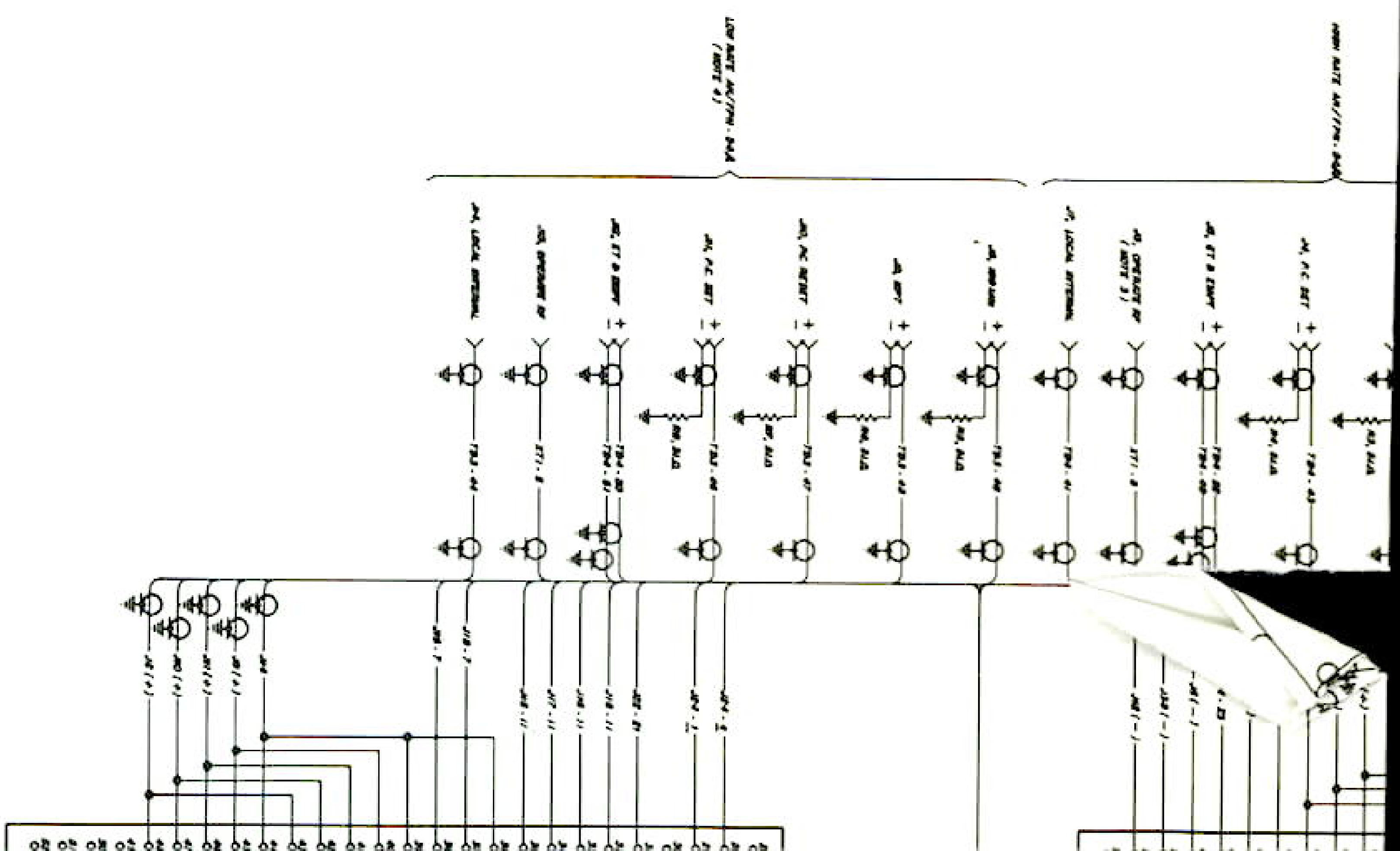
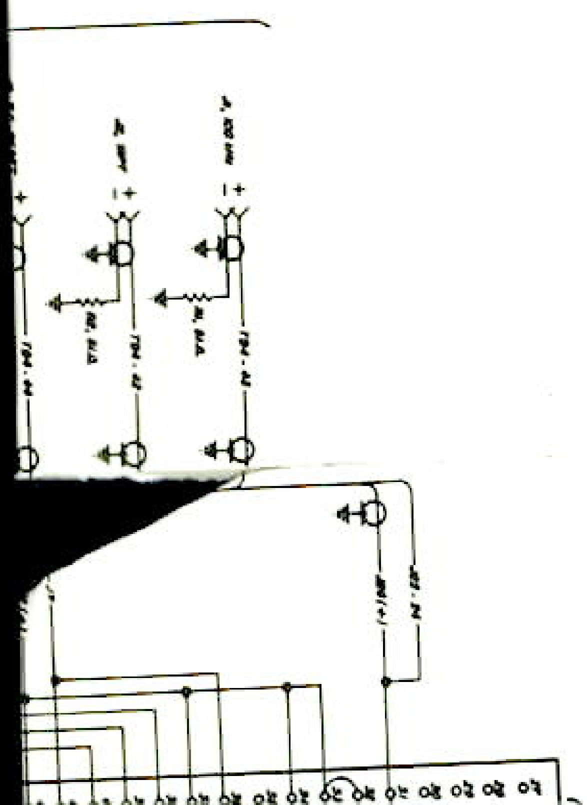
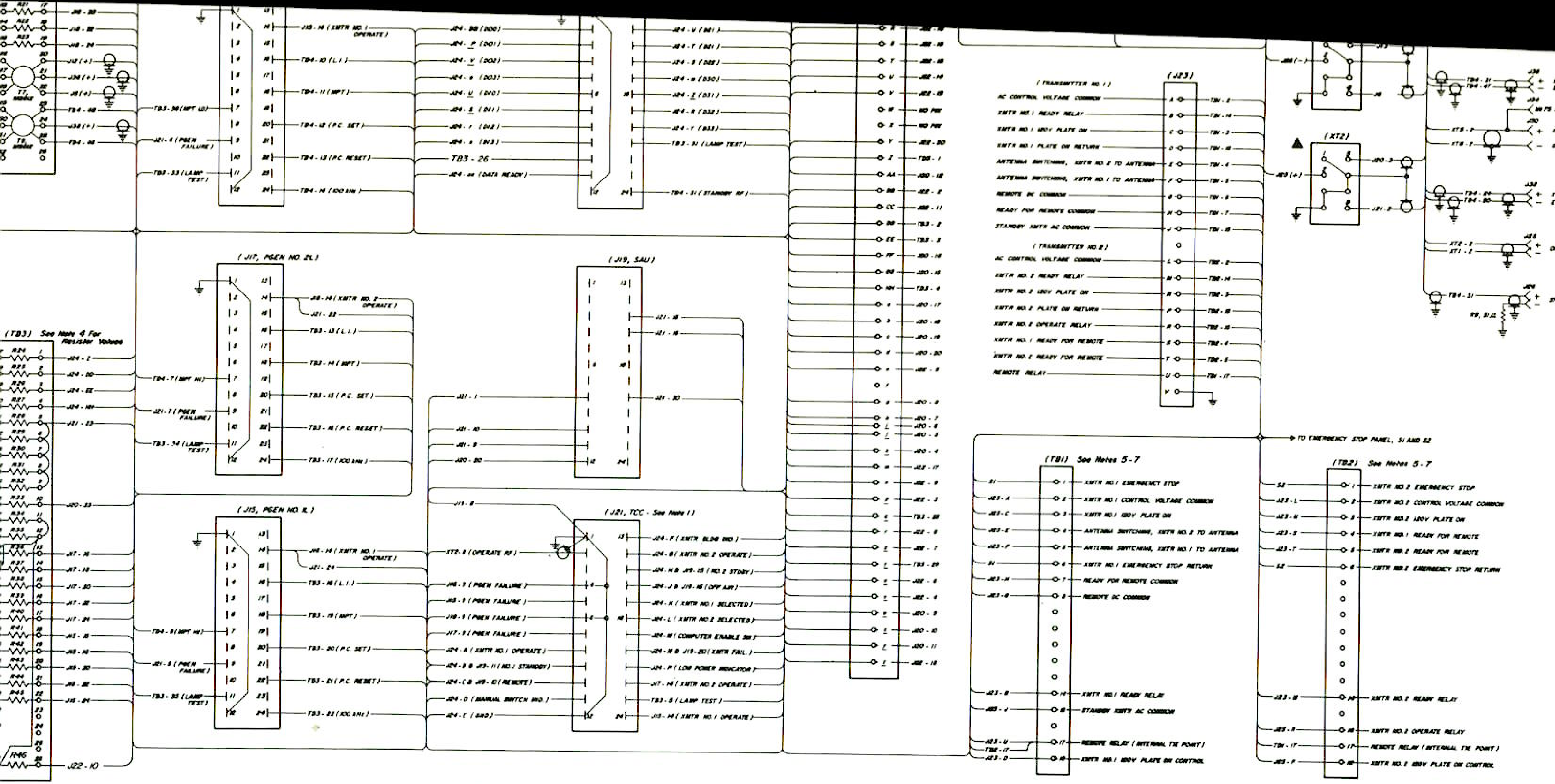


Figure 7.37. W0678-2/PCON Module Parts Locator

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LOC
C1	1B	R15	
C2	2A	R16	
C3	2B	R17	
C4	1D	R18	
C5	1E	R19	
C6	6E	R20	
C7	3B	R21	
C8	5B	R22	
C9	3C	R23	
C10	4C	R24	
C11	4D	R25	
C12	2A	R26	
C13	2B		
		S1	
CR1	2B		
CR2	2B	TP1	
CR3	3C	TP2	
CR4	4C	TP3	
CR5	1B	TP4	
CR6	3C	TP5	
CR7	6B	TP6	
CR8	7B	TP7	
CR9	6B	TP8	
CR10	7B	TP9	
CR11	4B		
CR12	5E	U1	
CR13	5E	U2	
CR14	3E	U3	
CR15	3E	U4	
		U5	
R1	1B	U6	
R2	3B	U7	
R3	4B	U8	
R4	1B	U9	
R5	1B	U10	
R6	2B	U11	
R7	3B	U12	
R8	4A	U13	
R9	4B	U14	
R10	6B	U15	
R11	7B	U16	
R12	1B	U17	
R13	3C	U18	
R14	4C		



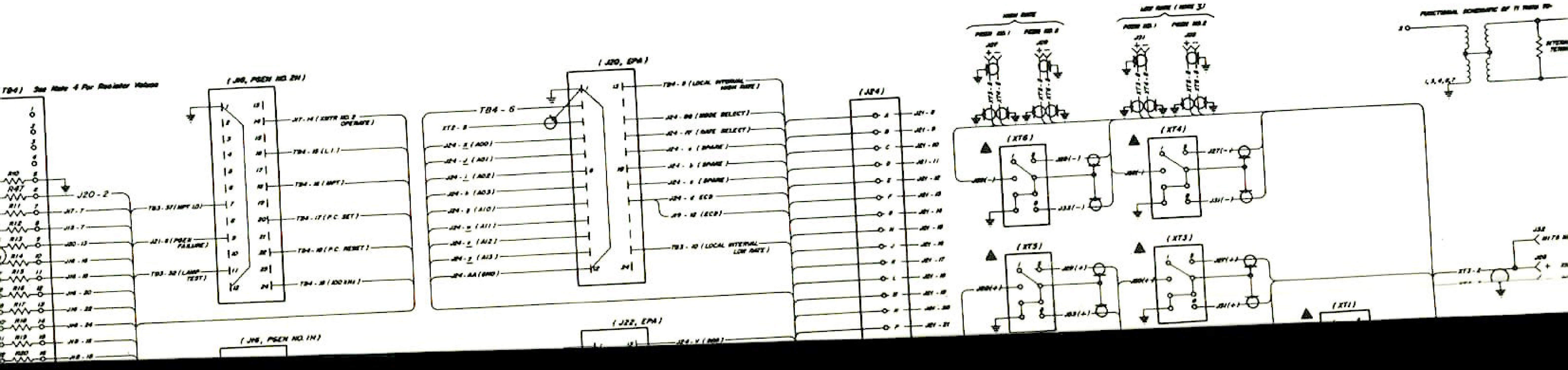




NOTES:

1. FOR DUAL-RATE OPERATION, REMOVE JUMPER WIRES J21-1 TO J21-4 AND J21-1 TO J21-6.
2. FOR SINGLE RATE OPERATION, TERMINATE WITH 50 Ω.
3. AT SINGLE RATE STATIONS USE LOW RATE PORTS.
4. R1-10 AND R24-27 = 51Ω
   R11, 12, 15 - 17, 20 - 22, 34, 36, 37 - 39, 42 - 44, AND 46, 47 = 680 Ω
   R13, 14, 19, 28 - 33, 40, = 180Ω
   R18, 23, 40, AND 45 = 75Ω
5. FOR USE WITH THE AN/FPN-39 TRANSMITTER, CONNECT JUMPERS AS INDICATED:
   TB1-8 TO TB1-17, TB1-14 TO TB1-15, TB1-14 TO TB2-14, TB2-8 TO TB2-16
6. FOR USE WITH THE AN/FPN-42 TRANSMITTER, CONNECT JUMPER FROM TB1-8 TO TB1-17
7. FOR USE WITH THE AN/FPN-44 TRANSMITTER, CONNECT JUMPERS AS INDICATED:
   TB1-5 TO TB2-7, TB1-8 TO TB1-18, TB1-18 TO TB2-18, TB2-5 TO TB2-16

Figure 7.38. Interface Unit Wiring Diagra



(J16, PGEN NO. 2H)
J20-2
(J20, EPA)
TB4 - 6
(J24)
HIGH RATE
LOW RATE (NOTE 3)
(XT6)
(XT4)
(XT5)
(XT3)
(XT1)
(J22, EPA)
(J16, PGEN NO. 1H)

[illegible] NO. 1
[illegible]

[illegible]

[illegible] NO. 2
[illegible]

[illegible]
[illegible]

[illegible]

[illegible]

m

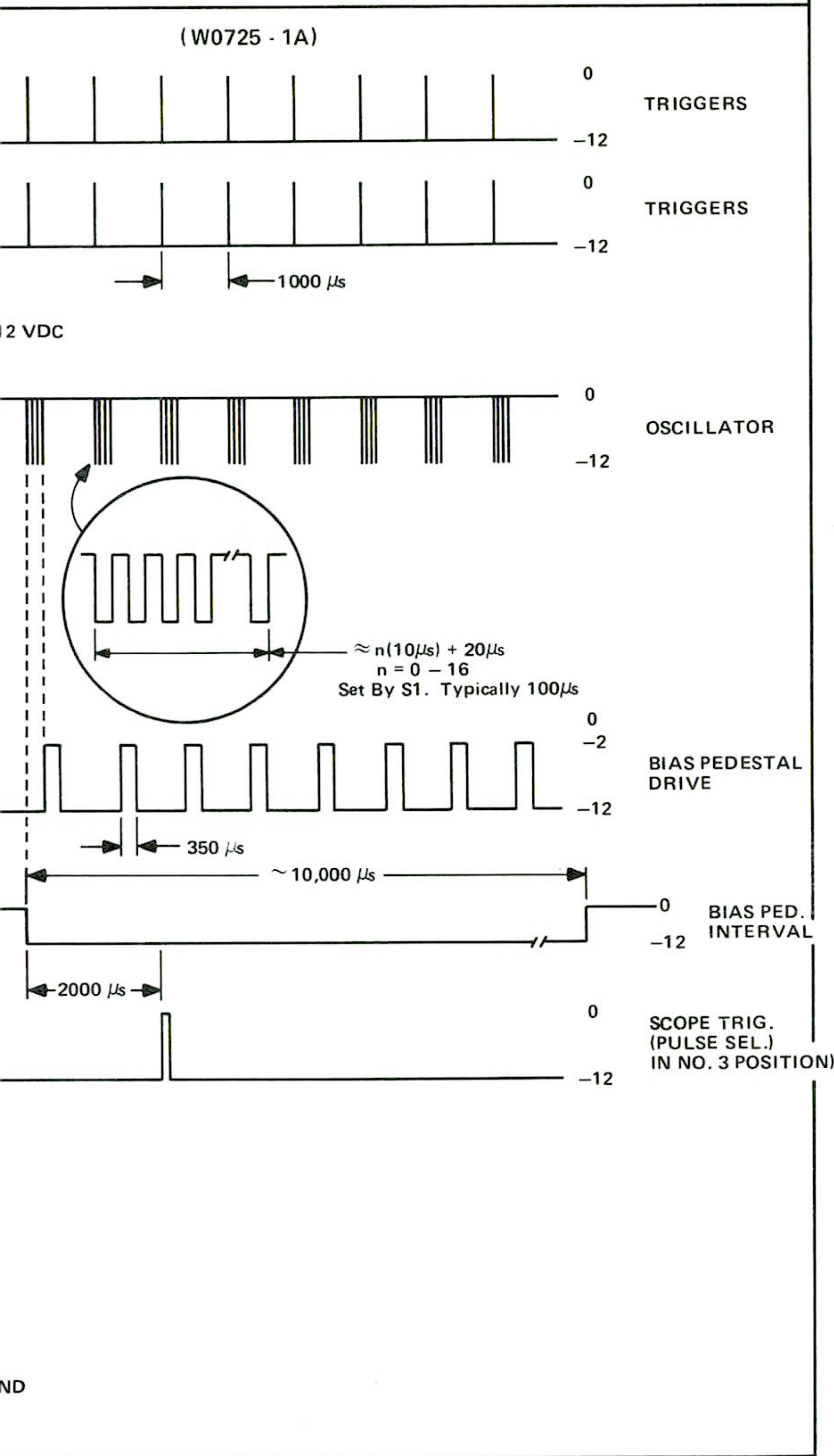
8

APPENDIX A

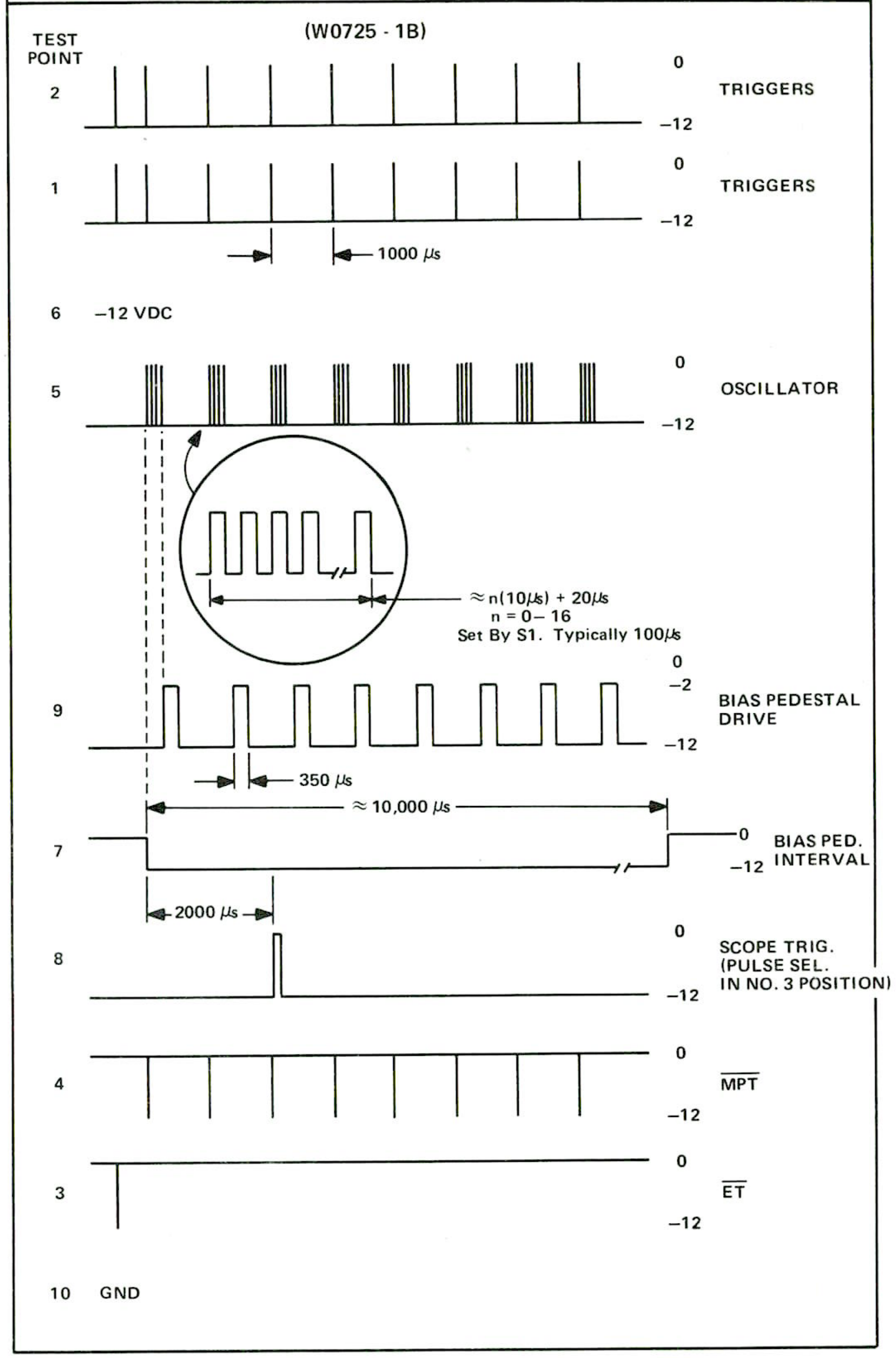
TCE/TRANSMITTER DIAGRAMS AND SCHEMATICS

A.1 Introduction. The fifteen diagrams and schematics in the appendix contain changes that have been made to various portions of the transmitters (AN/FPN-39/42/44) during the installation of the LORAN Replacement Equipment. Additional information for the AN/FPN-42 Loran Transmitting Set including parts list can be found in the Technical Manual for the AN/FPN-42 Loran Transmitting Set (CG7610-01-GEO-4701).

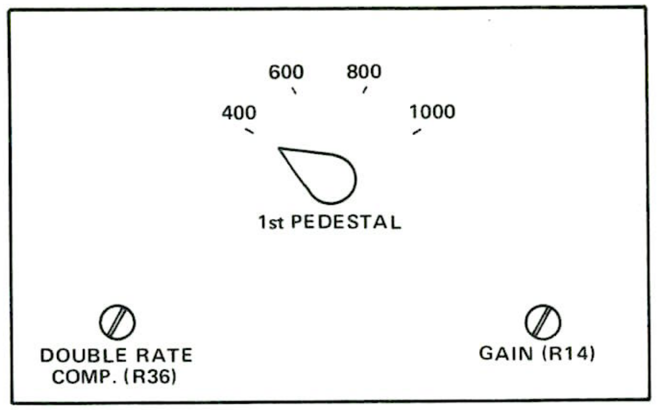
TRIGGER SPLITTER/BIAS PEDESTAL DRIVE (TS/BPD) MODULE TEST POINTS



TRIGGER SPLITTER/BIAS PEDESTAL DRIVE (TS/BPD) MODULE TEST POINTS



BIAS PEDESTAL GENERATOR CONTROLS



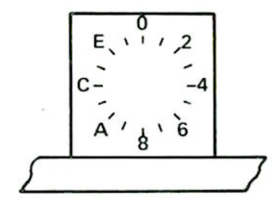
LOCATION: BEHIND ACCESS PANEL BETWEEN PA BIAS CONTROLS.

DESCRIPTION:
1st PEDESTAL - 4-POSITION WAFER SWITCH; LIMITS AMPLITUDE OF FIRST BIAS PEDESTAL.
GAIN - SCREW DRIVER ADJUST POTENTIOMETER; SETS SLOPE OF BIAS PEDESTAL GROUP.
DOUBLE RATE COMP. - SCREW DRIVER ADJUST POTENTIOMETER; USED ONLY IN DOUBLE RATE STATIONS TO SIMULATE HV POWER SUPPLY RECOVERY.

PROCEDURE:
a. SET BIAS PEDESTAL POSITION AS OUTLINED IN TS/BPD MODULE CONTROL SECTION.
b. OBSERVE TAIL OF TRANSMITTED PULSE, SELECT 1st PEDESTAL SWITCH POSITION FOR DESIRED FIRST PULSE TAIL DAMPING.
NOTE:
AFTER SWITCHING 1st PEDESTAL POSITIONS ADJUST GAIN CONTROL FOR A SLIGHT POSITIVE SLOPE IN THE PEDESTAL GROUP.
c. OBSERVE TAIL OF LAST PULSE, ADJUST GAIN CONTROL UNTIL TAIL OF LAST PULSE MATCHES THAT OF THE FIRST PULSE.
d. (1) DOUBLE RATE STATIONS: ADJUST DOUBLE RATE COMP FOR EVEN TAIL DAMPING ACROSS CROSSING RATE GROUP.
(2) SINGLE RATE STATIONS: TURN DOUBLE RATE COMP FULL ccw.

Figure A.1. Transmitter Selector/Bias Pedestal Drive Module and Bias Pedestal Generator Operating Instructions

TRIGGER SPLITTER/BIAS PEDESTAL DRIVE (TS/BPD) MODULE CONTROLS



S1, EDGE VIEW OF TS/BPD MODULE

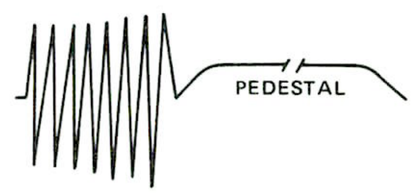
DESCRIPTION:

S1 IS A 16 POSITION, SCREW DRIVER ADJUST ROTARY SWITCH MOUNTED ON THE TS/BPD MODULE USED TO CONTROL THE POSITION OF THE BIAS PEDESTAL WITH RESPECT TO THE RF DRIVE WAVEFORM.

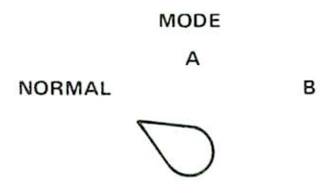
PROCEDURE:

a. OBSERVE TP4; ADJUST S1 UNTIL THE OSCILLATOR WAVEFORM IS 100 μs (± 5μs) LONG. EACH INCREMENT OF S1 WILL CHANGE THE OSCILLATOR WAVEFORM 10 μs (± 2μs).

b. OBSERVE THE RIGHT/LEFT 2nd IPA INPUT WAVEFORM, THE BIAS PEDESTAL SHOULD BEGIN AFTER THE END OF RF DRIVE WAVEFORM. IF NOT, INCREASE S1 (INCREMENT IN cw DIRECTION).



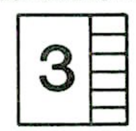
RIGHT/LEFT 2nd IPA INPUT



MODE:

A THREE POSITION WAFER SWITCH SELECTS A TRIGGER EVERY INTERVAL (NORMAL) OR EVERY OTHER INTERVAL (A or B).

PULSE SELECTION



PULSE SELECTION:

A 10-POSITION THUMBWHEEL SWITCH SELECTS THE SCOPE TRIGGER.

0 = EARLY TRIGGER

1 thru 9 = RESPECTIVE MULTIPULSE TRIGGER

TR

TEST POINT

7

6

5

4

3

2

1

8

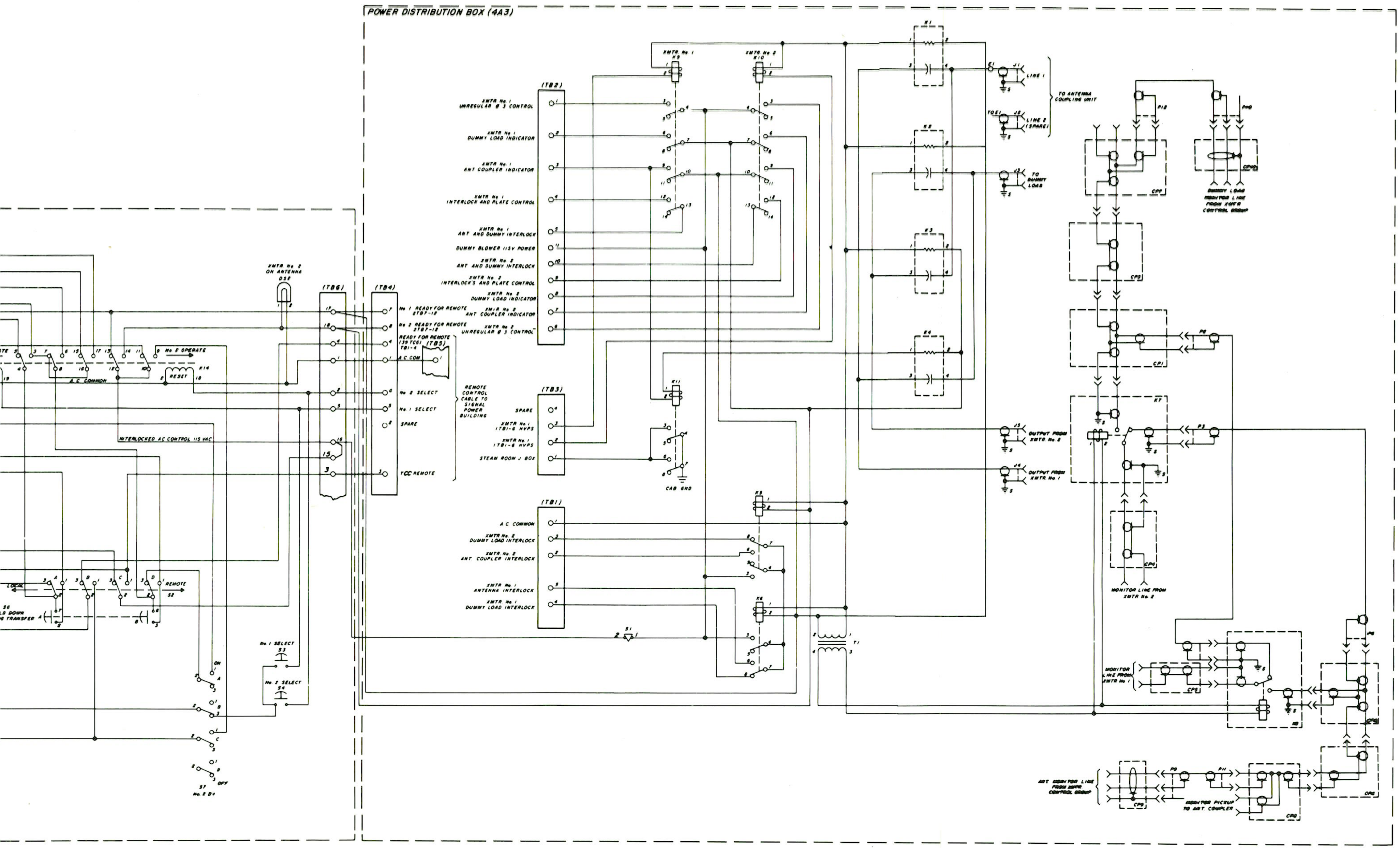
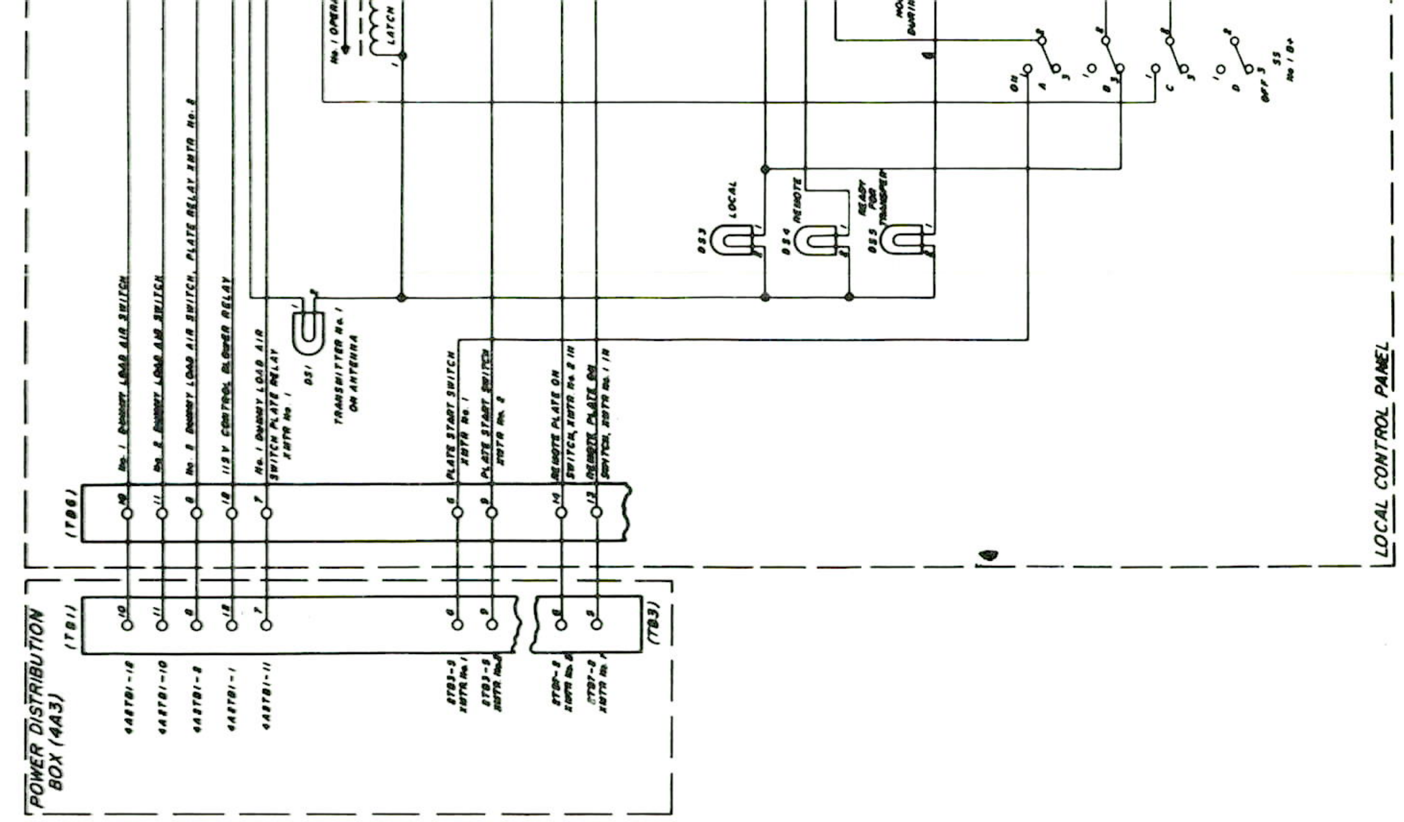
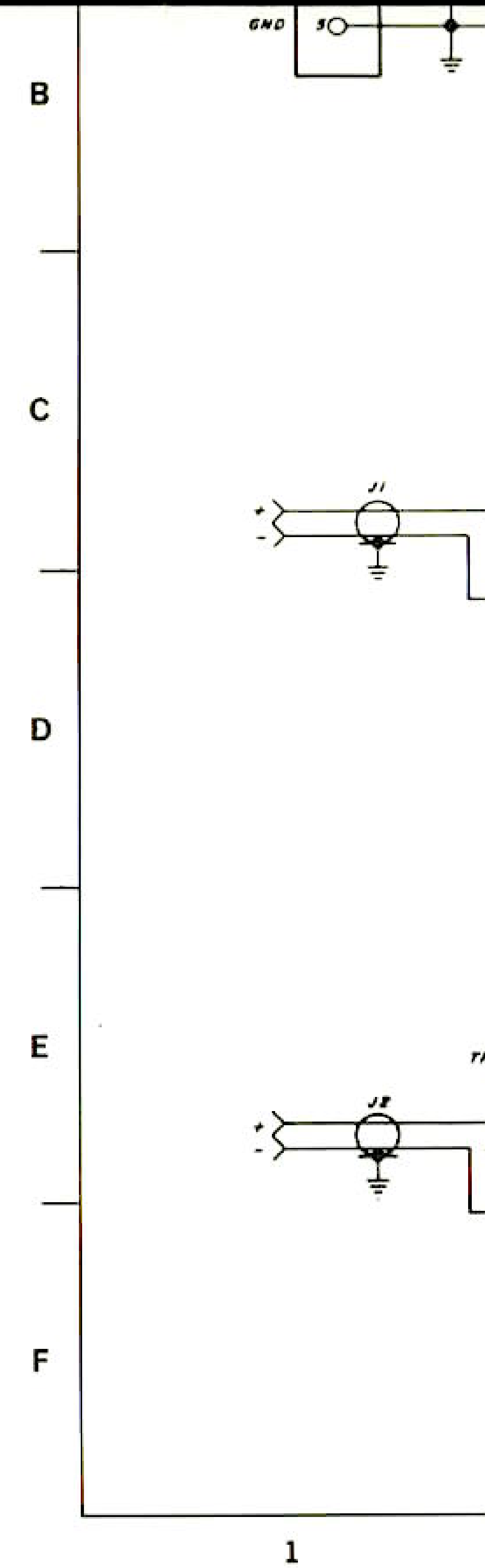


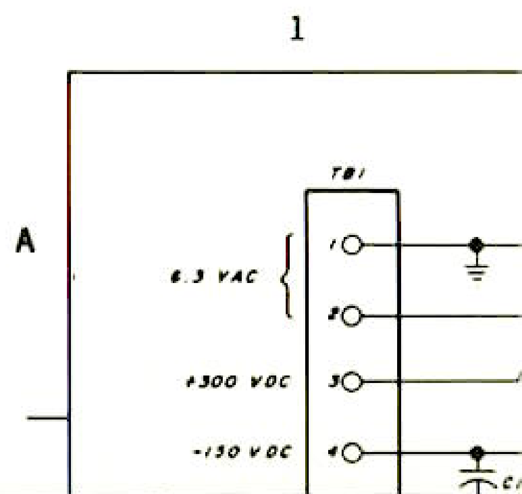
Figure A.2. Schematic Diagram Of Power Distribution Box Unit 4A3 Modified For LRE/AN/FPN-39


POWER DISTRIBUTION BOX (4A3)
(TB1)
(TB3)
(TB6)
LOCAL CONTROL PANEL
LOCAL
REMOTE
READY FOR TRANSFER
LATCH
No. 1 DUMMY LOAD AIR SWITCH
No. 2 DUMMY LOAD AIR SWITCH
115 V CONTROL BLOWER RELAY
PLATE START SWITCH
TRANSMITTER No. 1 ON ANTENNA

C8	6B
C9	6B
C10	6C
C11	2A
C12	1B
C13	4D
J1	1C
J2	1E
J3	2F
J4	7C
J5	7C
J6	7B
J7	7B
L1	2A
R1	2C
R2	2D
R3	2C
R4	2D
R5	3C
R6	3C
R7	3C
R8	3C
R9	3D
R10	4C
R11	4D
R12	4C
R13	4C
R14	4D
R15	5B
R16	5B
R17	5D
R18	5D
R19	5C
R20	5C
R21	5D
R22	5D
R23	7B
R24	7C
R25	7C
R26	7C
R27	7B
R28	7B
R29	7C
R30	7D
R31	2E
R32	2F
T1	2C
T2	2E
T3	6C
TB1	1A
V1	3C
V2	5D
V3	5C



PART LOCATION INDEX	
REF. DESIG.	LOCATION
C1	2C
C2	2D
C3	3C
C4	3D
C5	5C
C6	6B
C7	6D



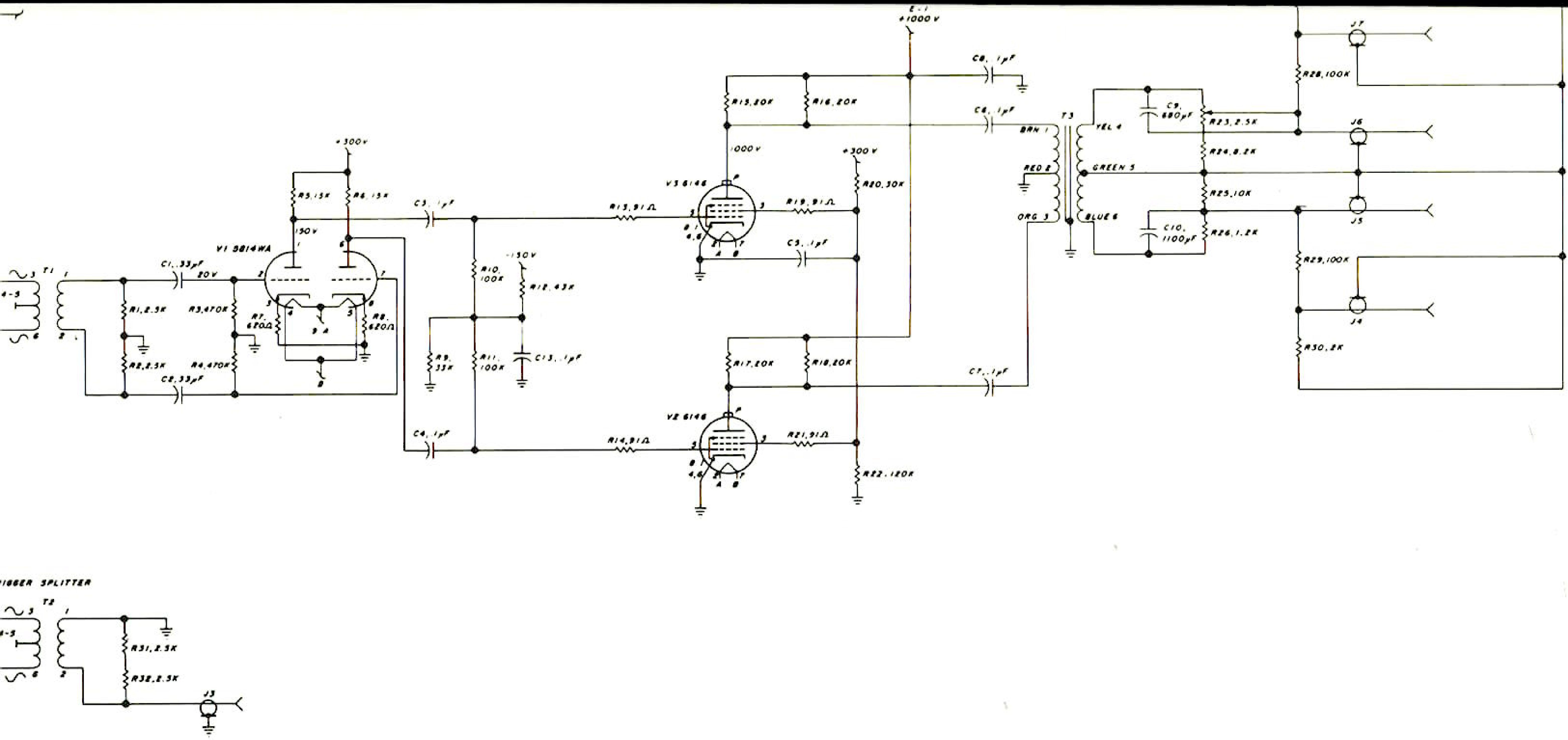
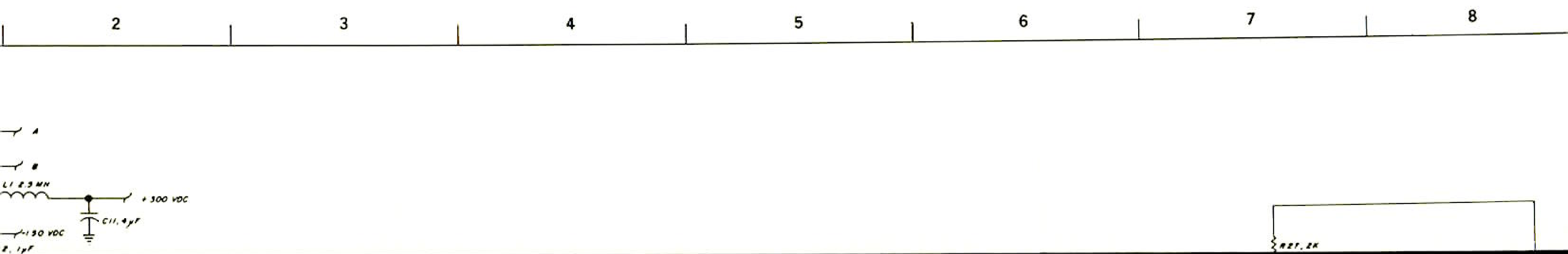
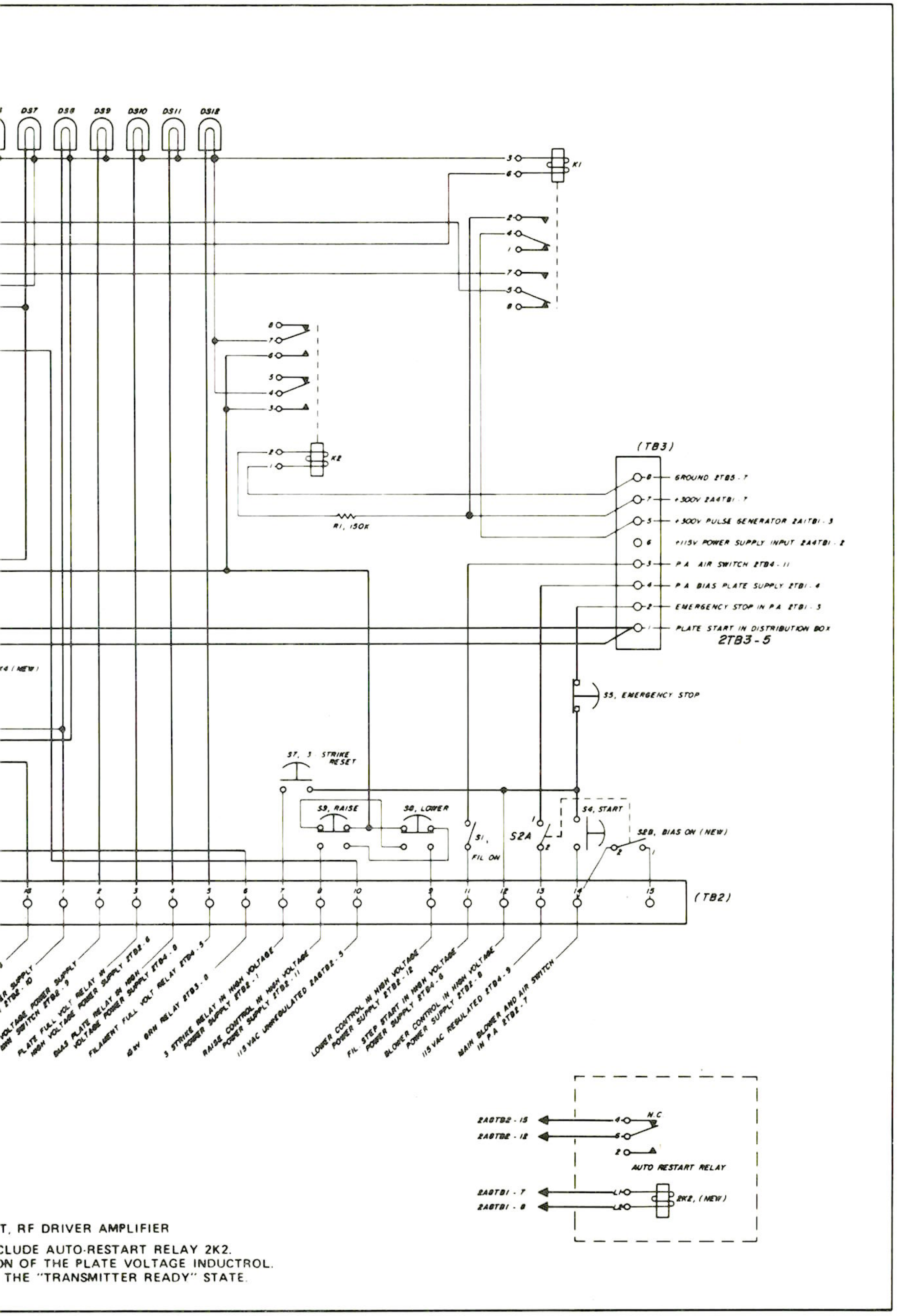


Figure A.3. AN/FPN-39 LRE RF Amplifier (New UD 2A1)

2 3 4 5 6 7 8


2
3
4
5
6
7
8
A
B
+300 VDC
+150 VDC

B
C
D
E
F



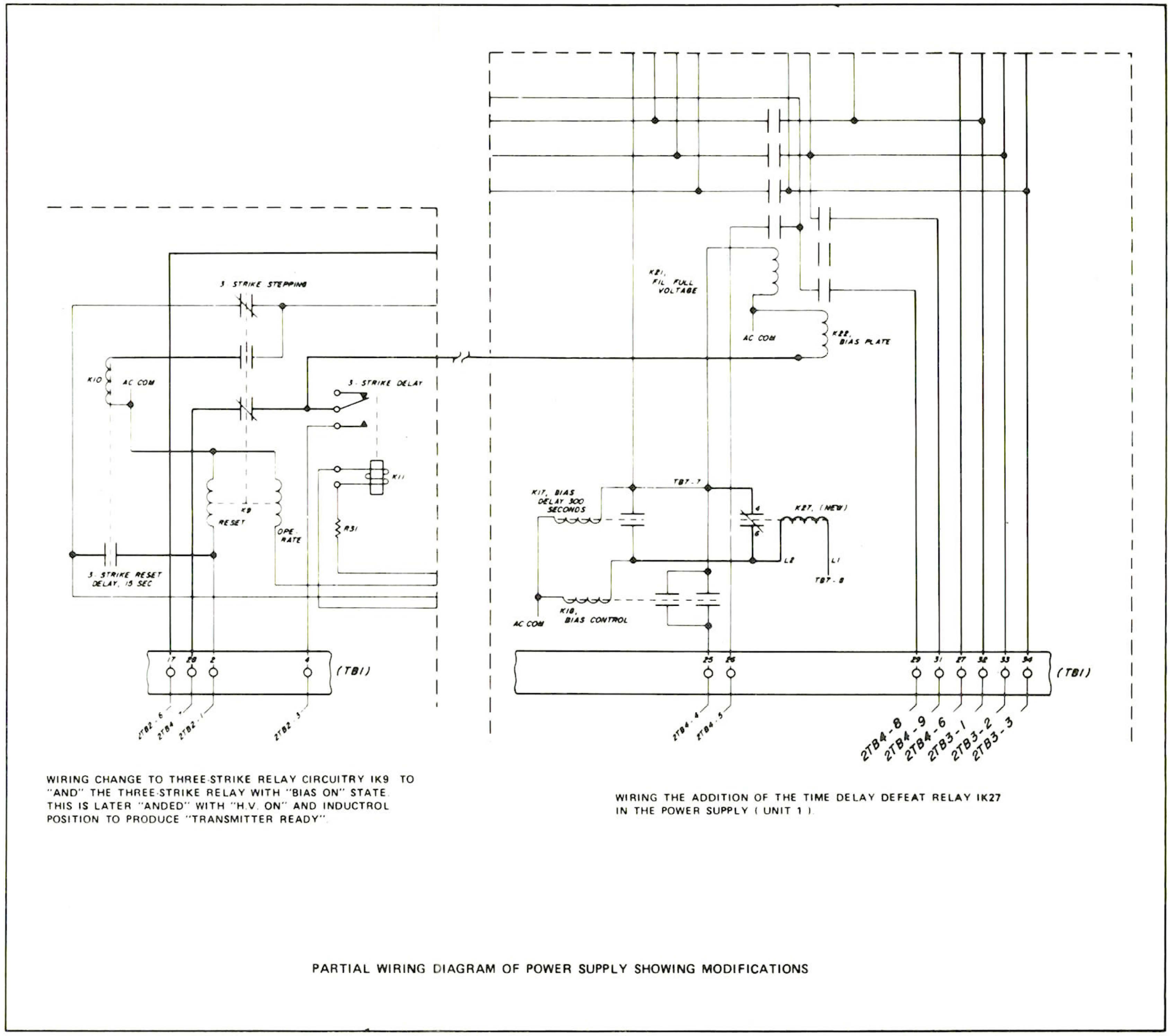
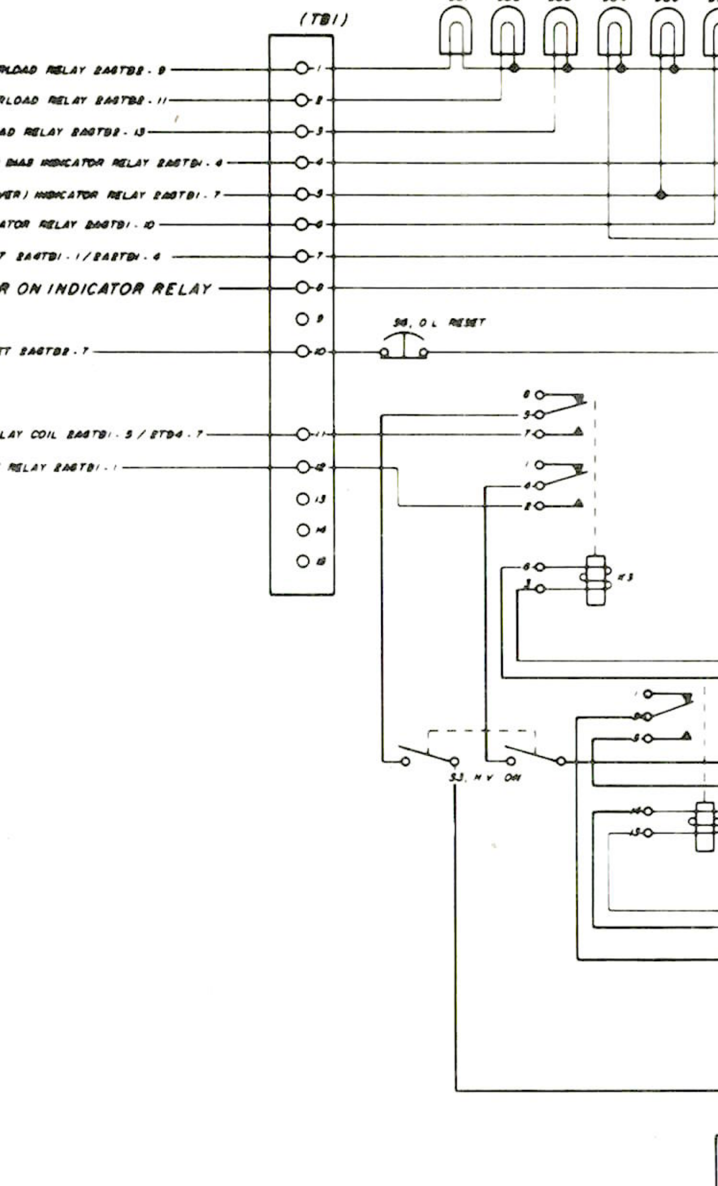


Figure A.4. Transmitter Wiring Changes For Installation Of LRE/AN/FPN-39



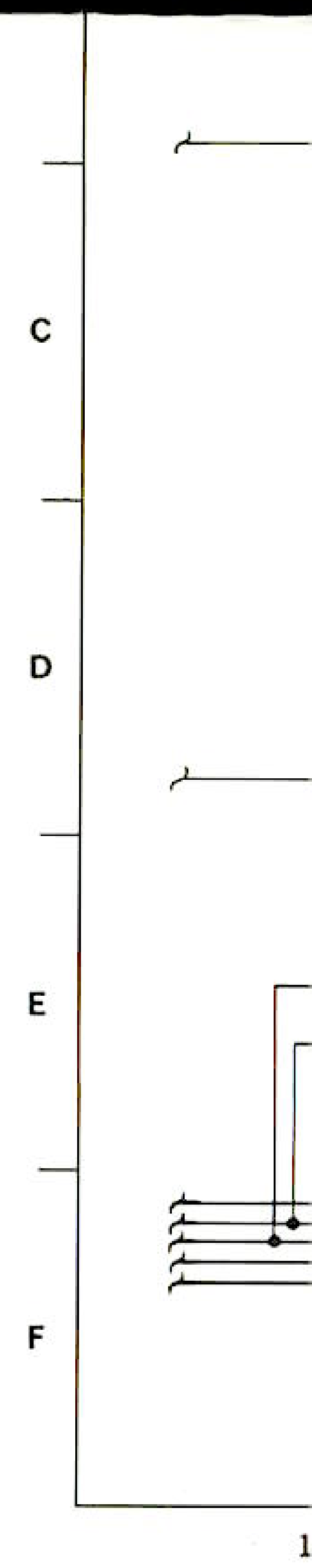
NOTES:

1. PREFIX ALL CIRCUIT SYMBOLS WITH 2A8
2. ALL HEAVY LINES ARE MODIFICATIONS

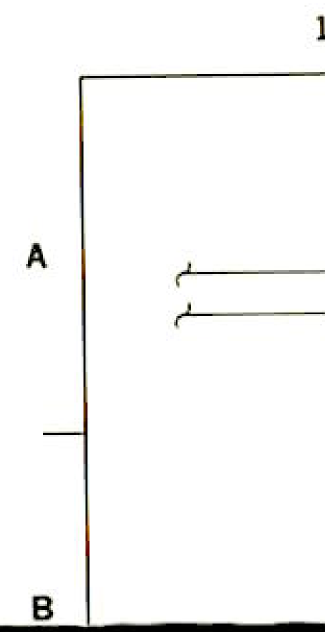
SCHEMATIC DIAGRAM OF 2A8 INDICATOR LIGH

REWIRING OF UD2A8 INDICATOR LIGHT UNIT TO INC
ADDITION OF 2A8K4 TO INDICATE A PRESET POSITIO
THE "H.V. ON" IS "ANDED" WITH 2A8K4 TO ADD TO

DS10	4C
DS11	1E
DS12	1E
DS13	4D
DS14	6C
DS15	5D
DS23	2C
F4	1E
F5	1E
K1	3E
K2	4C
K7	6D
K25	7D
K26	7D
K27	6C
K28	2C
K29	2C
K30	2C
K31	3C
K32	3C
K33	4C
K34	5D
K39	2E
K40	4E
M19	3D
R19	7D
R21	8D
R23	7D
S2	3E & 5C
S3	5B & 6E
S4	3C
S6	6E
S7	2B
S8	3C
S14	6C
S16C	5E
TB3	1A



PART LOCATION INDEX	
REF. DESIG.	LOCATION
DS4	2C
DS5	2C
DS6	3C



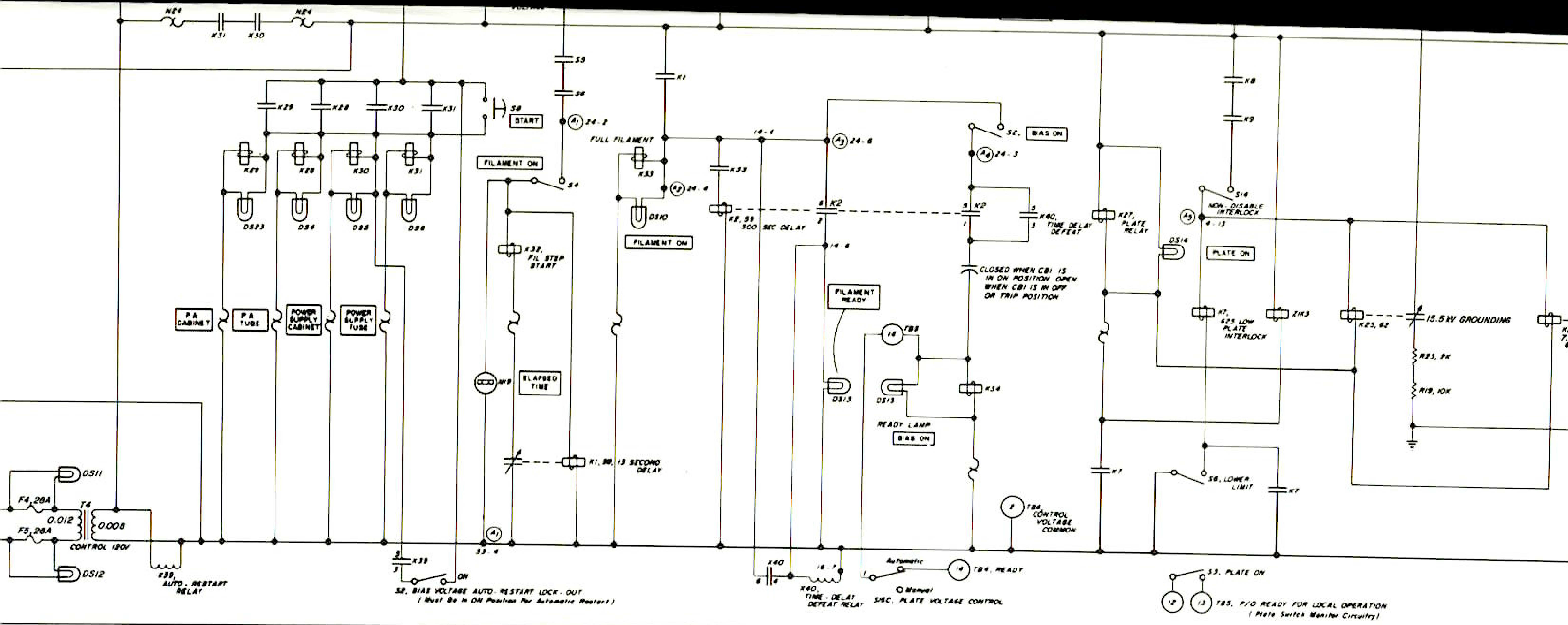
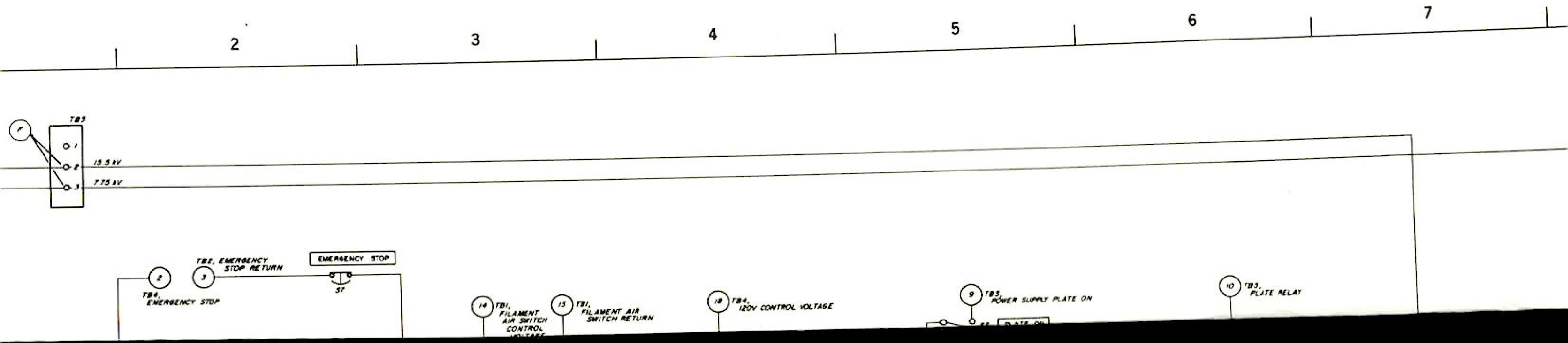
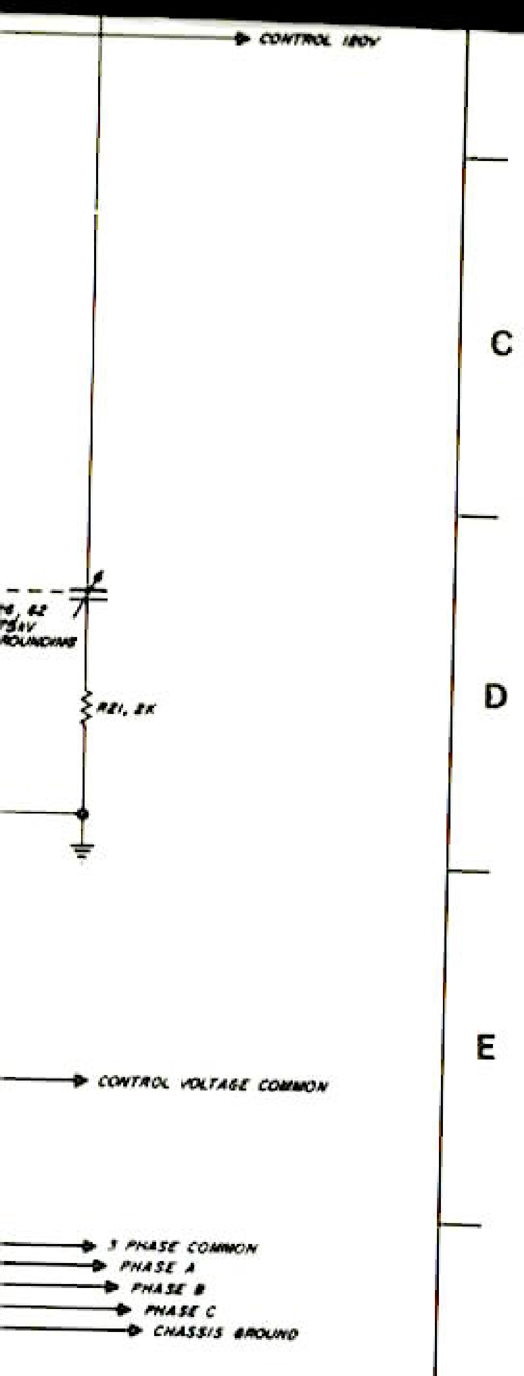


Figure A.5. PP-2540/F
Schematic
Modificati

2 3 4 5 6 7


2
3
4
5
6
7
TB3
13.5 kV
7.75 kV
TB2, EMERGENCY STOP RETURN
EMERGENCY STOP
S7
TB4, EMERGENCY STOP
TB1, FILAMENT AIR SWITCH CONTROL
TB1, FILAMENT AIR SWITCH RETURN
TB4, 120V CONTROL VOLTAGE
TB3, POWER SUPPLY PLATE ON
TB3, PLATE RELAY



FPN-42 Control Circuit
Diagram (Partial Wiring Of LRE
ons)

A.11/A.12

8

8

A

B

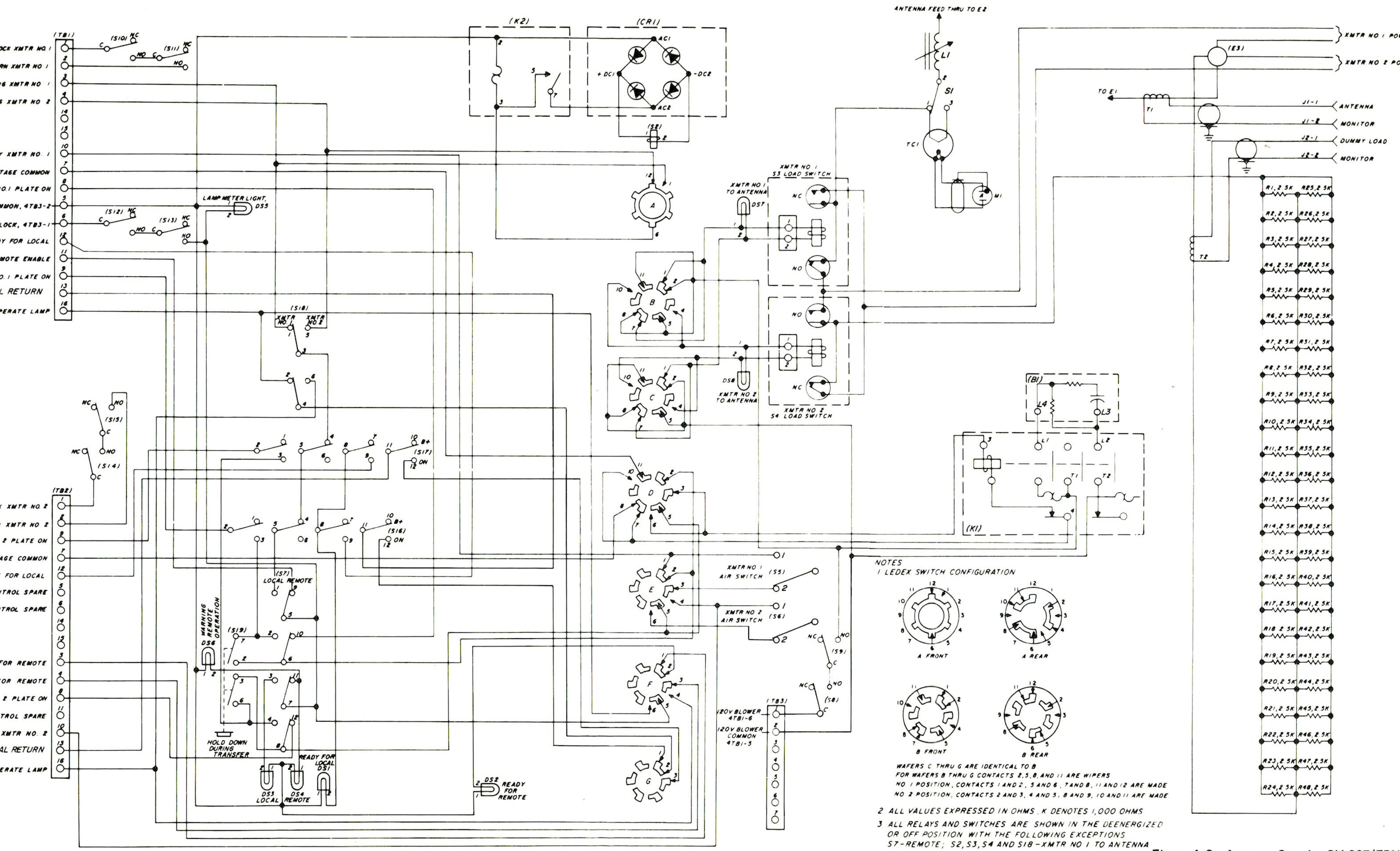
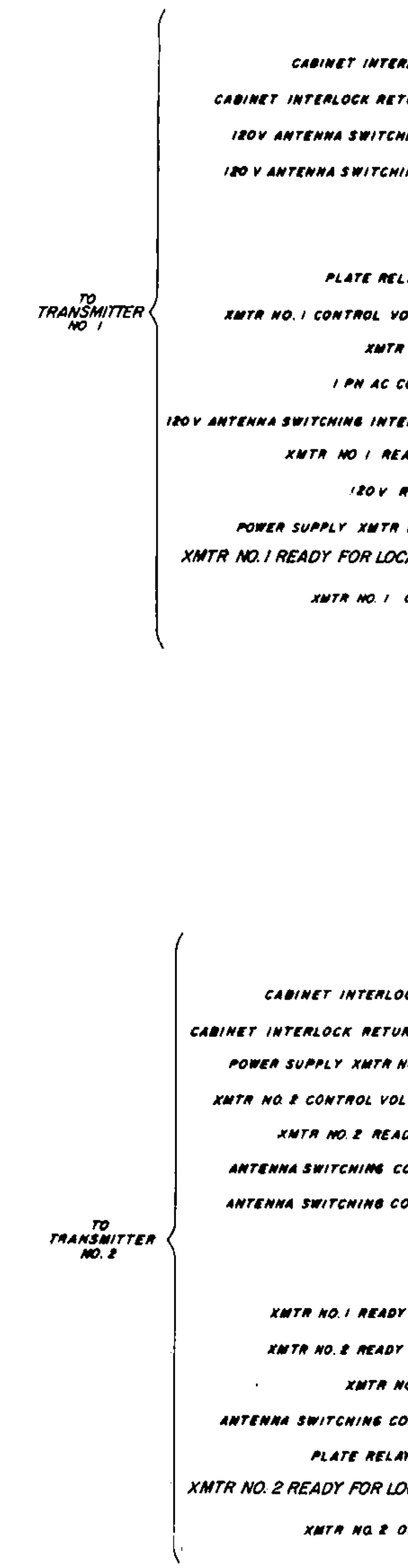
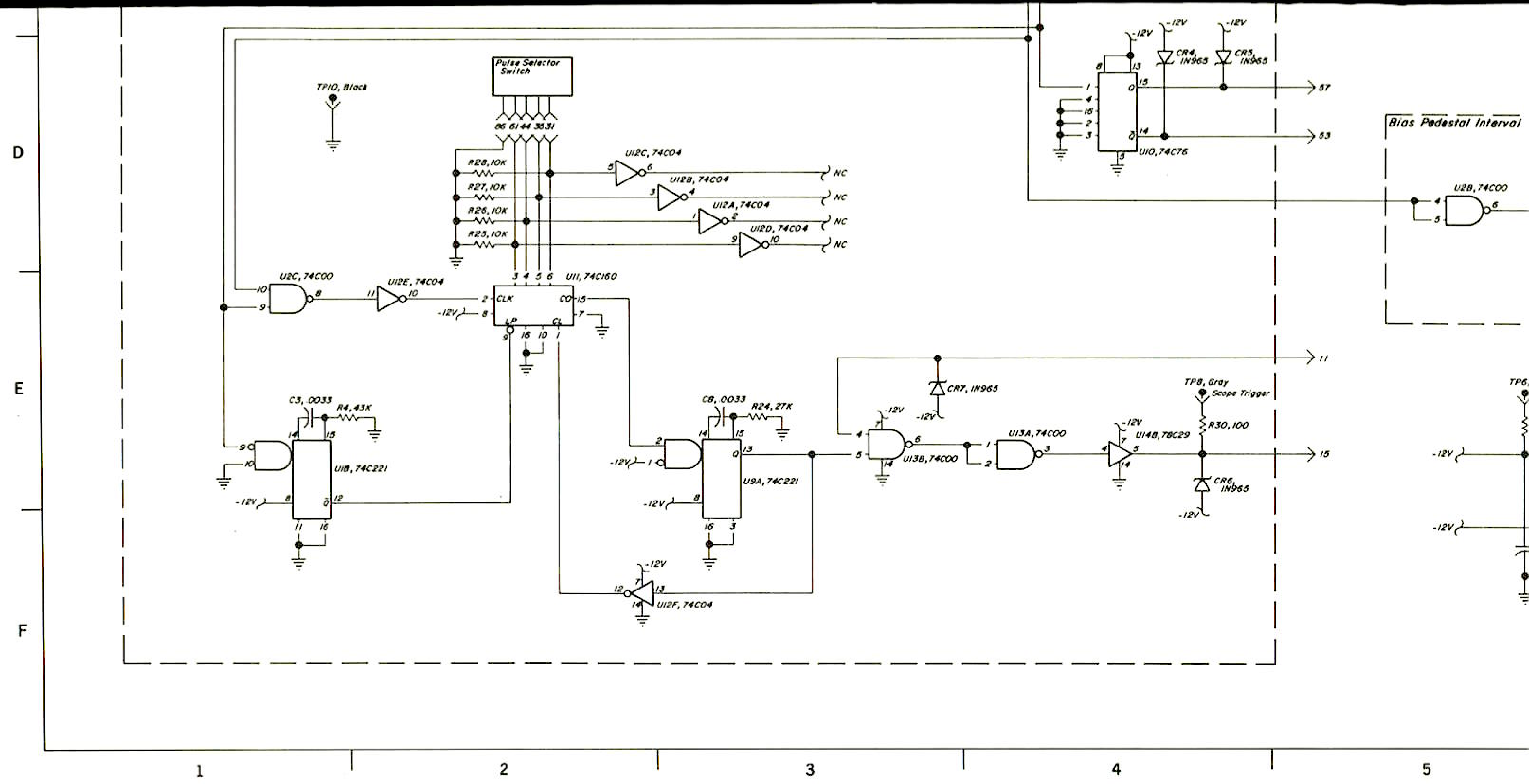


Figure A.6. Antenna Coupler CU-807/FPN-42 Wiring Diagram

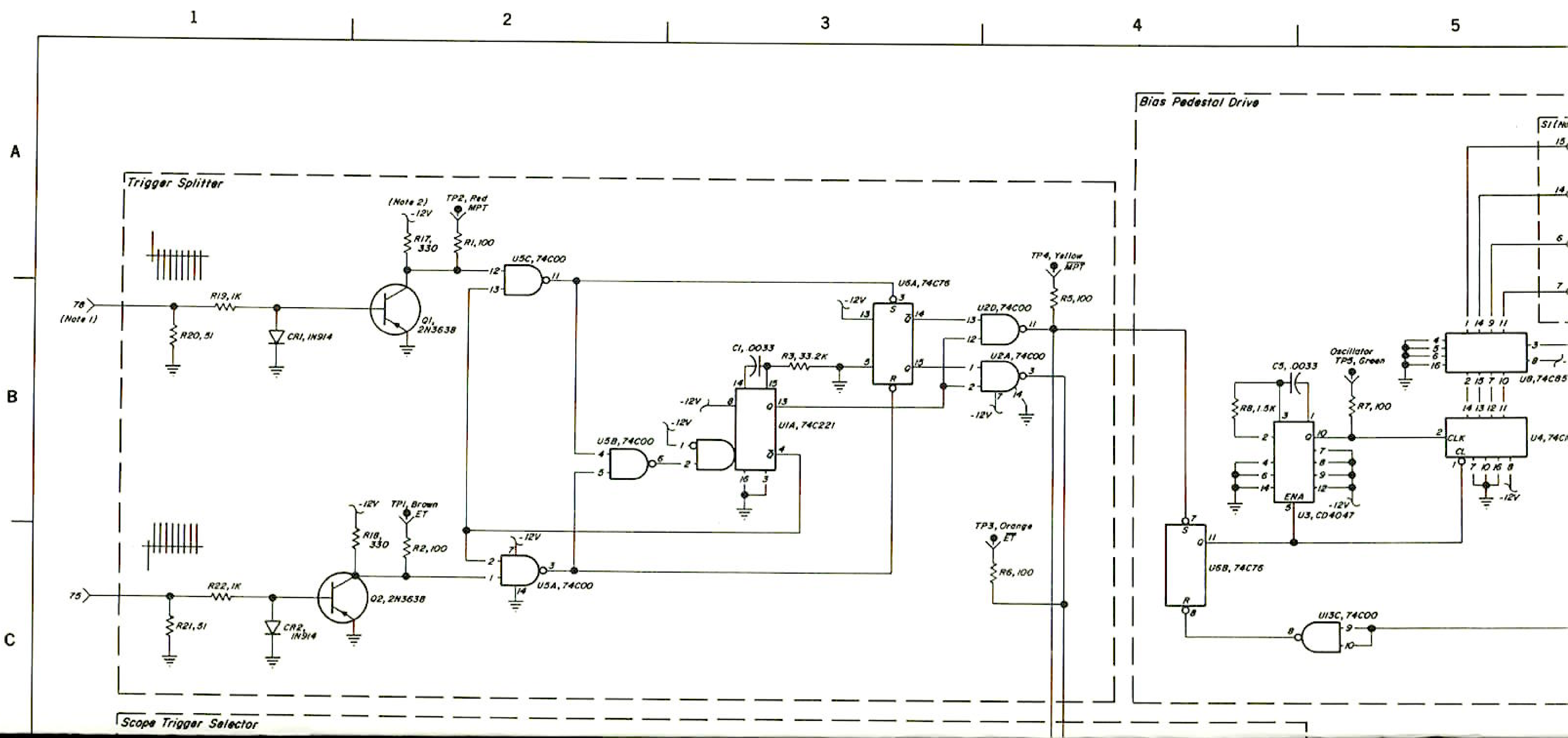

TO TRANSMITTER NO 1
TO TRANSMITTER NO. 2
PLATE RELAY

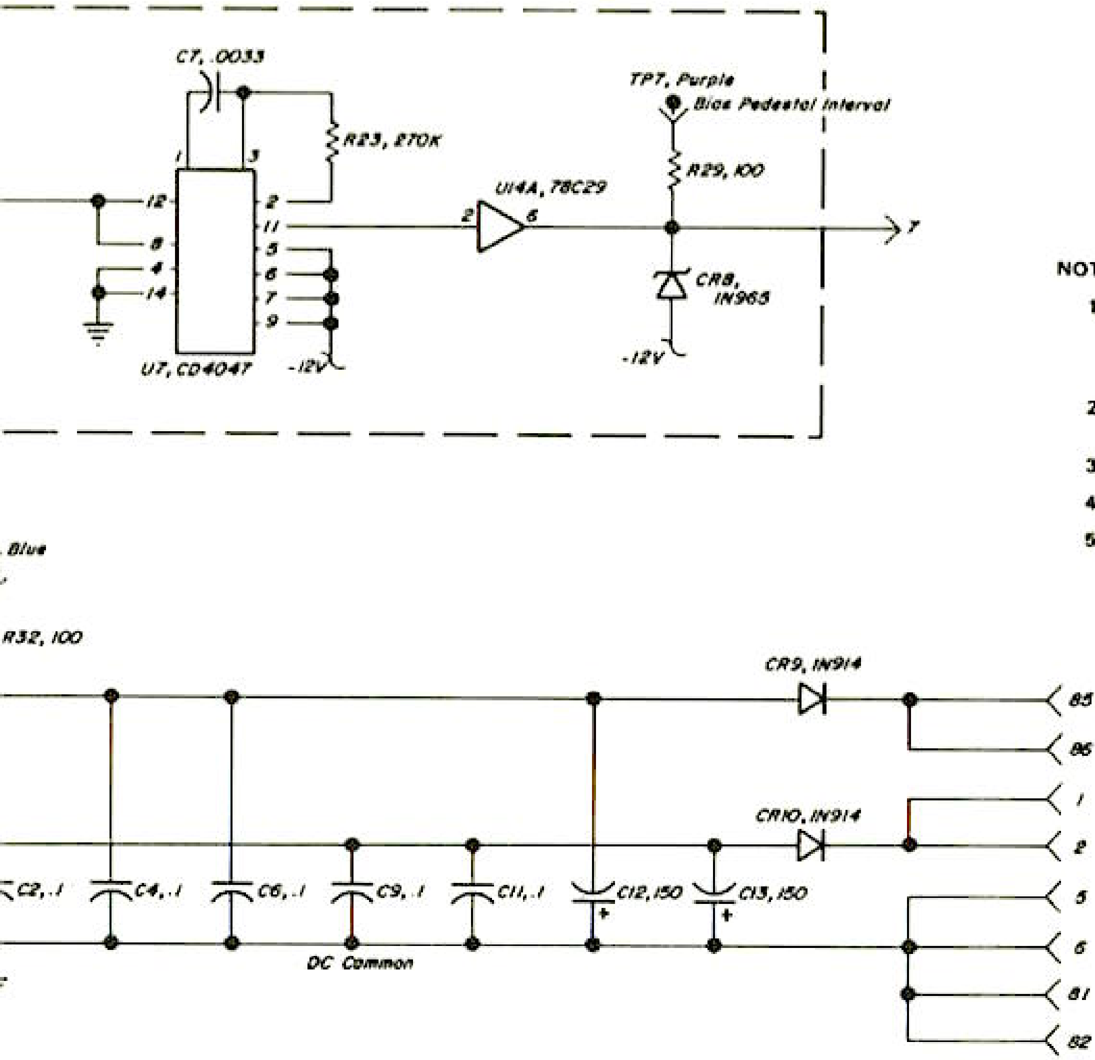
CR8	6D	TP1	2B
CR9	7E	TP2	2A
CR10	7F	TP3	4C
		TP4	4A
Q1	2B	TP5	5B
Q2	2C	TP6	5E
Q3	7B	TP7	6D
		TP8	4E
R1	2A	TP9	7B
R2	2C	TP10	1D
R3	3B		
R4	1E	U1	1E,3B
R5	4A	U2	4B,5D
R6	4C	U3	5B
R7	5B	U4	5B
R8	4B	U5	2A,2B,2C
R9	6A	U6	3B,4C
R10	6A	U7	6D
R11	6A	U8	5B
R12	6A	U9	3E,6B
R13	6B	U10	4D
R14	6B	U11	2E
R15	6C	U12	2D,2E,2F,3D
R16	6C	U13	3E,4E,5B,5C
R17	2A	U14	4E,6B,6D

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	3B	R18	2C
C2	5F	R19	1B
C3	1E	R20	1B
C4	6F	R21	1C
C5	4B	R22	1C
C6	6F	R23	6D
C7	6D	R24	3E
C8	3E	R25	2D
C9	6F	R26	2D
C10	NOT USED	R27	2D
C11	6F	R28	2D
C12	6F	R29	6D
C13	6F	R30	4E
		R31	7B
CR1	1B	R32	5E
CR2	1C	R33	7B
CR3	4D	R34	7B
CR4	4D		
CR5	7B	S1	5A
CR6	4E	S2	6B
CR7	3E		



D
E
F
1
2
3
4
5
Pulse Selector Switch
TP10, Black
86 61 44 35 31
R28, 10K
R27, 10K
R26, 10K
R25, 10K
U12C, 74C04
U12B, 74C04
U12A, 74C04
U12D, 74C04
NC
U2C, 74C00
U12E, 74C04
U11, 74C160
CLK
LP
CL
CO
-12V
C3, .0033
R4, 43K
U1B, 74C221
C8, .0033
R24, 27K
U9A, 74C221
U12F, 74C04
CR7, 1N965
U13B, 74C00
U13A, 74C00
U14B, 78C29
TP8, Gray
Scope Trigger
R30, 100
CR6, 1N965
CR4, 1N965
CR5, 1N965
U10, 74C76
Bias Pedestal Interval
U2B, 74C00
57
53
11
15
TP6


Trigger Splitter
Scope Trigger Selector
Bias Pedestal Drive
78
(Note 1)
75
(Note 2)
-12V
TP2, Red
MPT
TP1, Brown
ET
TP3, Orange
ET
TP4, Yellow
MPT
Oscillator
TP5, Green
R19, 1K
R20, 51
CR1, 1N914
R17, 330
R1, 100
Q1, 2N3638
R22, 1K
R21, 51
CR2, 1N914
R18, 330
R2, 100
Q2, 2N3638
U5C, 74C00
U5A, 74C00
U5B, 74C00
C1, .0033
R3, 33.2K
U1A, 74C221
U6A, 74C76
U2D, 74C00
U2A, 74C00
R5, 100
R6, 100
C5, .0033
R8, 1.5K
R7, 100
U3, CD4047
ENA
CLK
CL
U6B, 74C76
U13C, 74C00
U8, 74C85
A
B
C
1
2
3
4
5

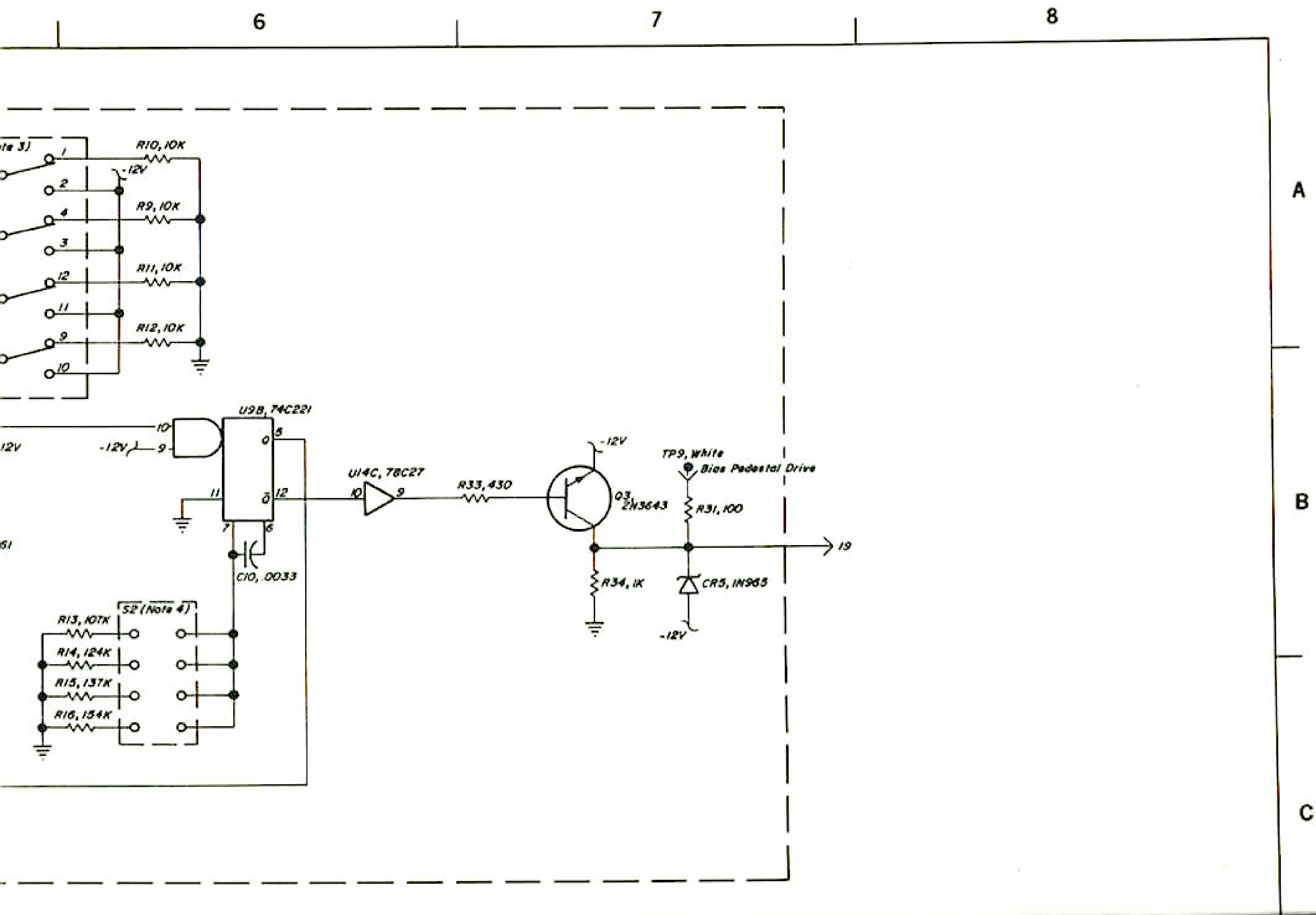


NOTES:

1. THE SIGNALS ON PINS 75 and 78 ARE RECEIVED FROM A DIFFERENTIALLY DRIVEN LINE. ON 75 THE EARLY TRIGGER IS NEGATIVE and THE MPTS ARE POSITIVE. ON 78 THE EARLY TRIGGER IS POSITIVE and THE MPTS ARE NEGATIVE.
2. Vcc CONNECTIONS ON ALL INTEGRATED CIRCUITS ARE CONNECTED TO 0 VDC. GROUND CONNECTIONS ARE CONNECTED TO −12 VDC.
3. PRESETS BIAS PEDESTAL DELAY.
4. SETS BIAS PEDESTAL WIDTH: 350, 400, 450, 500 μs.
5. UNLESS OTHERWISE SPECIFIED, ALL CAPACITANCE VALUES ARE IN μF, and ALL RESISTANCE VALUES IN OHMS, K = 1000, M = 10^6.

Figure A.7. W672S-18/TS/BPD Module Schematic

D E F 6 7 8



6
7
8
A
B
C
(Note 3)
R10, 10K
-12V
R9, 10K
R11, 10K
R12, 10K
U9B, 74C221
-12V
U14C, 78C27
R33, 430
-12V
TP9, White
Bias Pedestal Drive
Q3
2N3643
R31, 100
19
C10, .0033
R34, 1K
CR5, 1N965
-12V
S2 (Note 4)
R13, 107K
R14, 124K
R15, 137K
R16, 154K

OCATION
2D
2D
2E
2E
2E
2E
5C
6C
5E
5E
5E
5E
6E
7E
7E
4B
6C
6C
5B
6B
2A
2A
3A
3A
3A
4A
6A
6A
6A
2A
2B
2B
3B
5B
2C
2C
4C
5C
6C
3D
4D
5D
5D
6D

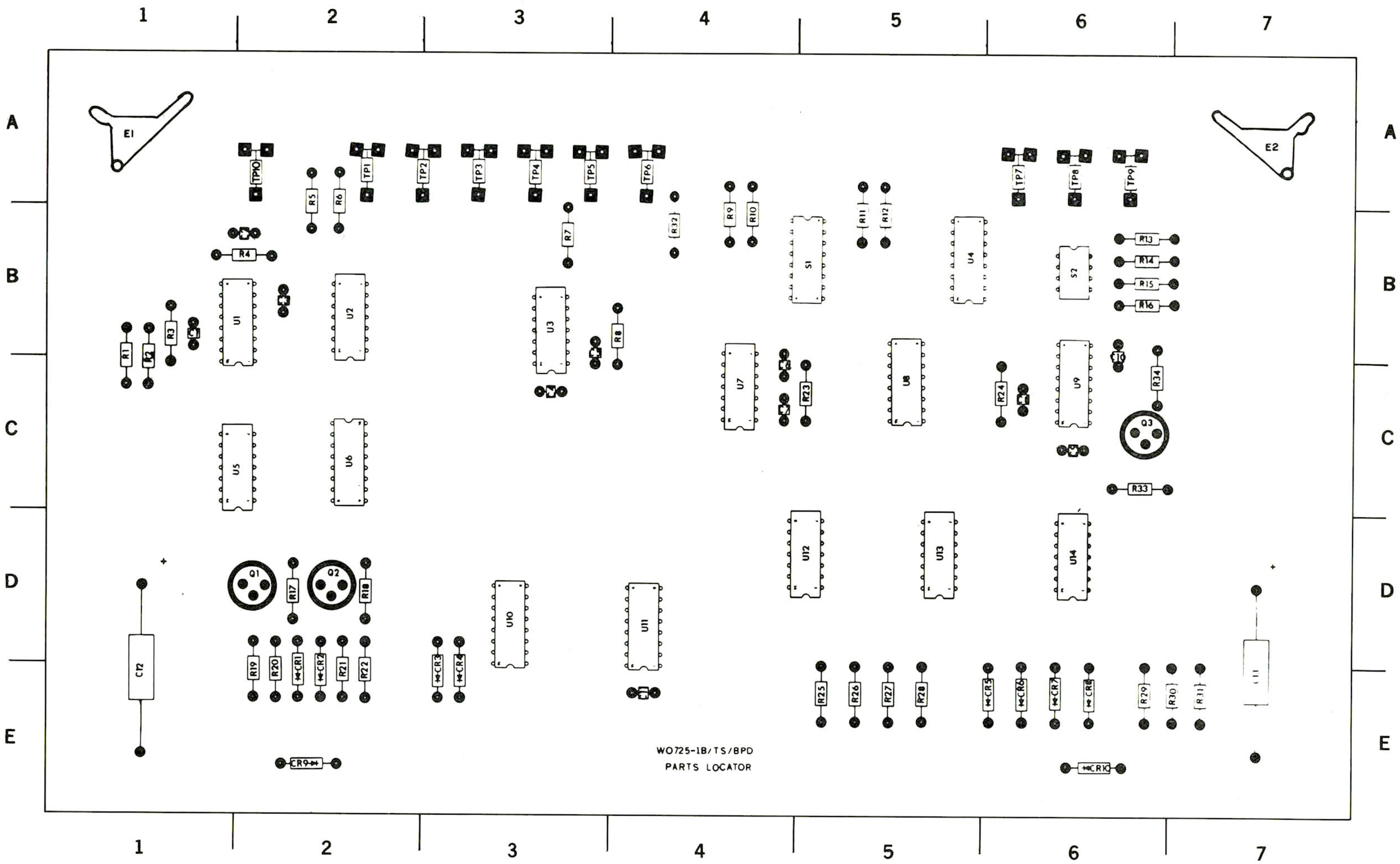
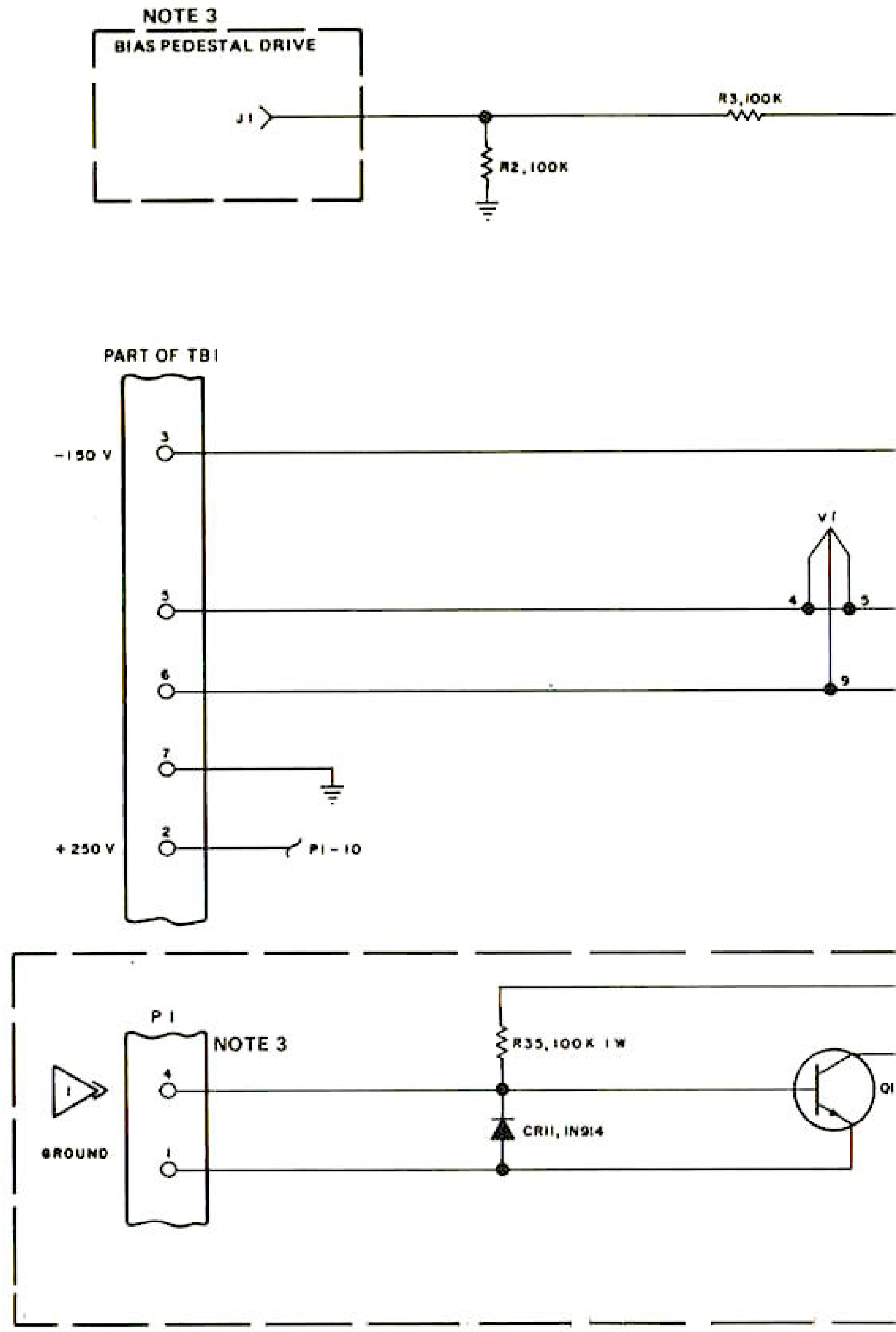
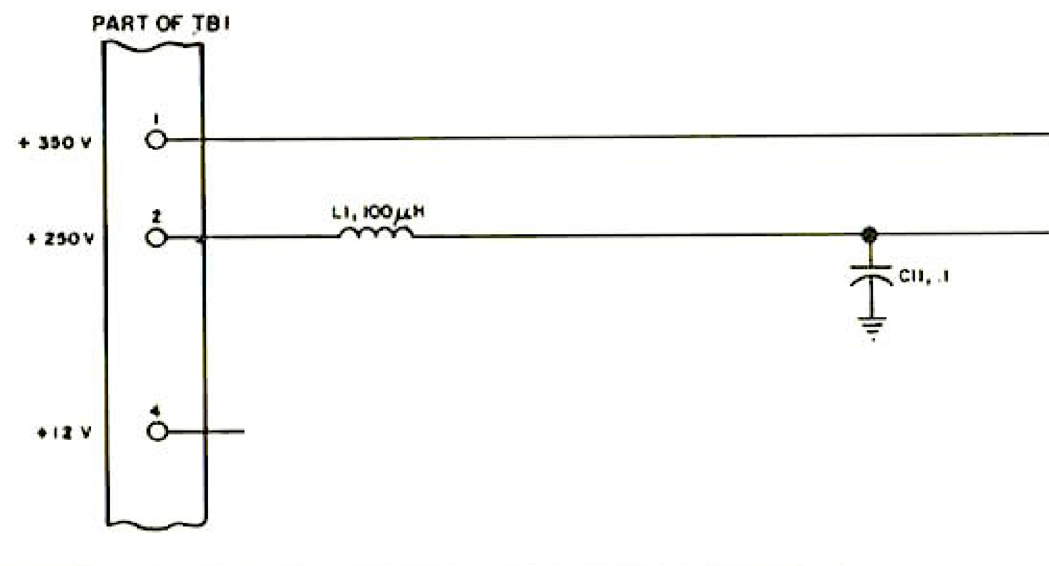


Figure A.8. W0725-1B/TS/BPD Module
Parts Locator

PART LOCATION INDEX			
REF. DESIG.	LOCATION	REF. DESIG.	LOCATION
C1	1B	R17	
C2	2B	R18	
C3	2B	R19	
C4	3C	R20	
C5	3B	R21	
C6	4C	R22	
C7	4C	R23	
C8	6C	R24	
C9	6C	R25	
C10	6B	R26	
C11	4E	R27	
C12	1E	R28	
C13	7E	R29	
		R30	
CR1	2E	R31	
CR2	2E	R32	
CR3	3E	R33	
CR4	3E	R34	
CR5	6E		
CR6	6E	S1	
CR7	6E	S2	
CR8	6E		
CR9	2E	TP1	
CR10	6E	TP2	
		TP3	
E1	1A	TP4	
E2	7A	TP5	
		TP6	
Q1	2D	TP7	
Q2	2D	TP8	
Q3	6C	TP9	
		TP10	
R1	1B		
R2	1B	U1	
R3	1B	U2	
R4	2B	U3	
R5	2A	U4	
R6	2A	U5	
R7	3B	U6	
R8	4B	U7	
R9	4B	U8	
R10	4B	U9	
R11	5B	U10	
R12	5B	U11	
R13	6B	U12	
R14	6B	U13	
R15	6B	U14	
R16	6B		


NOTE 3
BIAS PEDESTAL DRIVE
J1
R2, 100K
R3, 100K
PART OF TB1
-150 V
+250 V
P1-10
V1
P1
NOTE 3
GROUND
R35, 100K 1W
CR11, IN914
Q1


PART OF TB1
+ 350 V
+ 250 V
+ 12 V
1
2
4
L1, 100 µH
C11, .1

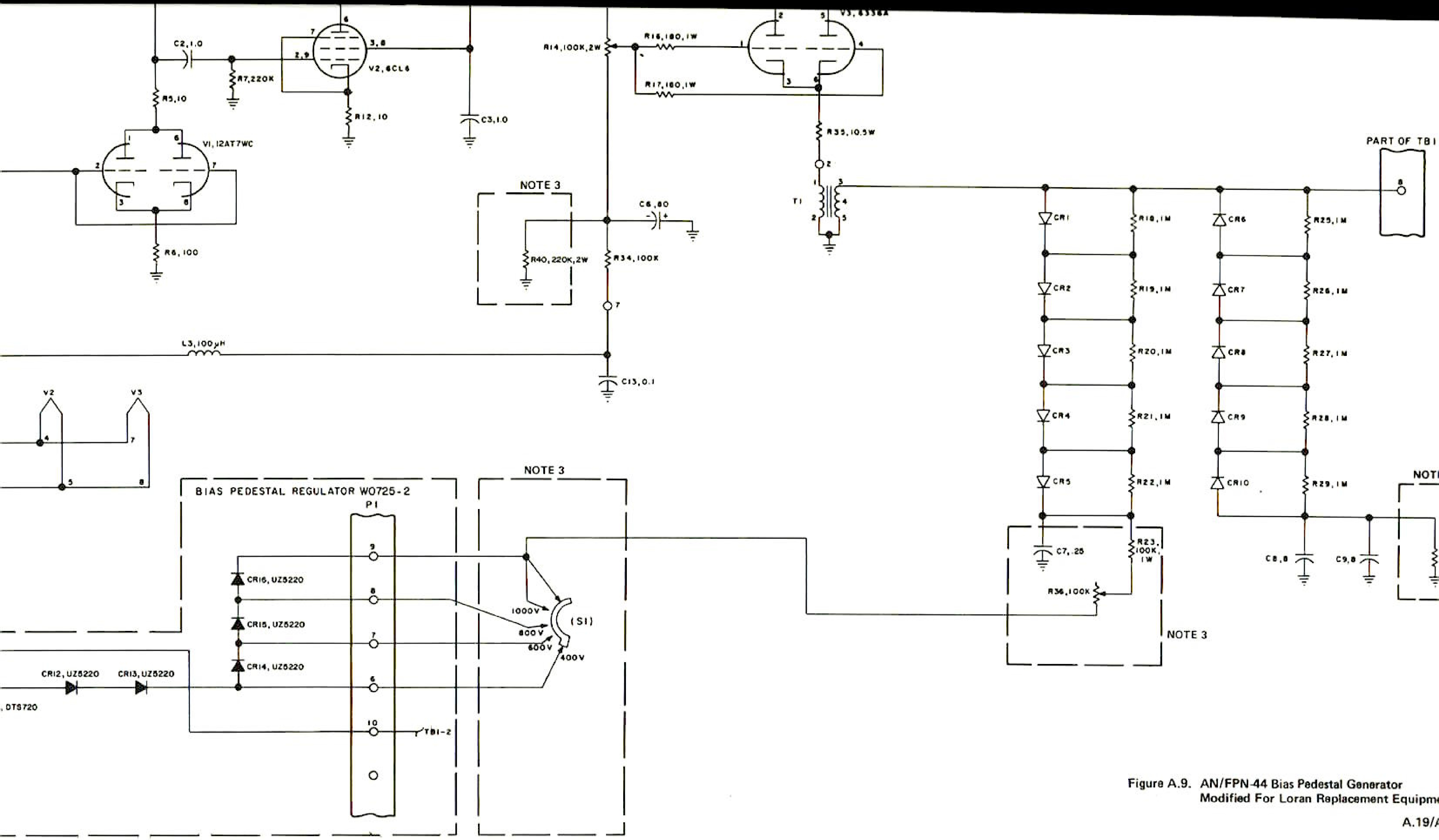
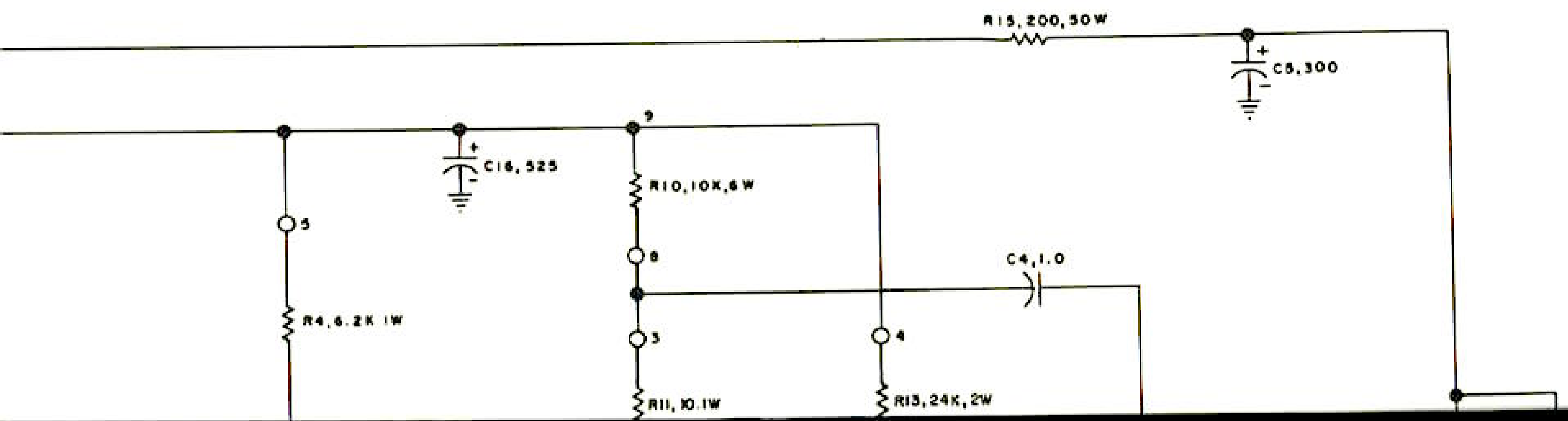


Figure A.9. AN/FPN-44 Bias Pedestal Generator Modified For Loran Replacement Equipm

A.19/



NOTES:

1. BIAS PEDESTAL SWITCH INTERNAL FROM TS/BPD BOARD.
2. P1 IS CINCH CONNECTOR 50-10A-20.
3. CIRCUIT SYMBOL ENCLOSED IN DASHED LINES ARE CHANGES TO THE ORIGINAL BIAS PEDESTAL GENERATOR.
4. PREFIX REFERENCE DESIGNATORS BY 1A4A5.
5. ALL RESISTORS VALUES IN OHMS (K DENOTES 1000).
6. ALL CAPACITORS VALUES IN μF.
7. DRAWING NO LONGER APPLIES AFTER FEEDBACK MODIFICATION.

E 3

ent

A.20

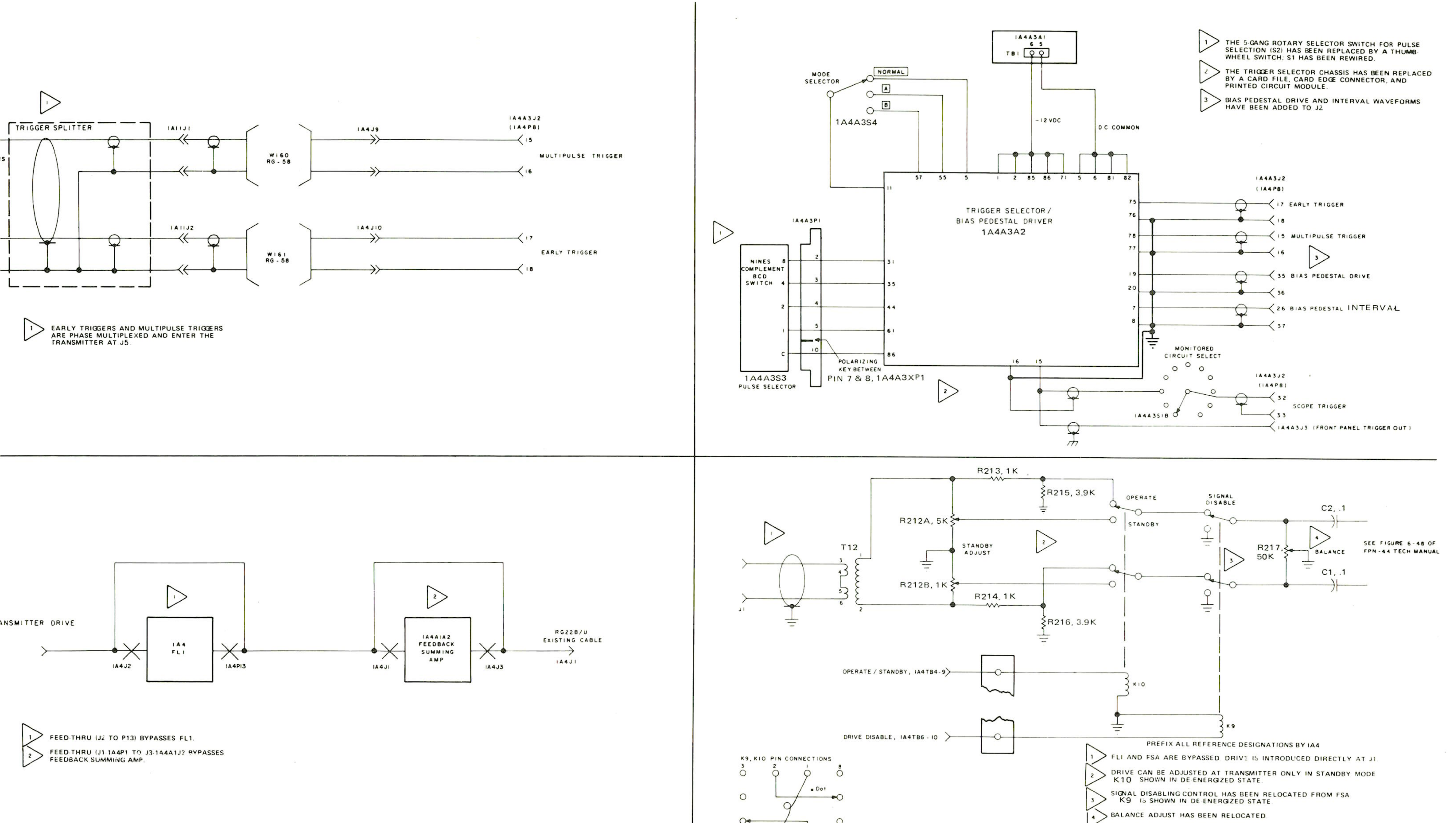
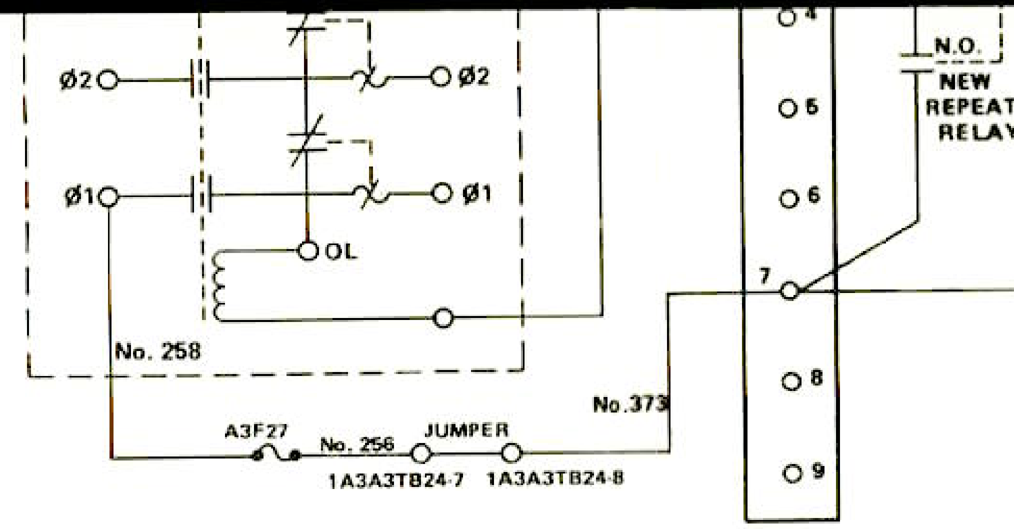
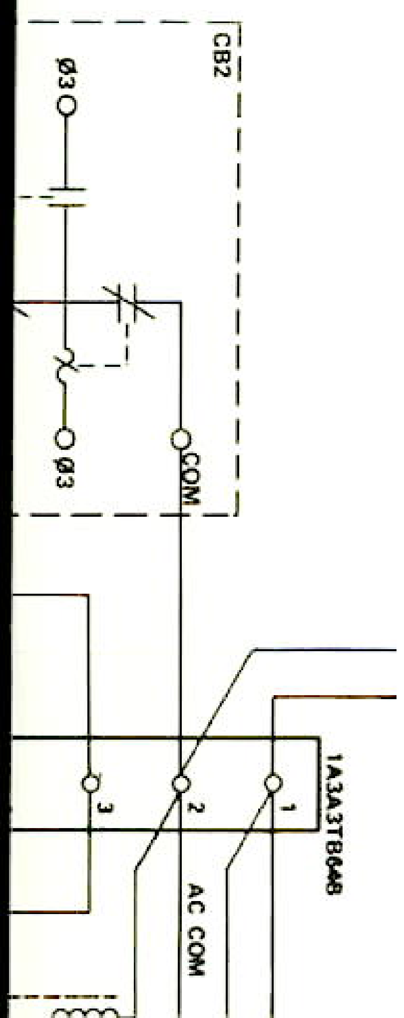


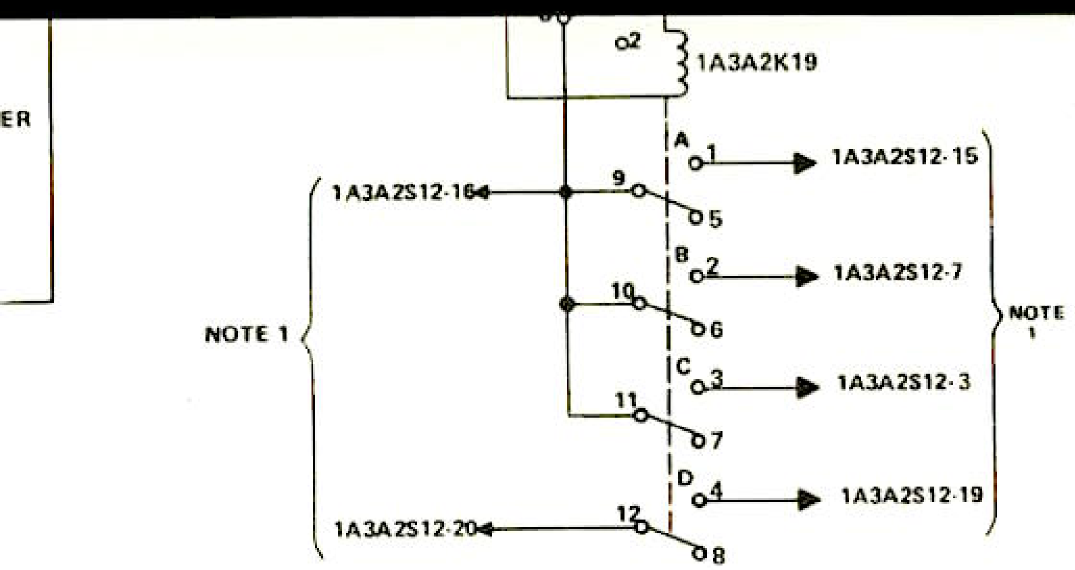
Figure A.10. AN/FPN-44 Transmitter Drive and Trigger Circuit Modifications To Accommodate Loran Replacement Equipment


1A11J5
EARLY TRIGGER/
MULTIPULSE TRIGGER
1A11
TRA



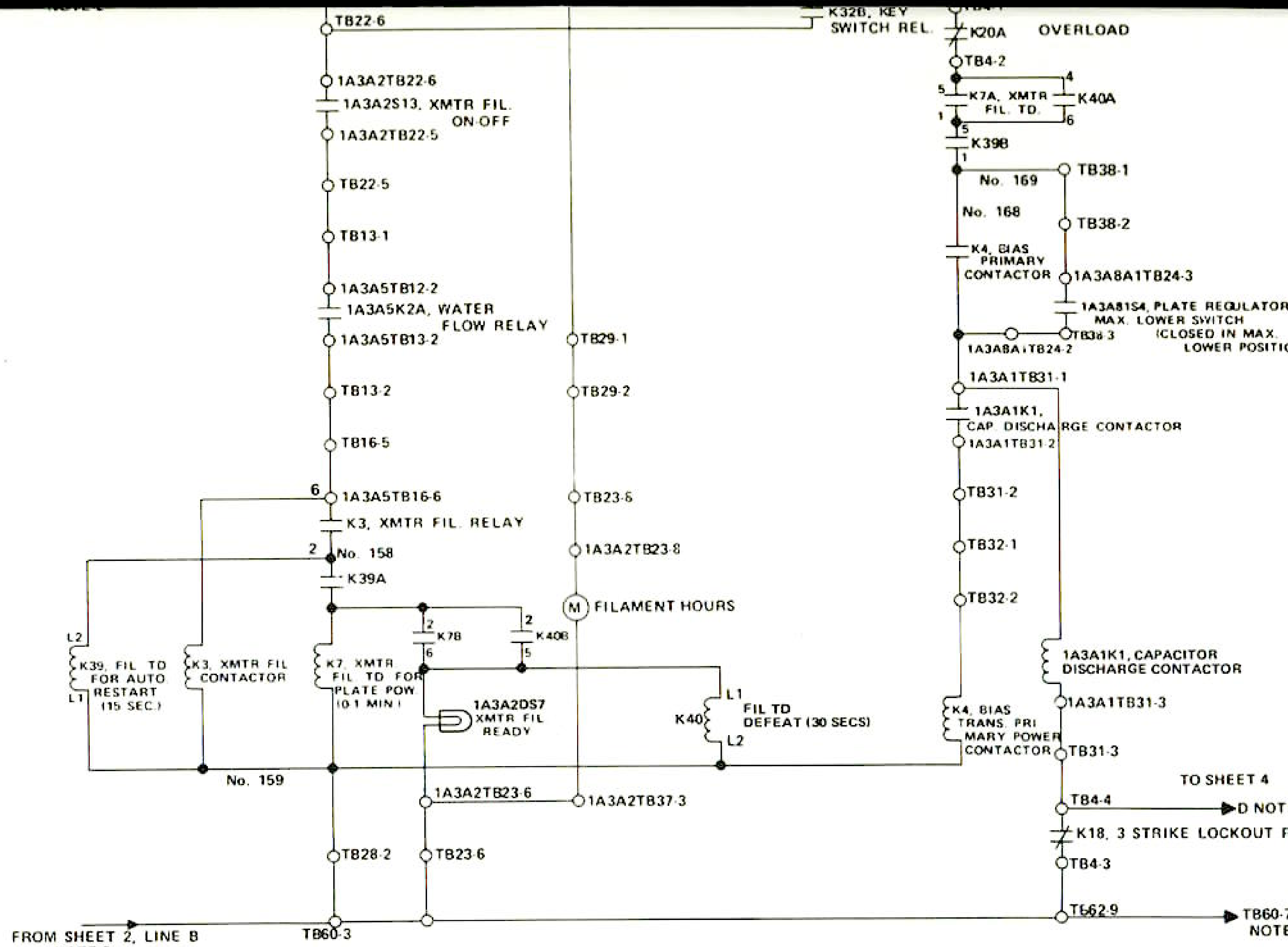
ADDITIONAL WIRIN
FOR "PLATE VOLTS"
"TRANSMIT


CB2
Ø3
Ø3
COM
1A3A3TB6A8
1
2
3
AC COM



NOTE 1: SEE FIGURE 5.1 SHEET 2 OF AN/FPN-44/45 TECHNICAL MANUAL.

G OF CONTROL PANEL (1A3)
and "PLATE ON" TO ESTABLISH
TER READY" STATE

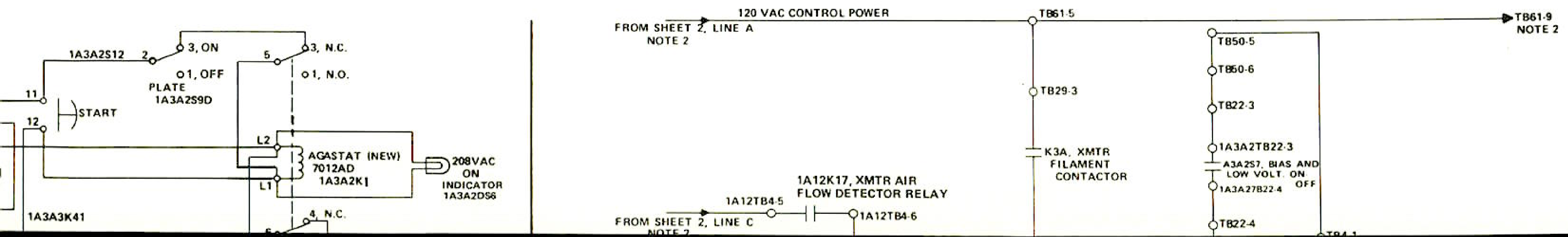


AN/FPN-44/45 PRIOR TO INSTALLATION OF HVPS (1A53)

NOTES:

1. SOME REFERENCE DESIGNATIONS ARE ABBREVIATED. PREFIX REFERENCE DESIGNATIONS WITH 1A3A3 WHERE APPLICABLE.
2. SEE FIGURE 5-1 SHEET 3 OF 10 FOR L.P. or 5-1 SHEET 8 OF 10 FOR H.P.

Figure A.11. LRE Time Delay Defeat Circuitry (K39 and K4

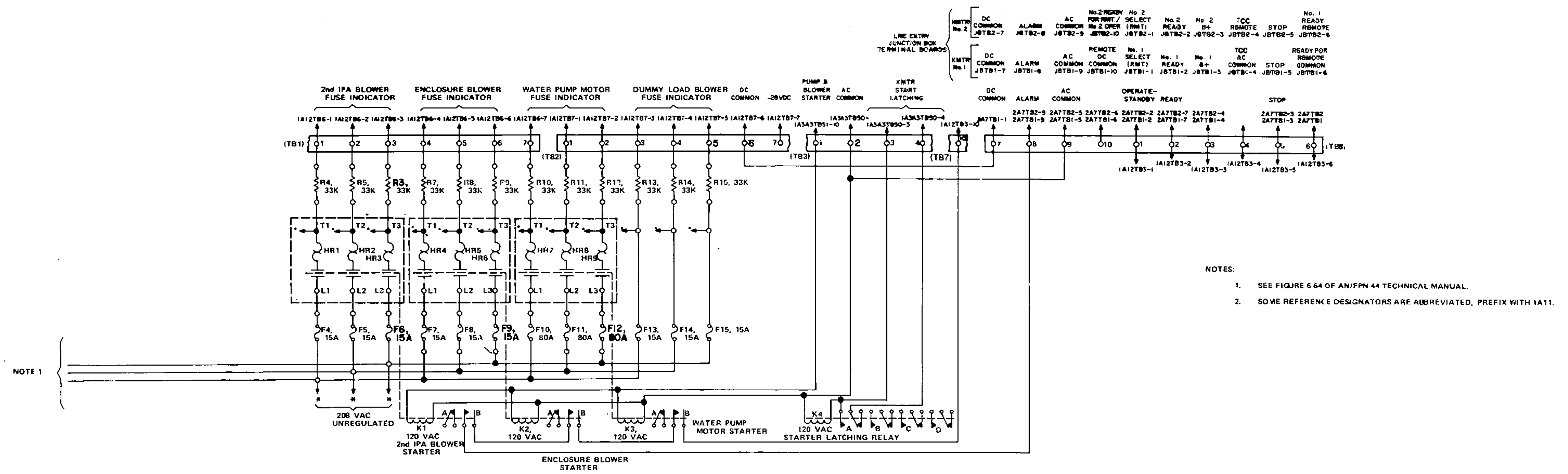

1A3A2S12
2
3, ON
1, OFF
PLATE
1A3A2S9D
11
12
START
5
3, N.C.
1, N.O.
L2
L1
AGASTAT (NEW)
7012AD
1A3A2K1
208VAC
ON
INDICATOR
1A3A2DS6
4, N.C.
1A3A3K41
120 VAC CONTROL POWER
FROM SHEET 2, LINE A
NOTE 2
TB61-5
TB61-9
NOTE 2
TB29-3
K3A, XMTR
FILAMENT
CONTACTOR
TB50-5
TB50-6
TB22-3
1A3A2TB22-3
A3A2S7, BIAS AND
LOW VOLT. ON
OFF
1A3A2TB22-4
TB22-4
1A12K17, XMTR AIR
FLOW DETECTOR RELAY
1A12TB4-5
1A12TB4-6
FROM SHEET 2, LINE C

ON)

E 2
ELAY

2

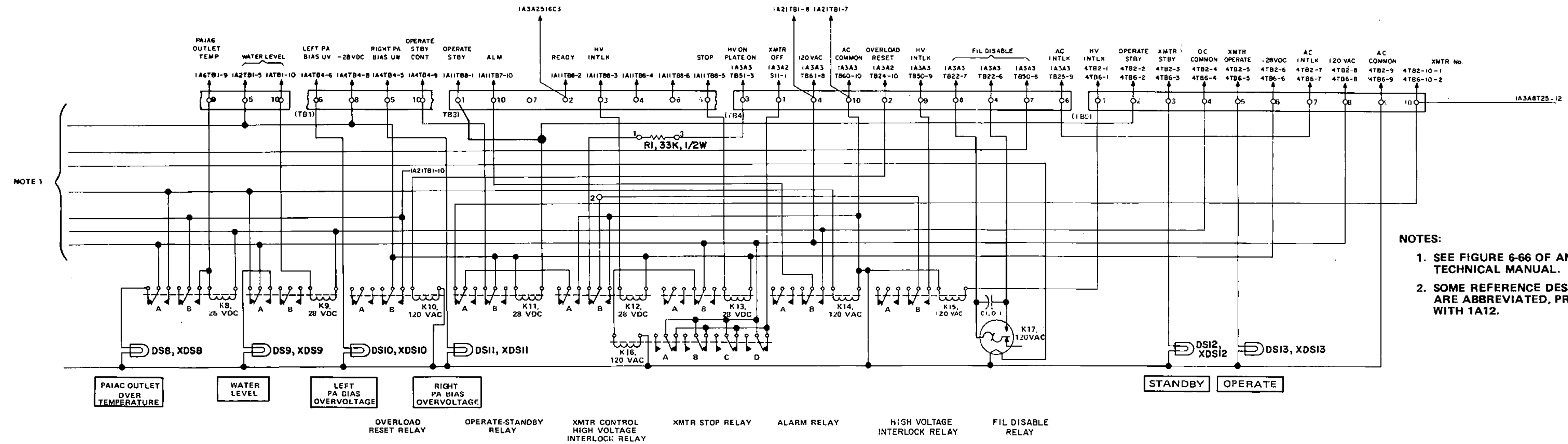
40)
A.24



NOTES:

1. SEE FIGURE 6-64 OF AN/FPN-44 TECHNICAL MANUAL.
2. SOME REFERENCE DESIGNATORS ARE ABBREVIATED, PREFIX WITH 1A11.

TRANSMITTER CONTROL WIRING (1A11) CHANGES FOR INSTALLATION OF LRE/AN/FPN-44



NOTES:

1. SEE FIGURE 6-66 OF AN/FPN-44 TECHNICAL MANUAL.
2. SOME REFERENCE DESIGNATORS ARE ABBREVIATED, PREFIX WITH 1A12.

Figure A.12. Transmitter Control Wiring (1A12) Changes For Installation Of LRE/AN/FPN-44

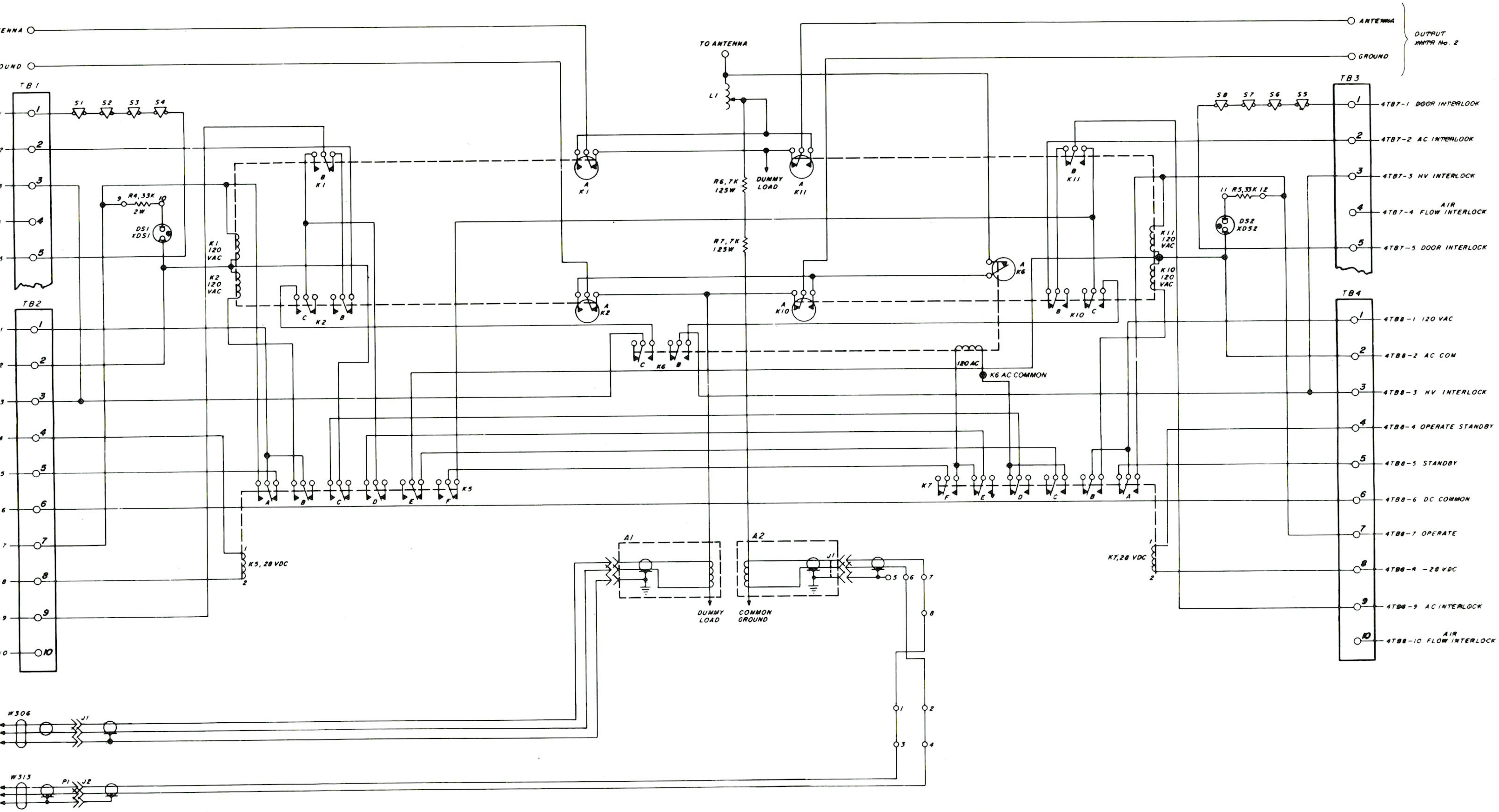
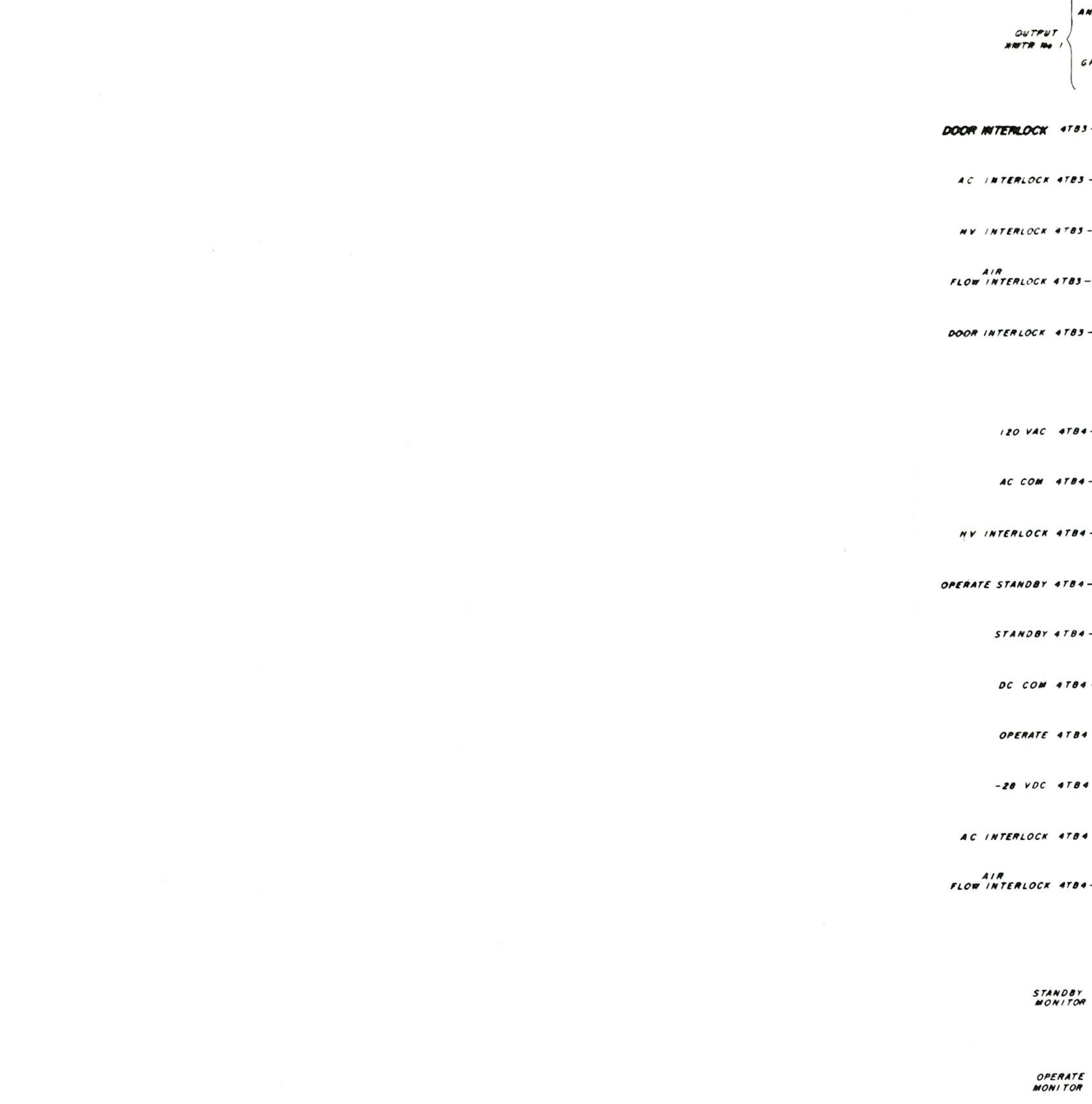
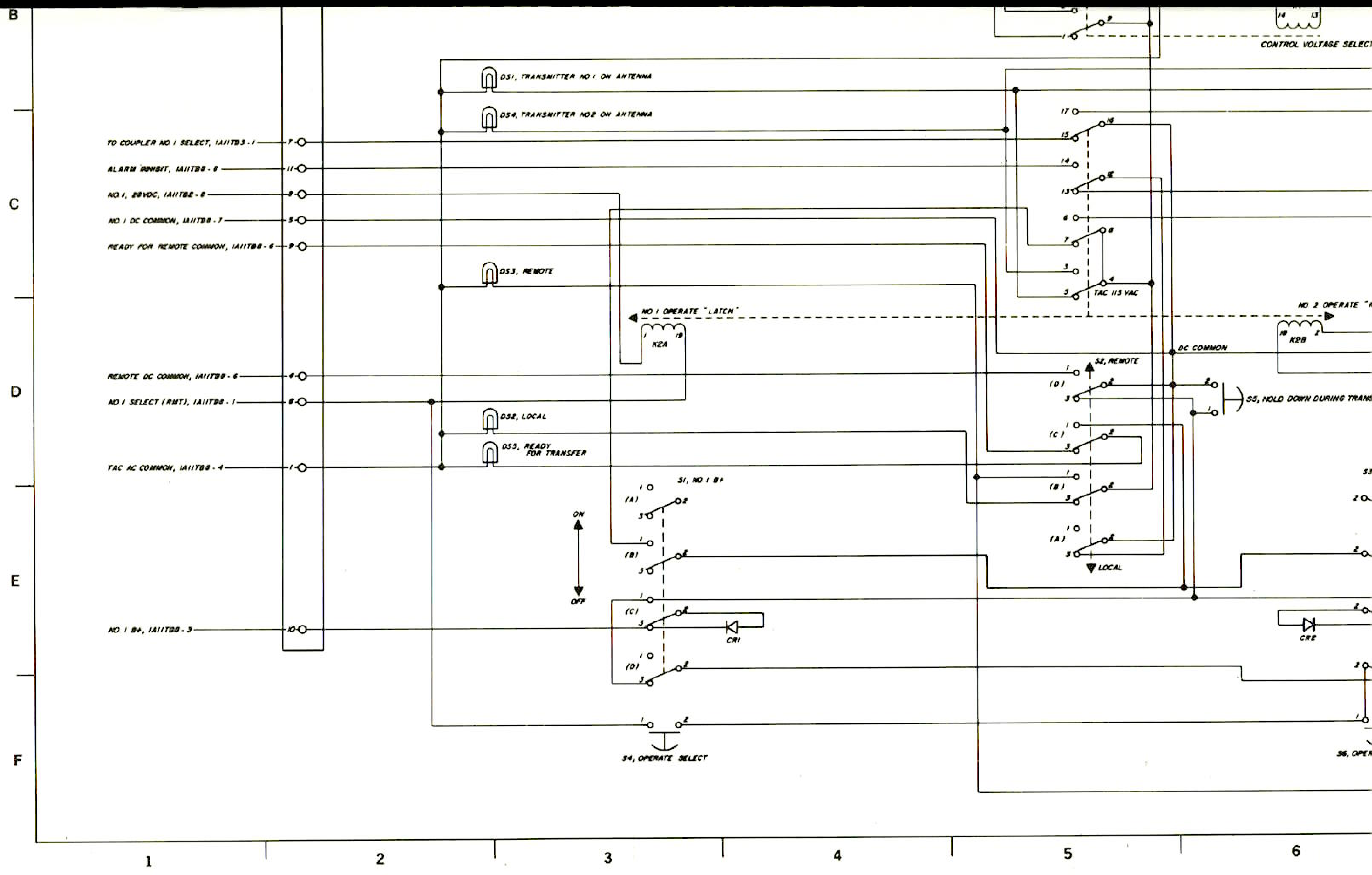


Figure A.13. LRE/AN/FPN-44 Antenna Coupler (3) Wiring Diagram

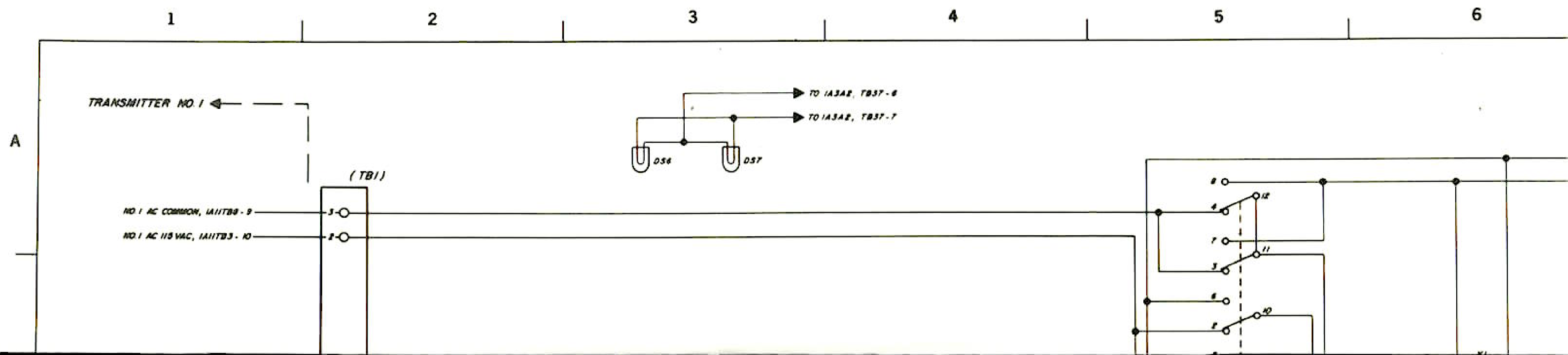

OUTPUT XMTR No 1
ANT
GR
DOOR INTERLOCK 4TB3-
AC INTERLOCK 4TB3-
HV INTERLOCK 4TB3-
AIR FLOW INTERLOCK 4TB3-
DOOR INTERLOCK 4TB3-
120 VAC 4TB4-
AC COM 4TB4-
HV INTERLOCK 4TB4-
OPERATE STANDBY 4TB4-
STANDBY 4TB4-
DC COM 4TB4-
OPERATE 4TB4-
-28 VDC 4TB4-
AC INTERLOCK 4TB4-
AIR FLOW INTERLOCK 4TB4-
STANDBY MONITOR
OPERATE MONITOR

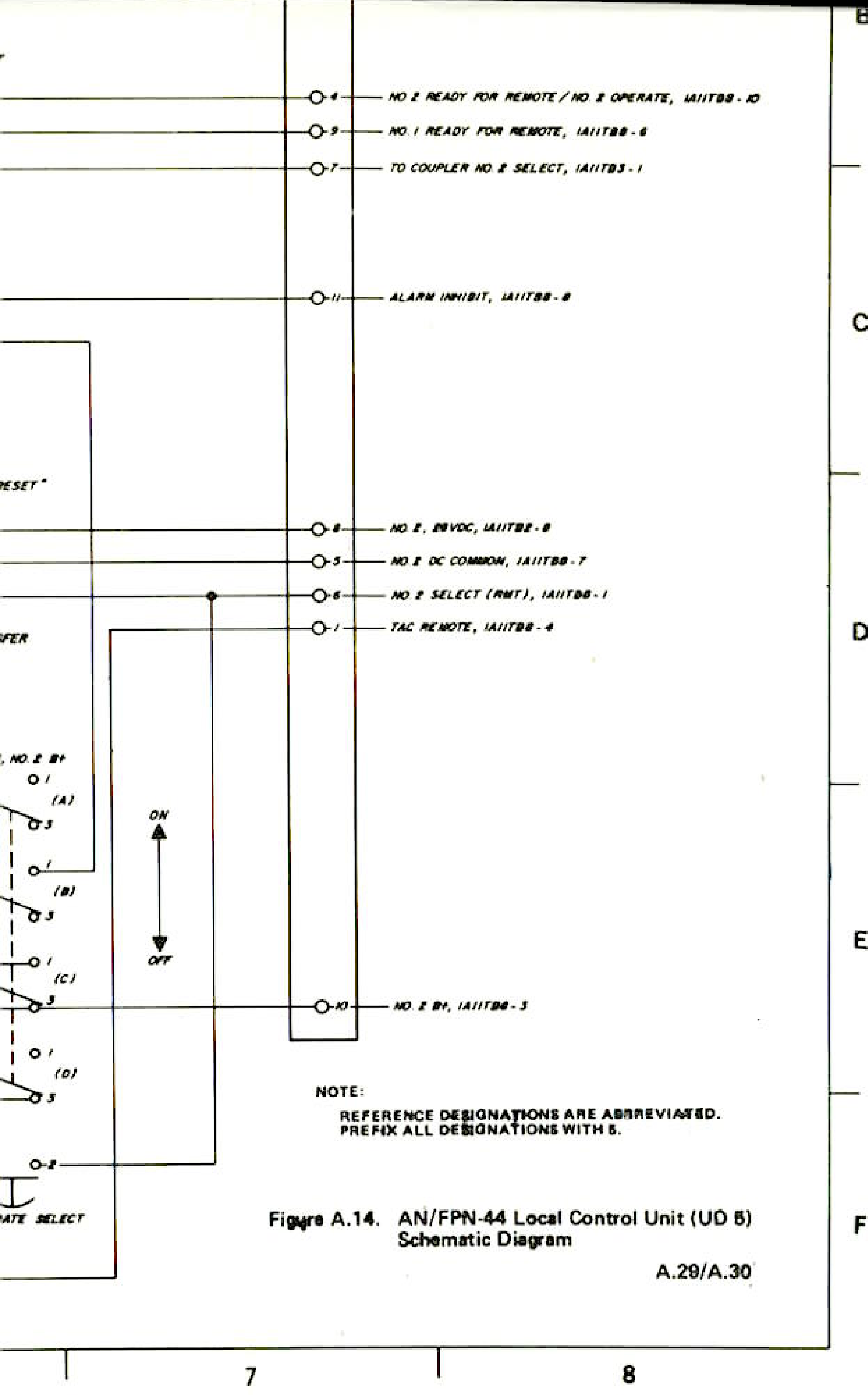
PART LOCATION INDEX

REF. DESIG.	LOCATION
CR1	4E
CR2	6E
DS1	2B
DS2	2D
DS3	2C
DS4	2C
DS5	2D
DS6	3A
DS7	3A
K1	6B
K2A	3D
K2B	6D
S1A	3E
S1B	3E
S1C	3E
S1D	3E
S2A	5E
S2B	5E
S2C	5D
S2D	5D
S3A	6E
S3B	6E
S3C	6E
S3D	6E
S4	3F
S5	6D
S6	6F
TB1	2A
TB2	7A



TO COUPLER NO 1 SELECT, 1A11TB3-1
ALARM INHIBIT, 1A11TB8-8
NO 1, 28VDC, 1A11TB2-8
NO 1 DC COMMON, 1A11TB8-7
READY FOR REMOTE COMMON, 1A11TB8-6
REMOTE DC COMMON, 1A11TB8-6
NO 1 SELECT (RMT), 1A11TB8-1
TAC AC COMMON, 1A11TB8-4
NO 1 B+, 1A11TB8-3
DS1, TRANSMITTER NO 1 ON ANTENNA
DS4, TRANSMITTER NO2 ON ANTENNA
DS3, REMOTE
DS2, LOCAL
DS5, READY FOR TRANSFER
NO 1 OPERATE "LATCH"
K2A
S1, NO 1 B+
ON
OFF
CR1
S4, OPERATE SELECT
TAC 115 VAC
S2, REMOTE
LOCAL
DC COMMON
S5, HOLD DOWN DURING TRANS
NO 2 OPERATE
K2B
CR2
CONTROL VOLTAGE SELECT
B
C
D
E
F
1
2
3
4
5
6

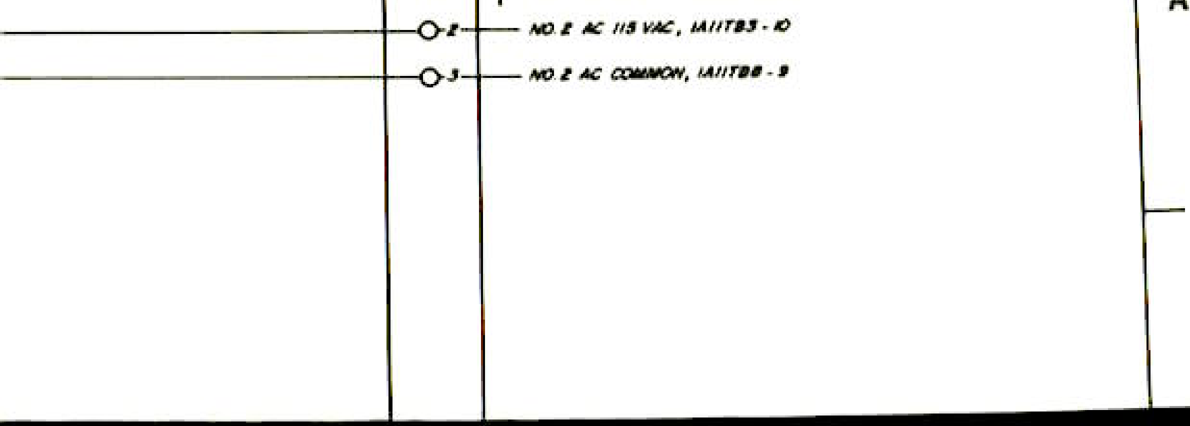

1
2
3
4
5
6
A
TRANSMITTER NO. 1
(TB1)
NO. 1 AC COMMON, 1A1TB8 - 9
NO. 1 AC 115 VAC, 1A1TB3 - 10
DS6
DS7
TO 1A3A2, TB37 - 6
TO 1A3A2, TB37 - 7



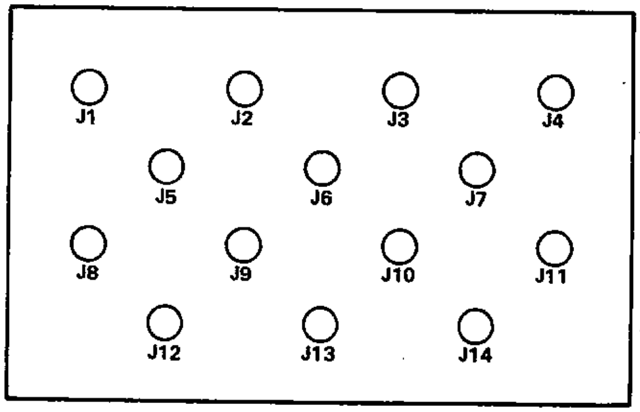
NOTE:

REFERENCE DESIGNATIONS ARE ABBREVIATED.
PREFIX ALL DESIGNATIONS WITH 5.

Figure A.14. AN/FPN-44 Local Control Unit (UD 5) Schematic Diagram


7
8
A
(TB2)
TRANSMITTER NO. 2
2
3
NO. 2 AC 115 VAC, 1A11TB3-10
NO. 2 AC COMMON, 1A11TB8-9

TWINAX CONNECTIONS FOR SCREEN ROOM JUNCTION BOX



(VIEWED FROM OUTSIDE)

SINCE JUNCTION BOX WAS NOT LABELED BY MANUFACTURER LABEL THE TWIN-AX CONNECTORS AS SHOWN. THEN DEDICATE THE CONNECTORS AS FOLLOWS:

J1	XMTR 1 DRIVE
J2	XMTR 1 ET/EMPT
J5	OPERATE RF
J8	XMTR 2 DRIVE
J9	XMTR 2 ET/EMPT
J12	DUMMY LOAD RF
J14	RF FROM REC. ANTENNA

Figure A.15. Screen Room Junction Box

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'77 SEP 15 AM 10: 43

22 AUG 1977

ELECTRONIC FIELD CHANGE BULLETIN

F.C. NO. 1 TYPE 4 TO AN/FPN-60 TRANSMITTER CONTROL SET

ROUTE	COPY	INITIAL
CO	/	[illegible]
XO		
E	2	[illegible]
F	[illegible]	
[illegible]	3	[illegible]

PURPOSE:

The purpose of this field change is to elevate Field Change No. 1 to TS-3550/FPN-60 from an equipment sub-unit level to an equipment level field change. This is being done in order to maintain record continuity with future AN/FPN-60 modifications. This field change supersedes and cancels "Field Change No. 1 to TS-3550/FPN-60 Electrical Pulse Analyzer". Modifications to the Datel power cube implememted by the canceled field change are to remain intact and are documented in the remainder of this field change.

DESCRIPTION:

This field change consists of inverting the 5 VDC Datel power cube and heatsinking it to the chassis of the TS-3550/FPN-60, using silicone insulating compound, four (4) 1.25 inch threaded spacers and four (4) 6-32 panhead screws.

IDENTIFICATION:

The inverted position of the 5 VDC Datel power cube in the TS-3550/FPN-60 will identify this field change.

MATERIALS REQUIRED:

1. A Field Change No. 1 Parts Kit and standard hand tools are all that are needed to perform this field change.

2. A list of parts contained in the parts kit is attached as enclosure (2) to this bulletin.

3. The Field Change Parts Kit (NSN CG5825-01-GL7-2921) is stocked by Coast Guard Supply Center, Brooklyn, N.Y. Initial distribution will be made by Commandant (G-EEE).

PROCEDURE:

1. Step-by-step installation instructions are provided as enclosure (1) to this bulletin.

2. Remove the canceled field change bulletin from all applicable technical manuals and discard the bulletin.

ROUTINE INSTRUCTIONS:

1. For EICAM reporting purposes, report completion of this field change on Form CG-4334D using TS-3550/FPN-60 as EQUIPMENT MODEL/TYPE. The serial number shall be reported as shown on the CGHQ-3134. Report the date of field change installation in blocks 3 to 8 on form CG-4334D. Record completion by an entry on the Field Change Accomplishment Plate, NSN I 0264-00-085-000, available from NPFC, Philadelphia, and on any other required records.

2. Maintenance support facilities shall maintain a library copy of this, and all other field change bulletins applicable to them. Additional or missing copies can be obtained from Coast Guard Supply Center, Brooklyn, N.Y. Order directly, using MILSTRIP procedures; no cost is involved. NSN CG-7610-01-GE8-1750 applies.

3. Upon completion, a copy of this field change bulletin shall be inserted in the front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished and that technical manual annotations and reports have been made. Coast Guard Supply Center, Brooklyn, N.Y., will update the Allowance Parts List to reflect any new changes.

R. E. WARAKSKY
By direction

Encl: (1) Step-by-Step Installation Instructions
(2) List of Parts Contained in Kit

DIST: (SDL NO. 105)
A: NONE
B: b,c(1st, 2nd, 5th, 7th, 11th, 12th, 13th, 14th, 17th only), giqs(2); p(1)
C: sv(2)
D: a(Guam, Tokyo only)(2)
E: c(2)
F: NONE

STEP-BY-STEP INSTALLATION INSTRUCTIONS

1. Secure power 115 VAC to the TS-3550/FPN-60 EPA.

2. Remove interconnect cables from back of the EPA and connect the cable removed from J7 into the cabinet dummy load.

3. Remove the EPA from the LRE rack.

4. Remove the top cover of the EPA.

5. Locate the 5 VDC DATEL POWER CUBE inside the EPA chassis.

6. Remove the four 6-32 panhead phillips screws which mount the power cube to the EPA chassis.

7. Apply a thin coat of silicone insulating compound to the top side of the DATEL POWER CUBE.

8. Remove the four 1" threaded spacers on which the power cube is mounted and replace with the four 1.25" threaded spacers provided.

9. Heatsink the power cube to the EPA chassis by turning the entire power cube upside down (bottom up). Secure the power cube to the EPA chassis with the four 6-32 screws removed in step 6. (See Figure 1).

10. Replace the top cover on the EPA.

11. Install the EPA back into the AN/FPN-60 LRE rack.

12. Reconnect all interconnect cables removed in Step 2.

13. Reconnect 115 VAC power to the EPA and observe readings. EPA should operate normally.

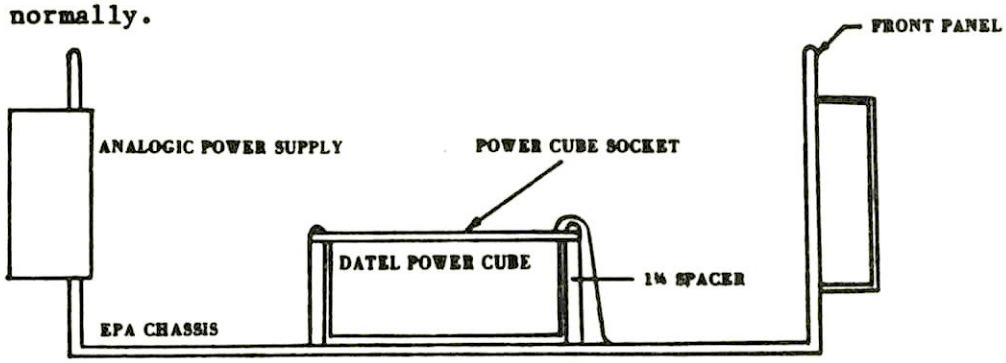

Figure 1

PARTS LIST FOR FIELD CHANGE NO. 1 PARTS KIT

ITEM	QTY	DESCRIPTION
1	4	1.250" threaded metal spacer
2	1	One tube silicone insulating compound.

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WASHINGTON, D.C. 20590
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G-EEE-7/63

ADMINISTRATION
RECEIVED
EECEN

'77 DEC 30 AM 10:15

07 OCT 1977

ELECTRONIC FIELD CHANGE BULLETIN

F.C. NO. 2 TYPE 1 TO AN/FPN-60 TRANSMITTER CONTROL SET

PURPOSE:

1. A forthcoming field change will provide AN/FPN-60 Transmitter Control Sets with a new Electrical Pulse Analyzer (EPA). The replacement of EPAs' will be on a round-robin basis. Initially, four new EPAs' will be available from the Electronics Engineering Center for the first stations to complete F.C. NO. 2 TO AN/FPN-60. Upon installation of the new EPA the old EPA will be returned to EECEN for modification and shipment to the next station.

2. The purpose of this field change is to provide multipulse triggers that will be required by the new EPA. As this field change requires authorized off air and because it is desirable to minimize turn around time in the round-robin replacement of equipments, this field change must be accomplished prior to receipt of the EPA field change.

DESCRIPTION:

This field change installs two resistors and four jumper wires in the J-3353/FPN-60. Approximately one hour is required to complete this field change.

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of 680 ohm resistors between terminals 26 and 52 of TB3, and terminals 6 and 32 of TB4 of J-3353/FPN-60 identifies this field change.

MATERIALS REQUIRED:

1. A Field Change No. 2 Parts Kit and standard hand tools are necessary to perform this field change.

2. A list of parts contained in the Field Change Parts Kit is attached as enclosure (2) to this bulletin.

3. The Field Change Parts Kit (NSN CG 5825-01-GL7-2959) is stocked at Coast Guard Supply Center, Brooklyn, N.Y. Initial distribution will be by Electronic Engineering Center, Wildwood, N.J.

PROCEDURE:

Step-by-step installation instructions are provided as Enclosure (1) to this bulletin.

INITIAL	COPY	ROUTE	
		1	CO
		~~3~~	~~XO~~
		2	E
[illegible]		4	F
		5	X
			FILE

ROUTINE INSTRUCTIONS:

1. For EICAM reporting purposes, report completion of this field change on Form CG-4334D using J-3353/FPN-60 as EQUIPMENT MODEL/TYPE. The serial number shall be reported as shown on the CGHQ-3134. Report the date of field change installation in blocks 3 to 8 on Form CG-4334D. Record completion by an entry on the Field Change Accomplished Plate, NSN I 0264-00-085-0000, and on any other required records.

2. Maintenance support facilities shall maintain a library copy of this, and all other field change bulletins applicable to them. Additional or missing copies can be obtained from Coast Guard Supply Center, Brooklyn, N.Y. Order directly, using MILSTRIP procedures; no cost is involved. NSN CG7610-01-GE8-1751 applies.

3. Upon completion, a copy of this field change bulletin shall be inserted in the front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished and that technical manual annotations and reports have been made. Coast Guard Supply Center, Brooklyn, N.Y., will update the Allowance Parts List to reflect any changes.

4. Upon completion, and in addition to the required EICAM report, units shall notify EECEN (LX/SMEF) direct via routine message info cognizant commands.

J F Culbertson
J. F. CULBERTSON
By direction

Encl: (1) Step-by-step installation instructions
(2) List of parts contained in Kit

Dist: (SDL No. 106)
A: None
B: b,c (1st, 2nd, 5th, 7th, 11th, 12th, 13th, 14th, 17th only), giqs (2); p(1)
C: sv (2)
D: a(Guam, Tokyo only) (2)
E: c(2)
F: None

STEP-BY-STEP INSTALLATION INSTRUCTIONS
READ COMPLETELY BEFORE PROCEEDING

1. Secure power to both transmitters and to the AN/FPN-60 Transmitter Control Set.

NOTE!!

AUTHORIZED OFF-AIR TIME IS REQUIRED TO PERFORM THIS FIELD CHANGE.

CAUTION

OBSERVE SAFETY PRECAUTIONS AS OUTLINED IN CHAPTER 2, CG-165-1.

2. Remove the right side panel of the TCS Rack.

3. Remove the top cover of the J-3353/FPN-60 Interface Unit.

4. Remove the four rack mount screws from the front panel of the Interface Unit.

5. Remove the front panel of the TCS Interface Unit by removing the 11 phillips-head screws. Prop the bottom front of the Interface Unit by placing a thick book or a small 2" X 4" piece of wood under it.

(Steps 5 thru 11 refer to Figure 1)

6. Install a 680 ohm 1/4 watt resistor between terminals 6 and 32 of TB4. The resistor lead going to terminal 32 should be left long enough to connect to terminal 33. (DO NOT CONNECT TO TERMINAL 33 AT THIS TIME!)

7. Install a 680 ohm 1/4 watt resistor between terminals 26 and 52 of TB3.

8. Install a jumper wire between TB3 terminal 26 and J22 pin 10. Use heat shrink tubing on the wire connected to J22.

9. Install a jumper wire between TB3 terminals 12 and 52.

10. Install a jumper wire between TB4 terminal 6 and J20 pin 2. Use heat shrink tubing on the wire connected to J20.

Enclosure (1)

11. Connect the long resistor lead (Step 5) to TB4 terminal 33. Make sure all leads are soldered. This completes the installation steps of the field change. Return TCS Interface to normal by removing prop, replacing front and top panels, and securing in the rack cabinet. Restore power.

12. Remove the original page 30, TCS Interface Wiring Diagram, from the equipment technical manual and insert the new page provided.

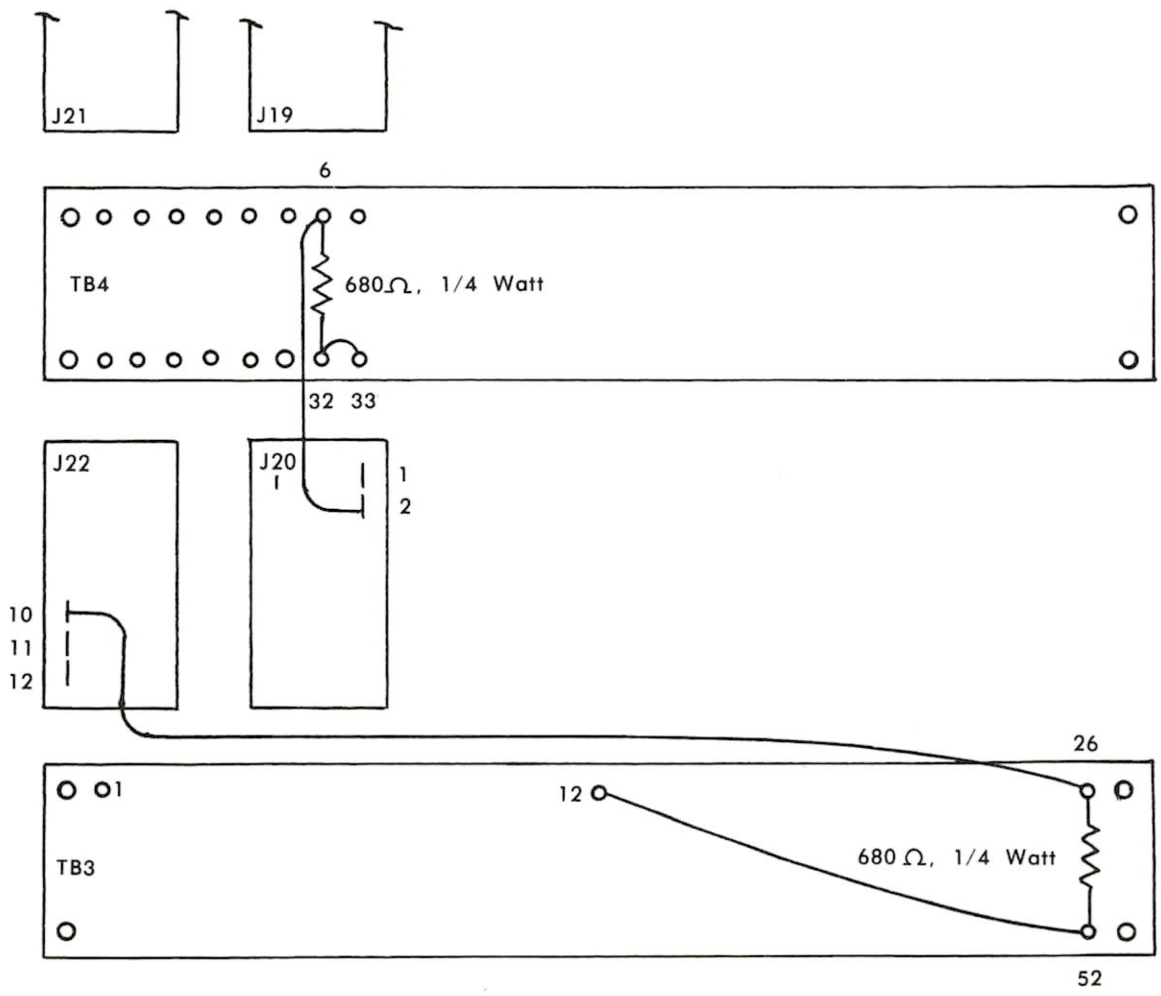
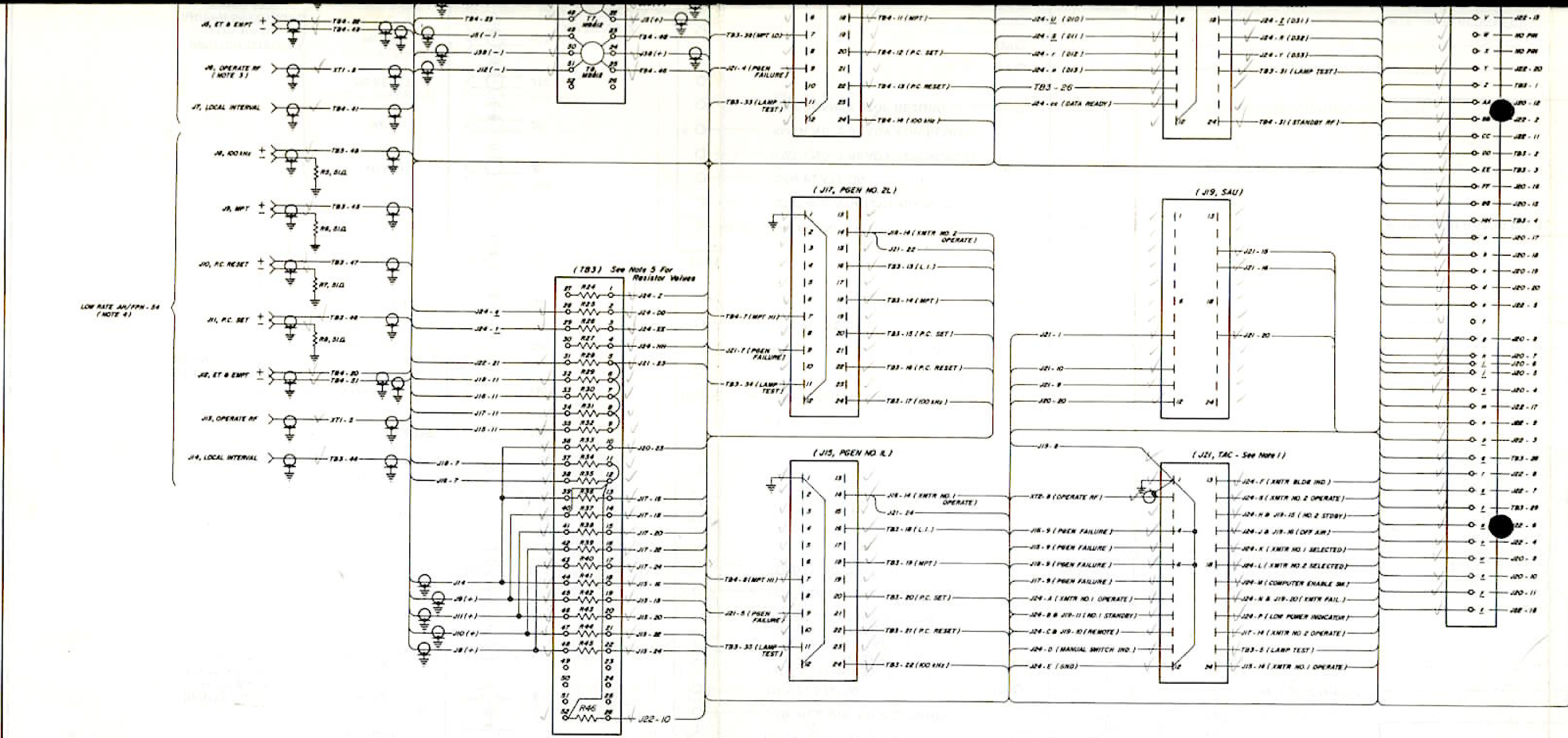


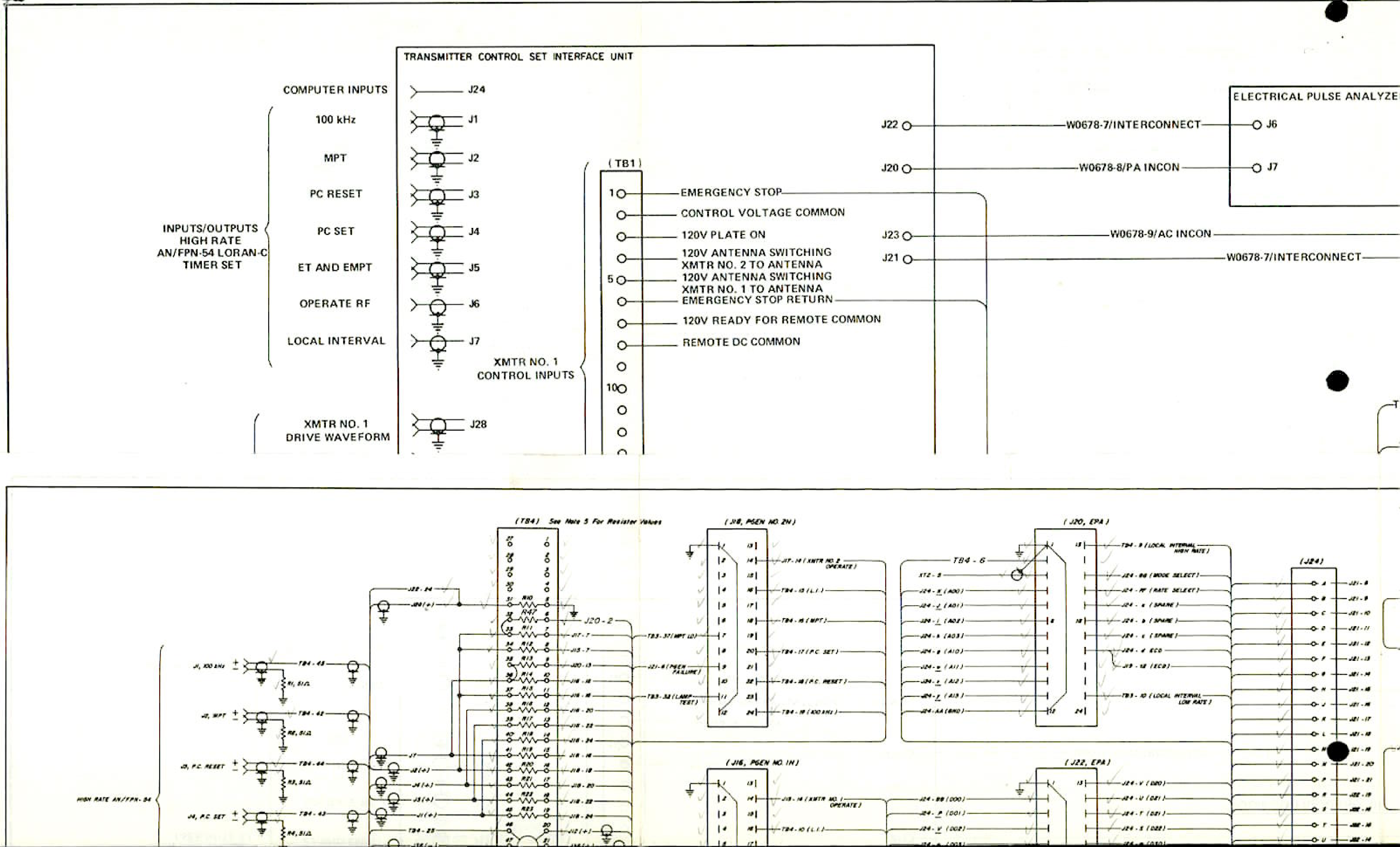
Figure 1: J3353/FPN-60 Interface Connections For MPT To EPA

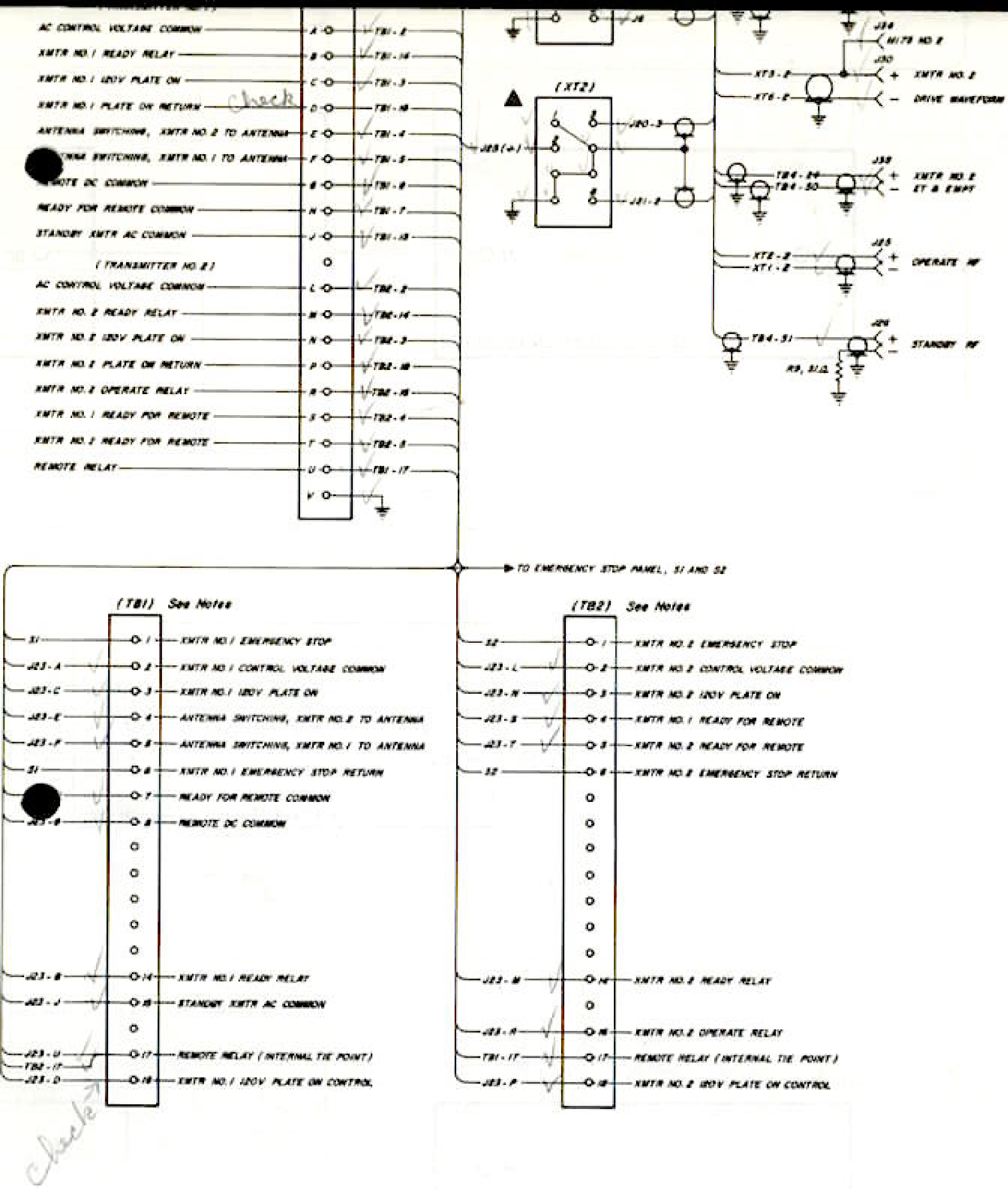


Check

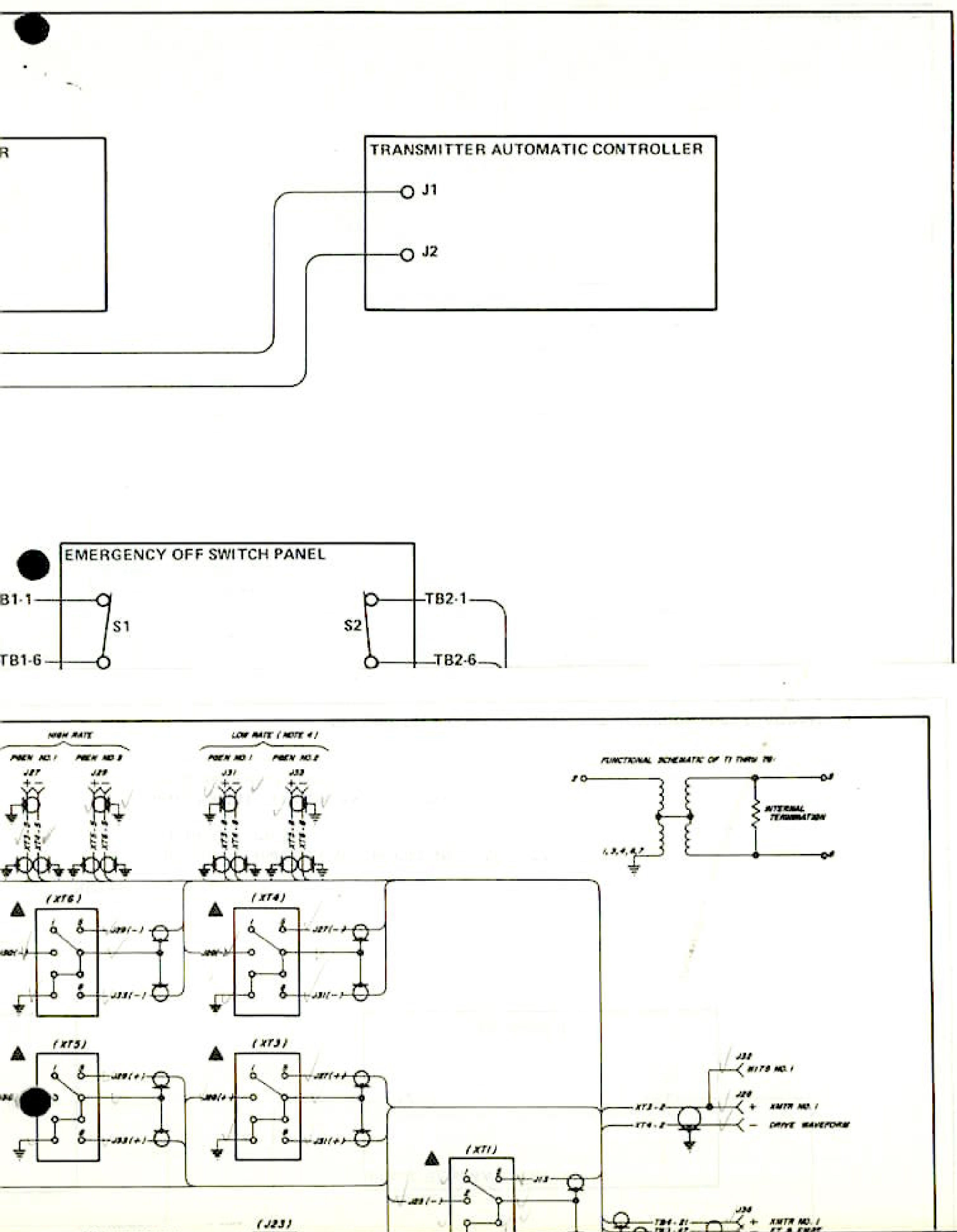
NOTES:

1. FOR DUAL-RATE OPERATION, REMOVE JUMPER WIRES J21-1 TO J21-4 AND J21-1 TO J21-6.
2. FOR SINGLE RATE OPERATION, TERMINATE WITH 50 Ω.
3. AT SINGLE RATE STATIONS USE LOW RATE PORTS.
4. R1-10 AND R24-27 = 51Ω
   R11, 12, 15 - 17, 20 - 22, 34, 35, 37 - 39, 42 - 44, AND 46, 47 = 680 Ω
   R13, 14, 19, 28 - 33, 40, = 180 Ω
   R18, 23, 40, AND 45 = 75Ω
5. FOR USE WITH THE AN/FPN-39 TRANSMITTER, CONNECT JUMPERS AS INDICATED: TB1-8 TO TB1-17, TB1-14 TO TB1-15, TB1-14 TO TB2-14, TB2-5 TO TB2-16
6. FOR USE WITH THE AN/FPN-42 TRANSMITTER, CONNECT JUMPER FROM TB1-8 TO TB1-17
7. FOR USE WITH THE AN/FPN-44 TRANSMITTER, CONNECT JUMPERS AS INDICATED: TB1-6 TO TB2-7, TB1-8 TO TB1-18, TB1-18 TO TB2-18, TB2-5 TO TB2-16


TRANSMITTER CONTROL SET INTERFACE UNIT
COMPUTER INPUTS
J24
100 kHz
J1
MPT
J2
PC RESET
J3
PC SET
J4
ET AND EMPT
J5
OPERATE RF
J6
LOCAL INTERVAL
J7
INPUTS/OUTPUTS
HIGH RATE
AN/FPN-54 LORAN-C
TIMER SET
XMTR NO. 1
DRIVE WAVEFORM
J28
XMTR NO. 1
CONTROL INPUTS
(TB1)
1
5
10
EMERGENCY STOP
CONTROL VOLTAGE COMMON
120V PLATE ON
120V ANTENNA SWITCHING
XMTR NO. 2 TO ANTENNA
120V ANTENNA SWITCHING
XMTR NO. 1 TO ANTENNA
EMERGENCY STOP RETURN
120V READY FOR REMOTE COMMON
REMOTE DC COMMON
J22
J20
J23
J21
W0678-7/INTERCONNECT
W0678-8/PA INCON
W0678-9/AC INCON
W0678-7/INTERCONNECT
ELECTRICAL PULSE ANALYZE
J6
J7
(TB4) See Note 5 For Resistor Values
J20-2
(J18, PGEN NO. 2H)
(J20, EPA)
TB4 - 6
(J24)
(J16, PGEN NO. 1H)
(J22, EPA)
HIGH RATE AN/FPN-54



REVISED: 3-22-77



TRANSMITTER AUTOMATIC CONTROLLER
J1
J2
EMERGENCY OFF SWITCH PANEL
TB1-1
TB1-6
S1
S2
TB2-1
TB2-6
HIGH RATE
LOW RATE (NOTE 4)
PGEN NO. 1
PGEN NO. 2
J27
J29
J31
J33
(XT6)
(XT4)
(XT5)
(XT3)
(XT1)
(J23)
FUNCTIONAL SCHEMATIC OF T1 THRU T6
INTERNAL TERMINATION
XT3-2
XT4-2
J32
J28
XMTR NO. 1
DRIVE WAVEFORM
J36

ENCLOSURE (2)

PARTS LIST FOR FIELD CHANGE KIT

ITEM	DESIGNATION	DESCRIPTION	AMT.
1	R46	680 ohm, 1/4 watt resistor	1
2	R47	680 ohm, 1/4 watt resistor	1
3		#22 stranded TFE hookup wire	2 ft.
4		3/32 inch TFE heat shrinkable tubing	2 in.
5		Field Change Accomplished Plate	1

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13 APR 1979

ELECTRONIC FIELD CHANGE BULLETIN

F. C. NO. 3 TYPE 1 TO AN/FPN-60 TRANSMITTER CONTROL SET

PURPOSE:

The purpose of this Field Change is to provide a modified Electrical Pulse Analyzer (EPA) TS-3550/FPN-60 for improved data collection and improved station operations.

INSTALLATION REQUIREMENT:

FC-3 to AN/FPN-60 cannot be accomplished unless FC-1 to the AN/FPN-54A and FC-2 to the AN/FPN-60 have already been accomplished.

DESCRIPTION:

The presence of a three digit thumbwheel for switch S3 on the front panel of the EPA identifies this Field Change.

MATERIALS REQUIRED:

1. A Field Change No. 3 Parts Kit (NSN CG 5825-01-GL7-3098), a modified EPA chassis and standard hand tools are needed to perform this Field Change.

2. A list of parts contained in the Parts Kit is attached as enclosure (1) to this Bulletin.

3. Initial distribution of the parts kit will be made by EECEN. Distribution of the modified EPAs will also be done by EECEN.

PROCEDURE:

1. This modification can be accomplished without securing power to the TCS rack or to the transmitters (in other words, without going off-air). Securing power to the EPA is all that is required.

DISTRIBUTION - SDL No. 105

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B	5	5							5							5	5		5							
C																			2			2				
D	2																									
E			2																							
F																										
G																										
H																										

NON-STANDARD DISTRIBUTION: B:c 1st; 2nd, 5th, 7th, 11th, 12th, 13th, 14th, 17, only (5): CG-31; Cape Race, Angissoq, Sandur, BO, Jan Mayen, Ejde, Williams Lake, only (2)

CAUTION

Insure that the step by step procedures for the removal of the EPA chassis are followed exactly, according to Enclosure (2) of this Field Change, or out of tolerance condition of the cycle loop will result.

2. During removal of the old EPA and the installation of the new EPA, the station Local Envelope Number (LEN) from the TIC panel will be unusable. After installation of the new EPA, the LEN (or any other number that uses local envelope crossover from the EPA) will increase by 10 us, because the new EPA measures ECD at 40 us instead of 30 us.

3. Step-by-step installation instructions are provided as enclosure (2).

4. Technical manual corrections are provided as enclosure (3).

ROUTINE INSTRUCTIONS:

1. For EICAM reporting purposes, report completion of this Field Change on Form CG-4334D using TS-3550/FPN-60 as EQUIPMENT/MODEL TYPE. Three entries are required as follows:

a. Report deinstallation (DI) of the unmodified TS-3550/FPN-60 using the serial number as shown on the Electronic Installation Record.

b. Report installation (NI) of the modified TS-3550/FPN-60 using the serial number as shown on the name plate of the modified EPA.

c. Report Field Change Accomplishment (FC) using the serial number of the modified TS-3550/FPN-60.

Report the date of the Field Change in blocks 3 to 8 on Form CG-4334D. Report completion by an entry on the Field Change Accomplished Plate, NSN I-0264-00-085-0000, and on any other required records.

2. Maintenance support facilities shall maintain a library copy of this, and all other Field Change Bulletins applicable to them. Additional copies can be obtained from Coast Guard Supply Center, Brooklyn, N.Y. (Code 341). Order directly using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-1752 applies.

3. Upon completion, a copy of this Field Change Bulletin shall be inserted in the front of all applicable technical manuals.

Cognizant commands shall ensure that the Field Change has been accomplished and that technical manual annotations and reports have been made. Coast Guard Supply Center Brooklyn, N.Y., will update the Allowance Parts list to reflect any changes.

4. Hereafter, when ordering modules, use the correct new stock number as listed in the parts list, enclosure (1).

5. Upon completion, units shall notify Commanding Officer, Coast Guard Electronics Engineering Center, Wildwood, N.J. direct via routine message and information copy to cognizant commands.

R E Warakomsky

R. E. WARAKOMSKY
By direction

Encl: (1) List of parts contained in kit
(2) Step-by-step installation instructions
(3) Technical manual corrections

STEP-BY-STEP INSTALLATION INSTRUCTIONS

READ COMPLETELY BEFORE PROCEEDING

1. Make technical manual corrections (Note: It is important to do the technical manual corrections BEFORE doing the rest of the Field Change),

a. Discard pages 13, 14, 15, 16, 17, 18, 19 and 20 of the TCS manual.

b. This Field Change contains entire pages which are to be inserted in the TCS manual. These pages are numbered 13, 14, 15, 16, 17, 18, 19 and 20. Insert these pages in the TCS manual.

c. Discard pages 5, 6, 7, 8, 9, 10 of the LRE system manual.

d. This Field Change contains entire pages which are to be inserted in the LRE system manual. These pages are numbered 5, 6, 7, 8, 9, 10. Insert these pages in the LRE system manual.

2. Program the ECD card to be installed (which will be inside the new EPA) and the spare ECD card in accordance with the procedure on page 14 of the TCS Manual.

3. Before proceeding with the rest of the Field Change, you may opt to do part of steps 16 or 19 at this time. These steps require fabrication of a cable (for single rate stations) or 2 cables (for dual rate stations) with materials supplied in the Field Change Kit: RG-58C/U coaxial cable and UG-88 BNC connectors.

CAUTION

Observe safety precautions as outlined in Chapter 2, CG-165-1.

4. Remove the cable connected to the OPERATE RF JACK (A8 J14) on the rear panel of the C-8621A/FPN control unit for the AN/FPN-54A. On dual rated stations, disconnect cables from both control units.

5. Mark all cables which are presently plugged into the rear panel jacks of the EPA according to their respective connections, J4 through J11.

6. Remove the cables marked in step 5 from the rear panel of the EPA chassis.

7. Disconnect the EPA AC power cord from the AC power strip.

8. Remove the EPA from the TCS rack by removing the four front panel screws.

9. Remove the top cover from the new EPA.

10. Install the new EPA in the TCS rack, and connect all cables which were previously disconnected in step 6.

11. Apply AC power to the modified EPA by plugging its AC power cord into the AC outlet strip located in the back of the TCS cabinet.

12. Pull the EPA forward so that it extends part way out of the front of the TCS rack. Pull it out far enough so that you can reach the (W0678-11/CLP ATTN) Clip Attenuator module test points and potentiometers.

13. Adjust R6 and R10 of the Clip Attenuator module in accordance with the procedure on page 14 of the TCS manual. R6 is closest to the rear panel.

14. Install the top cover on the new EPA, push the new EPA all the way into the TCS rack, and secure it with the front panel screws.

NOTE: Steps 15 and 16 are for single rated stations and steps 17 through 19 are for dual rated stations; i.e, for dual rated stations, go to step 17.

15. Disconnect the OPERATE PCI cable from A8J13 of the C-8621A/FPN Timer Set Control. Connect a BNC T-connector UG-274C/U to A8J13 and reconnect the OPERATE PCI cable to one end of the T-connector.

16. Fabricate a cable with the materials supplied in the Field Change Kit (unless you have already done this in step 3), with BNC (UG-88) connectors on each end. Connect this cable to the other side of the previously installed T-connector (step 15) and J13 of the new EPA. The routing of this cable must follow the routing of existing cables between equipment racks. Go to step 20.

17. Disconnect the OPERATE RCI cable from A8J13 of the low rate* C-8621A/FPN Timer Set Control. Connect the BNC T-connector UG-274C/U to the jack and reconnect the OPERATE RCI cable to one end of the T-connector.

*Low Rate: The highest numbered rate for a dual rated station. For example: For a dual rated station of 7930 and 5930, 7930 is the low rate.

18. Repeat step 17 for the high rate timer set control unit (C-8621A/FPN).

19. Fabricate two cables with materials supplied in the Field Change Kit (unless you have already done this in step 3), with BNC (UG-88) connectors on each end. Connect one cable between the PCI T-connector at A8J13 of the low rate Timer Set Control Unit and J13 of the EPA. Connect the other cable between the PCI-T-connector at A8J13 of the high rate Timer Set Control Unit and J12 of the EPA.

20. Check the operation of the GCF-W-678-PP Time Interval Counter (TIC) panel and the EPA you just installed by disconnecting and reconnecting the EPA AC power cord at least three times to see if the LEN number remains the same within 5 microseconds.

21. Pack the old EPA that you removed in the shipping container that the new EPA was received in. Do not remove any of the modules from the old EPA, and make sure they are inside the old EPA when you pack it.

22. Pack the spare modules for the old EPA in the containers that the modules for the new EPA came in. The old modules are of no use to you anymore since there have been extensive changes to make them work in the new EPA.

23. As soon as possible, ship the old EPA with its modules and all spare EPA modules back to EECEN, marked for "LX/WO-853-A4". The old EPA will be modified and used to accomplish the field change at another Loran-C station. The modules you will be sending back are:

a. WO678-3/GATCON
b. WO678-18B/ECD
c. WO678-4/PK DET
d. WO678-11/CLP ATTEN

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30 APR 1979

ELECTRONIC FIELD CHANGE BULLETIN

F.C. NO. 4 TYPE 1 TO AN/FPN-60 TRANSMITTER CONTROL SET

PURPOSE:

The purpose of this change is to increase the resolution of the transmitted drive adjust potentiometer on the SG-1099/FPN-60 Pulse Generator and add a vernier dial with a locking feature.

DESCRIPTION:

The Field Change consists of removing the present gain control and replacing it with a ten-turn control and adding a concentric scale incremental dial with a locking feature.

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of a vernier dial on the front panel of the pulse generator identifies this change.

MATERIALS REQUIRED:

1. A Field Change No. 4 Type 1 Parts Kit and standard hand tools are necessary to perform this Field Change.

2. A list of parts contained in the Field Change Parts Kit is attached as enclosure (2) to this bulletin.

3. The Field Change Parts Kit (CG5825-01-GL7-3106) is stocked at Coast Guard Supply Center, Brooklyn, NY. Initial distribution will be by Coast Guard Supply Center, Brooklyn, NY.

PROCEDURE:

Step-by-step installation instructions are provided as enclosure (1) to this bulletin.

DISTRIBUTION - SDL No. 109

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B		5	5				5		5							5	5		5							
C																			2			2				
D	2																									
E			2																							
F																										
G																										
H																										

NON-STANDARD DISTRIBUTION: B: (c) 1st, 2nd, 5th, 7th, 11th, 12th, 13th, 14th, 17th only (5). CG-31: Cape Race, Angissoq, Sandur, Bo, Jan Mayan, Ejde, Williams Lake only (2).

ROUTINE INSTRUCTIONS: 30 APR 1979

1. For EICAM reporting purposes, report completion of this Field Change on Form CG-4334D using AN/FPN-60 as EQUIPMENT MODEL/TYPE. The serial number shall be reported as shown on the Electronic Installation Record (EIR). Report the date of Field Change installation in blocks 3 to 8 on Form CG-4334D. Record completion by an entry on the Field Change Accomplished Plate, NSN I 0264-00-085-000, and on any other required records.

2. Maintenance support facilities shall maintain a library copy of this and all other field change bulletins applicable to them. Additional or missing copies can be obtained from Coast Guard Supply Center, Brooklyn, NY (CODE 341). Order directly using MILSTRIP procedures; no cost is involved. NSN CG7610-01-GE8-1753 applies.

3. Upon completion, a copy of this Field Change Bulletin shall be inserted in the front of all applicable Technical Manuals. Cognizant commands shall ensure that the field change has been accomplished and that Technical Manual annotations and reports have been made. Coast Guard Supply Center, Brooklyn, NY, will update the Allowance Parts List to reflect any changes.

R. E. WARAKOMSKY
By direction

Encl: (1) Step-by-Step Installation Instructions
(2) Parts List for Field Change Kit

Enclosure (1)

30 APR 1979

STEP-BY-STEP INSTALLATION INSTRUCTIONS

1. With an oscilloscope observe and record the amplitude of the transmitter drive waveform at J2 on the front panel of the standby PGEN.

2. Secure power to the standby SG-1099/FPN-60 Pulse Generator.

3. Disconnect input and output cables at rear of the PGEN.

4. Remove rack mount screws from front panel of the PGEN unit. (See Figure 1).

5. Remove PGEN unit from rack and remove cover.

6. Locate R2 on front panel and remove the two nuts on the outside.

7. Label the wires on the pot center, left, right (looking down) (see Figure 2).

8. Remove potentiometer from the rear side of the shaft hole in front panel and enlarge hole to a 3/8" diameter suitable to the new potentiometer shaft. Position the flat side of the multiturn potentiometer downward. (See Figure 3 and 4).

9. Follow instructions enclosed with the dial for proper installation. (See Figure 5).

10. Turn shaft of R2 fully counter clockwise and set dial to 0.00. Tighten screw with allen wrench after properly aligned.

11. Resolder the wires to the contracts of the multiturn potentiometer.

12. To replace the PGEN in the rack, perform steps 2 to 5 in reverse order, and adjust the vernier dial until the TDW is the same amplitude as observed in step 1.

13. Switch transmitters and perform steps 1 to 12 on the other PGEN.

14. This completes the Field Change.

F.C. NO. 4 TO AN/FPN-60

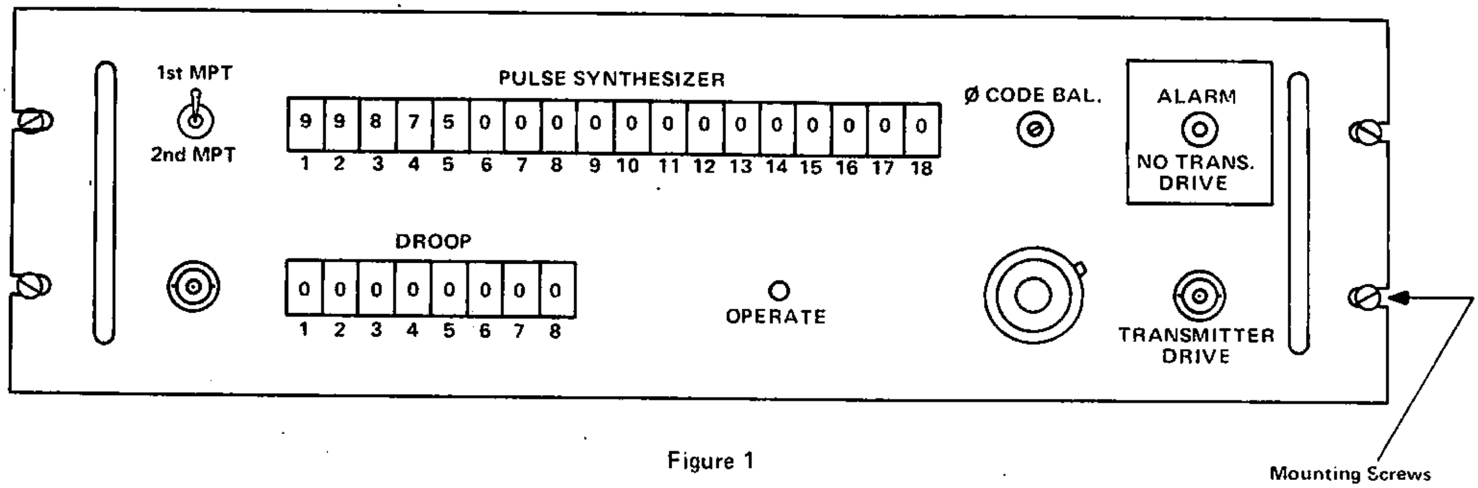

Figure 1

Front Panel Of PGEN Showing Location Of Mounting Screws

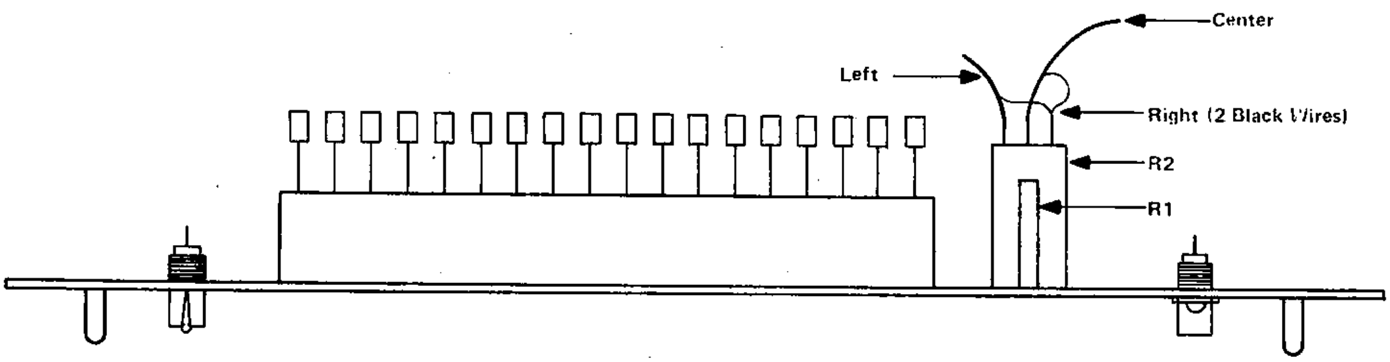

Figure 2

Top View Of Front Panel Showing Temporary Labeling Of R2 Wiring

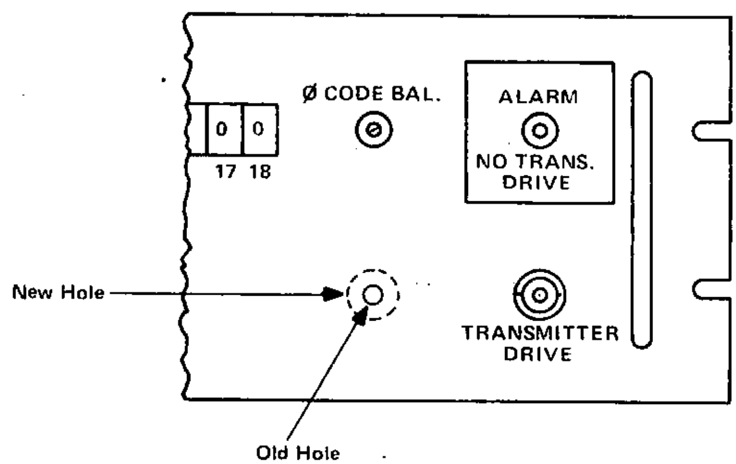

Figure 3

F.C. NO. 4 TO AN/FPN-60

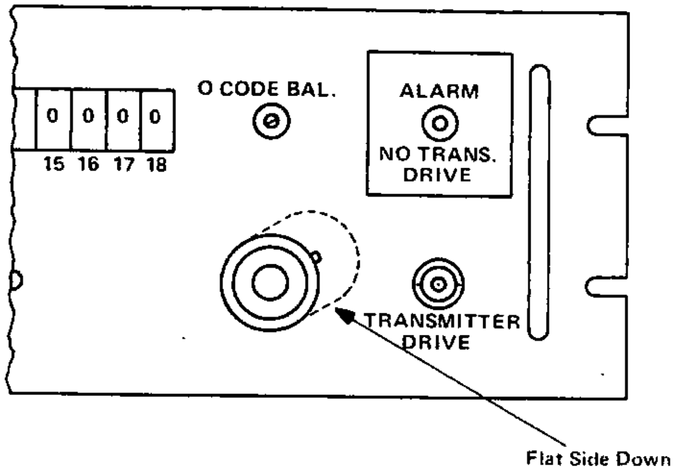

Figure 4

Front Panel Of PGEN Showing Proper Installation Of Multi-turn Potentiometer

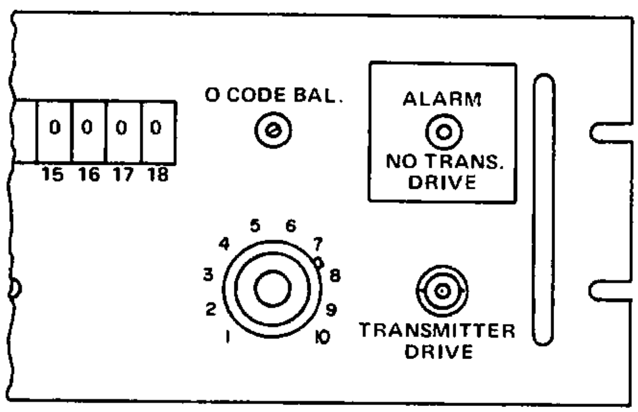

Figure 5

Front Panel Of PGEN Showing Properly Completed Proposed Field Change

Enclosure (2)

30 APR 1979

PARTS LIST FOR FIELD CHANGE
NO. 1 to AN/FPN-60

ITEM	DESIGNATION	QTY	DESCRIPTION
1	R2	1	62JA-2500, OHM/ CLAROSTAT (POT)
2		1	H-510-2 BOURN'S DIAL
3			FIELD CHANGE ACCOMPLISHED PLATE NSN I0264-00-085-0000

761001GE81753

7610 01 GE8 1753 03/23/91

AN/FPN-60 FC4

4612H4

EA

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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U.S. Coast Guard
Washington, D.C. 20593
(202) 426-1201

29 JAN 1981

ERRATA SHEET

TO

F.C. NO. 4 TYPE 1 TO AN/FPN-60 TRANSMITTER CONTROL SET

PURPOSE:

This ERRATA Sheet corrects the ROUTINE INSTRUCTIONS for reporting the completion of this field change.

PROCEDURE:

Under ROUTINE INSTRUCTIONS change para 1, 1st sentence to read, "For EICAM reporting purpose, report completion of this field change on Form CG-4334D using SG-1099/FPN-60 as Equipment Model/Type.

ROUTINE INSTRUCTIONS:

Upon completion, this errata sheet shall be attached in front of the indicated field change in the applicable technical publication.

J. I. MALONEY, CAPT., USCG
CHIEF, ELECTRONICS ENGINEERING DIVISION

DISTRIBUTION - SDL No. 112

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
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B		5	5				5		5										5							
C																			2			2				
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05 APR 1995

ELECTRONIC FIELD CHANGE BULLETIN

F.C. NO. 5 TYPE 1 TO AN/FPN-60 TRANSMITTER CONTROL SET

PURPOSE:

This field change modifies the AN/FPN-60 Transmitter Control Set (TCS) Technical Manual to reflect the Remote Operating System (ROS) equipment modifications. It also replaces old nomenclature plates with new nomenclature plates to reflect whether the equipment is non-ROS- or ROS-modified.

DESCRIPTION:

1. This field change incorporates a new appendix, new parts list pages, and new schematic pages into the AN/FPN-60 Transmitter Control Set (TCS) Technical Manual to reflect the Remote Operating System (ROS) equipment modifications.

2. This field change replaces the nomenclature plates in the AN/FPN-60 TCS with new nomenclature plates.

Original	Non-ROS-Modified	ROS-Modified
AN/FPN-60	AN/FPN-60(V)	AN/FPN-60A(V)
J-3353/FPN-60	J-3353/FPN-60(V)	J-3353/FPN-60A(V)
SA-2063/FPN-60	SA-2063/FPN-60(V)	SA-2063/FPN-60A(V)

3. This field change modifies the TS-3550/FPN Electrical Pulse Analyzer (EPA) to allow the watchstander and maintenance technician to view peak volts and Envelope-to-Cycle Difference (ECD) on the TS-3550/FPN EPA's Digital Panel Meter when the TS-3550/FPN is in the "Remote" mode.

DISTRIBUTION - SDL No. 132

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
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D																				1						
E								*																		
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Non-standard Distribution (Continued on page 3)

EQUIPMENT AFFECTED:

This field change is applicable to all AN/FPN-60 Transmitter Control Sets.

IDENTIFICATION OF ACCOMPLISHMENT:

The ability to read peak volts and ECD on the EPA Digital Panel Meter while in the "Remote" mode, and the presence of the new nomenclature plates installed on the TCS will identify this change.

MATERIALS REQUIRED:

1. Units with the AN/FPN-60(V) (non-ROS-modified) Transmitter Control Set will require Field Change No. 5 Parts Kit A, National Stock Number (NSN) CG 5825-01-GL7-5133.

2. Units with the AN/FPN-60A(V) (ROS-modified) Transmitter Control Set will require Field Change No. 5 Parts Kit B, NSN CG 5825-01-GL7-5134.

3. A Field Change No. 5 Parts Kit A or B and standard hand tools are all that is needed to perform this field change.

4. A list of parts contained in parts kit A or B is provided as enclosure (2) to this bulletin.

5. To order field change kits at no cost, field units and commanding officers of Headquarters units will send "MILSTRIP REQUISITIONS" to Supply Center Baltimore, in accordance with current directives. NSN CG 5825-01-GL7-5133 applies for Parts Kit A, and NSN CG 5825-01-GL7-5134 applies for Parts Kit B.

PROCEDURE:

1. Follow the Step-by-step Installation Instructions provided as enclosure (1) to this bulletin for the AN/FPN-60 Nomenclature plates and TS-3550/FPN EPA modifications.

2. Follow the Technical Manual Correction Instructions provided as enclosure (3) to this bulletin to update the AN/FPN-60 Transmitter Control Set Technical Manual.

ROUTINE INSTRUCTIONS:

1. Record completion by an entry on the Field Change Accomplished Plate, NSN I 0264-LP-085-0000 (available from the Naval Publications and Forms Center, Philadelphia, PA.)

2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Supply Center, Baltimore, MD (Code 341). Order directly, using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-1754 applies.

3. Upon completion, a copy of this field change bulletin shall be inserted in the front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished, and that applicable technical manual annotations and reports have been made.

S. W. Clark

S. W. CLARK

Encl: (1) Step-by-step Installation Instructions
(2) Parts Lists for Field Change No. 5 Parts Kits A and B
(3) Technical Manual Corrections to the AN/FPN-60 Series

Non-Standard Distribution (Continued from page 1)

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STEP-BY-STEP INSTALLATION INSTRUCTIONS
FOR AN/FPN-60 TRANSMITTER CONTROL SET

NOTES:

This field change will require approximately 2 hours to install.

Observe all safety precautions outlined in COMDTINST M10550.25, Chapter 2.

Read all instructions before attempting to install this field change.

1. Inform the Control Monitor Station that you will be performing maintenance on the TS-3550/FPN Electrical Pulse Analyzer (EPA).

2. Secure power to the TS-3550/FPN EPA.

3. Label and disconnect cables from the back of the EPA, and connect the cable removed from jack J7 into the cabinet dummy load.

4. Remove the EPA from the AN/FPN-60 Transmitter Control Set (TCS).

5. Remove the top cover of the EPA.

6. Place the paper template (item #4 of F.C. No. 5 Parts Kit) over XA2 edge connector; see diagrams 1 and 2. Pin 23 and 12 should be indicated.

7. Jumper pins 23 and 12 together using the wire provided as parts kit item #5.

8. Remove the paper template. Replace the top cover on the EPA.

9. Install the EPA into the AN/FPN-60 rack.

10. Reconnect all cables that were disconnected in step 3.

11. Reconnect power to the EPA and observe readings. EPA should operate normally.

12. To verify proper installation of the jumper wire, place the Front Panel Control/Remote Control switch (S5) in the "Remote Control" position. The Digital Panel Meter should continue to display ECD and Peak Volts properly.

13. Place switch S5 back in the "Front Panel Control" position.

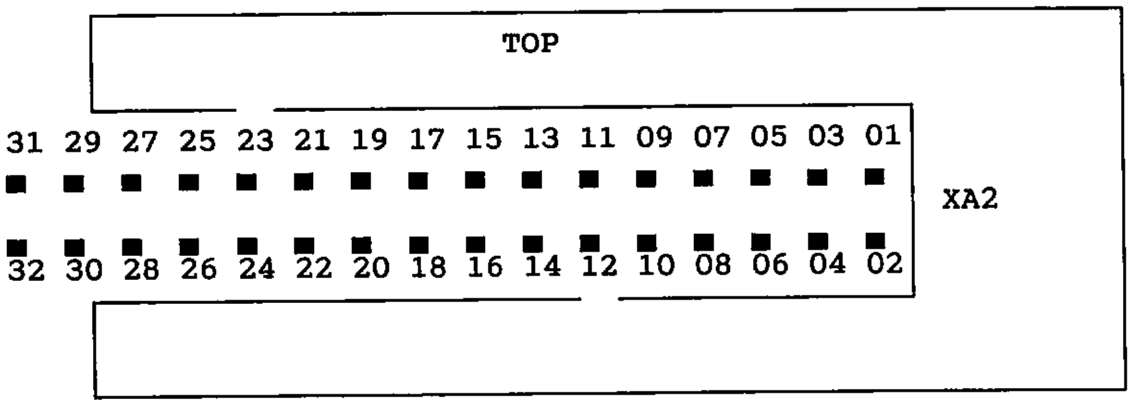

Diagram 1

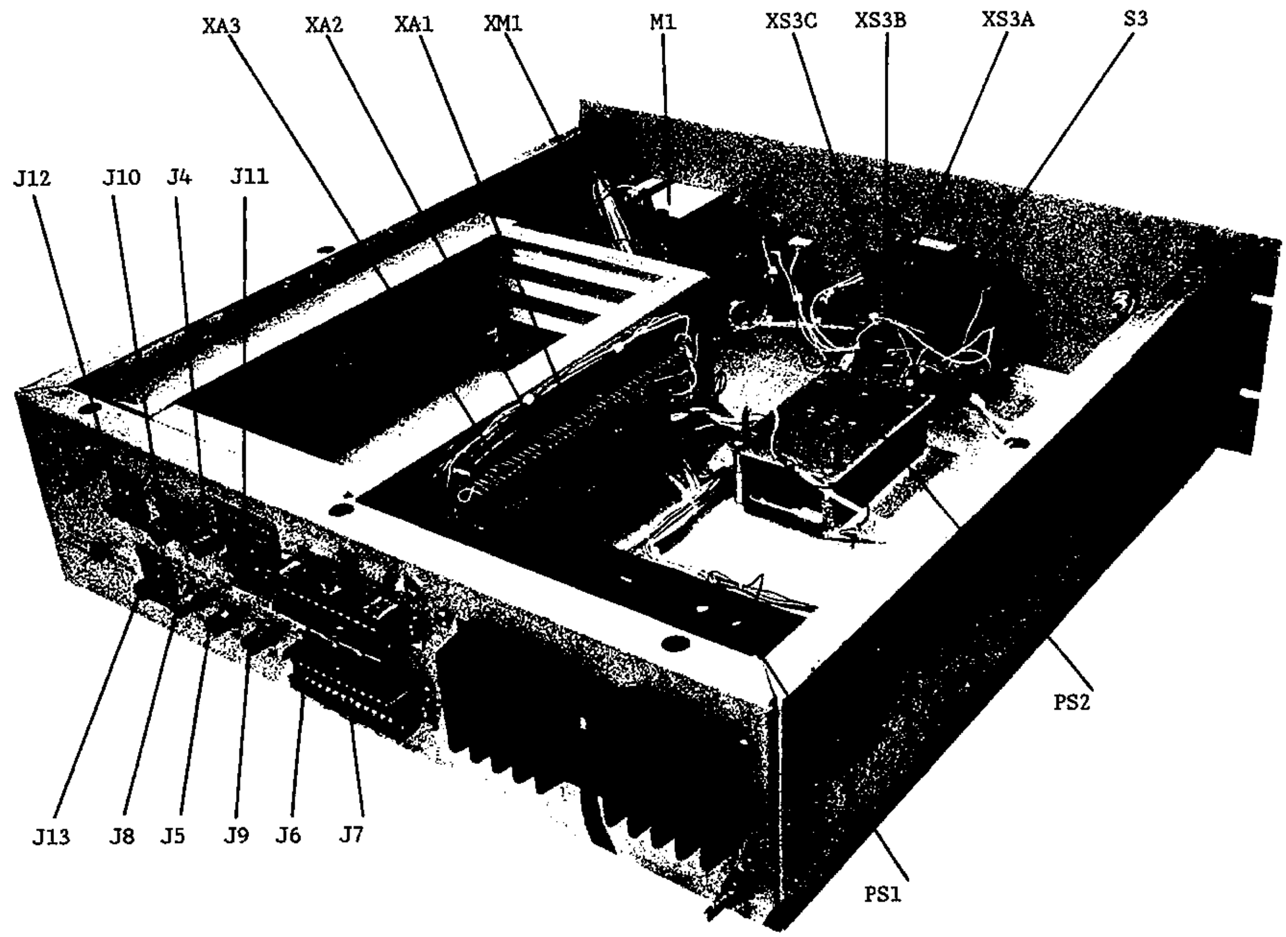

Diagram 2

14. Inform the Control Monitor Station that you have completed maintenance on the TS-3550/FPN EPA.

15. Locate the nomenclature plate AN/FPN-60 on the front of the TCS and remove it. Locate the nomenclature plate AN/FPN-60(V) or AN/FPN-60A(V), parts kit item #1. Stamp or inscribe the serial number that is on the AN/FPN-60 nomenclature plate onto the AN/FPN-60(V) or AN/FPN-60A(V) nomenclature plate. Install the new nomenclature plate using the existing hardware.

16. Locate the nomenclature plate J-3353/FPN-60 on the Interface Unit and remove it. Locate the nomenclature plate J-3353/FPN-60(V) or J-3353/FPN-60A(V), parts kit item #2. Stamp or inscribe the serial number that is on the J-3353/FPN-60 nomenclature plate onto the J-3353/FPN-60(V) or J-3353/FPN-60A(V) nomenclature plate. Install the new nomenclature plate using the existing hardware on the Interface Unit.

17. Locate the nomenclature plate SA-2063/FPN-60 on the Switch Assembly and remove it. Locate the nomenclature plate SA-2063/FPN-60(V) or SA-2063/FPN-60A(V), parts kit item #3. Stamp or inscribe the serial number that is on the SA-2063/FPN-60 nomenclature plate onto the SA-2063/FPN-60(V) or SA-2063/FPN-60A(V) nomenclature plate. Install the new nomenclature plate using the existing hardware on the Switch Assembly.

18. Deinstall the AN/FPN-60, J-3353/FPN-60, and SA-2063/FPN-60 from the Electronic Installation Record (EIR) using the Electronic Equipment Information System (EEIS) procedures, stating "NOMENCLATURE CHANGE" in the comments field.

19. Enter the AN/FPN-60(V), SA-2063/FPN-60(V), J-3353/FPN-60(V) or AN/FPN-60A(V), SA-2063/FPN-60A(V), J-3353/FPN-60A(V) as a new installation; whichever applies to your station, using EEIS procedures.

PARTS LIST FOR FIELD CHANGE #5 PARTS KIT A
NSN CG 5825-01-GL7-5133.

ITEM	QTY	DESCRIPTION
1	1	AN/FPN-60(V) Nomenclature Plate
2	1	J-3353/FPN-60(V) Nomenclature Plate
3	1	SA-2063/FPN-60(V) Nomenclature Plate
4	1	XA2 Paper Template
5	1	3-3/4" Jumper Wire

PARTS LIST FOR FIELD CHANGE #5 PARTS KIT B
NSN CG 5825-01-GL7-5134.

ITEM	QTY	DESCRIPTION
1	1	AN/FPN-60A(V) Nomenclature Plate
2	1	J-3353/FPN-60A(V) Nomenclature Plate
3	1	SA-2063/FPN-60A(V) Nomenclature Plate
4	1	XA2 Paper Template
5	1	3-3/4" Jumper Wire

U.S. Department of Transportation
United States Coast Guard

Commanding Officer(EO-R)
USCG Electronics
Engineering Center

P. O. Box 60
Wildwood, NJ 08260-0060
(609) 523-7314

ELECTRONIC FIELD CHANGE BULLETIN DEC 9 1992

F.C. No. 6 TYPE 2 TO AN/FPN-60(V)

PURPOSE:

This Field Change Bulletin authorizes the installation of an exhaust fan in the AN/FPN-60(V) cabinet, CY-7523/FPN-60(V), to prevent problems caused by excessive heat.

DESCRIPTION:

This field change documents the installation of an exhaust fan and screen guard in the top panel of the CY-7523/FPN-60(V) cabinet.

EQUIPMENT AFFECTED:

This field change is applicable to the AN/FPN-60(V) cabinet, CY-7523/FPN-60(V).

IDENTIFICATION OF ACCOMPLISHMENT:

This field change may be identified by the presence of an exhaust fan installed in the top panel of the CY-7523/FPN-60(V) cabinet.

MATERIALS REQUIRED:

A copy of Field Change No. 6 Bulletin, with enclosures (1) through (3), and standard hand and power tools are required to complete this field change.

PROCEDURE:

1. Remove top panel of CY-7523/FPN-60(V) cabinet.

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A																										
B	*	2			1				*								1	10	10							
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Non-Standard Distribution continued on page 3

2. Using the template supplied in enclosure (2), mark inside surface of the panel where exhaust fan is to be installed.

3. Using a drill and saber saw (or hack saw), cut a hole as shown in enclosure (2). Make cut from inside surface to minimize scratches to outside of equipment rack. Remove any burrs or rough edges with a file.

4. Solder power cord to the exhaust fan, placing heat shrink tubing over connections to prevent arcing.

5. Attach brackets to exhaust fan using the hardware enclosed in the screen kit.

6. Mount the exhaust fan and bracket combination to the cabinet panel with station-supplied hardware.

7. Attach screen guard as shown in enclosure (2).

8. Reinstall panel on CY-7523/FPN-60(V) cabinet. Route the power cable, in accordance with good engineering practices, to the grounded AC power strip in the CY-7523/FPN-60(V) cabinet.

9. Make technical manual corrections using enclosure (3).

<u>ROUTINE INSTRUCTIONS</u>:

1. Record completion of this field change by an entry on the Field Change Accomplished Plate, NSN 0264-LP-086-0000 (available from the Naval Publications and Forms Center, Philadelphia, PA).

2. Maintenance and support facilities shall maintain a library copy of this and all other field change bulletins applicable to them. Additional and replacement copies can be obtained from Coast Guard Supply Center, Brooklyn, NY (Code 341). Order directly, using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-1755 applies.

3. Upon completion, a copy of this Field Change Bulletin shall be inserted in the front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished, and that technical manual annotations and applicable reports have been made.

L. T. Anderson

L. T. ANDERSON

Encl: (1) Parts Supplied by Station
(2) Installation Diagram and Template
(3) AN/FPN-60(V) Technical Manual Corrections

Non-Standard Distribution (Continued from page 1)

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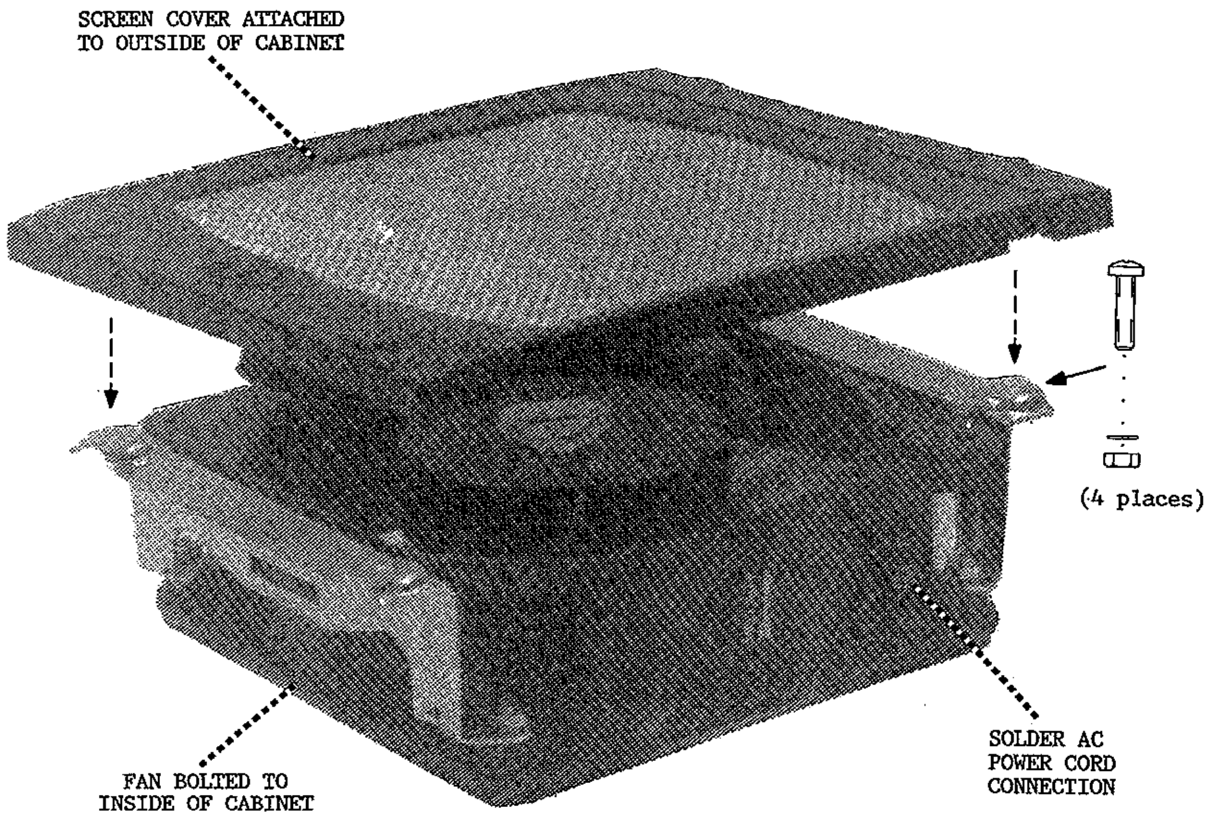
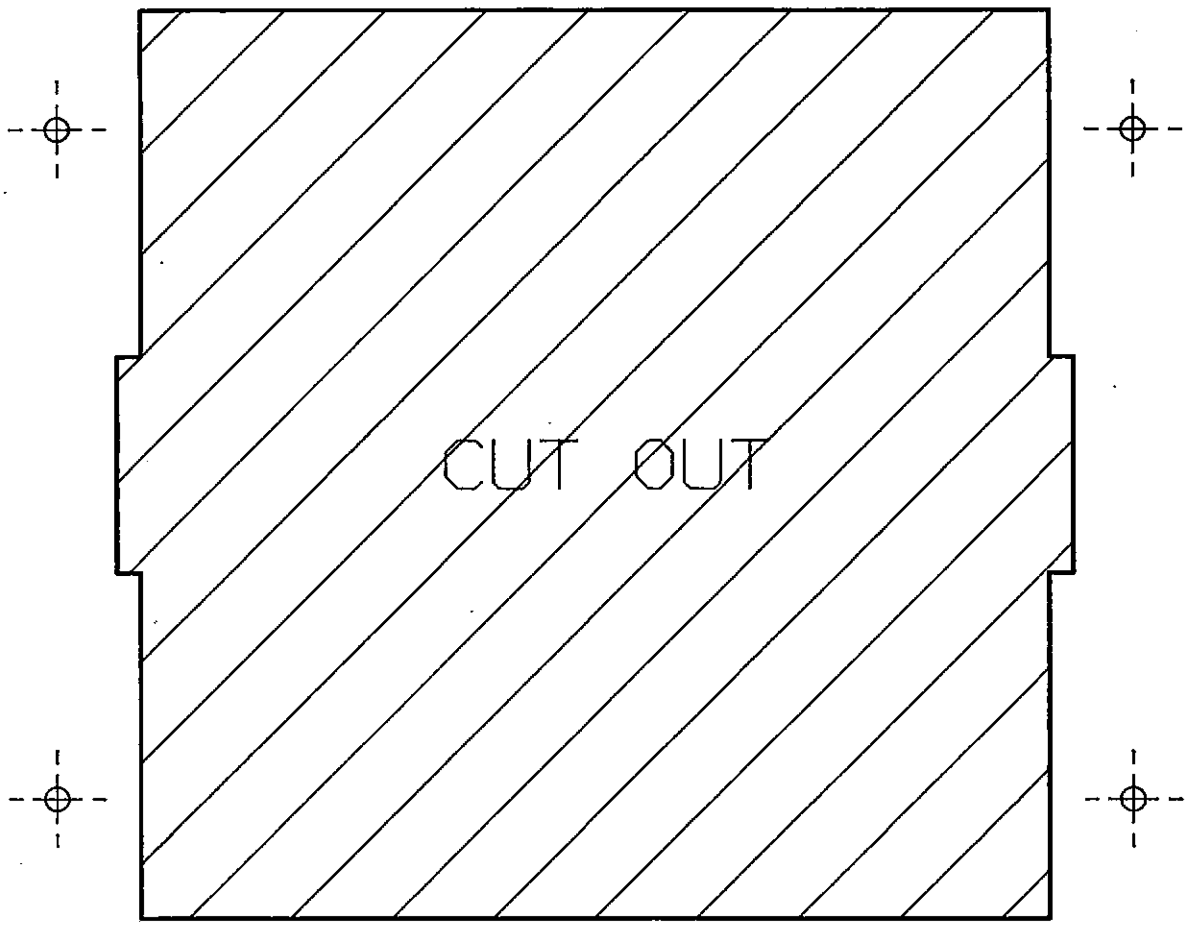
PARTS SUPPLIED BY STATION

PART	PART NUMBER	SOURCE OF SUPPLY
1. Box Fan	WS2107FL-1009 WS2107F-1110	NSN 4140-00-726-9755 NSN 4140-00-442-3490
2. Screen Guard Kit	060003	IMC Magnetics Corp. 570 Main Street Westbury, NY 11590 (516)231-8100
3. Screws, Nuts, Washers, Tie Wraps		Local Procurement
4. 6-Foot Light Duty Power Cord with 120-VAC Plug		Local Procurement
5. Heat Shrink Tubing		Local Procurement


SCREEN COVER ATTACHED
TO OUTSIDE OF CABINET
(4 places)
FAN BOLTED TO
INSIDE OF CABINET
SOLDER AC
POWER CORD
CONNECTION

Enclosure: (2)



TEMPLATE FOR HOLE

U.S. Department of Transportation
United States Coast Guard

Commanding Officer(R)
USCG Electronics
Engineering Center

P. O. Box 60
Wildwood, NJ 08260-0060
(609) 523-7312

ELECTRONIC FIELD CHANGE BULLETIN

F.C. NO. 7 TYPE 1 TO AN/FPN-60(V) TRANSMITTER CONTROL SET

PURPOSE:

The purpose of this field change is to install new nomenclature plates which properly identify units of the AN/FPN-60 (V) Loran-C Transmitter Control Set.

DESCRIPTION:

This field change consists of replacing the nomenclature plates on the GCF-W-757-TSS, C-9888/FPN-60, TS-3550/FPN-60, SG-1099/FPN-60, and CY-7523/FPN-60 with new nomenclature plates.

EQUIPMENT AFFECTED:

This field change is applicable to all Loran-C stations that have the AN/FPN-60(V) Transmitter Control Set installed.

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of the following nomenclature plates will identify this change: SM-807/FPN-60(V), C-9888/FPN-60(V), TS-3550/FPN, SG-1099/FPN-60(V), and CY-7523/FPN-60(V).

MATERIALS REQUIRED:

1. A Field Change Bulletin No. 7, with enclosure (1), new nomenclature plates, and standard hand tools are all that is required to perform this Field Change.

2. For field change materials at no cost, field units and commanding officers of Headquarters units will send **"APA MILSTRIP REQUISITIONS"** to Supply Center, Brooklyn, in accordance with current directives. National Stock Numbers (NSNs) for nomenclature plates are provided in enclosure (2).

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C											*											*				
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Da: Tokyo and Guam (2)

Non-standard Distribution (Continued on page 2)

PROCEDURE:

1. Follow all safety instructions outlined in COMDTINST M10550.25 Chapter 2.

2. Follow step-by-step instructions of enclosure (1).

ROUTINE INSTRUCTIONS:

1. Record completion of this Field Change by an entry on the Field Change Accomplished Plate, NSN 0264-LP-085-0000 (available from the Naval Publications and Forms Center, Philadelphia, PA).

2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Supply Center, Brooklyn, NY (Code 341). Order directly, using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-1756 applies.

3. Upon completion, a copy of this Field Change Bulletin shall be inserted in the front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished, and that applicable reports have been made.

L. T. Anderson

L. T. ANDERSON

Encl: (1) Step-by-step Installation Instructions
(2) Nomenclature Plate NSN List For Field Change No. 7

Non-Standard Distribution (Continued from page 1)

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THE CANADA BUILDING, 5TH FLOOR
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NOMENCLATURE PLATE NATIONAL STOCK NUMBER LIST FOR FIELD CHANGE NO. 7

ITEM	DESCRIPTION	NSN
1	SM-807/FPN-60(V) Nomenclature Plate	CG 9905-01-GL7-5103
2	C-9888/FPN-60(V) Nomenclature Plate	CG 9905-01-GL7-5104
3	TS-3550/FPN Nomenclature Plate	CG 9905-01-GL7-5105
4	SG-1099/FPN-60(V) Nomenclature Plate	CG 9905-01-GL7-5106
5	CY-7523/FPN-60(V) Nomenclature Plate	CG 9905-01-GL7-5107

STEP-BY-STEP INSTALLATION INSTRUCTIONS

1. Remove the nomenclature plate GCF-W-757-TSS from the Transmitter System Simulator.

2. Stamp or inscribe the serial number that is on the GCF-W-757-TSS nomenclature plate onto the SM-807/FPN-60(V) nomenclature plate.

3. Install the nomenclature plate SM-807/FPN-60(V) using the existing hardware.

4. Remove the nomenclature plate C-9888/FPN-60 from the Coupler Transmitter Control.

5. Stamp or inscribe the serial number that is on the C-9888/FPN-60 nomenclature plate onto the C-9888/FPN-60(V) nomenclature plate.

6. Install the nomenclature plate C-9888/FPN-60(V) using the existing hardware.

8. Remove the nomenclature plate TS-3550/FPN-60 from the Electrical Pulse Analyzer.

9. Stamp or inscribe the serial number that is on the TS-3550/FPN-60 nomenclature plate onto the TS-3550/FPN nomenclature plate.

10. Install the nomenclature plate TS-3550/FPN using the existing hardware.

11. Remove the nomenclature plate SG-1099/FPN-60 from the Pulse Generator.

12. Stamp or inscribe the serial number that is on the SG-1099/FPN-60 nomenclature plate unto the SG-1099/FPN-60(V) nomenclature plate.

13. Install the nomenclature plate SG-1099/FPN-60(V) using the existing hardware.

14. Remove the nomenclature plate CY-7523/FPN-60 from the Electrical Equipment Cabinet.

15. Stamp or inscribe the serial number that is on the CY-7523/FPN-60 nomenclature plate onto the CY-7523/FPN-60(V) nomenclature plate.

16. Install the nomenclature plate CY-7523/FPN-60(V) using the existing hardware.

17. Remove the GCF-W-757-TSS, C-9888/FPN-60, TS-3550/FPN-60, SG-1099/FPN-60, and CY-7523/FPN-60 from the Electronic Installation Record (EIR) using the Electronic Equipment Information System (EEIS) procedures stating, "NOMENCLATURE CHANGE" in the comments field. Note that these old nomenclatures may no longer appear in the EEIS Master Equipment Nomenclature file. In such a case, red-line the item on the EIR, and add the comment "NOMENCLATURE CHANGE" in the margin.

18. Enter the SM-807/FPN-60(V), C-9888/FPN-60(V), TS-3550/FPN, SG-1099/FPN-60(V), and CY-7523/FPN-60(V) as a new installation using EEIS procedures.

U.S. Department of Transportation
United States Coast Guard

Commanding Officer(R)
USCG Electronics
Engineering Center

P. O. Box 60
Wildwood, NJ 08260-0060
(609) 523-7312

ELECTRONIC FIELD CHANGE BULLETIN

F.C. NO. 8 TYPE 4 TO AN/FPN-60(V) TRANSMITTER CONTROL SET AUG 13 1993

PURPOSE:

The purpose of this field change is to re-issue documentation for Field Change No. 1 Type 4 to AN/FPN-60 Transmitter Control Set of 22 August 1977.

DESCRIPTION:

1. The field change consists of checking for proper installation of power cube PS2 in the TS-3550/FPN Electrical Pulse Analyzer (EPA).

2. It also provides a page addition to the AN/FPN-60(V) Series Transmitter Control Set Technical Manual.

EQUIPMENT AFFECTED:

This field change is applicable to Loran-C stations operating with AN/FPN-60(V) Series Transmitter Control Set equipment.

IDENTIFICATION OF ACCOMPLISHMENT:

This field change may be identified by the 5-VDC Datel power cube PS2 mounted, bottom up, and heat sinked to the EPA chassis.

MATERIALS REQUIRED:

1. A Field Change No. 8 Bulletin and enclosures (1) through (3) are required to complete this Field Change.

DISTRIBUTION - SDL No. 130

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Non-Standard Distribution (Continued on page 2)

PROCEDURE:

1. Follow all safety instructions outlined in COMDTINST M10550.25 Chapter 2.

2. Follow the step-by-step installation instructions of enclosure (1).

ROUTINE INSTRUCTIONS:

1. Record completion of all changes by an entry on the Field Change Accomplished Plate, NSN 0264-LP-085-0000 (available from the Naval Publications and Forms Center, Philadelphia, PA).

2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Supply Center, Brooklyn, NY (Code 341). Order directly, using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-1757 applies.

3. Upon completion, a copy of this Field Change Bulletin shall be inserted in the front of all applicable technical manuals. Cognizant commands shall ensure that the Field Change has been accomplished, and that applicable reports have been made.

L. T. ANDERSON

Encl: (1) Step-by-step Installation Instructions
(2) Parts List for Field Change No. 8
(3) Technical Manual Corrections to the AN/FPN-60(V) Series Transmitter Control Technical Manual

Non-Standard Distribution (Continued from page 1)

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STEP-BY-STEP INSTALLATION INSTRUCTIONS

1. Inform control site before starting this procedure.

2. Secure 115-VAC power to the TS-3550/FPN Envelope Pulse Analyzer (EPA).

3. Tag and disconnect cables from back of EPA. Connect the cable removed from jack J7 into cabinet dummy load.

4. Remove EPA from Loran Replacement Equipment (LRE) rack.

5. Remove the top cover of the EPA.

6. Locate the 5-VDC Datel power cube PS2 to see if it is mounted with silicon heat-sink compound to the EPA chassis, and held in place by four, 1 1/4-inch spacers. See Figure 7.20A, enclosure (3).

7. If power cube PS2 is correctly installed on the EPA chassis, skip Steps 8 through 12 and continue with Step 13.

8. If power cube PS2 is not installed properly on the EPA chassis and is still suspended above the chassis by four, 1-inch spacers, proceed with Steps 9 through 17.

9. Remove the four 6-32 panhead, crosspoint screws which mount the power cube PS2 to the EPA chassis.

10. Remove the four, 1-inch threaded spacers on which the power cube PS2 is mounted, and insert four, 1 1/4-inch threaded spacers.

11. Apply a thin coat of silicone insulating compound to the top of the power cube PS2.

12. Heat sink the power cube PS2 to the EPA chassis by turning the power cube PS2 upside down, bottom up. Secure the power cube PS2 to the EPA with the four, 6-32 screws removed in Step 9. (See Figure 1.)

13. Replace the top cover on the EPA.

14. Install the EPA into the LRE rack.

15. Reconnect all cables that were disconnected in Step 3.

16. Reconnect 115-VAC power to the EPA and observe readings. EPA should operate normally.

17. Inform the control site when equipment is returned to normal operation.

PARTS LIST FOR FIELD CHANGE #8

ITEM	QTY	DESCRIPTION	SOURCE
1	4	1.250 inch threaded metal spacer	P/N 313 6477 028 E.F. Johnson Co. P.O. Box Drawer 59089 Minneapolis, MN 55459 1-800-747-8167
2	1	Silicone insulating compound	NSN 9G 6850-00-927-9461

U.S. Department of Transportation
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P. O. Box 60
Wildwood, NJ 08260-0060
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ELECTRONIC FIELD CHANGE BULLETIN

12 MAR 1996

F. C. NO. 9 TYPE 1 TO AN/FPN-60(V)/AN/FPN-60A(V) TRANSMITTER CONTROL SET

PURPOSE:

The purpose of this field change is to provide easy access rear panel test points for measuring the DC power supplies in the C-9888/FPN-60(V) Transmitter Coupler Control, SG-1099/FPN-60(V) Pulse Generator, and the TS-3550/FPN Electrical Pulse Analyzer.

DESCRIPTION:

This field change consists of installing five test points in the rear panel of the C-9888/FPN-60(V) Transmitter Coupler Control and the TS-3550/FPN Electrical Pulse Analyzer for measuring PS1 and PS2. Four test points are installed in the SG-1099/FPN-60(V) Pulse Generator for measuring PS1.

EQUIPMENT AFFECTED:

All AN/FPN-60(V) and AN/FPN-60A(V) Loran-C Local Status Monitor Sets are affected by this field change.

IDENTIFICATION OF ACCOMPLISHMENT:

Accomplishment of this field change can be identified by the presence of voltage test points mounted in the rear panel of the C-9888/FPN-60(V) Transmitter Coupler Control, SG-1099/FPN-60(V) Pulse Generator, and the TS-3550/FPN Electrical Pulse Analyzer.

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Non-standard Distribution (Continued on page 3)

MATERIALS REQUIRED:

1. Single-rated stations will require Field Change No. 9 Bulletin Parts Kit A, Activity Control Number (ACN) CG 5825-01-GL7-5697. A list of parts contained in the parts kit is provided as enclosure (2) to this bulletin.

2. Dual-rated stations will require Field Change No. 9 Bulletin Parts Kit B, Activity Control Number (ACN) CG 5825-01-GL7-5698. A list of parts contained in the parts kit is provided as enclosure (3) to this bulletin.

TOOLS REQUIRED:

50 ohm dummy load, rack mounted
Crimping tool
Drill Portable, Electric
Drill, twist: 1/4 inch
File, Hand
Hammer
Heat gun
Multimeter, digital
Nut driver, 1/4"
Oscilloscope and 2 calibrated X10 scope probes
Solder station
Solder
Safety goggles
Stripper, wire
Pliers, straight nose
Punch, center
Screwdriver: short flat tip
Screwdriver: short phillips tip
Screwdriver: medium flat tip
Wire cutter
Wire labels
Wrench, adjustable, 4 inch
Reamer, hand
Vacuum cleaner

PROCEDURES:

1. **SINGLE-RATED STATIONS ONLY:** Using MILSTRIP procedures order Field Change No. 9 Bulletin Parts Kit A, ACN CG 5825-01-GL7-5697 applies. There is no cost involved.

2. **DUAL-RATED STATIONS ONLY:** Using MILSTRIP procedures order Field Change No. 9 Bulletin Parts Kit B, ACN CG 5825-01-GL7-5698 applies. There is no cost involved.

3. Follow the Step-by-step installation instructions provided as enclosure (1) to install this field change in the AN/FPN-60(V) or the AN/FPN-60A(V) Series Transmitter Control Set.

4. Follow the instructions provided as enclosure (5) to correct the technical manual for AN/FPN-60(V) Series Transmitter Control Set.

5. Follow the instructions provided as enclosure (4) upon completion of this field change.

ROUTINE INSTRUCTIONS:

1. Record completion of this field change by making an entry on the Field Change Accomplished Plate, NSN OI 0264-LP-085-0000 (available from the Naval Publications and Forms Center, Philadelphia, PA).

2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Supply Center, Baltimore, MD (Code 341). Order directly, using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-1758 applies.

3. Upon completion, a copy of this field change bulletin shall be inserted in the front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished and that applicable reports have been made.

F. A. ADAMS

Encl: (1) Step-by-step Installation Instructions for AN/FPN-60(V)/AN/FPN-60A(V) Transmitter Control Set
(2) Parts List for Field Change No. 9 Bulletin Parts Kit A
(3) Parts List for Field Change No. 9 Bulletin Parts Kit B
(4) EECEN Field Change Installation Questionnaire
(5) Technical Manual Corrections to the AN/FPN-60(V) Series Transmitter Control Set Technical Manual

Non-Standard Distribution (Continued from page 1)

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STEP-BY-STEP INSTALLATION INSTRUCTIONS FOR AN/FPN-60(V)/AN/FPN-60A(V) TRANSMITTER CONTROL SET

NOTES:

a. The installation instructions are divided into three sections. Each section will pertain to an individual piece of equipment within the AN/FPN-60(V)/AN/FPN-60A(V) Transmitter Control Set. Section one will cover TS-3550/FPN Electrical Pulse Analyzer. Section two will cover C-9888/FPN-60(V) Transmitter Coupler Control. Section three will cover SG-1099/FPN-60(V) Pulse Generator.

b. Using the field change bulletin and enclosures (2) or (3), verify all installation parts and tools required are available.

c. Each section of this field change installation instruction will require approximately 2 hours to install.

d. Observe all safety precautions outlined in COMDTINST M10550.25 Chapter 2.

e. Read all instructions before attempting to install this field change.

Section 1: Installation Instructions for the TS-3550/FPN Electrical Pulse Analyzer (EPA).

1.1 Using wire markers, label the cables attached to rear panel of the EPA.

1.2 Prepare associated equipment for maintenance:

a. Advise the Control Monitor Station that you will be performing maintenance on the EPA and you will be placing the Timers in local control and the Local Site Operating System (LSOS) will be in Station Maintenance.
b. Place LSOS in Station Maintenance mode.
c. Place Timers in Local Control.
d. Connect jumper wire between TP2 (orange) to TP6 (black) of the operate timer Error Sense (M) board. Dual-rated stations must connect jumper on both rates to prevent Cycle Compensation activity.
e. Place Transmitter in Local Control.

1.3 Secure power to the EPA.

1.4 Disconnect all cables from the EPA and connect the cable removed from J7 into the rack mounted EPA Junction Box (dummy load). Dress all other cable out of the way.

1.5 Remove the four rack mounting screws and remove the EPA from the Transmitter Control Set.

1.6 Placing the EPA on a test/work bench and remove the top cover by loosening the captive hardware fasteners.

1.7 Remove the four screws that mount Power Supply 1 (PS1) to the chassis. Remove all printed circuit boards (PCBs) from the chassis and dress the internal wiring so that the back of the chassis can be safely worked on.

1.8 Clean the area the Test point label, parts kit item #12, will be applied to and attach the label as per Figure 1.

NOTE:

Safety goggles should be worn while performing steps 1.9-1.11

1.9 Using a center punch and hammer, mark a hole on the large plus signs (+) of the test point label.

1.10 Using an electric drill with an 1/4 inch twist drill, drill holes through the chassis on the punches made in step 1.9, taking care not to damage parts inside the chassis.

1.11 Remove the burrs from the holes using a small metal file and remove any metal shaving from the inside chassis using a vacuum cleaner.

1.12 Use Table 1 of Figure 1 for correct Tip jack color location. Mount the Tip jacks to the rear panel of the EPA using its associated star washer and bolt.

1.13 Strip, fasten, and solder the Red wire, parts kit item #1, to the Red tip jack, parts kit item #6.

1.14 Cut and place a 1/2-inch section of electrical insulating sleeving, parts kit item #11, over the soldered connection, ensure solder connection is completely covered. Use a heat gun to reduce the diameter of the heat shrink.

1.15 Repeat steps 1.13 and 1.14 for all four colored tip jacks; using the chart below:

TEST POINT#	TIP JACK COLOR	WIRE COLOR
TP2	Brown	Brown
TP3	Blue	Blue
TP5	Green	Green
TP4	Orange	Orange

1.16 Using Table 1 of Figure 1 for correct connections, route the Red, Brown, Blue, and Green wires attached to the Tip jacks to the appropriate terminal board points.

ELECTRICAL PULSE ANALYZER

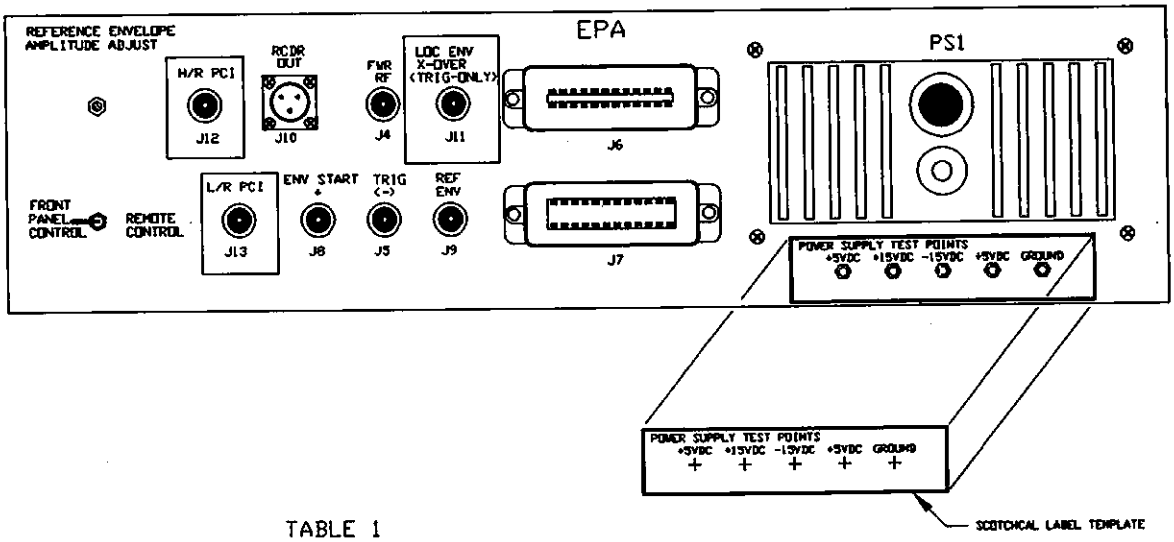

TABLE 1

EPA POWER SUPPLY CONNECTION POINT(S) FOR TEST JACKS			
POWER SUPPLY AND VOLTAGES		TB-1	TEST JACK DESTINATION
PS1	+5VDC	PIN 2	TP1 RED
	+15VDC	PIN 6	TP2 BROWN
	-15VDC	PIN 4	TP3 BLUE
	GROUND	PIN-1	TP5 GREEN
PS2	GROUND		
	+5VDC	SEE NOTE #1	TP4 ORANGE

NOTE 1
THE PS2 +5VDC WIRE
IS CONNECTED DIRECTLY
TO THE TP4 ORANGE TEST POINT

110V AC IN

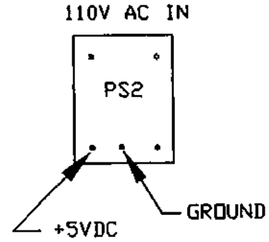

TABLE 2

	NOMINAL VOLTAGE	UPPER LIMIT	LOWER LIMIT	AC RMS RIPPLE
PS1	+5.0V	+5.25V	+4.75V	1.4mV
	+15.0V	+15.5V	+14.5V	2.8mV
	-15.0V	-15.5V	-14.5V	2.8mV
PS2	+5.0V	+5.50V	+4.50V	15mV

Figure 1

1.17 Cut all wires to an appropriate length to reach their respective points on the terminal board.

1.18 Crimp and solder a terminal lug, parts kit item #14, to the Red wire.

1.19 Repeat step 1.18 for the Blue, Brown and Green wire.

1.20 Using Table 1 of Figure 1 for correct connections, connect the Red, Brown, Blue, and Green wires terminal lug to the appropriate terminal board points.

1.21 Using Table 1 of Figure 1 for correct connection, route the Orange wire to power supply 2.

1.22 Cut the wire to an appropriate length to reach the +5VDC post of PS2.

1.23 Desolder the existing wire attached to the +5VDC post of PS2.

1.24 Twist the wire removed in step 1.23 together with the Orange wire and place a 1/2-inch piece of electrical insulating sleeving, parts kit item #11, over wires.

1.25 Solder the two wires to the +5VDC post of PS2. Use a heat gun to reduce the diameter of the heat shrink over the soldered connection.

1.26 Using the tiedown straps, parts kit item #13, dress all wiring as necessary.

1.27 Perform a continuity test by using a multimeter to measure between the tip jacks and wire connection points.

1.28 Reinstall PS1 and the PCBs removed in steps 1.7.

1.29 Apply AC power to EPA on the work bench. Using a multimeter verify the correct voltages correspond to each test point as indicated in Table 2 of Figure 1. Refer to the AN/FPN-60(V) Series Transmitter Control Set Technical Manual for power supply adjustments.

1.30 Remove AC power from the EPA, Replace the top cover tightening the captive hardware fasteners, install the EPA into the AN/FPN-60(V) Transmitter Control Set. Reinstall the rack mounting screws.

1.31 Reconnect all cables disconnected in step 1.4.

1.32 Reconnect AC power. Using both a digital multimeter and Oscilloscope check the power supply voltages and ripple, Refer to Table 2 of Figure 1 for proper voltage levels.

1.33 Verify the ECD and Peak Volts readings are normal. Verify all switches and connections are in their proper position.

1.34 Return equipment to normal configuration:

a. Inside the Operate Timer remove the jumper wire from the Error Sense (M) board.
b. Place Timers in Remote Control.
c. Place Transmitter in Remote control.
d. Place LSOS in Normal operating mode.
e. Advise the Control Monitor Station that you have completed maintenance on the EPA and the Timers are in Remote control and the Local Site Operating System (LSOS) is in normal operating mode.

Section 2: Installation Instructions for the C-9888/FPN-60(V) Transmitter Coupler Control (TCC)

2.1 Using wire markers, label the cables attached to rear panel of the TCC.

2.2 Prepare associated equipment for maintenance:

a. Advise the Control Monitor Station that you will be performing maintenance on the TCC and you will be placing the timers in local control and the Local Site Operating System (LSOS) will be in Station Maintenance.
b. Place LSOS in Station Maintenance mode.
c. Place timers in local control.
e. Place transmitter in local control.

2.3 Secure power to the TCC.

2.4 Disconnect all cables from TCC and connect the cable removed from J2 into the rack mounted TCC junction box (dummy load). Dress all other cable out of the way.

2.5 Remove the four rack mounting screws and remove the TCC from the Transmitter Control Set.

2.6 Placing the TCC on a test/work bench and remove the top cover by loosening the captive hardware fasteners.

2.7 Remove the four screws that mount power supply 1 (PS1) to the chassis. Remove the edge connector XPS1 from the power supply. Remove the power supply and dress the internal wiring so that the back of the chassis can be safely worked on.

2.8 Remove all printed circuit boards from the chassis.

2.9 Clean the area the test point label, parts kit item #26, will be applied to and attach the label as per Figure 2.

NOTE:

Safety goggles should be worn while performing steps 2.10-2.12

CONTROL, COUPLER-TRANSMITTER

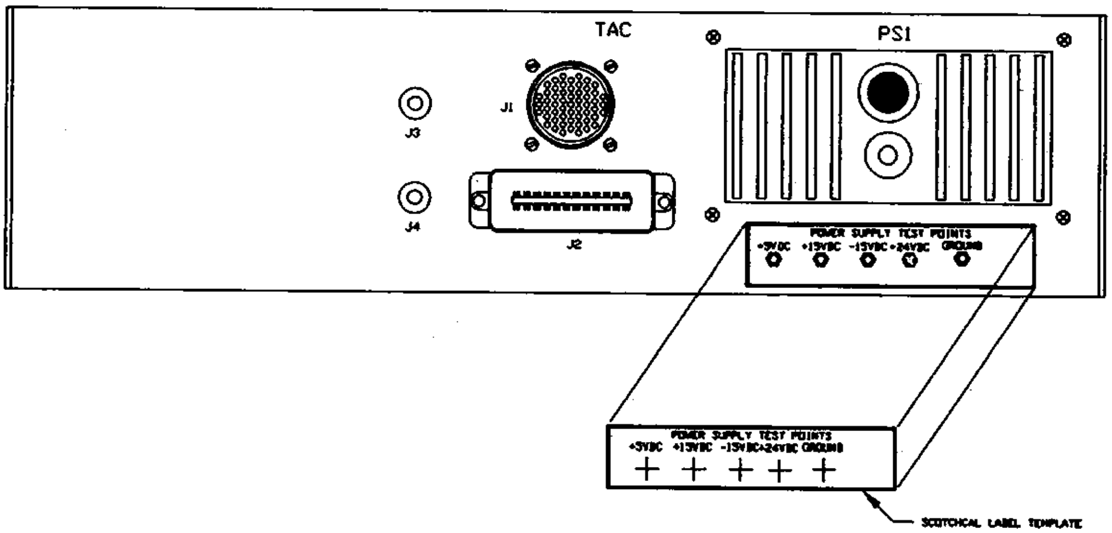

TABLE 1

TCC POWER SUPPLY WIRE HOOK-UP CONNECTION POINT(S) FOR TEST JACKS				
POWER SUPPLY AND VOLTAGES		CONNECTOR (XPS1)	TEST JACK DESTINATION	
PS1	+5VDC	PIN 12	TP1	RED
	+15VDC	PIN 2	TP2	BROWN
	-15VDC	PIN 3	TP3	BLUE
	GROUND	PIN 1	TP5	GREEN
PS2	+24VDC	SEE NOTE 1	TP4	ORANGE

TABLE 2

	NOMINAL VOLTAGE	UPPER LIMIT	LOWER LIMIT	AC RMS RIPPLE
PS1	+5.0V	+5.25V	+4.75V	1.4mV
	+15.0V	+15.0V	+14.5V	2.8mV
	-15.0V	-15.5V	-14.5V	2.8mV
PS2	+24.0V	+24.5V	+23.5V	4.2mV

NOTE 1
The PS2 +24VDC wire is connected directly to the orange test point.

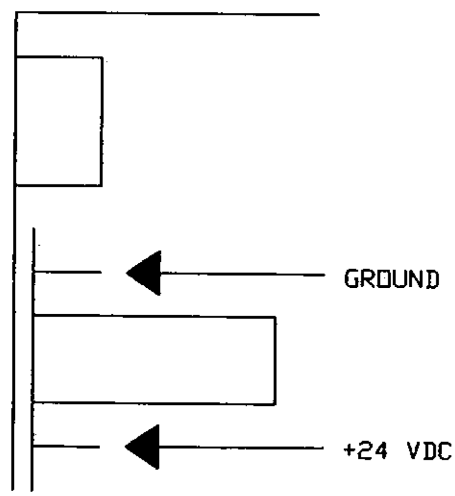

Figure 2

2.10 Using a center punch and hammer, mark a hole on the large plus signs (+) of the test point label.

2.11 Using an electric drill with an 1/4 inch twist drill, drill holes through the chassis on the punches made in step 2.10, taking care not to damage parts inside the chassis.

2.12 Remove the burrs from the holes using a small metal file and remove any metal shaving from the inside chassis using a vacuum cleaner.

2.13 Use Table 1 of Figure 2 for correct tip jack color location. Mount the tip jacks to the rear panel of the TCC using its associated star washer and bolt.

2.14 Strip, fasten, and solder the Red wire, parts kit item #15, to the Red tip jack, parts kit item #20.

2.15 Cut and place a 1/2-inch section of electrical insulating sleeving, parts kit item #25, over the soldered connection, ensure solder connection is completely covered. Use a heat gun to reduce the diameter of the heat shrink.

2.16 Repeat steps 2.14 and 2.15 for all four colored tip jacks; using the chart below:

TEST POINT#	TIP JACK COLOR	WIRE COLOR
TP2	Brown	Brown
TP3	Blue	Blue
TP5	Green	Green
TP4	Orange	Orange

2.17 On the edge connector XPS1, remove the heat shrink from pins 1, 3, and 12.

2.18 Form and route the Red, Brown, Green, and Blue wires along existing power supply edge connector wiring harness. Using tiedown straps, parts kit item #27, loosely tie the wires to maintain the route.

2.19 Connect tip jacks to XPS1:

a. De-solder existing wiring on XPS1 pin 1.
b. Locate the Green wire from TP5, trim, strip, and twist together with the wire removed from pin 1.
c. Place a 1/2-inch length of electrical insulating sleeve, parts kit item #25, over the new pin 1 wire bundle.
d. Reconnect and solder the wires back to pin 1.
e. Place the electrical insulating sleeve over the soldered connection and use a heat gun to reduce the diameter of the electrical insulating sleeve.

2.20 Repeat step 2.19 for the following tip jacks:

XPS1 CONNECTION	WIRE COLOR	TEST POINT#
Pin 2*	Brown	TP2
Pin 3	Blue	TP3
Pin 12	Red	TP1

*** There is no wire to desolder from Pin 2.**

2.21 Using Table 1 of Figure 2 for correct connection, route the Orange wire to power supply 2 (PS2).

2.22 Desolder the existing wires attached to the +24VDC post of PS2.

2.23 Twist the wires removed in step 2.22 together with the Orange wire and place a 1/2-inch piece of electrical insulating sleeving, parts kit item #25, over wires.

2.24 Solder the new wire bundle to the +24VDC post of PS2. Using a heat gun, reduce the diameter of the heat shrink over the soldered connection.

2.25 Using the tiedown straps, parts kit item #27, dress all wiring as necessary.

2.26 Perform a continuity test by using an ohmmeter to measure between the test point jacks and power supply edge connector pins. Refer to Table 1 of Figure 2.

2.27 Attach XPS1, edge connector, to the PS1 and reinstall the power supply and PCBs removed in steps 2.7 and 2.8.

2.28 Apply AC power to TCC on the work bench. Using a multimeter, verify the correct voltages correspond to each test point as indicated in Table 2 of Figure 2. Refer to the AN/FPN-60(V) Series Transmitter Control Set Technical Manual for power supply adjustments.

2.29 Remove AC power from the TCC, replace the top cover tightening the captive hardware fasteners, install the TCC into the Transmitter Control Set. Reinstall the rack mounting screws.

2.30 Reconnect all cables disconnected in step 2.4.

2.31 Reconnect AC power. Using both a digital multimeter and oscilloscope check the power supply voltages and ripple. Refer to Table 2 of Figure 2 for proper voltage levels.

2.32 Verify all switches and connections are in their proper position and all proper indications are displayed.

2.33 Return equipment to normal configuration:

a. Place timers in remote control.
b. Place transmitter in remote control.
c. Place LSOS in normal operating mode.
d. Advise the Control Monitor Station that you have completed maintenance on the TCC and the timers are in remote control and the Local Site Operating System (LSOS) is in normal operating mode.

Section 3: Installation Instructions for the SG-1099/FPN-60(V) Pulse Generator (PGEN).

NOTES:

a. This field change should be performed only on the PGEN(s) in the standby mode. The operate transmitter must be switched and placed in the standby mode to accomplish the installation on all PGEN(s).

b. Installation of this section will take approximately 2 hours per PGEN.

3.1 Using wire markers, label the cables attached to rear panel of the PGEN.

3.2 Prepare associated equipment for maintenance:

a. Advise the Control Monitor Station that you will be performing maintenance on the PGEN and you will be placing the timers in local control and the Local Site Operating System (LSOS) will be in station maintenance.
b. Place LSOS in station maintenance mode.
c. Place timers in local control.
d. Place transmitter in local control.

3.3 Secure power to the PGEN.

3.4 Disconnect all cables from the PGEN and dress all cables out of the way.

3.5 Remove the four rack mounting screws and remove the PGEN from the Transmitter Control Set.

3.6 Placing the PGEN on a test/work bench and remove the top cover by loosening the captive hardware fasteners.

3.7 Remove the four screws that mount power supply 1 (PS1) to the chassis. Remove the edge connector XPS1 from the power supply. Remove the power supply and dress the internal wiring so that the back of the chassis can be safely worked on.

3.8 Remove all printed circuit boards from the chassis.

3.9 Clean the area the test point label, parts kit item #37, will be applied to and attach the label as per Figure 3.

PULSE GENERATOR

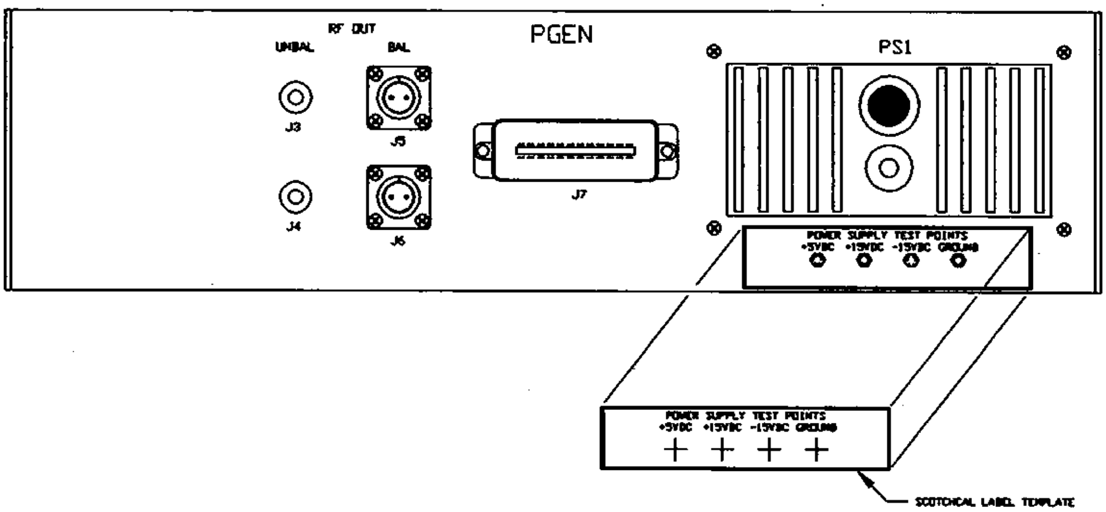

TABLE 1

PGEN POWER SUPPLY WIRE HOOK-UP CONNECTION POINT(S) FOR TEST JACKS				
POWER SUPPLY AND VOLTAGES		CONNECTOR (XPS1)	TEST JACK DESTINATION	
PS1	+5VDC	PIN 12	TP1	RED
	+15VDC	PIN 2	TP2	BROWN
	-15VDC	PIN 3	TP3	BLUE
	GROUND	PIN 1	TP4	GREEN

TABLE 2

	NOMINAL VOLTAGE	UPPER LIMIT	LOWER LIMIT	AC RIPPLE
PS1	+5.0V	+5.25V	+4.75V	1.4mV
	+15.0V	+15.5V	+14.5V	2.8mV
	-15.0V	-15.5V	-14.5V	2.8mV

Figure 3

NOTE:

Safety goggles should be worn while performing steps 3.10-3.12

3.10 Using a center punch and hammer, mark a hole on the large plus signs (+) of the test point label.

3.11 Using an electric drill with an 1/4-inch twist drill, drill holes through the chassis on the punches made in step 3.10, taking care not to damage parts inside the chassis.

3.12 Remove the burrs from the holes using a small metal file and remove any metal shaving from the inside chassis using a vacuum cleaner.

3.13 Use table 1 of Figure 3 for correct tip jack color location. Mount the tip jacks to the rear panel of the PGEN using its associated star washer and bolt.

3.14 Strip, fasten and solder the Red wire, parts kit item #28, to the Red tip jack, parts kit item #32.

3.15 Cut and place a 1/2-inch section of electrical insulating sleeving, parts kit item #36, over the soldered connection, ensure solder connection is completely covered. Use a heat gun to reduce the diameter of the electrical insulating sleeve.

3.16 Repeat steps 3.14 and 3.15 for all three colored tip jacks; using the chart below:

TEST POINT#	TIP JACK COLOR	WIRE COLOR
TP2	Brown	Brown
TP3	Blue	Blue
TP4	Green	Green

3.17 On the edge connector XPS1, remove the heat shrink from pins 1, 2, 3, and 12.

3.18 Form and route the Red, Brown, Green, and Blue wires along existing power supply edge connector wiring harness. Using tiedown straps, parts kit item #38, loosely tie the wires to maintain the route.

3.19 Connect tip jacks to XPS1:

a. De-solder existing wiring on XPS1 pin 1.
b. Locate the Green wire from TP4, trim, strip and twist together with the wire removed from pin 1.
c. Place a 1/2-inch length of electrical insulating sleeve, parts kit item #36, over the new pin 1 wire bundle.
d. Reconnect and solder the wires back to pin 1.
e. Place the electrical insulating sleeve over the soldered connection and use a heat gun to reduce the diameter of the electrical insulating sleeve.

3.20 Repeat step 19 for the following tip jacks:

XPS1 CONNECTION	WIRE COLOR	TEST POINT#
Pin 2	Brown	TP2
Pin 3	Blue	TP3
Pin 12	Red	TP1

3.21 Properly dress the wires to the power supply edge connector wiring harness tightening all tiedown straps.

3.22 Perform a continuity test by using an ohmmeter to measure between the test point jacks and power supply edge connector pins. Refer to Table 1 of Figure 3.

3.23 Attach XPS1, edge connector, to the power supply and reinstall the power supply and PCBs removed in steps 3.7 and 3.8.

3.24 Apply AC power to PGEN on the work bench. Using a multimeter verify the correct voltages correspond to each test point as indicated in Table 2 of Figure 3. Refer to the AN/FPN-60(V) Series Transmitter Control Set Technical Manual for power supply adjustments.

3.25 Remove AC power from the PGEN, replace the top cover tightening the captive hardware fasteners, install the PGEN into the Transmitter Control Set. Reinstall the rack mounting screws.

3.26 Reconnect all cables disconnected in step 3.4.

3.27 Reconnect AC power. Using both a digital multimeter and Oscilloscope check the power supply voltages and ripple. Refer to Table 2 of Figure 3 for proper voltage levels.

3.28 Verify all switches and connections are in their proper position and all proper indications are displayed.

3.29 Return equipment to normal configuration:

a. Place timers in remote control.
b. Place transmitter in remote control.
c. Place LSOS in normal operating mode.
d. Advise the Control Monitor Station that you have completed maintenance on the PGEN and the timers are in remote control and the Local Site Operating System (LSOS) is in normal operating mode.

PARTS LIST FOR FIELD CHANGE #9 PARTS KIT A
NSN CG 5825-01-GL7-5697

Parts for installing field change in the TS-3550/FPN Electrical Pulse Analyzer

Item	Quantity	Description	National Stock Number
1	1	Wire, 35", AWG 22, Red	6145-00-548-2692
2	1	Wire, 35", AWG 22, Brown	6145-00-643-3714
3	1	Wire, 35", AWG 22, Blue	6145-00-643-2178
4	1	Wire, 35", AWG 22, Orange	6145-00-669-6622
5	1	Wire, 35", AWG 22, Green	6145-00-617-0372
6	1	Tip Jack, Red (Test Point)	5935-00-702-4199
7	1	Tip Jack, Brown (Test Point)	5935-00-764-2135
8	1	Tip Jack, Blue (Test Point)	5935-00-766-4617
9	1	Tip Jack, Orange (Test Point)	5935-00-813-5874
10	1	Tip Jack, Green (Test Point)	5935-00-733-6587
11	1	Insulating sleeving, Electrical 4.0" length	5970-00-954-1622
12	2	Test point label	
13	15	Strap, Tiedown, 4 inch	5975-00-111-3208
14	8	Terminal lug, 16-22 AWG, #6 Stud Size	5940-00-231-4430

Parts for installing field change in the C-9888/FPN-60(V) Transmitter Coupler Control

Item	Quantity	Description	National Stock Number
15	1	Wire, 22", AWG 22, Red	6145-00-548-2692
16	1	Wire, 22", AWG 22, Brown	6145-00-643-3714
17	1	Wire, 22", AWG 22, Blue	6145-00-643-2178
18	1	Wire, 35", AWG 22, Orange	6145-00-669-6622
19	1	Wire, 22", AWG 22, Green	6145-00-617-0372
20	1	Tip Jack, Red (Test Point)	5935-00-702-4199
21	1	Tip Jack, Brown (Test Point)	5935-00-764-2135
22	1	Tip Jack, Blue (Test Point)	5935-00-766-4617
23	1	Tip Jack, Orange (Test Point)	5935-00-813-5874
24	1	Tip Jack, Green (Test Point)	5935-00-733-6587
25	1	Insulating sleeving, Electrical 4.0" length	5970-00-954-1622
26	2	Test point label	
27	15	Strap, Tiedown, 4 inch	5975-00-727-5153

ENCLOSURE (2)

PARTS LIST FOR FIELD CHANGE #9 PARTS KIT A
NSN CG 5825-01-GL7-5697

ENCLOSURE (3)

PARTS LIST FOR FIELD CHANGE #9 PARTS KIT B
NSN CG 5825-01-GL7-5698

Parts for installing field change in the SG-1099/FPN-60(V) Pulse Generator

NOTE:

Dual Rated stations will require four part packages, one for each SG-1099/FPN-60(V) Pulse Generator.

Item	Quantity	Description	National Stock Number
28	1	Wire, 22", AWG 22, Red	6145-00-548-2692
29	1	Wire, 22", AWG 22, Brown	6145-00-643-3714
30	1	Wire, 22", AWG 22, Blue	6145-00-643-2178
31	1	Wire, 22", AWG 22, Green	6145-00-617-0372
32	1	Tip Jack, Red (Test Point)	5935-00-702-4199
33	1	Tip Jack, Brown (Test Point)	5935-00-764-2135
34	1	Tip Jack, Blue (Test Point)	5935-00-766-4617
35	1	Tip Jack, Green (Test Point)	5935-00-733-6587
36	1	Insulating sleeving, Electrical 4.0" length	5970-00-954-1622
37	2	Test point label	
38	15	Strap, Tiedown, 4 inch	5975-00-727-5153

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OCT 10 1997

ERRATA SHEET NO. 1

TO

F. C. NO. 9 TYPE 1 TO AN/FPN-60(V)/AN/FPN-60A(V) TRANSMITTER CONTROL SET

PURPOSE:

This errata sheet provides pen and ink corrections to Field Change Bulletin No. 9 to the AN/FPN-60(V)/AN/FPN-60A(V) Transmitter Control Set and the Step-by-step Installation Instructions provided as Enclosure (1) to the field change.

PROCEDURE:

1. Locate the Field Change Bulletin No. 9 to the AN/FPN-60(V)/AN/FPN-60A(V) Transmitter Control Set and make the following pen and correction to the heading on page 1:

Change:

"F. C. NO. 9 TYPE 1 TO AN/FPN-60(V)/AN/FPN-60A(V) TRANSMITTER CONTROL SET"

To read:

"F. C. NO. 9 TYPE 1 TO AN/FPN-60(V) TRANSMITTER CONTROL SET
F.C. NO. 1 TYPE 1 TO AN/FPN-60A(V) TRANSMITTER CONTROL SET"

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Non-Standard Distribution (Continued on Page 2)

2. Locate Enclosure (1) to Field Change Bulletin No. 9 to the AN/FPN-60(V)/AN/FPN-60A(V) Transmitter Control Set, and make the following pen and correction to page 5, step 2.2:

   Between steps (c) and (e), add:

   d. **Connect jumper wire between TP2 (orange) to TP6 (black) of the operate timer Error Sense (M) board. Dual-rated stations must connect jumper on both operate timers to prevent Cycle Compensation activity.**

ROUTINE INSTRUCTIONS:

Upon completion, attach this errata sheet in front of Field Change Bulletin No. 9 to the AN/FPN-60(V)/AN/FPN-60A(V). Copies of this errata sheet may be obtained from Coast Guard Engineering Logistic Center, Baltimore, MD. Order directly, using MILSTRIP procedures; no cost is involved. National Stock Number CG 7610-01-GE8-1760 applies.

C. A. SCHUE, III

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NOV 5 1997

ELECTRONIC FIELD CHANGE BULLETIN

F. C. NO. 10 TYPE 1 TO AN/FPN-60(V) LORAN-C TRANSMITTER CONTROL SET
F. C. NO. 2 TYPE 1 TO AN/FPN-60A(V) LORAN-C TRANSMITTER CONTROL SET

PURPOSE:

This field change authorizes the addition of a PP-7839/G Standby DC Power Supply (Unit 1A12) in the AN/FPN-60(V)/60A(V) Transmitter Control Set at all single-rate Loran-C tube-transmitter stations.

DESCRIPTION:

This field change provides instructions to install a PP-7839/G Standby DC Power Supply into the AN/FPN-60(V)/60A(V) rack and configure associated GCF-W-1177-I/F DC Interface cables for proper operation.

EQUIPMENT AFFECTED:

This field change is applicable to AN/FPN-60(V)/60A(V) Transmitter Control Sets AT SINGLE-RATE LORAN-C STATIONS ONLY. Although it is located in the AN/FPN-60(V)/60A(V) Transmitter Control Set rack, the PP-7839/G Standby DC Power Supply is configured to provide DC backup power to the tertiary cesium (part of the GCF-RWL-1817B Frequency Standard Set), multicoupler (CU-2297/FSN-2(V)), and all Bravo/Charlie/Delta receivers (R-2240/FSN-2(V)) in the event of a power failure.

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Non-Standard Distribution (Continued on Page 3)

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of a PP-7839/G Standby DC Power Supply located above the SB-4156/FPN-60(V) Waveform Panel (Unit 1A8) in the AN/FPN-60(V)/60A(V) rack will identify accomplishment of this change.

MATERIALS REQUIRED:

The Engineering Logistics Center (ELC) will provide one (1) PP-7839/G Standby DC Power Supply (NSN XB 6130-01-044-3796) and a new set of batteries for the AN/FPN-60(V)/60A(V) Transmitter Control Set. One (1) AC power cord and one (1) DC Interface cable will also be provided. The installing unit's other existing GCF-W-1177-I/F DC Interface cables will be used during installation of this field change.

TOOLS REQUIRED:

Screwdriver, medium Phillips tip
Screwdriver, small flat tip
Soldering iron
Ohmmeter

PROCEDURE:

1. PP-7839/G Standby DC Power Supplies will be shipped to applicable Loran-C stations as they become available. The installing unit is NOT required to order any parts.

2. Upon receipt of a PP-7839/G, follow the step-by-step installation instructions provided as enclosure (1) to this bulletin.

3. Follow the technical manual instructions provided as enclosure (3) to correct the AN/FPN-60(V) and AN/FPN-60A(V) Transmitter Control Set Technical Manual.

4. Complete and return the Field Change Installation Questionnaire provided as enclosure (4).

ROUTINE INSTRUCTIONS:

1. Record completion of this field change by making an entry on the Field Change Accomplishment Plate, National Stock Number (NSN) OI 0264-LP-085-0000 (available from the Naval Publications and Forms Center, Philadelphia, PA).

2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Engineering Logistic Center, Baltimore, MD. Order directly using MILSTRIP procedures; no cost is involved. NSN CG 7610-01-GE8-1759 applies.

3. Upon completion, a copy of this field change bulletin shall be inserted in front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished and that applicable technical manual annotations and reports have been made.

C. A. SCHUE, III

Encl: (1) Step-by-step Installation Instructions
(2) Field Change Parts List
(3) Technical Manual Corrections to the AN/FPN-60(V) and AN/FPN-60A(V) Transmitter Control Sets Technical Manual
(4) LSU Field Change Installation Questionnaire

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STEP-BY-STEP INSTALLATION INSTRUCTIONS FOR THE MODIFIED AN/FPN-60(V)/60A(V) PP-7839/G (Unit 1A12) STANDBY DC POWER SUPPLY

NOTE:
This installation applies to SINGLE-RATE tube transmitting stations ONLY.

Observe all safety precautions outlined in COMDTINST M10550.25, Chapter 2.

Read ALL instructions before attempting to install this field change.

Numbers in brackets [ ] correspond to the item number on the field change Parts List, enclosure (2).

1. Install new batteries [1] into the PP-7839/G Standby DC Power Supply [2]. Plug the PP-7839/G into a wall outlet, turn on the AC switch and allow the batteries to charge overnight.

   WARNING:

   ENSURE THAT THE GCF-W-1177-I/F DC INTERFACE AND ALL ASSOCIATED EQUIPMENT CABLES ARE CONFIGURED IN ACCORDANCE WITH THE DC LOAD BALANCING CHART SHOWN IN TABLE 1 ON PAGE 2 OF THESE INSTRUCTIONS.

   CABLE S131 (INPUT DC INTERFACE) IS A NEW CABLE PROVIDED WITH THE PP-7839/G. IT WILL BE USED DURING THIS INSTALLATION.

2. Remove the lower blank panel located above the SB-4156/FPN-60 Waveform Panel (Unit 1A8) in the AN/FPN-60/60A rack.
3. Place the PP-7839/G into the AN/FPN-60/60A rack between the Waveform Panel and upper blank panel. Secure the power supply using the rack screws removed in Step 2.
4. Run the interface cable [3] from the GCF-W-1177-I/F DC Interface to the PP-7839/G (J1) in the AN/FPN-60/60A rack. NOTE: The existing connector on the cable attaches to the DC Interface, J30. DO NOT CONNECT IT AT THIS TIME. Cut the cable to length ensuring an adequate service loop is left at both ends.
5. Attach the connector [4] at the PP-7839/G end of the cable by following these steps:
   a. Slide the cable clamp and small clear insert onto the cable.
   b. Solder the white wire (positive) to pin A of the body.
   c. Solder the black wire (negative) to pin C of the body.
   d. Assemble the connector.
   e. Attach the clamp saddles to the connector and tighten. Ensure cable is secure in the connector. Verify no shorts are present on the connector.
   f. Label both ends of the cable "S131".

6. Connect the cable to the DC Interface at J30. Connect the other end of the cable to the PP-7839/G at J1.
7. Connect the AC power cord [5] to the PP7839/G and plug it into the AC power strip located in the rear of the AN/FPN-60/60A rack.
8. Turn on the PP-7839/G AC and BATTERY switches.
9. Inform the control station that testing of the DC backup power will commence.
10. Turn off the AC switch on the PP-7839/G in the AN/FPN-60/60A rack.
11. Remove power to each piece of equipment being backed up by the PP-7839/G in the AN/FPN-60/60A rack: Secure power to the Tertiary Cesium (in the GCF-RWL-1817B Frequency Standard rack), Multicoupler (CU-2297/FSN-2) if used, and all R-2240/FSN-2 Loran Receivers by unplugging each unit from the AC power strip in the rear of it's associated rack.
12. The PP-7839/G and associated equipment should operate continuously with no alarms or abnormalities for at least 20 minutes.
13. Re-apply power to the above equipment. Turn on the AC switch on the PP-7839/G in the AN/FPN-60/60A rack. Restore all equipment to normal operation.
14. If there were any problems with the tests, please contact the USCG Loran Support Unit at (609) 523-7275.

CABLE NO.	DC I/F JACK	SINGLE-RATED STATION ONLY	LOAD (AMPS)
S131	J30	INPUT DC INTERFACE	
S135	J19	TERT CESIUM	1.3
S141	J20	MULTICOUPLER	0.1
S142	J26	DELTA RCVR (IF USED)	1.1
S145	J21	BRAVO/CHARLIE RCVR #1	1.1
S146	J22	BRAVO/CHARLIE RCVR #2	1.1
S147	J23	BRAVO/CHARLIE RCVR #3	1.1
S148	J24	BRAVO/CHARLIE RCVR #4	1.1
		TOTAL LOAD	6.9

TABLE 1. DC LOAD BALANCING FOR AN/FPN-60/60A PP-7839/G STANDBY DC POWER SUPPLY

PARTS LIST FOR FIELD CHANGE NO. 10/2 TO THE AN/FPN-60(V)/60A(V) TRANSMITTER CONTROL SET

NOTE: ALL ITEMS ARE PROVIDED BY USCG LSU WILDWOOD AND ELC BALTIMORE. NO FIELD CHANGE PARTS KIT APPLIES.

ITEM	QTY	DESCRIPTION	NSN
1	2 ea.	12V/24AH Battery, NP24-12B2	XB 6140-01-GL3-4682
2	1 ea	PP-7839/G DC Backup Power Supply	XB 6130-01-044-3796
3	30 ft.	DC Interface Cable, 16/2 (GCF-W-1177-I/F DC Interface connector attached)	9Z 6145-00-284-0067
4	1 ea.	Connector, CA3106E12S-2002-10P (For connection to PP-7839/G)	9N 5935-00-236-2259
5	1 ea.	AC Power Cord, 10ft. (modified for use on PP-7839/G)	9G 6150-00-842-0721

U.S. Department of Transportation
United States Coast Guard

Commanding Officer
United States Coast Guard
Loran Support Unit

12001 Pacific Avenue
Wildwood, NJ 08260-3232
Staff Symbol: SMEF
Phone: (609) 523-7275
FAX: (609) 523-7264

ELECTRONIC FIELD CHANGE BULLETIN

JAN - 7 1999

F. C. NO. 11 TYPE 4 TO AN/FPN-60(V) LORAN-C TRANSMITTER CONTROL SET
F. C. NO. 3 TYPE 4 TO AN/FPN-60A(V) LORAN-C TRANSMITTER CONTROL SET

PURPOSE:

This field change documents the installation of the GCF-W-1186-ABS Automatic Blink System.

DESCRIPTION:

This field change provides page changes to the AN/FPN-60(V)/AN/FPN-60A(V) Technical Manual to document the installation of the GCF-W-1186-ABS Automatic Blink System.

EQUIPMENT AFFECTED:

This field change is applicable to all AN/FPN-60(V) and AN/FPN-60A(V) Loran-C Transmitter Control Sets.

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of this field change bulletin in front of the AN/FPN-60(V) and AN/FPN-60A(V) Technical Manual identifies accomplishment of this field change.

MATERIALS REQUIRED:

This field change bulletin with enclosures is required to complete this field change.

DISTRIBUTION – SDL No. 135

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B	*		*		2				*									12	5			2				
C																						*				
D																				*						
E																										
F																										
G																										
H																										

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Cv: LORSTA (Attu, Dana, Fallon, George, Kodiak, Middletown, Port Clarence, Searchlight, Shoal Cove, Saint Paul; Tok) (2)
Dt: ESU (Portsmouth, Boston, Cleveland, New Orleans, Miami, St. Louis, Seattle, Alameda, Kodiak) (1)

Non-Standard Distribution (Continued on Page 3)

TOOLS REQUIRED:

None.

PROCEDURE:

1. Follow the step-by-step instructions for technical manual page changes in enclosure (1).
2. Complete and return the Field Change Installation Questionnaire provided as enclosure (2).

ROUTINE INSTRUCTIONS:

1. Record completion of this field change by making an entry on the Field Change Accomplishment Plate, NSN O1 0264-LP-085-0000, available from the Naval Publications and Forms Center, Philadelphia, PA.

2. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained from Coast Guard Engineering and Logistics Center, Baltimore, MD. Order directly, at no cost, using MILSTRIP procedures. NSN CG 7610-01-GE8-1761 applies.

3. Upon completion, a copy of this field change bulletin shall be inserted in front of all applicable technical manuals. Cognizant commands shall ensure that the field change has been accomplished and that applicable technical manual annotations and reports have been made.

C.A. SCHUE, III

Encl: (1) Technical Manual Corrections to the AN/FPN-60(V) and AN/FPN-60A(V) Loran-C Transmitter Control Set
(2) LSU Field Change Installation Questionnaire

Non Standard Distribution (Continued from Page 1)

Coordinator Of Chain Operations
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Alexandria, VA 22310-3998 (2 copies)

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Coast Guard PMS Contractor
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Fairfax, VA 22031-3091 (1 Copy)

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Kodiak, AK 99616-0032

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Canada V2G 2V8

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Canadian Coast Guard
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Canada A0K 4S0 (2 copies)

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Ottawa, Ontario K1A0N7
ATTN: AMTJ-E (2 copies)

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Canadian Coast Guard Base
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Canada A0G 3A0

Station Manager
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United States Coast Guard

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United States Coast Guard
Loran Support Unit

12001 Pacific Avenue
Wildwood, NJ 08260-3232
Staff Symbol: SDIV
Phone: (609) 523-7275
FAX: (609) 523-7307

ELECTRONIC FIELD CHANGE BULLETIN

F. C. NO. 11 TYPE 2 TO THE AN/FSN-1(V) LORAN-C REMOTE CONTROL SET
F. C. NO. 18/15 TYPE 2 TO THE AN/FPN-54A/65 LORAN-C TIMER SET
F. C. NO. 24/21 TYPE 2 TO THE AN/FPN-64/64A LORAN-C TRANSMITTER SET
F. C. NO. 12/4 TYPE 2 TO THE AN/FPN-60/60A LORAN-C TRANSMITTER CONTROL SET

PURPOSE:

This field change is being implemented to reduce the maintenance required by Type 387 incandescent lamps in Loran equipment.

DESCRIPTION:

This field change removes the Type 387 incandescent lamps from Loran equipment and replaces them with Light Emitting Diodes (LED)s. Replacement LEDs are rated at 100,000 hour Mean Time Before Failure (MTBF) and draw 25% less power than incandescent lamps.

EQUIPMENT AFFECTED:

This field change is applicable to the AN/FSN-1(V) LORAN-C REMOTE CONTROL SET, AN/FPN-54A/65 LORAN-C TIMER SET, AN/FPN-64/64A LORAN-C TRANSMITTER SET, and the AN/FPN-60/60A LORAN-C TRANSMITTER CONTROL SET.

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of LEDs in place of Type 387 incandescent lamps in Loran equipment will identify accomplishment of this change.

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	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B	*		*		2				*									6	5			2				
C																						2				
D																				*						
E																										
F																										
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ELECTRONIC FIELD CHANGE BULLETIN

F. C. NO. 13 TYPE 1 TO AN/FPN-60(V) LORAN-C TRANSMITTER CONTROL SET
F. C. NO. 5 TYPE 1 TO AN/FPN-60A(V) LORAN-C TRANSMITTER CONTROL SET

PURPOSE:

This field change increases the Pulse Generator (PGEN) transmitter drive output level. This enables all Lorstas to reduce the drive settings on their PGENs to '7' or less.

DESCRIPTION:

This field change increases the value of R17 on the PSYN card (NSN 5998-01-040-7048) to 620 ohms.

EQUIPMENT AFFECTED:

This field change is applicable to all AN/FPN-60(V) and AN/FPN-60A(V) Loran-C Transmitter Control Sets.

IDENTIFICATION OF ACCOMPLISHMENT:

The presence of a 620 ohm resistor in the R17 location and a blue stripe on the edge of each PSYN card on station will identify accomplishment of this field change.

MATERIALS REQUIRED:

All tube transmitting stations will receive the following parts with this field change bulletin:

Resistor, 620 ohms, ¼ watt, (6 ea)	5905-00-136-3891
Paint Pen, Blue, (1 ea)	7520-01-207-4157

DISTRIBUTION – SDL No. 135

	a	b	c	d	e	f	g	h	I	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B	*		*		2				*									6	5			2				
C																						*				
D																				*						
E																										
F																										
G																										
H																										

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Dt: ESU (Portsmouth, Boston, Cleveland, New Orleans, Miami, St. Louis, Seattle, Alameda, Kodiak) (1)

Non-standard distribution continued on page 3

TOOLS REQUIRED:

No special tools are required.

PROCEDURE:

SAFETY NOTE

COMPLY WITH U.S. COAST GUARD SAFETY PRECAUTIONS, ELECTRONICS MANUAL, COMDTINST M10550.25(SERIES).

1. Desolder and remove the 470 ohm resistor in the R17 location on the PSYN card.
2. Replace with the 620 ohm resistor provided in the parts kit.
3. Using the paint pen provided, make a blue stripe on the edge of the PSYN card (next to the green stripe), indicating that this change to the PSYN card has been made.
4. Repeat steps 1 through 3 for each PSYN card on station.
5. Make the following pen and ink change to the AN/FPN-60(V)/60A(V) Technical Manual: Page 7.65/7.66 W0678-1/PSYN Module Schematic: Locate R17 in block 2C of the schematic diagram, just above U3. Change the value of R17 from 470 to 620 ohms. At the bottom of the page, write: F.C. 13/5 TO AN/FPN-60(V)/60A(V).

ROUTINE INSTRUCTIONS:

1. Maintenance support facilities shall maintain a library copy of this and all other applicable field change bulletins. Additional and replacement copies can be obtained by accessing the Loran Support Unit web page, http://www.uscg.mil/hq/lsu/webpage/smefpage.htm, and downloading the field change bulletin.

2. Upon completion, a copy of this field change bulletin shall be inserted in front of all applicable technical manuals. Cognizant commands shall ensure that this field change has been accomplished and that applicable technical manual annotations and reports have been made.

G. K. WEEKS, JR.

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of Transportation

United States
Coast Guard

TECHNICAL MANUAL

FOR

AN/FPN-60(V) AND AN/FPN-60A(V) SERIES

TRANSMITTER CONTROL SETS

EFFECTIVE SEPTEMBER 1984

RECORD OF CHANGES

CHANGE NO.	DATED	TITLE OR BRIEF DESCRIPTION	ENTERED	
			DATE	BY

LORAN-C
AN/FPN-60 TRANSMITTER CONTROL SET
TECHNICAL MANUAL
COMMENTS

CHECK ONE: PROBLEM ____ QUESTION ____ COMMENTS ____

DATE ________________

REMARKS:

NAME ____________________________ RANK/RATE/TITLE _______________

MAILING ADDRESS ____

____

____

TELEPHONE NUMBER: FTS ______________ COMMERCIAL (   ) ______________

MAIL TO: COMMANDING OFFICER (sm)
USCG ELECTRONICS ENGINEERING CENTER
WILDWOOD, NJ 08260

NOTE:

ALL REFERENCES TO THE PP-7839/G STANDBY DC POWER SUPPLY (UNIT 1A12) IN THIS TECHNICAL MANUAL APPLY TO SINGLE-RATED LORAN STATIONS ONLY.

THERE IS NO PP-7839/G STANDBY DC POWER SUPPLY LOCATED IN THE AN/FPN-60(V)/60A(V) TRANSMITTER CONTROL SET AT DUAL-RATED STATIONS. EQUIVALENT DC BACKUP FUNCTIONS ARE PROVIDED BY THE PP-7839/G LOCATED IN THE HIGH-RATE AN/FPN-54A/65 TIMER RACK.

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CHAPTER 5. MAINTENANCE

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APPENDIX A. TCE/TRANSMITTER DIAGRAMS AND SCHEMATICS

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CHAPTER 1

GENERAL INFORMATION

1.1 Introduction. This technical manual provides a description of the various units of the AN/FPN-60(V) and AN/FPN-60A(V) Transmitter Control Sets (TCS). The TCS is installed at Loran-C Transmitting Stations which have the AN/FPN-44A, 44B, or 45B Loran-C Transmitter installed. The TCS generates the drive waveforms for the transmitters and monitors the transmitter status and parameters of the transmitted signal. The TCS also provides an interface between the transmitter and the timing and control equipment. Figures 1.1 and 1.2 show the equipment for a dual-rate and single-rate configuration, respectively. Figure 7.1 is the Loran-C System Block Diagram. Appendix A contains diagrams of changes that have been made to the various transmitters and have not been placed in the transmitter technical manuals. Appendix B contains information on the ROS modified equipment in the AN/FPN-60A(V) TCS.

1.1.1 The following units of the AN/FPN-60(V) and AN/FPN-60A(V) are covered in this manual:

a. 1 -Electrical Equipment Cabinet (CY-7523/FPN-60(V))
b. 1A1-Switch Assembly (SA-2063/FPN-60(V))
c. 1A1-Switch Assembly (SA-2063/FPN-60A(V)) (AN/FPN-60A(V) only)
d. 1A2-Transmitter Coupler Control (C-9888/FPN-60(V))
e. 1A3-Electrical Pulse Analyzer (TS-3550/FPN)
f. 1A4-Pulse Generator No. 1 (Low Rate) (SG-1099/FPN-60(V))
g. 1A5-Pulse Generator No. 1 (High Rate) (SG-1099/FPN-60(V)) (installed at dual-rated stations only)
h. 1A6-Pulse Generator No. 2 (Low Rate) (SG-1099/FPN-60(V))
i. 1A7-Pulse Generator No. 2 (High Rate) (SG-1099/FPN-60(V)) (installed at dual-rated stations only)
j. 1A8-Waveform Panel (SB-4156/FPN-60)
k. 1A9-Interface Unit (J-3353/FPN-60(V)
l. 1A9-Interface Unit (J-3353/FPN-60A(V) (AN/FPN-60A(V) only)
m. 1A10-EPA Dummy Load Junction Box
n. 1A11-TCC Dummy Load Junction Box
o. 1A12-PP-7839/G Standby DC Power Supply (USED IN AN/FPN-60(V)1/60A(V)1 SINGLE-RATE CONFIGURATION ONLY)

1.2 <u>General Description.</u>

1.2.1 The Transmitter Control Set (Figures 1.1 and 1.2) performs the following functions:

a. Generates the drive waveforms for the transmitters.

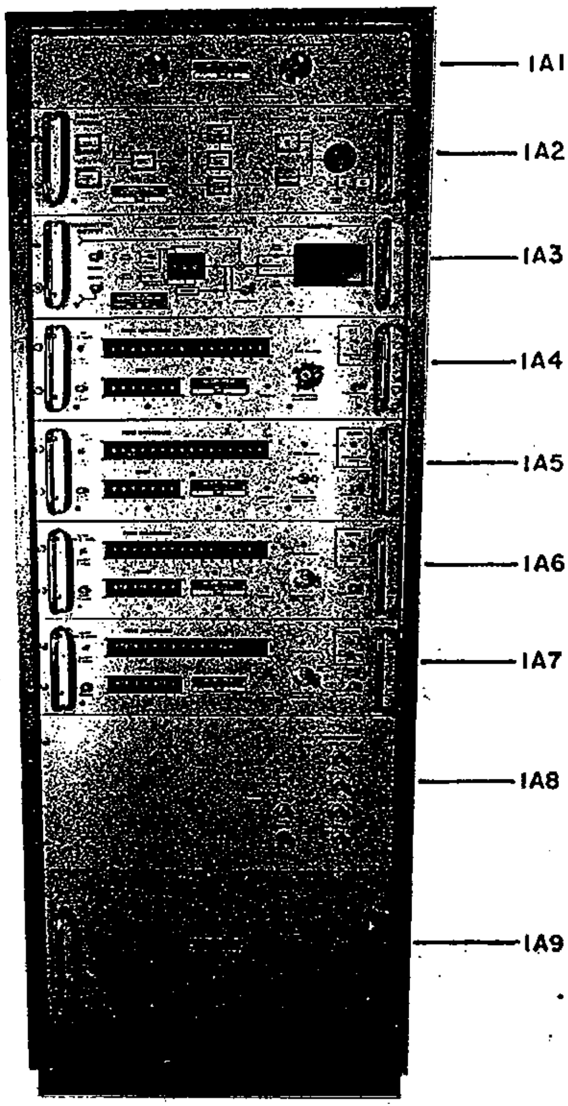


Figure 1.1. AN/FPN-60(V)2 Transmitter Control Set (Dual-Rate Configuration)

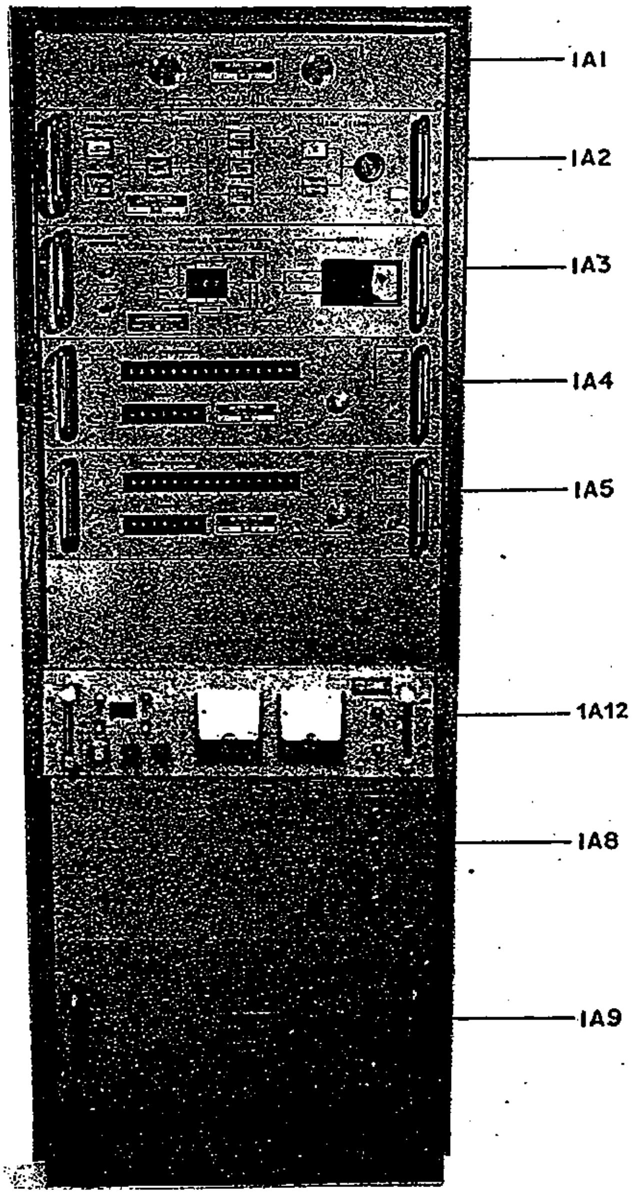


Figure 1.2. AN/FPN-60(V)1 Transmitter Control Set
(Single-rate configuration)

b. Monitors the transmitted signal level.

c. Provides the interface between the AN/FPN-54A Loran-C Timing set(s), the ABS Automatic Blink System, and the transmitters.

d. Provides a measurement of the radiated Loran-C pulse shape and amplitude.

e. Measures and displays the Envelope-to-Cycle-Difference (ECD).

f. Provides a means for remotely stopping the transmitters.

g. Indicates the status of both transmitters.

h. Automatically initiates a switch to the standby transmitter if the signal radiated by the operate transmitter drops below a preset level.

i. Provides a means for external monitoring of the Loran-C signal.

1.3 Unit Description.

1.3.1 Switch Assembly (1A1). The Switch Assembly (Figure 1.3) contains an emergency stop push button for each transmitter. These switches provide for the shutdown of power to the transmitters to prevent injury to personnel or damage to the equipment. These switches are connected in series with the transmitter stop and emergency stop switches in the associated transmitting equipment (refer to the applicable transmitting set technical manual for locations).

1.3.1.1 Switch Assembly (1A1). SA-2063/FPN-60A (V) is a modified switch assembly to be used at ROS equipped stations. The switch assembly is modified to allow both vacuum tube transmitters to be de-energized remotely and simultaneously.

1.3.1.2 AN/FPN-44A/44B/45B Loran-C Transmitters.

WARNING

HAZARDOUS VOLTAGES ARE STILL PRESENT IN THE AN/FPN-44A/44B/45B TRANSMITTERS AFTER THE ACTIVATION OF THE SWITCH.

When the emergency stop button is depressed , the transmitter shuts down, with the exception of the blowers and primary cooling, which are on a time delay circuit. This is done to insure that the power amplifier (PA) vacuum tubes are cooled down properly.

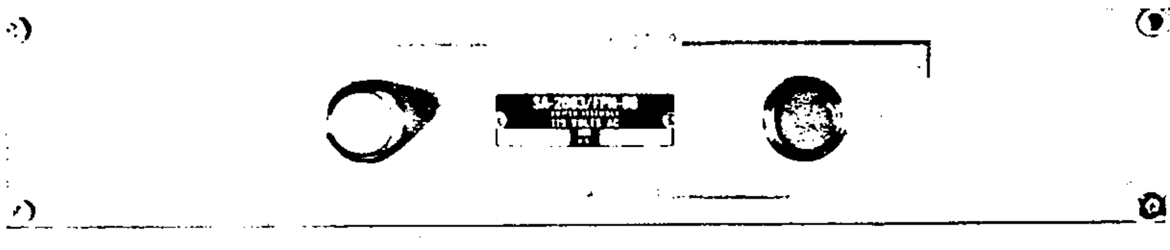


Figure 1.3. 1A1-Switch Assembly ~~(SA-2063/FPN-60)~~ SA-2063/FPN-60(V)

1.3.2 Transmitter Coupler Control (1A2). The Transmitter Coupler Control (Figure 1.4) contains the Transmitter Control Module W0678-5/XMTR CON, Relay Assembly W0678-13, and Transmitter Control Driver W0678-6/XMTR CON DVR. The Transmitter Coupler Control (TCC) performs the following functions:

a. Monitors the status of the transmitters, pulse generators, and antenna coupler.

b. Switches transmitters automatically upon a transmitter failure.

c. Permits the manual switching of transmitters remotely.

d. Displays transmitter local/remote control mode.

e. Displays TRANSMITTER 1 and 2 status (OPERATE or STANDBY).

f. Enables the STANDBY TRANSMITTER to operate into dummy load.

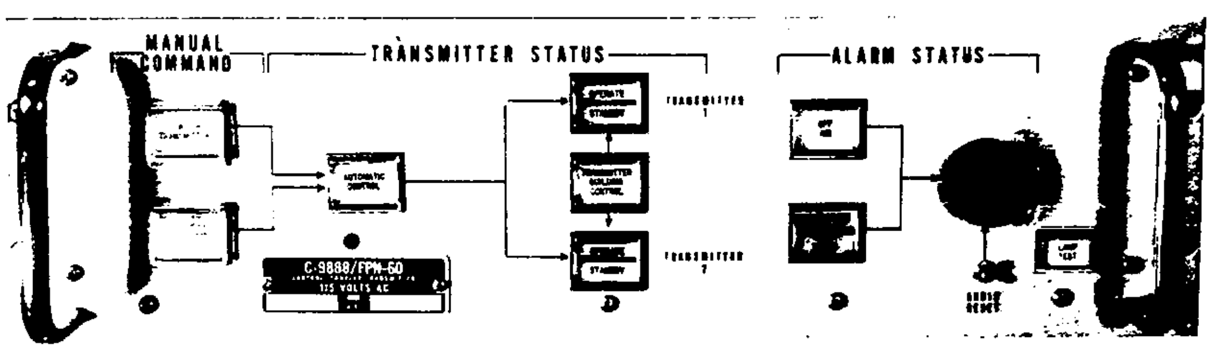


Figure 1.4. 1A2-Transmitter Coupler Control ~~(C-9888/FPN-60)~~ C-9888/FPN-60(V)

1.3.3 Electrical Pulse Analyzer (1A3). The Electrical Pulse Analyzer (Figure 1.5) contains a Gate Control Module W0678-3A/GATCON, an Envelope-to-Cycle-Difference Module W0678-18C/ECD, a Peak Detector Module W0678-4/PK DET, and a Clip Attenuator Module W0678-11A/CLP

FC #5 to AN/FPN-60

ATTN. The Electrical Pulse Analyzer (EPA) performs the following functions:

a. Generates a Reference Envelope Waveform.

b. Measures and displays the peak value of a selected half-cycle of a selected pulse or the peak amplitude of a LORAN-C pulse within a pulse group. The Electrical Pulse Analyzer can perform this function for either rate at a dual-rated station.

c. Displays a measure of ECD.

d. Generates the Local Envelope Crossover trigger.

Figure 1.5. 1A3-Electrical Pulse Analyzer (TS-3550/FPN)

1.3.4 Pulse Generator (1A4-1A7). A dual-rated station has Pulse Generators 1A4 thru 1A7 (see Figure 1.1). A single-rated station has Pulse Generators 1A4 and ~~1A6~~ 1A5 (see Figure 1.2). The Pulse Generator (Figure 1.6) contains the Pulse Control Module W0678-2/PCON, Group Droop Module W0678-19B/GR DROOP (for dual-rated stations and stations having tail drive), and Pulse Synthesizer Module W0678-1/PSYN. The Group Droop Module W0678-20/GR DROOP is unique to LORAN STATION CAPE RACE, replacing the W0678-19B/GR DROOP module. The Pulse Generator (PGEN) performs the following functions:

a. Generates a transmitter drive signal of adjustable shape.

b. Provides for phase code balance adjustments.

c. Generates an oscilloscope trigger signal.

d. Provides the capability of selecting either 1st MPT (NON-Ø CODED) or 2nd MPT (Ø CODED) for the SCOPE TRIGGER.

e. Provides for transmitted signal droop compensation.

f. Provides control of the transmitter drive signal amplitude.

g. Provides visual alarm and logic level output when transmitter drive is below a set level.

FC 10/2 to AN/FPN-60(V)/60A(V)

h. For dual-rated stations, provides dynamic droop compensation of the transmitter drive signal.

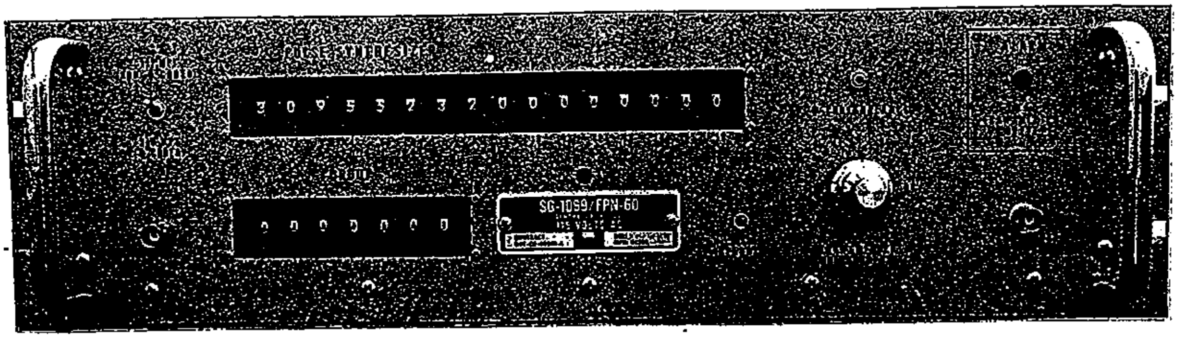


Figure 1.6. 1A4-1A7 - Pulse Generator (SG-1099/FPN-60(V))

1.3.5 <u>Waveform Panel (1A8).</u> The Waveform Panel (Figure 1.7) has two inputs, ENV TRIG+ and ENV TRIG-. It also provides a convenient access to the following signals:

a. Full wave rectified version of the Loran-C signal.

b. Reference Loran-C signal envelope.

c. Oscilloscope trigger (select operate high or low rate).

d. Optional waveform jack.

Figure 1.7. 1A8-Waveform Panel (SB-4156/FPN-60(V))

1.3.6 Interface Unit (1A9). The Interface Unit (Figure 1.8) is the unit through which all signals among the AN/FPN-54A Loran The ABS Timing Set and the Pulse Generators (PGENs) are routed. In addition, all signals among the units of the Transmitter Control Set (except those of the Waveform Panel) are routed to this unit. The Interface Unit also performs impedance matching, muticoupling, and signal isolation.

1.3.6.1 Interface Unit (1A9). The J-3353/FPN-60A(V) is a modified Interface Unit to be used at ROS equipped stations.

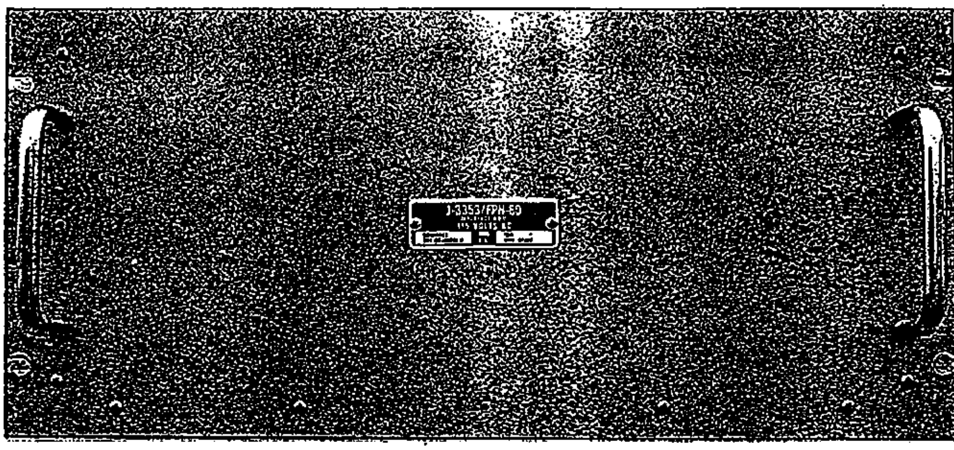


Figure 1.8. 1A9-Interface Unit (J-3353/FPN-60(V))

1.3.7 EPA Dummy Load Junction Box (1A10). The EPA Dummy Load Junction Box is used when the EPA is removed from the equipment cabinet.

1.3.8 TCC Dummy Load Junction Box (1A11). The TCC Dummy Load Junction Box is used when the TCC is removed from the equipment cabinet.

1.3.9 PP-7839/G Standby DC Power Supply (1A12). Used in AN/FPN-60(V)1/60A(V)1 single-rate configurations only. The Standby DC Power Supply (Figure 1.9) provides DC power with battery backup to the GCF-W-1177-I/F DC Interface Box located in the GCF-RWL-1817B Frequency Standard Set. In the event of AC power failure, DC backup power is distributed through the DC Interface Box to the Tertiary Cesium (part of GCF-RWL-1817B), Multicoupler (CU-2297/FSN-2(V), if used), and all Bravo/Charlie/Delta receivers (R-2240/FSN-2(V)).

1.4 Reference Data. Table 1.1 lists the electrical power requirements of several units of the Transmitter Control Set. Tables 1.2 and 1.3 list the equipment supplied and the equipment required but not supplied, respectively. Figure 1.9 shows the relationships of all the units of the Transmitter Control Set.

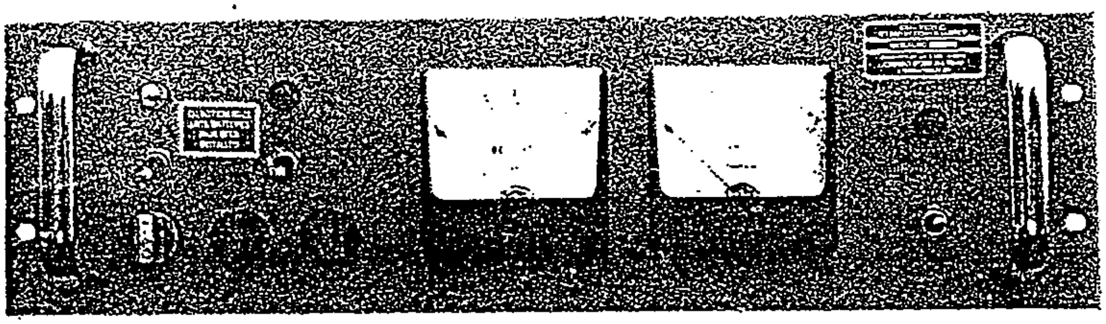


Figure 1.9. 1A12-Standby DC Power Supply (PP-7839/G)

Table 1.1. Electrical Power Requirements

NAME/DESIGNATION	INPUT POWER
Transmitter Coupler Control C-9888/FPN-60(V)	115 VAC 10% 50-60 Hz, 22 W
Electrical Pulse Analyzer TS-3550/FPN	115 VAC 10% 50-60 Hz, 31 W
Pulse Generator SG-1099/FPN-60(V)	115 VAC 10% 50-60 Hz, 28 W

Table 1.2. Equipment Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		OVERALL DIMENSIONS			VOLUME	WEIGHT
	NAME	DESIGNATION	HEIGHT	WIDTH	DEPTH		
1 NOTE A	Switch Assembly	SA-2063/FPN-60(V)	3.5 in 9 cm	19.0 in 48 cm	2.0 in 5 cm	.08 ft3 2192 cm3	1.5 lbs .7 kg
1	Transmitter Coupler Control	C-9888/FPN-60(V)	5.25 13	19.0 48	17.0 43	.98 27751	21.0 9.5
1	Electrical Pulse Analyzer	TS-3550/FPN	5.25 13	19.0 48	20.75 53	1.19 33854	28.0 12.7
NOTE B	Pulse Generator	SG-1099/FPN-60(V)	5.25 13	19.0 48	17.0 43	.98 27751	17.0 7.7
1	Waveform Panel	SB-4156/FPN-60(V)	8.75 22	19.0 48	1.0 3	.1 2681	2.5 1.1
1 NOTE C	Interface Unit	J-3353/FPN-60(V)	8.75 22	19.0 48	10.0 25.4	.96 27235	11.5 5.2
NOTE D	Blank Panel		10.5 27	19.0 48	-- --	-- --	-- --
1	Electrical Equipment Cabinet	CY-7523/FPN-60(V)	59.5 151	21.875 56	31.125 79	23.4 668024	170.0 77.2

NOTES:
A. The SA-2063/FPN-60A(V) Switch Assembly is used in AN/FPN-60A(V) Transmitter Control Sets.
B. Four for dual-rated stations; Two for single-rated stations.
C. The J-3353/FPN-60A(V) Interface Unit is used in AN/FPN-60A(V) Transmitter Control Sets.
D. One for single-rated stations, only.

Table 1.3. Equipment Required But Not Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
1	Status Alarm Unit	BZ-265/FSN-2(V)	Displays TCS Alarm Data	
NOTE A	Time Interval Counter Panel	SB-4266/FSN-2(V)	Sets ECD Limits	
1	Remote Control Group Technical Manual			
NOTE B	Timer Set	AN/FPN-54A	Generates Timing and Phase Code Signals	MPT, PCI, and LI
2	LORAN-C Transmitter	NOTE C		
1	Oscilloscope	AN/USM-281 or Equivalent	Installation Alignment and Testing	50 MHz, BW; 10 mV Sensitivity; Delayed Sweep; Delayed Gate Output
1	Multimeter	CCUH-8000A or Equivalent	Installation Alignment and Testing	50 VDC; 150 VAC; 5 Amp (DC); 200 to 2 M

NOTES:
A. Quantity dependent upon number of rates and responsibilities.
B. Two for dual-rated stations; One for single-rated stations.
C. AN/FPN-44A/44B or 45B.

Note: The PP-7839/G Standby DC Power Supply does not interface with any equipment in the TCS rack. Refer to Para 1.3.9

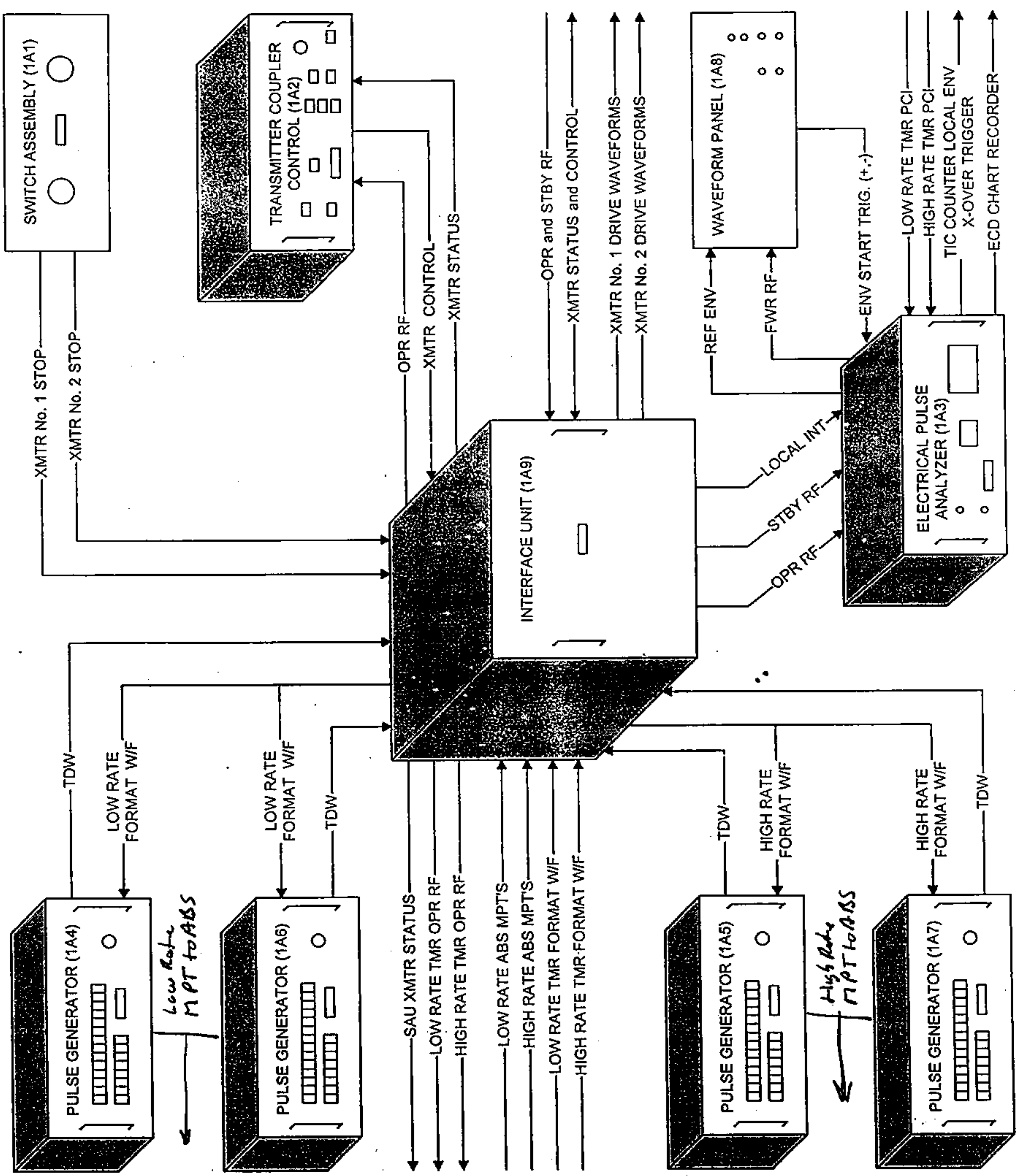


Figure ~~1.9~~ 1.10 Interrelationships Of TCS Units

1.5 Inquiries. For logistics support, Engineering Logistics Center is the Inventory Control Point (ICP). Refer to E/GICPINST 4408.1 (series) for XB stock number assistance. For logistic assistance, contact Customer Services Branch at Engineering Logistics Center, Baltimore, MD.

NOTE

For the latest version of the E/GICPINST 4408.1 (series) instruction, contact:

Commanding Officer (028)
USCG Engineering Logistics Center
2401 Hawkins Point Rd.
Baltimore, MD 21226-6204

1.6 Abbreviations. The abbreviations used throughout this manual are listed and defined in Table 1.4.

1.7 Safety Precautions.

1.7.1 Reference Publications. The following is a list of publications that all technical personnel must be familiar with:

a. M10550.13 - Electronics Manual
b. M10550.14 - Electronics Manual
c. M10550.15 - Electronics Manual
d. M5100.29 - Safety Manual
e. M11000.1 - Civil Engineering Manual
f. CG-139 - Cardiopulmonary Resuscitation Handbook
g. CG-516 - First Aid Health Lesson Plan

1.7.2 Notes, Warnings, and Cautions.

NOTE

READ ALL — They are used in narrative or illustrative non-procedural data.

READ ALL

WARNING
THEY DISCLOSE HAZARDS WHICH MAY CAUSE BODILY INJURY OR DEATH!

READ ALL

CAUTION
THEY REVEAL INFORMATION WHICH MAY DAMAGE OR DESTROY EQUIPMENT!

Table 1.4. List of Abbreviations

CODE	DEFINITION	CODE	DEFINITION
ABS	AUTOMATIC BLINK SYSTEM	PC	PHASE CODE
AM	AMPLITUDE MODULATED	PC RESET	PHASE CODE RESET
CCW	COUNTER CLOCKWISE	PC SET	PHASE CODE SET
CLP ATTN	CLIP ATTENUATOR	PCI	PHASE CODE INTERVAL
DPM	DIGITAL PANEL METER	PCON	PULSE CONTROL
DR	DUAL RATE	PGEN	PULSE GENERATOR
DVM	DIGITAL VOLT METER	PK DET	PEAK DETECTOR
ECD	ENVELOPE-TO-CYCLE DIFFERENCE	PSYN	PULSE SYNTHESIZER
EMPT	EARLY MULTIPULSE TRIGGER	RCG	REMOTE CONTROL GROUP
EOC	END OF CONVERSION (A LOGIC SIGNAL GENERATED IN THE DIGITAL PANEL METER OF THE EPA)	RCI	REMOTE CONTROL INTERFACE
EPA	ELECTRICAL PULSE ANALYZER	RF	RADIO FREQUENCY
ET	EARLY TRIGGER	SA	SWITCH ASSEMBLY
ETA	ENVELOPE TIMING ADJUSTMENT	SMEF	SYSTEM MAINTENANCE ENGINEERING FACILITY
FWR	FULL WAVE RECTIFIED	STBY, STDBY	STANDBY
GATCON	GATE CONTROL	SYNC	SYNCHRONOUS NUMBER
GR DROOP	GROUP DROOP	TBC	TRANSMITTER BUILDING CONTROL
GRI	GROUP REPETITION INTERVAL	TCC	TRANSMITTER COUPLER CONTROL
GRR	GROUP REPETITION RATE	TCE	TIMING AND CONTROL EQUIPMENT
HR	HIGH RATE	TCS	TRANSMITTER CONTROL SET
IAW	IN ACCORDANCE WITH	TDW	TRANSMITTER DRIVE WAVEFORM
ICP	INVENTORY CONTROL POINT	TIC	TIME INTERVAL COUNTER
I/F	INTERFACE	TINO	TIME INTERVAL NUMBER
LED	LIGHT EMITTING DIODE	TMR	TIMER
LEN	LOCAL ENVELOPE NUMBER	TP	TEST POINT
LI	LOCAL INTERVAL	TTL	TRANSISTOR TRANSISTOR LOGIC
LPA	LOCAL PHASE ADJUSTMENT	TTY	TELETYPE
LR	LOW RATE	VPK	PEAK VOLTAGE
LRE	LORAN REPLACEMENT EQUIPMENT	W	WATTS
LSB	LEAST SIGNIFICANT BIT	WF	WAVEFORM
MPT	MULTIPULSE TRIGGER	WP	WAVEFORM PANEL
MSB	MOST SIGNIFICANT BIT	XMTR	TRANSMITTER
MTBF	MEAN TIME BETWEEN FAILURE	XMTR CON	TRANSMITTER CONTROL
OOT	OUT OF TOLERANCE	XMTR CON DVR	TRANSMITTER CONTROL DRIVER
OP	OPERATE	100 kHz	NON-PHASE CODED 100 kHz SINEWAVE

CHAPTER 2

INSTALLATION

2.1 Introduction. This chapter provides procedures for unpacking and inspecting the Transmitter Control Set equipment. It describes procedures for installing, programming, adjusting, and initially operating each unit of the TCS. There are also procedures for the de-installation and shipment of equipment.

2.2 Unpacking and Initial Inspection.

2.2.1 Inspect the shipping containers for external damage. If the containers are damaged, have the carrier's agent present when the containers are unpacked.

2.2.2 After unpacking the containers, inspect the chassis and modules for mechanical damage. Inspect all electrical wiring and connections to ensure that connections have not been damaged. Inspect for damage and note any scratches, dents, broken knobs, or broken wires on the units, including cables (see Table 2.1).

Table 2.1. Materials Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		OVERALL DIMENSIONS			VOLUME	WEIGHT
	NAME	DESIGNATION	LENGTH	WIDTH	DEPTH		
36	Mounting Screws	10-32	.5 in. 1.3 cm.				
36	Captive Nuts	10-32					
2	Two conductor cables	Alpha 1897	114 in. 289 cm.				
Note A	Interconnect Cable	W0678-7	78 in. 198 cm.				
1	Interconnect Cable (PA)	W0678-8	78 in. 198 cm.				
1	Interconnect Cable (AC)	W0678-9	78 in. 198 cm.				
1	Copper Strap		55 in. 139 cm.	1.0 in. 2.5 cm.	.0625 in. .16 cm.		

NOTE A: Six for Dual-Rated stations.
Four for Single-Rated stations.

2.3 Installation Instructions.

2.3.1 Materials. Table 2.1 lists the materials that are supplied. Table 2.2 lists the materials that are required, but not supplied. Table 2.3 is a cable interconnect list between the TCS units. For more information on cables listed in Table 2.3 see Figure 7.3.

Table 2.2. Materials Required But Not Supplied

QUANTITY PER EQUIPMENT	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTICS
	NAME	DESIGNATION		
4	Coaxial Cables	RG-58C/U	Connect EPA to WP	Length 4 feet
8	Connectors	UG-88/U	For Cables used between EPA and WP	BNC
NOTE A	Twinaxial Cables	RG-22B/U	Connect PGEN's to I/F	Length 4 feet
NOTE B	Connectors	UG-421B/U	For PGEN's to I/F Cables	Polarized Twinax
1	AC Power Cable(Note C)	ALPHA 1937	Connect Electrical Power from Circuit Breaker to to Cabinet	12-2

NOTES: A. Four each for Dual-Rated Stations.
Two each for Single-Rated Stations.

B. Eight each for Dual-Rated Stations.
Four each for Single-Rated Stations.

C. Length as required to meet Station Equipment Location.

2.3.2 Electrical Equipment Cabinet.

2.3.2.1 The location of the TCS equipment cabinet is to the right of the AN/FPN-54A Loran Timing Set (as viewed from the front). Locations of the individual units are as shown in Figure 1.1 or Figure 1.2.

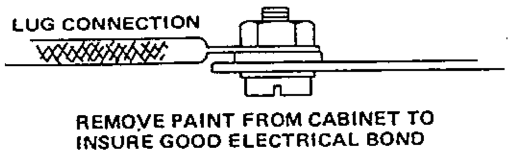
> **WARNING**
>
> Ensure that the circuit breaker designated for this cabinet is OFF and tagged.

Table 2.3. TCS Units Cable Interconnect List

FROM	CABLE CONNECTOR	CABLE	CABLE CONNECTOR	TO
SA * (S1)	#22-16 Lugs	Alpha 1897	#22-16 Lugs	I/F (TB1-1,TB1-6)
SA * (S2)	#22-16 Lugs	Alpha 1897	#22-16 Lugs	I/F (TB2-2,TB2-6)
TCC (J1) *		Multiconductor Cable ALPHA #6025 W0678-9/AC Interconnect Cable		I/F (J23)
TCC (J2) *		Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable		I/F (J21)
EPA (J4)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J1)
EPA (J5)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J4)
EPA (J6) *		Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable		I/F (J22)
EPA (J7) *		Multiconductor Cable ALPHA #6016 W0678-8/PA Interconnect Cable		I/F (J20)
EPA (J8)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J3)
EPA (J9)	BNC UG-88/U	RG-58 C/U	BNC UG-88/U	WP (J2)
PGEN (J5)*	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J31)
PGEN (J7)*		Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable		I/F (J15)
PGEN (J5)*	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J33)
PGEN (J7)*		Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable		I/F (J17)
PGEN (J5) **	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J27)
PGEN (J7) **		Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable		I/F (J18)
PGEN (J5) **	Polarized Twinax UG-421 B/U	RG-22 B/U	Polarized Twinax UG-421 B/U	I/F (J29)
PGEN (J7) **		Multiconductor Cable ALPHA #6016 W0678-7/Interconnect Cable		I/F (J16)
PP-7839/G (J2) * (SINGLE-RATE ONLY)	Cannon CA-3106E12S -2002-10P	Belden 16-2	Cannon MS3456W14S-9PW	DC Interface (GCF-W-1177 -I/F) (J30)

* These cables are supplied.
** These cables are supplied for dual-rated stations.

2.3.2.2 Ground the cabinet to the timer room grounding system (see Figure 2.1 for the overhead ducting scheme). Local connection with the system is made with silver solder and pigtail connections at either the overhead or below floor ducting. Additional grounding information may be found in COMDTINST M10550.15.



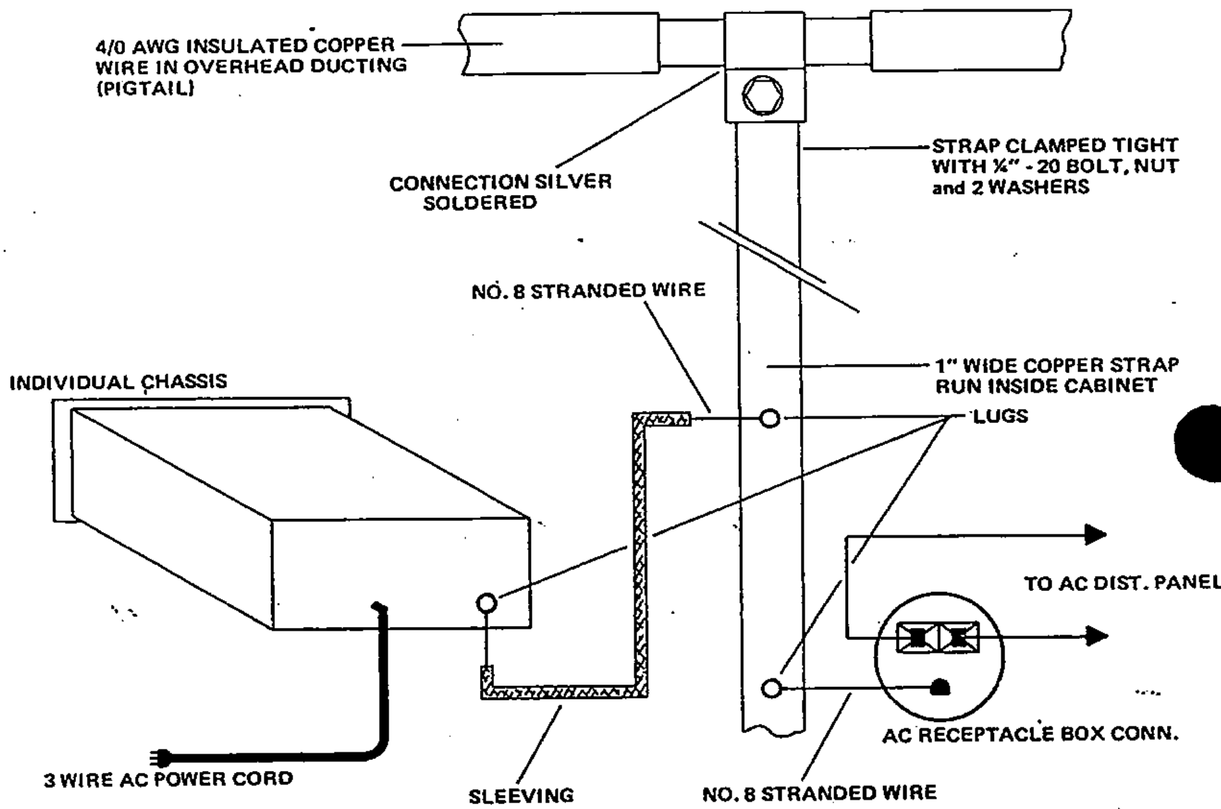


Figure 2.1. Chassis and Cabinet Grounding Details for Overhead Ducting

CAUTION
The Electrical Equipment Cabinet is on a separate circuit breaker, located inside the timer room. DO NOT energize the cabinet, until after the installation of all units. All units are energized upon the application of power.

2.3.2.3 Connect the [illegible] line power cable from th power distribution panel (ensure that the circuit breaker is off) to the cabinet terminal block 1TB1 via the duct at the top of the cabinet. The terminal block supplies power to an AC outlet strip, located inside the cabinet.

2.3.2.4 Figure 2.2 is an illustration of the Electrical Equipment Cabinet. The Electrical Equipment Cabinet is a standard item that has been modified for Coast Guard use.

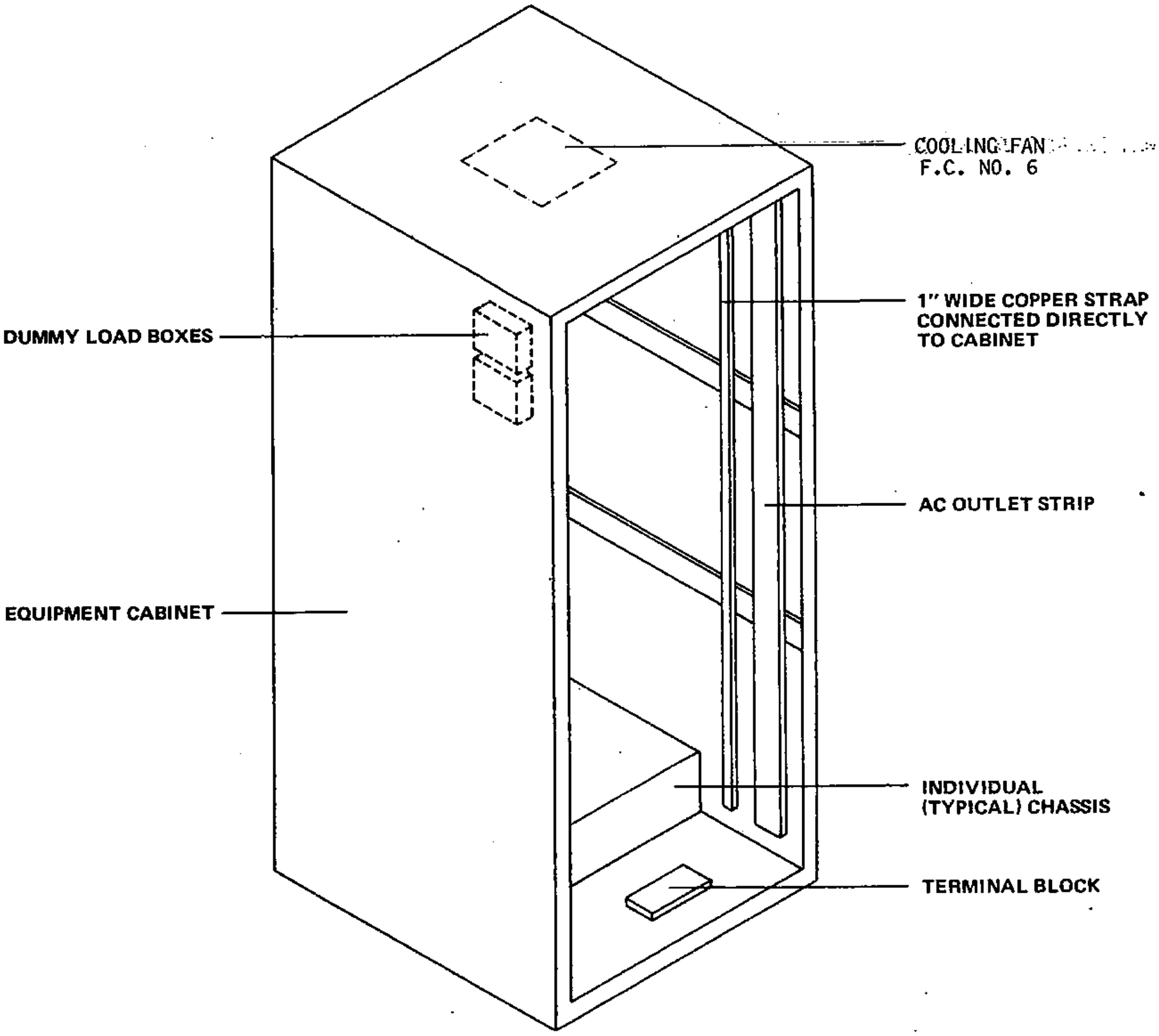


Figure 2.2. Electrical Equipment Cabinet (Rear View)

NOTE

The station's drawings contain the types of cables used between the TCS and other equipments. This manual contains cable specifications of the cables interconnecting the units of the TCS. All of the wiring/cabling in this chapter is for dual-rated stations. Single-rated stations will make connections to "low rate" or "rate 1" only.

2.3.3 Switch Assembly

2.3.3.1 Mount the Switch Assembly (SA) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.3.2 Refer to Table 2.3 and Figure 7.3 to connect the Switch Assembly to the Interface Unit.

2.3.4 Transmitter Coupler Control

2.3.4.1 Mount the Transmitter Coupler Control (TCC) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.5 Electrical Pulse Analyzer

2.3.5.1 Mount the Electrical Pulse Analyzer (EPA) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.5.2 Set the FRONT PANEL CONTROL/REMOTE CONTROL switch (S5), located on the rear of the EPA (Figure 2.3), to the FRONT PANEL CONTROL position.

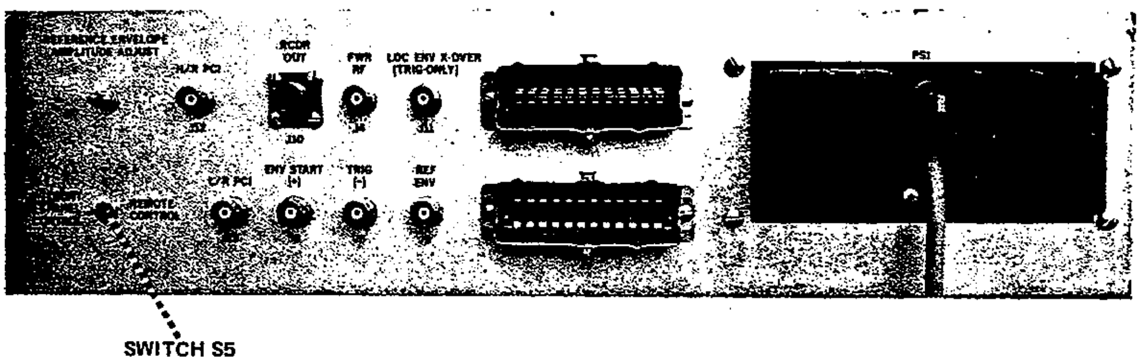


Figure 2.3. EPA Rear Panel Location of Switch S5

2.3.5.3 Connect the coaxial cables in accordance with Figure 7.4.

2.3.5.4 Connect a two conductor, shielded cable from a chart recorder (refer to the Remote Control Group technical manual) to J10 on the EPA (see Figure 7.4). Table 2.4 shows the required connections to be made.

Table 2.4. EPA-Chart Recorder Wiring

To Connect From J10 to Recorder	Use Pins		
	A	B	C (shield)
For Current Drive (0-1 ma) Zin $\leq$ 1500Ω	+	–	
For Voltage Drive (0-5 v) Zin $\geq$ 50 KΩ		+	–

2.3.6 Pulse Generator

2.3.6.1 At dual-rated stations, mount the four Pulse Generators (PGENs) as shown in Figure 1.1, using sixteen 10-32 mounting screws and captive nuts.

2.3.6.2 At single-rate stations, mount the two PGENs in the 1A4 and 1A5 locations (see Figure 1.2) using eight 10-32 mounting screws and captive nuts. Mount the blank panel in the 1A6 and 1A7 locations.

2.3.7 Waveform Panel

2.3.7.1 Mount the Waveform Panel (WP) in the cabinet (see Figure 1.1) using four 10-32 mounting screws and captive nuts.

2.3.7.2 Connect the coaxial cables between the EPA and the Waveform Panel in accordance with Figure 7.3.

2.3.8 Interface Unit

2.3.8.1 Mount the Interface Unit (I/F) in the cabinet (see Figure 1.1 or Figure 1.2) using four 10-32 mounting screws and captive nuts.

2.3.8.2 Connect the coaxial cables between the Timer Control Unit and the Interface Unit in accordance with Figure 7.4.

2.3.8.3 Refer to Figure 2.4 for twin-axial connector polarity. This polarity configuration must be maintained to obtain correct signal distribution.

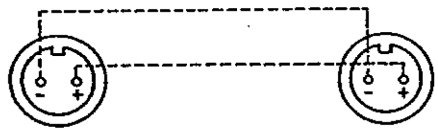


Figure 2.4. Twin-axial Polarity

2.3.8.4 Connect the twin-axial cables in accordance with Figures 7.3 and 7.4. If the station is single-rated make only the low rate connections.

2.3.8.5 Connect cables between the following pairs of jacks:

a. J15 I/F to J7 PGEN (1A4) (W0678-7/Interconnect Cable).
b. If dual-rated, J16 I/F to J7 PGEN (1A7) (W0678-7/Interconnect Cable).
c. J17 I/F to J7 PGEN (1A6) (W0678-7/Interconnect Cable).
d. If dual-rated, J18 I/F to J7 PGEN (1A5) (W0678-7/Interconnect Cable).
e. J19 I/F to Status Alarm Unit (BZ-265/FSN-2(V)) TB3-12 thru TB3-18 (see Figure 7.4).
f. J20 I/F to J6 EPA (W0678-7/Interconnect Cable).
g. J21 I/F to J2 TCC (W0678-7/Interconnect Cable).
h. J22 I/F to J7 EPA (W0678-8/PA Interconnect Cable).
i. J23 I/F to J1 TCC (W0678-9/AC Interconnect Cable).

2.3.9 Standby DC Power Supply

2.3.9.1 Used only in the AN/FPN-60(V)1/60A(V)1 single-rate configuration. Refer to Field Change No. 10/2 to AN/FPN-60(V)/60A(V) Installation Instructions to install the PP-7839/G Standby DC Power Supply.

2.3.10 Ground all units to the copper strap in the cabinet, according to Figure 2.1. Plug the TCC, EPA, PGENS and Standby DC Power Supply into the cabinet's AC power receptacles.

2.4 Installation Drawings. Figures 2.6-2.11 show the dimensions of the units of the TCS.

2.5 Adjusting and Programming.

2.5.1 Electrical Pulse Analyzer programming.

NOTE

To prevent transmitted signal timing shifts due to the cycle compensation loop in the operate timer when working on the EPA, connect a jumper from TP2 (Orange) to TP6 (Black) on the M Card of the operate timer. This disables the cycle compensation loop. If the station is dual-rated, connect a jumper from TP2 (Orange) to TP6 (Black) on the M Card of the operate timers of both rates. Remove the jumper(s) when done.

2.5.1.1 ECD module programming. Program both the operate W0678-18C/ECD module and the spare W0678-18C/ECD module according to Table 2.5.

Table 2.5. W0678-18C/ECD Module Programming

STATION CONFIGURATION	PROGRAMMING
Low Rate Master	Connect E3 to E5
High Rate Master	Connect E3 to E4
Low Rate Secondary	Do Not Connect E3 to E5
High Rate Secondary	Do Not Connect E3 to E4

2.5.1.2 Chassis programming. Program the EPA chassis according to Figure 2.5.

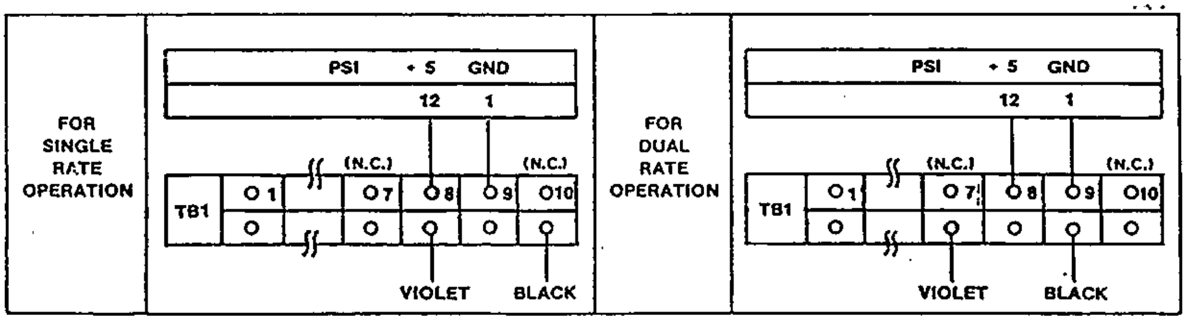


Figure 2.5. Pictorial of EPA Chassis Programming

2.5.2 Pulse Generator programming. Refer to Figure 7.31 for the backplane wiring differences between PGENs at various stations.

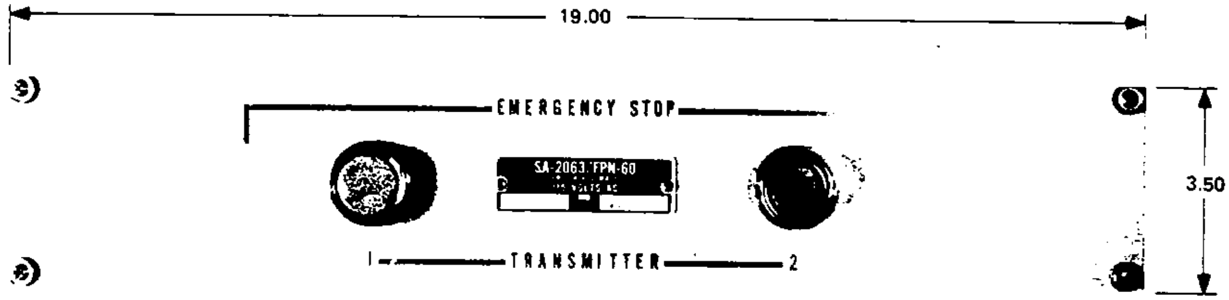


Figure 2.6. 1A1 Switch Assembly

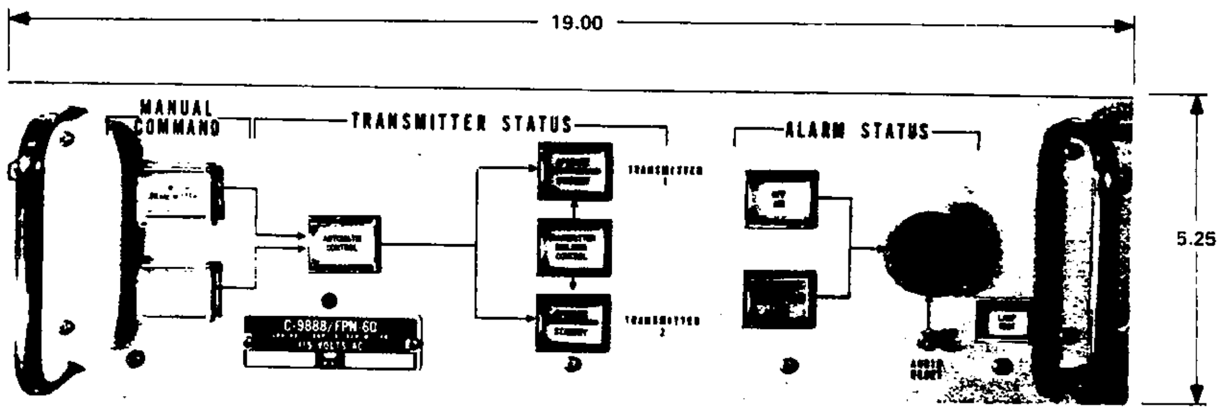


Figure 2.7. 1A2 Transmitter Coupler Control

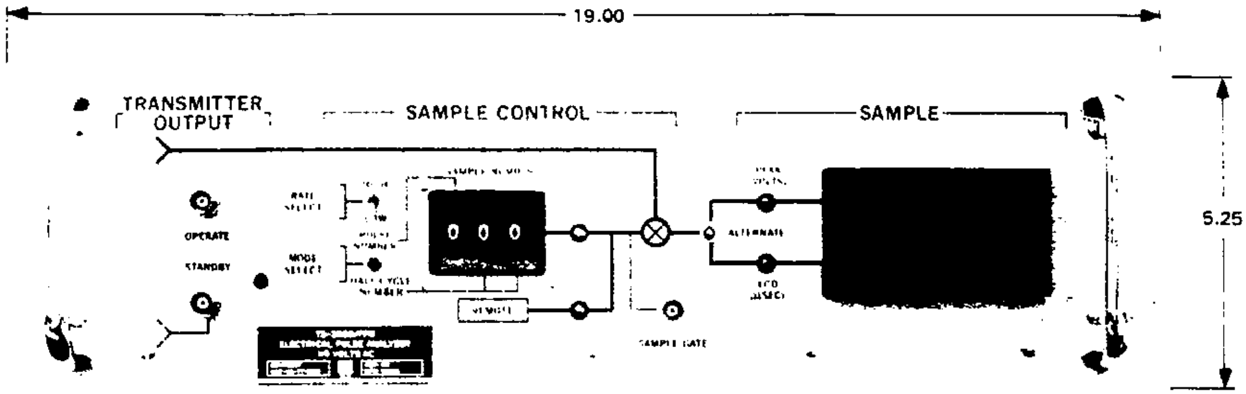


Figure 2.8. Electrical Pulse Analyzer

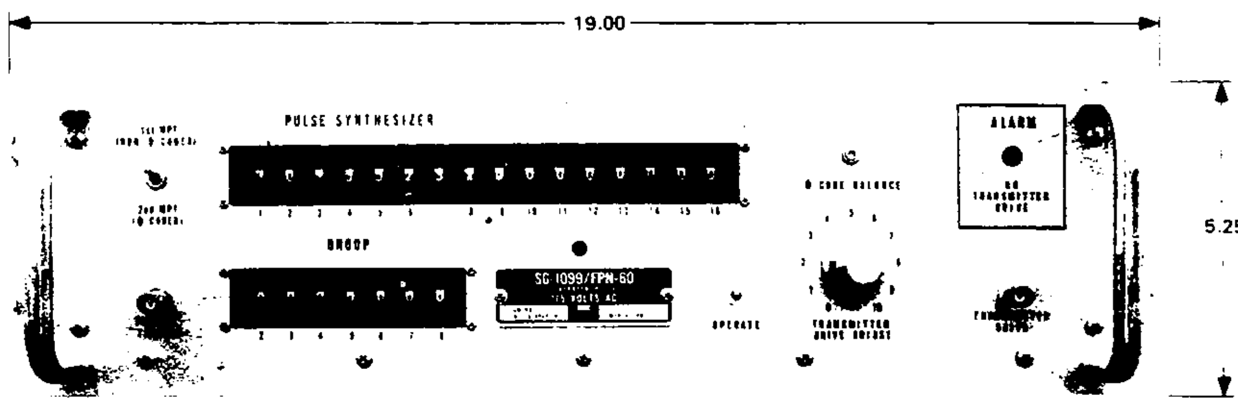


Figure 2.9. 1A4-1A7 Pulse Generator

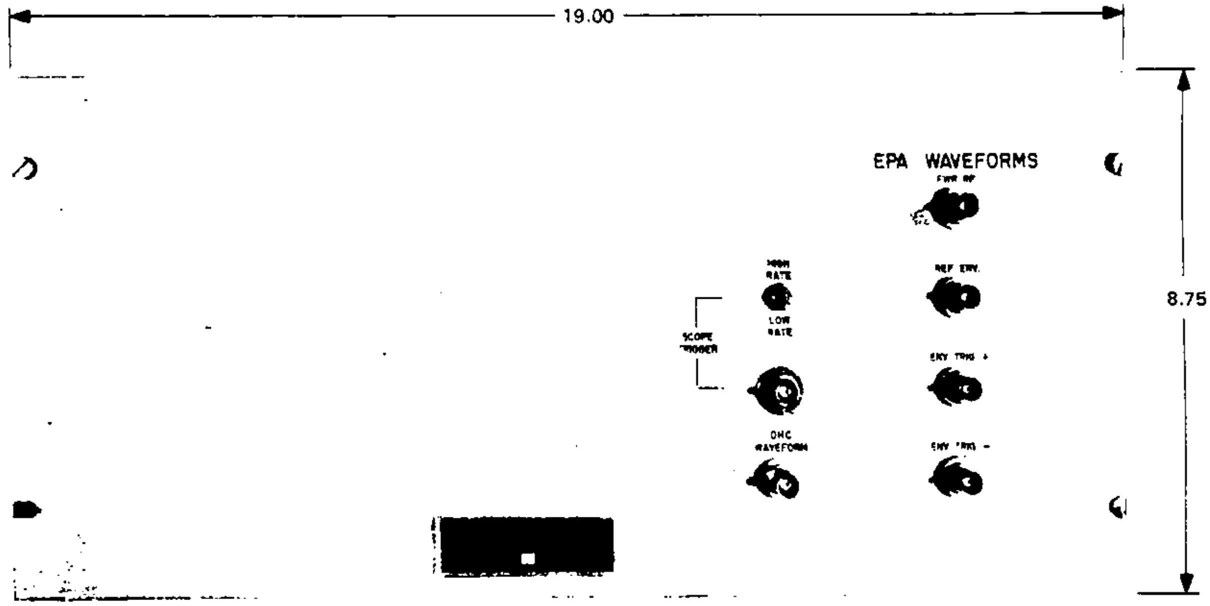


Figure 2.10. 1A8 Waveform Panel

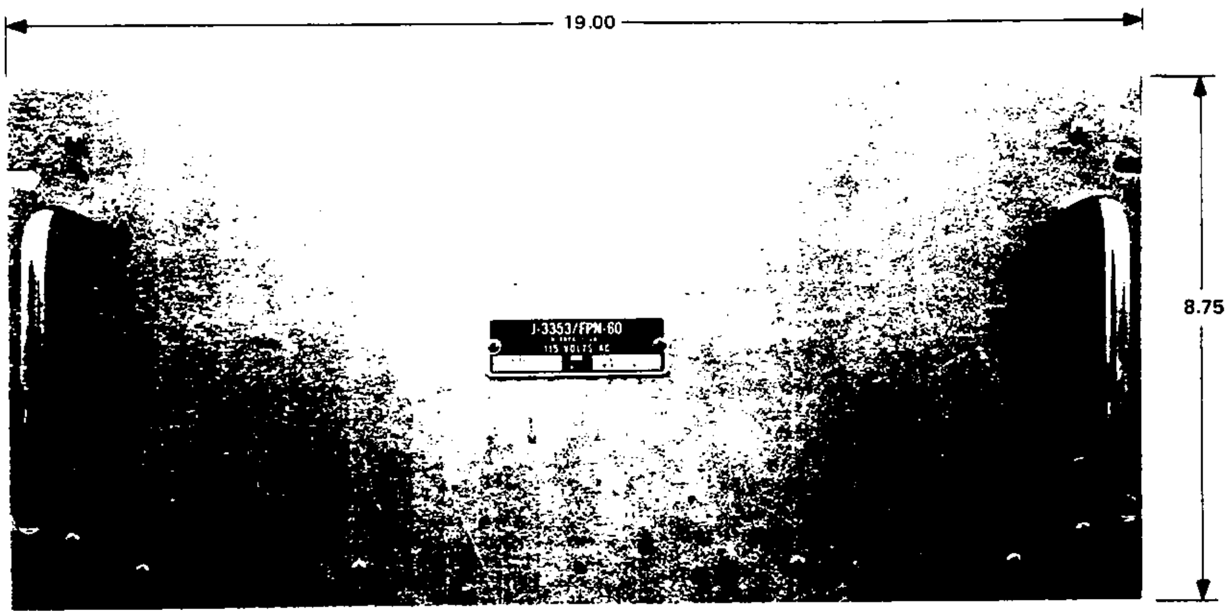


Figure 2.11. 1A9 Interface Unit

procedure is required when replacing a Group Droop module as well as for initial installation. For test point and potentiometer locations refer to Figure 2.12.

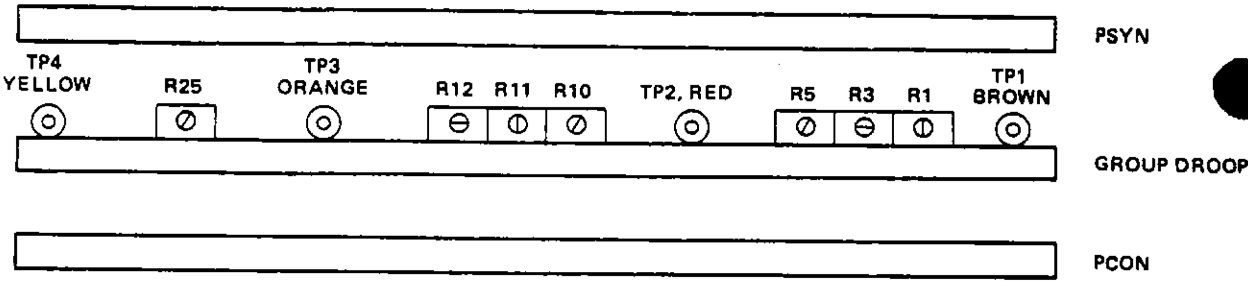


Figure 2.12. Test Point and Potentiometer Locations
(as viewed with PGEN side panel removed)

NOTE

All jumpers are to be of #22 AWG solid wire.

a. W0678-19B/GR DROOP module for AN/FPN-44/44A/45 Transmitters.

(1) Jumper pin 1 to pin 14 and pin 5 to pin 16 on E2. Jumper pin 3 to pin 9 and pin 7 to pin 8 on E4. (See Figure 2.13.)

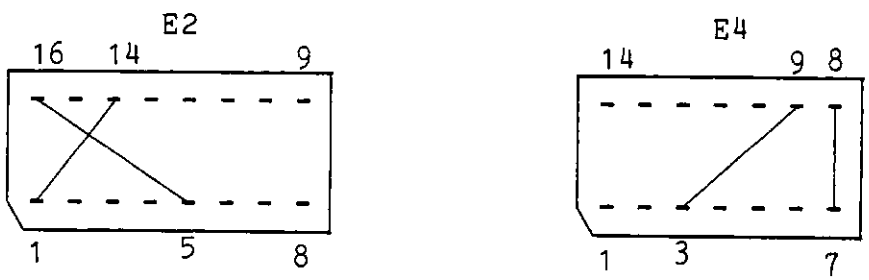


Figure 2.13. Programming of W0678-19B/GR DROOP Module Headers for AN/FPN-44/44A/45 Transmitters

(2) For stations not employing tail drive, if Q4 has not been removed, do so now. Insert a jumper between the source and drain of Q4, see Figures 2.14 and 7.34.

(3) For stations not employing tail drive, if C10 has not been removed, remove it.

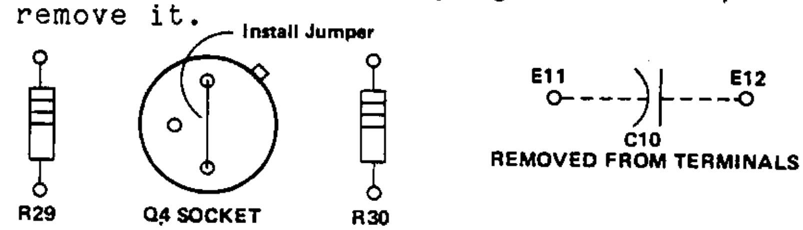


Figure 2.14. W0678-19B/GR/DROOP MODULE CHANGES

(4) Adjust R1 and R5 (see Figure 2.12) fully in the clockwise direction.

(5) Adjust R12 and R10 (see Figure 2.12) fully in the counterclockwise direction.

(7) Install the module in the PGEN and set the PGEN DROOP thumbwheels to all zeroes (0's) and the TRANSMITTER DRIVE ADJUST to zero.

b. W0678-19B/GR DROOP module for AN/FPN-42 Transmitters.

(1) Jumper pin 5 to pin 9 and pin 7 to pin 8 on E4. Insert a jumper between pin 3 and pins 5, 14, and 16 on E2. (See Figure 2.15.) Insert a jumper between the source and drain pins of the Q4 socket and remove C10 (see Figures 2.14 and 7.34).

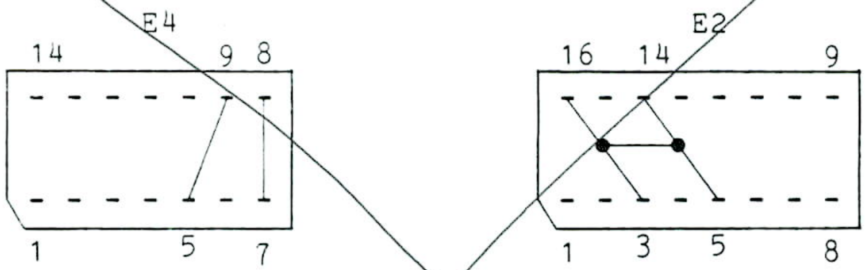


Figure 2.15. Programming of W0678-19B/GR DROOP Module Headers for AN/FPN-42 Transmitters

(2) Adjust R12 and R25 fully in the counterclockwise direction. Do not touch again.

c. For Tail Drive adjustment procedure for the W0678-19B/GR DROOP module for the AN/FPN-44/44A/45 Transmitters with feedback modification, see Paragraph 2.7.

d. Refer to local instructions to program the W0678-20/GR DROOP module for LORAN Station CAPE RACE.

e. A Group Droop module is not used with the AN/FPN-39 Transmitter.

2.6 Initial Operation.

2.6.1 Equipment turn-on. Energize the circuit breaker to the TCS Electrical Equipment Cabinet.

2.6.2 Power Supplies. Check the power supplies of all units according to:

Power Supply	Reference paragraph
TCC PS1	5.3.3.1.a
TCC PS2	5.3.3.1.b
EPA PS1	5.3.3.2.a
EPA PS2	5.3.3.2.a
PGEN PS1	5.3.3.3

2.6.3 Electrical Pulse Analyzer initial operation.

2.6.3.1 Set the front panel switches as follows:

a. RATE SELECT switch to LOW.
b. MODE SELECT switch to PULSE NUMBER position.
c. PEAK (VOLTS)/ECD (usec) switch to ALTERNATE.

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the number one (1) position. Observe the Digital Panel Meter and PEAK/ALTERNATE/ECD LEDs for both PEAK (VOLTS) and ECD (usec) readings (see Figure 3.3).

2.6.3.3 Monitor the Sample Gate and Operate RF on the oscilloscope (see Figure 2.16). Trigger the oscilloscope from the red test point (TP7) on one of the DRRG modules in the standby low rate timer. The Sample Gate should move from pulse to pulse as the pulse select thumbwheel is rotated from one (1) to nine (9) for master, and from one (1) to eight (8) for a secondary station.

2.6.3.4 Set the PULSE NUMBER thumbwheel to one (1), and observe the alternate PEAK (VOLTS) and ECD (usec) readings on the Digital Panel Meter and alternate lighting of the respective LEDs.

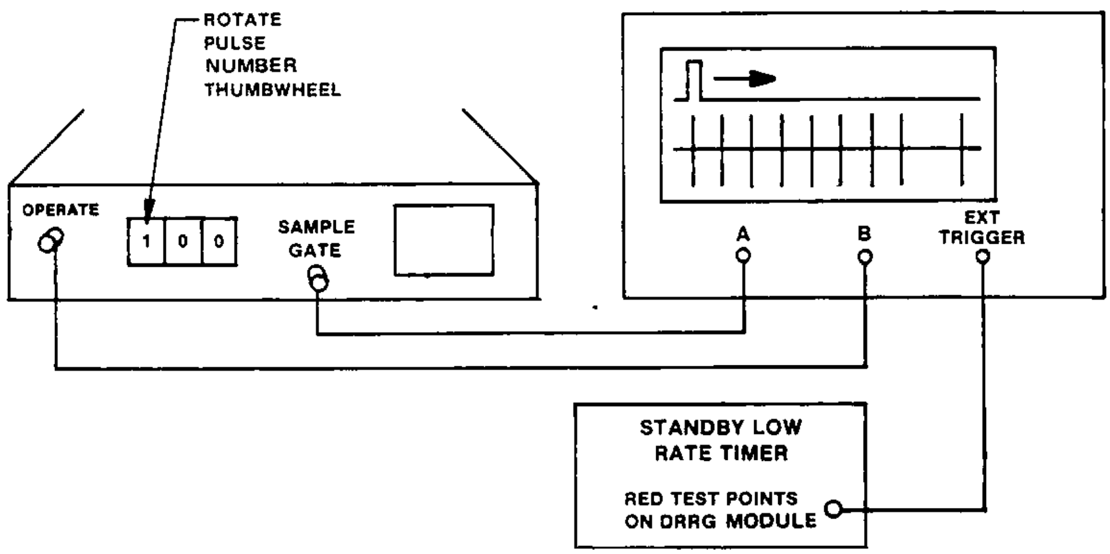

Figure 2.16. Sample Gate Versus Operate RF

2.6.3.5 Make half-cycle readings as follows:

a. Set the MODE SELECT switch to the HALF-CYCLE position.

b. Set the PULSE NUMBER thumbwheel to one (1).

c. Set the PEAK (VOLTS)/ECD (usec) switch to PEAK (VOLTS) position.

d. Rotate the two (2) HALF-CYCLE NUMBER thumbwheels from one (1) to nineteen (19) and observe the Digital Panel Meter. The Digital Panel Meter reading should increase, reaching a peak value at about the 13th, 14th, or 15th half-cycle. From then on the voltage should decrease in value.

e. Repeat step d. for each position of the PULSE NUMBER thumbwheel from one (1) to eight (8), or nine (9) for a master station.

2.6.3.6 For a dual-rated station, change the RATE SELECT switch to high rate and repeat paragraghs 2.6.3.3 to 2.6.3.5. Use the DRRG red test point of the standby high rate timer.

2.6.3.7 Observe the EPA Full Wave Rectified RF, Reference Envelope, and chart recorder drive as follows (see Figure 2.17):

a. Connect one oscilloscope channel to the REF ENV jack, J2, on the Waveform Panel (this is the same signal that is on the EPA rear panel jack, J9).

b. Connect the other oscilloscope channel to the FWR RF jack, J1, on the Waveform Panel (this is the same signal that is on the EPA rear panel jack, J4).

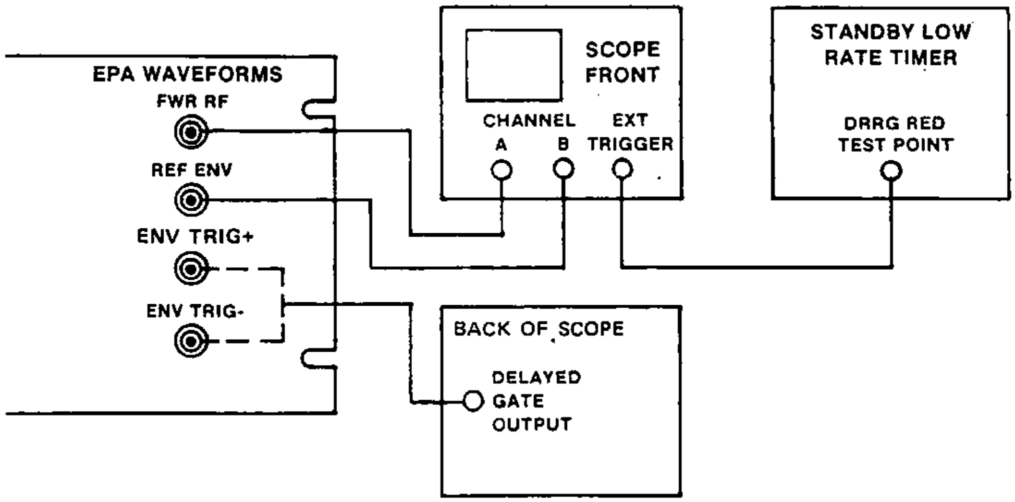

Figure 2.17. Oscilloscope Connections for Monitoring EPA Waveforms

c. Connect the delayed gate output of the oscilloscope to one of the ENV TRIG jacks, J3 (positive) or J4 (negative) on the Waveform Panel, depending upon the polarity of the oscilloscope delayed gate output. These are the same as EPA rear panel jacks, J8 or J5, respectively.

d. Set the horizontal sweep of the oscilloscope to 200 us per division, and the delay sweep to 20 us per division.

e. Adjust the oscilloscope sweep delay to line up the Reference Envelope and the Full Wave Rectified RF waveforms on the oscilloscope.

f. If the station is dual-rated, shift the oscilloscope trigger to the standby high rate timer DRRG red test point, and repeat step e.

g. Check J10 on the rear of the EPA for a voltage of 0-5 volts. A chart recorder can be connected in accordance with Table 2.4. ~~Further information on the chart recorder can be found in the Remote Control Set AN/FSN-2(v) technical manual.~~

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2.6.3.5 Adjust the W0678-11A/CLP ATTN module as follows:

a. On Channel A of the oscilloscope, monitor the Sample Gate (see Figure 5.19) at J3 located on the EPA front panel. If the Sample Gate is not present refer to paragraph 5.3.

b. Place the MODE SELECT switch (S2) in the HALF-CYCLE NUMBER position. Set the PULSE NUMBER thumbwheel to position 1 and the HALF-CYCLE NUMBER to position 08.

c. Remove the chassis mount screws and pull the EPA chassis out far enough from the cabinet so that the top cover of the chassis can be removed. Leave all input/output cables connected to the EPA.

d. On Channel B of the oscilloscope, monitor the Clip Attenuator Gate at TP1 (white test point) on the Clip Attenuator module (see Figure 2.18).

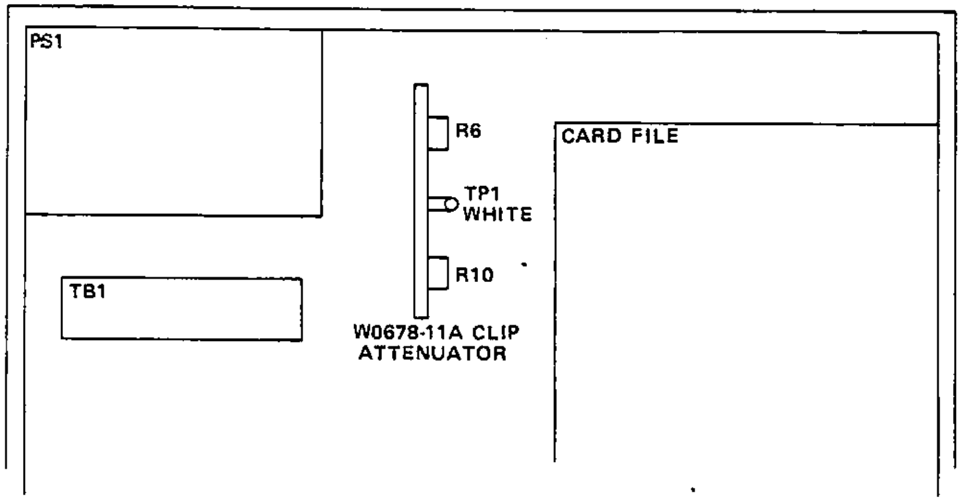

Figure 2.18. Top View of EPA Showing Location of Clip Attenuator Module

e. Adjust R10 on the Clip Attenuator module so that the Sample Gate overlaps with the leading edge of the Clip Attenuator Gate (see Figure 2.19.a).

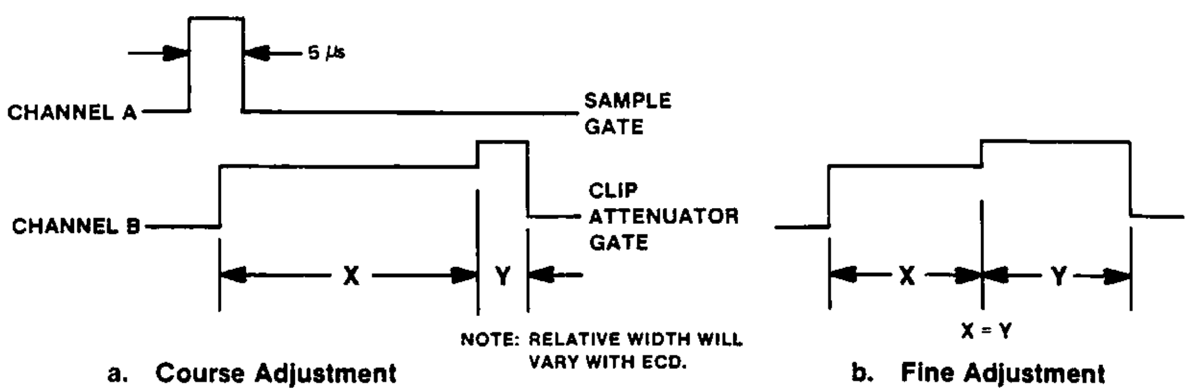

Figure 2.19. Clip Attenuator Waveform Adjust

f. Monitor only the Clip Attenuator Gate and adjust R10 so that X=Y (see Figure 2.19.b).

2.6.3.9 Check for the presence of the Local Envelope Crossover trigger as follows:

a. Set the Time Interval Counter (TIC) to the following settings:

(1) TIME BASE - 0.1 usec.

(2) FUNCTION - T.I. A to B.

(3) A channel trig - Negative ( ).

(4) B channel trig - Positive ( ).

(5) SAMPLE RATE - Turn clockwise, then fully counterclockwise but not into off detent.

b. Set the TIC Panel switches to:

(1) START thumbwheel - 2.

(2) STOP thumbwheel - 3.

(3) RATE select switch - LOW RATE.

c. Observe a LEN number on the TIC digital display.

2.6.3.10 Check the Envelope-to-Cycle-Difference recorder to observe that there is a recorder output from the EPA.

2.6.3.11 Adjust the PEAK (VOLTS) display as follows:

a. Set the front panel controls as follows:

(1) MODE SELECT switch to PULSE NUMBER position.

(2) SAMPLE NUMBER switch to 100.

b. Disable the cycle compensation loop by connecting a jumper from TP2 (Orange) to TP6 (Black) on the M Card of the operate timer (of both rates, if dual-rated).

NOTE

If TP2 (Orange) on the M Card is not jumpered to ground, transmitted signal timing shifts due to the cycle compensation loop may occur.

c. Remove the chassis cover of the EPA.

WARNING
Hazardous voltages are present in the RF return cable.

d. Locate and disconnect the keyed twinax connector in the Current Transformer cable (as close to the transformer as possible).

to differentially measure the zero-to-peak voltage on the first LORAN-C pulse of the transmitted pulse group. Ensure that the resistor is placed across the plus and minus pins of the twinax connector (refer to Figure 2.20).

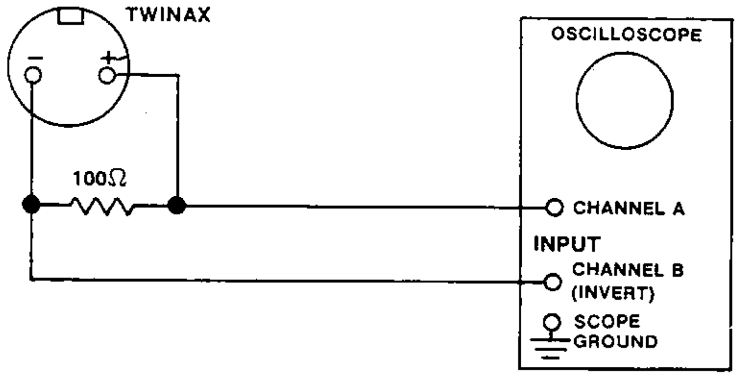

Figure 2.20. Oscilloscope Twinax Connector Test Setup

f. Remove the resistor and reconnect the twinax connector.

g. Adjust the potentiometer (R6) on the Clip Attenuator module (refer to Figure 2.18 for location of R6) until the pulse peak reading on the EPA DPM is the same as the value obtained in step e. (±1 volt) or in accordance with local directives. Since the volt/ampere ratio of the Current Transformer (Pearson Model 1705) is 1/10, the peak current on the antenna may be obtained by multiplying this reading by ten.

h. Replace the top cover on the EPA and re-install the EPA back into the rack using four panel mount screws to securely hold the EPA in place.

i. Enable the cycle compensation loop on the operate timer(s) by removing the jumper(s) from TP2 (Orange) to TP6 (Black) on the M Card(s).

2.6.4 <u>Transmitter Coupler Control initial operation</u>.

2.6.4.1 Perform the following adjustments of the TCC with the AN/FPN-~~42/44/44A/45~~ 44A/44B/45B Transmitters:

a. Monitor the peak amplitude of the first LORAN pulse of a group as outlined in paragraph 3.3.2.2. Insure that the transmitter is operating at the prescribed output power.

b. Reduce the transmitter drive adjust on the operate PGEN until the EPA reads a DPM voltage 80% of the prescribed DPM voltage reading, as promulgated by current operating directives. (This corresponds to a 64% radiated power level.)

c. Adjust the TCC threshold detector level adjust, R8 (see Figure 5.13) on the W0678-5/XMTR CON module, clockwise until the OFF AIR lamp goes off, and then counterclockwise until the OFF AIR lamp illuminates. The OFF AIR indicator is a one-half second delayed action indication. Adjust R8 in small increments to avoid over-correction.

d. Return the transmitter drive to the original settings.

e. Repeat steps a. and b. to insure that the OFF AIR alarm condition occurs properly.

2.6.4.2 Perform the following adjustments of the TCC with the AN/FPN-39 Transmitter:

NOTE

> Three personnel are required to perform the following checks; two in the transmitter building, and one in the timer room.

a. On the oscilloscope, monitor the amplitude of the pulse group (8 for secondary station, 9 for master station) as outlined in paragraph 3.3.2.2. Ensure that the transmitter is operating at the prescribed output power.

b. Adjust the oscilloscope vertical deflection and position controls until the positive portion of the waveform (the portion from the zero line to the positive peak) measures 5 major divisions.

c. At the transmitter building, lower the plate voltage on the operate transmitter (see the AN/FPN-39 technical manual) until the positive portion of the waveform measures 4 major divisions (this indicates that the transmitter is now at 80% of rated voltage output, which corresponds to 64% rated power).

d. Adjust the TCC threshold detector level adjust, R8 (see Figure 5.13) on the W0678-5/XMTR CON module, clockwise until the OFF AIR lamp extinguishes, and then counterclockwise until the OFF AIR lamp illuminates. The OFF AIR indicator is a one-half second delayed action indication. Adjust R8 in small increments to avoid over-correction.

e. Return the transmitter drive to the original settings.

f. Repeat steps a. and b. to insure that the OFF AIR alarm condition occurs properly.

2.6.5 <u>Pulse Generator initial operations for dual-rated stations</u>.

2.6.5.1 The following are definitions and measurement procedures to be followed in performing adjustments to the Pulse Generator.

NOTE

> READ ALL STEPS PRIOR TO STARTING ANY ADJUSTMENTS.

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a. The following are definitions used in the adjustment procedures:

(1) Phase code balance - Operate RF: equal amplitude peaks of the alternately phase coded pulses between the phase code intervals observed at the OPERATE RF jack of the EPA.

(2) Phase code balance - PGEN: equal amplitude peaks of the Transmitter Drive Waveform (TDW) alternately phase coded pulses. Proper phase code balance of the PGEN includes phase offset of less than 100 nsec, as defined below.

(3) Phase code offset of 30-usec zero crossing: the 30-usec zero crossing of a phase coded pulse observed at the TRANSMITTER DRIVE jack on PGEN. The phase offset is the magnitude of the separation between the zero crossing of the positively and negatively phase coded pulses.

(4) Phase jitter of the 30-usec zero crossing: the peak-to-peak phase shift of the 30-usec zero crossing of any operate RF pulse during the crossover epoch.

(5) Droop - The amplitude differences between any individual pulse and any other pulse within the same pulse group.

(6) Group Droop - The amplitude differences between any pulse of one group to any pulse of the other group over the interval.

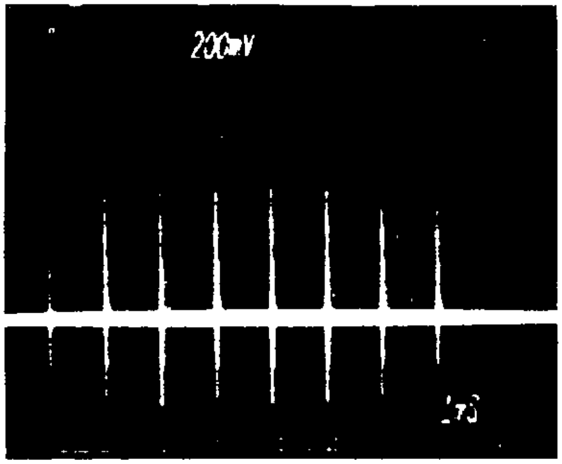
b. The following are the measurement procedures to be used:

(1) Triggering: Trigger the oscilloscope from the red test point of a DRRG board in the standby timer. This trigger is moved by inserting Local Phase Adjustments (LPAs) into the standby timer. Write down each LPA, as it is inserted, for easy recovery, should it become necessary to switch timers during the measurements. Also, once the LPA necessary to find the 30-usec zero crossing is found, it is a fixed value and can be used for future measurements.

(2) Oscilloscope sweep mode: Never use delayed sweep when measuring phase jitter, as it introduces some jitter. 50 nsec per division is desired to obtain accurate jitter measurements. Use delayed sweep only when determining the LPA necessary to obtain the 30-usec zero crossing.

(3) Obtaining the 30-usec zero crossing: Observe the desired pulse at any sweep time that will display only that pulse at the left side of the display (trigger with TP7 (Red) of DRRG module). Expand the sweep and locate the 30-usec zero crossing. Ensure that the oscilloscope trace is centered on a major horizontal division. Alternately insert LPAs in the standby timer and expand the sweep time to keep the 30-usec zero crossing in the left center of the display. As the display time decreases, reduce the volts per division scale to increase the slope of the waveform. Intensity and focus need to be adjusted accordingly. Upon reaching 50 nsec per division of sweep, center the zero crossing (it is a vertical line) on the display and record the total LPA insertion. Inserting LPAs in 5 usec increments moves the start of the pulse. Inserting LPAs in 1000 usec increments displays the 30-usec zero crossing of the adjacent pulses.

(4) Figures 2.21 and 2.22 show proper and improper phase code balance, respectively. Figure 2.22 is observed when the PSYN module is not properly adjusted (if this occurs, return the module in accordance with E/GICP instructions).

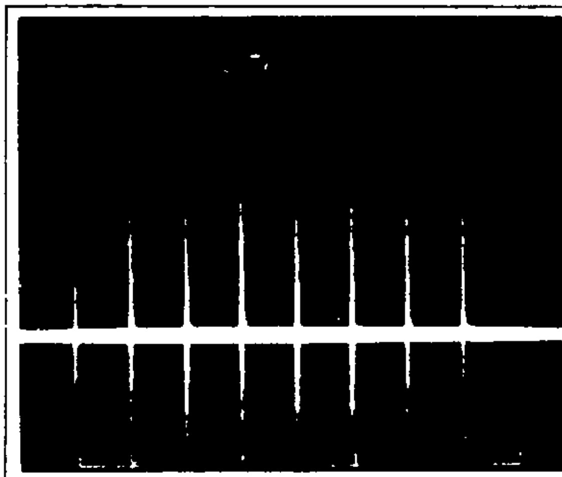


COMMENTS	SOURCE	SETTINGS
GROUND REF: Two divisions below center.	SIGNAL: Xmtr. Drive jack on PGEN. Coaxial cable.	TRIGGER: External (+)
		MODE: Main Sweep
	TRIGGER: TP7 (Red) of E,F,or G module (DRRG) of stby rate timer.	HORIZONTAL: 1 ms/Div
		VERTICAL: 0.2 V/Div

Figure 2.21. Proper Phase Code Amplitude Balance

NOTE

A properly adjusted PSYN module allows the positive and negative halves of the pulses to be balanced.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Two divisions below center.	SIGNAL: Xmtr. Drive jack on PGEN. Coaxial cable.	TRIGGER: External (+)
		MODE: Main Sweep
	TRIGGER: TP7 (Red) of E,F,or G module (DRRG) of stby rate timer.	HORIZONTAL: 1 ms/Div
		VERTICAL: 0.2 V/Div

Figure 2.22. Improper Phase Code Amplitude Balance

c. These adjustments ensure a more efficient operation of the transmitter with a minimum of phase jitter.

(1) Adjust the PGEN phase code balance and ensure that the phase offset is less than 100 nsec.

(2) Ensure that the transmitter Power Amplifier (PA) section cathode current is balanced to within 5% tube-to-tube and 5% bank-to-bank. Ensure that PA tube filaments do not exceed the rated voltage. Neutralize the 1st and 2nd Intermediate Power Amplifiers (IPAs). Ensure that the 1st IPA is not in saturation. After the transmitter has been properly balanced, proceed to the adjustments.

d. The following are phase jitter maximums that must be maintained at dual-rated transmitting stations:

(1) Phase jitter of all sixteen pulses must not exceed that described in COMDTINST M16562.4 paragraph 2.B.5.c.

(2) Phase code offset of the alternately phase coded pulses must not exceed 100 nsec.

(3) Phase code amplitude imbalance (bounce) of the transmitter drive waveform (TDW) peaks at the PGEN must not exceed .1 volt, while achieving phase code balance of the Operate RF.

2.6.5.2 <u>W0678-19B/GR DROOP module adjustments for AN/FPN-~~44/44A/45~~ 44A/44B/45B Transmitters</u>. Perform the following steps to adjust the W0678-19B/GR DROOP module for use with the AN/FPN-44/44A/45 transmitters without the Feedback Modification.

NOTE

READ ALL STEPS PRIOR TO STARTING ANY ADJUSTMENTS. Steps a. through m. are to be performed on any initial issue or replacement modules, prior to performing step n.

a. Place the DROOP thumbwheels to zeroes (0's) and the TRANSMITTER DRIVE ADJUST to zero. Insure that all modules are programmed according to paragraph 2.5.3.a.

b. Set up a calibrated oscilloscope (with x10 probe) according to Figure 2.23.

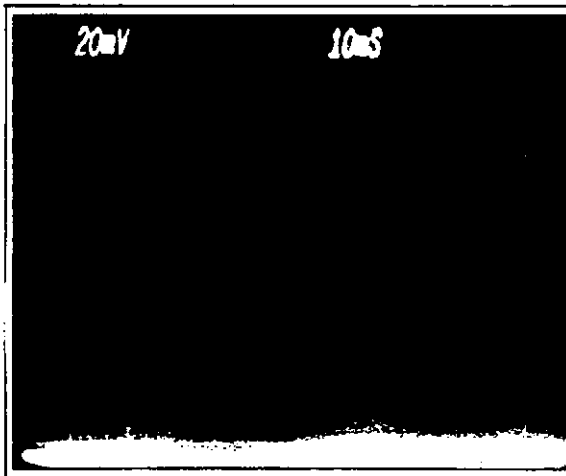
	COMMENTS	SOURCE	SETTINGS
	Channel input coupling switch in ground position. Adjust the scope trace to bottom of graticule.	SIGNAL: TRIGGER:	TRIGGER: Internal Auto MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.23. Oscilloscope Set Up

c. Place the oscilloscope vertical channel input coupling switch to the DC position.

d. Place the oscilloscope Trigger Source switch to External. Trigger the scope from an opposite rate PGEN front panel SCOPE TRIGGER jack (1st MPT selected). This means that if the low rate PGEN is

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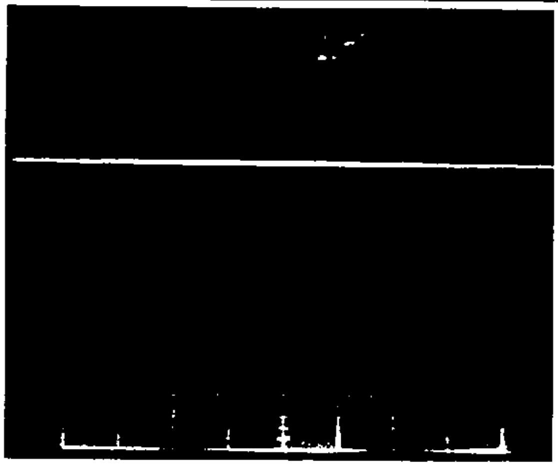
being adjusted, the trigger would be from the high rate PGEN front panel jack.

e. Connect the oscilloscope to TP4 (Yellow) on the Group Droop module being adjusted. Connect the probe ground clip to the chassis.

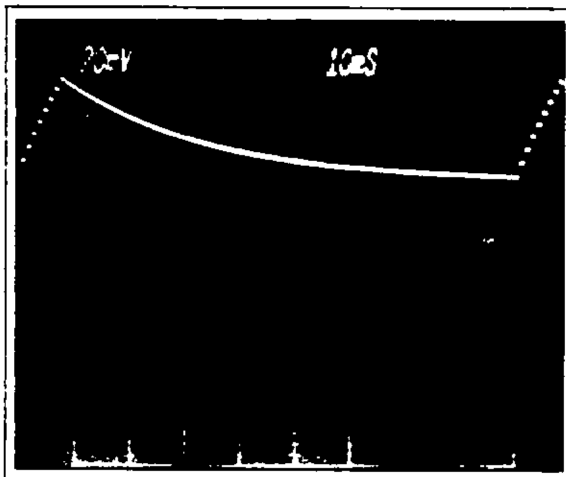
f. Record the DC Reference level (see Figure 2.24). This DC reference level should be in the range of +0.9 to 1.1VDC.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom of graticule. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module. x10 Probe	TRIGGER: External (+) Normal
	TRIGGER: SCOPE TRIGGER jack of opposite rate PGEN.	MODE: Main Sweep
		HORIZONTAL: 10 ms/Div
		VERTICAL: 0.02 V/Div

Figure 2.24. DC Reference Level

g. Adjust R1 counterclockwise until a ladder waveform appears (see Figure 2.25) and its peak reaches +1.4VDC. Adjust R12 clockwise until the decay of the ladder waveform reaches the DC level recorded in step f. just before the start of the next ladder waveform. While adjusting R12, it will be necessary to readjust R1 to maintain the peak of the ladder waveform at +1.4VDC.



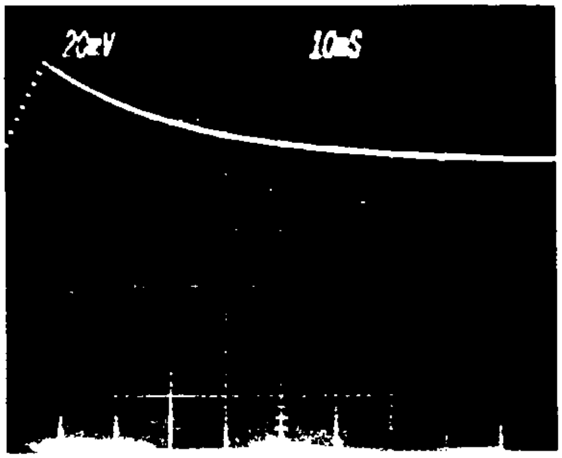
COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. LR is 9960 HR is 8970 Waveform may vary slightly for different rates. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module. x10 Probe	TRIGGER: External (+)
	TRIGGER: SCOPE TRIGGER jack of opposite rate PGEN.	MODE: Main Sweep
		HORIZONTAL: 10 ms/Div
		VERTICAL: 0.02 V/Div

Figure 2.25. Opposite Rate Ladder Waveform

h. Do not readjust R12 again. Adjust R1 clockwise until the ladder waveform just disappears (DC level signal) see Figure 2.24.

PGEN to the SCOPE TRIGGER jack of the PGEN being adjusted.

j. Adjust R5 counterclockwise until a ladder waveform appears (see Figure 2.26) and its peak reaches +1.4VDC. Adjust R10 clockwise until the decay of the ladder waveform reaches the DC Reference level recorded in step f. just before the start of the next ladder waveform. While adjusting R10, it will be necessary to readjust R5 to maintain the peak of the ladder waveform at +1.4VDC.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. Waveform is for 9960 rate. Waveform may vary slightly for different rates. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module x10 Probe TRIGGER: SCOPE TRIGGER jack of same rate PGEN.	TRIGGER: External (+) MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

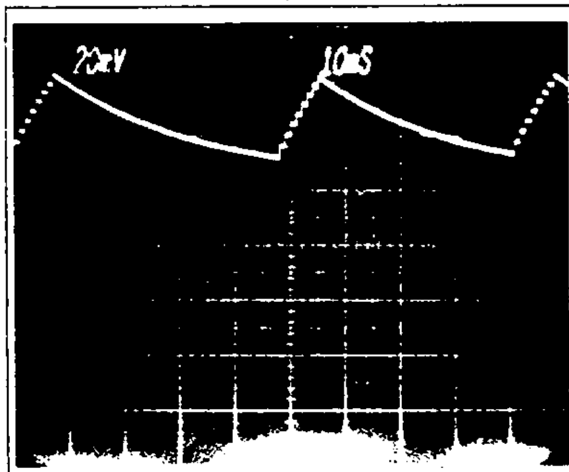
Figure 2.26. Same Rate Ladder Waveform

k. Do not readjust R5 or R10.

l. Move the oscilloscope trigger cable from the PGEN being adjusted to the SCOPE TRIGGER jack of the opposite rate PGEN.

m. Adjust R1 counterclockwise until a stable ladder waveform appears. Both the stable and crossing ladder waveforms will be varying in amplitude. Adjust R1 counterclockwise until the stable waveform reaches +1.4VDC when the crossing ladder waveform nears point A in Figure 2.27. The crossing ladder waveform should be +1.4VDC near point A in Figure 2.27.

A



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. LR is 9960. HR is 8970. Waveforms may vary slightly for different rates. Ground probe	SIGNAL: TP4 (Yellow) GR DROOP module x10 Probe TRIGGER: SCOPE TRIGGER jack of opposite rate PGEN.	TRIGGER: External (+) MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.27. Crossing Ladder Waveforms

n. Operate the transmitter in Dummy Load, adjust the PGEN drive to obtain normal drive level and insure that the PGEN is operating correctly.

2.6.5.3 <u>W0678-19B/GR DROOP module initial adjustments for AN/FPN-42 Transmitters</u>. Perform the following steps to adjust the W0678-19B/GR DROOP module for use with the AN/FPN-42 Transmitters:

a. Ensure that all W0678-19B modules are programmed according to para 2.5.3.b.

b. Set oscilloscope with zero reference level at the bottom of the graticule with the vertical input set at .02 V/Div. Set the horizontal sweep at 10 msec/div. Use properly calibrated divide by 10 probes.

c. In the standby high rate PGEN, observe the waveform on TP4 (Yellow) on Channel A of the oscilloscope and trigger the oscilloscope from the SCOPE TRIGGER jack (1st MPT selected) of the same PGEN. Adjust R1, R3, and R11 (see Figure 2.12) until two ladder waveforms are present.

d. Adjust R11 until the ladder waveforms disappear, then turn R11 in the opposite direction until the ladder waveforms reappear. The DC level of the waveform should be between 1.0 and 1.1 volts. Adjust R3 until the peak of the stable ladder (the other will drift across the screen) is between 1.2 and 1.25 volts.

e. Move the oscilloscope trigger cable to the SCOPE TRIGGER jack of the low rate standby PGEN. Adjust R1 until the peak of the stable ladder is between 1.2 and 1.25 volts.

f. Both ladder waveforms are now equal in magnitude, and the DC Reference level is approximately 1.1 volts. There should be no difference in the waveforms when the trigger is moved. If there is, repeat the above steps until the two waveforms are equal. When this is accomplished, this module is the standard. Do not adjust it in any of the following steps. Figures 2.28 and 2.29 show the proper appearance of the "standard" waveform.

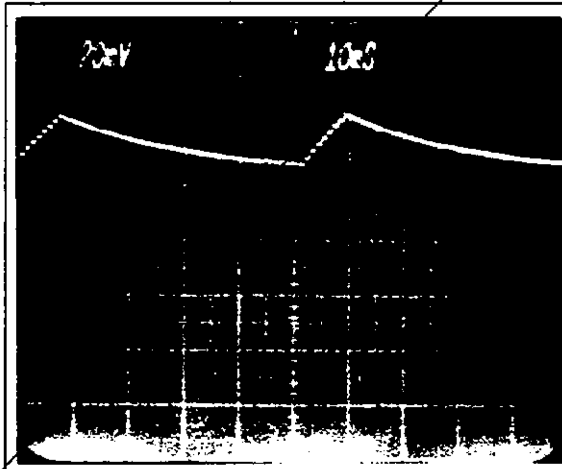
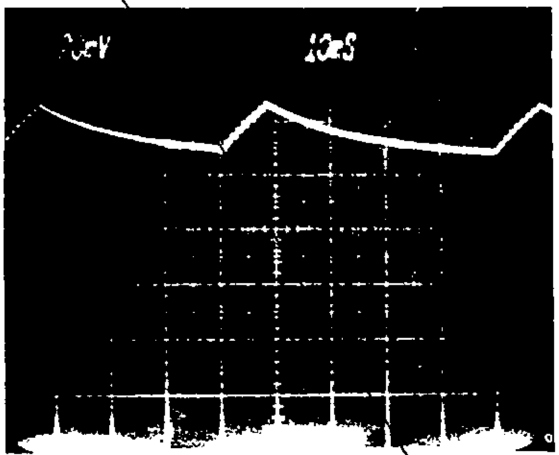
	COMMENTS	SOURCE	SETTINGS
	GROUND REF: Bottom graticule. Use x10 probe for signal connection. Ground probe	SIGNAL: TP4 (Yellow) on GR DROOP module of high rate PGEN. TRIGGER: SCOPE TRIGGER jack on PGEN being adjusted.	TRIGGER: External (+) MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.28. Proper Same Rate Ladder Waveform

FC 10/2 to AN/FPN-60(V)/60A(V)

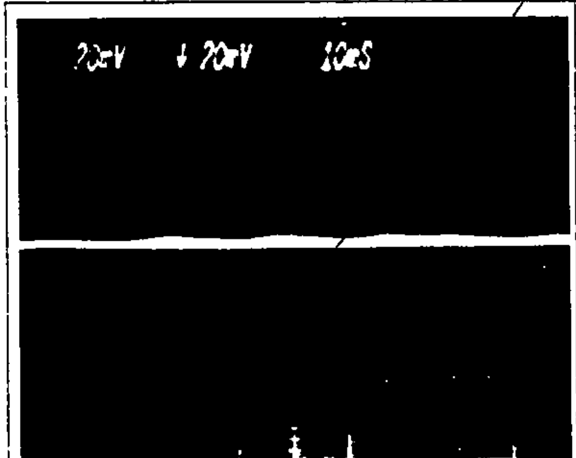
g. With the standard waveform on Channel A of the oscilloscope, observe the waveform at TP4 (Yellow) on the Group Droop module in the standby low rate PGEN on Channel B (use same settings). Adjust this module using steps (a) thru (f) above. Invert Channel B and add it to Channel A (A+B). Adjust the vertical position control to center the trace when both channels are grounded. Return to the A+B display.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. Use x10 probe for signal connection. Ground probe	SIGNAL: TP4 (Yellow) on GR DROOP module of low rate PGEN. TRIGGER: SCOPE TRIGGER jack of PGEN being adjusted.	TRIGGER: External (+) MODE: Main Sweep HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.29. Proper Opposite Rate Ladder Waveform

h. With the oscilloscope trigger coming from the same PGEN, adjust R3 for as straight as possible line on the left side of the display. Trigger the oscilloscope from an opposite rate PGEN and adjust R1 for as straight a line as possible on the left side of the display. Adjust R11 for a straight line across the entire display. Repeat these steps until the two waveforms add to a straight line similar to Figure 2.30. Observe Channel B alone and not inverted, to ensure that it is set properly.



COMMENTS	SOURCE	SETTINGS
GROUND REF: Bottom graticule. Channel B inverted. Use x10 probe for signal connection. Ground probe	SIGNAL: TP4 (Yellow) on GR DROOP module of both rate PGENS. TRIGGER: SCOPE TRIGGER jack of low rate PGEN.	TRIGGER: External (+) MODE: Main Sweep (A+B) HORIZONTAL: 10 ms/Div VERTICAL: 0.02 V/Div

Figure 2.30. A+B Waveform

i. Switch transmitters and adjust the phase code balance and transmitter drive (drive may have to be reduced). Droop should be less than 5% for both the group and pulse train.

FC 10/2 to AN/FPN-60(V)/60A(V)

NOTE

The following step adjusts droop. Any attempt to improve droop shall maintain the voltage values given in the above steps. During any adjustment ensure that (1) the two ladders on the TP4 waveform are equal in magnitude and (2) the high and low rate TP4 waveforms are identical among all PGENs.

j. Continue to observe the standard waveform on Channel A of the scope, and adjust the remaining PGEN Group Droop modules in accordance with the above steps. Repeat step i, for the other transmitter, first making sure that it is properly balanced. Adjust the spare module. All Group Droop modules should now be interchangeable without any readjustments.

k. The peak-to-peak amplitude of the TDW observed at the PGEN TRANSMITTER DRIVE jack must not exceed 2.5 volts to achieve the constraints in the above paragraph. At this drive level, the station is still able to transmit at its assigned power level.

2.6.5.4 Adjustment procedures for the W0678-20/GR DROOP module. The adjustments for this module are done at the depot.

NOTE

Three personnel are required to perform the following checks; two in the transmitter building, and the other in the timer room.

2.6.6 Operational Checks. Paragraph 2.6.6.1 is a step-by-step check of the TCS equipment. Paragraphs 2.6.6.2 and 2.6.6.3 require the switching of transmitters and contain additional checks. These procedures are written for a dual-rated station, but can be used at a single-rated station, remembering that a single-rated station has only one operate and one standby PGEN. If any of the checks fail, recheck all connections and repeat the checks. If any of the checks still fail, refer to Chapter 5 for the troubleshooting procedures. After the successful completion of the below checks, the Transmitter Control Set will be ready for operation.

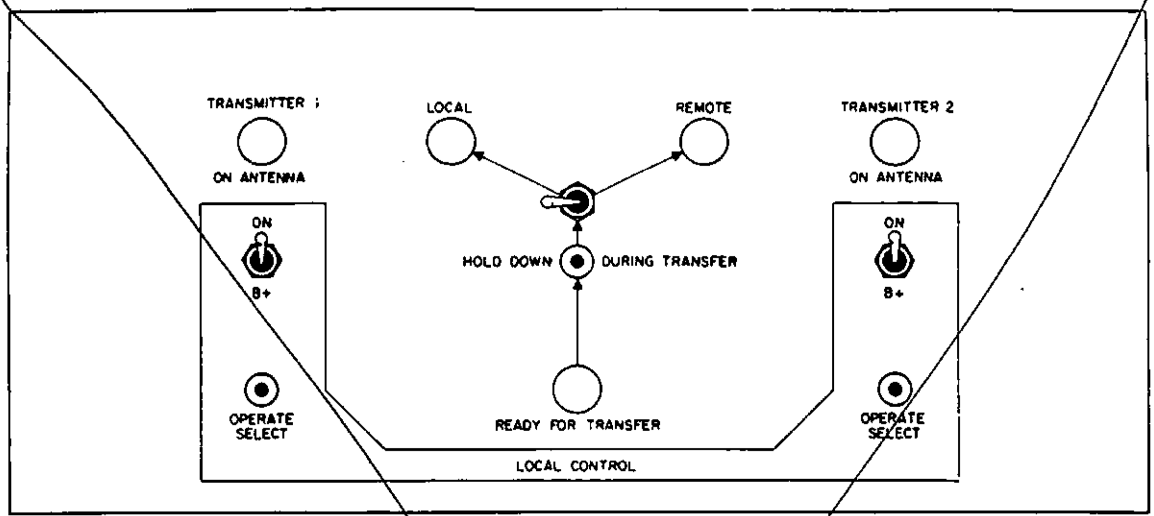
2.6.6.1 Perform the following steps:

a. Insure that the following are set:

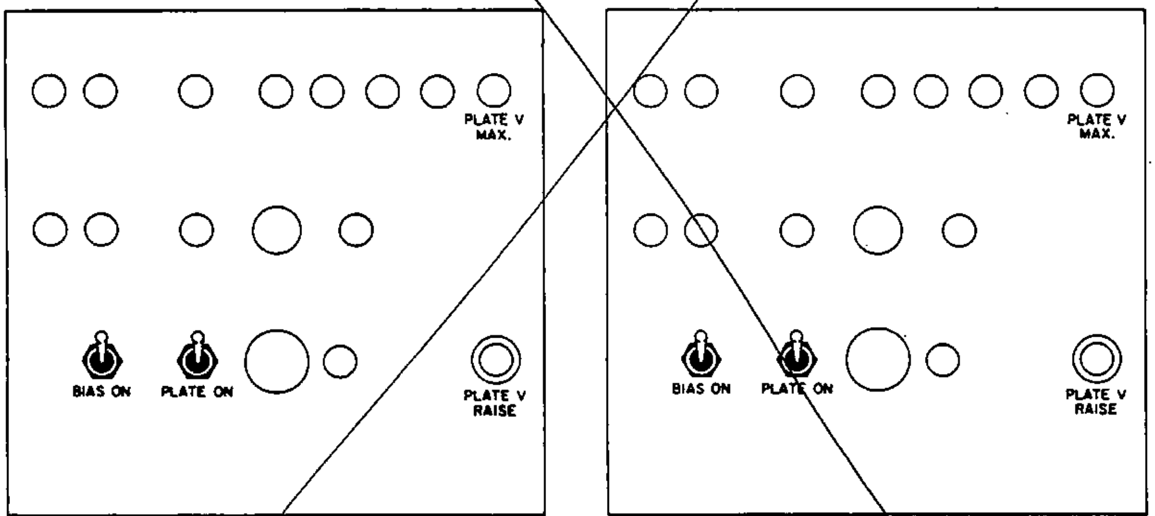
(1) All alarms are off and the TRANSMITTER DRIVE ADJUST on the PGENs is set for full rated power.

(2) The B+ switch turned on for the operate transmitter only on the Local Control Panel. (Figures 2.31-2.34 show the panels and control units of the AN/FPN-~~39, 42, 44/45 and 44A~~ 44A/44B/45B transmitters respectively).

AN/FPN-39 TRANSMITTER



LOCAL CONTROL PANEL IN POWER DISTRIBUTION UNIT (3A4)



LOW POWER UNIT -(2A8) TRANSMITTER NO. 1

LOW POWER UNIT -(2A8) TRANSMITTER NO. 2

Figure 2.31. AN/FPN-39 Local Control Panel and Low Power Units

FC 10/2 to AN/FPN-60(V)/60A(V)

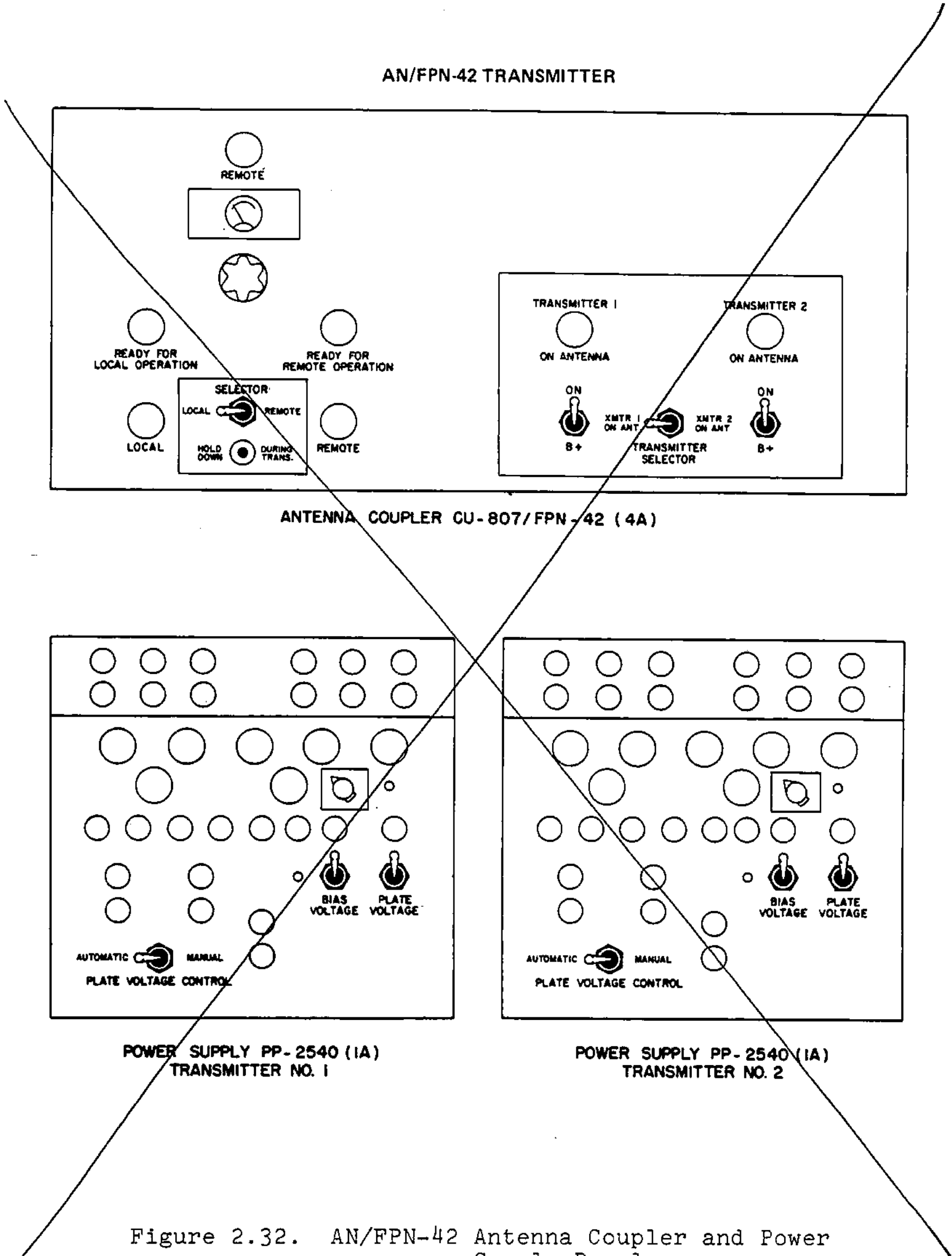
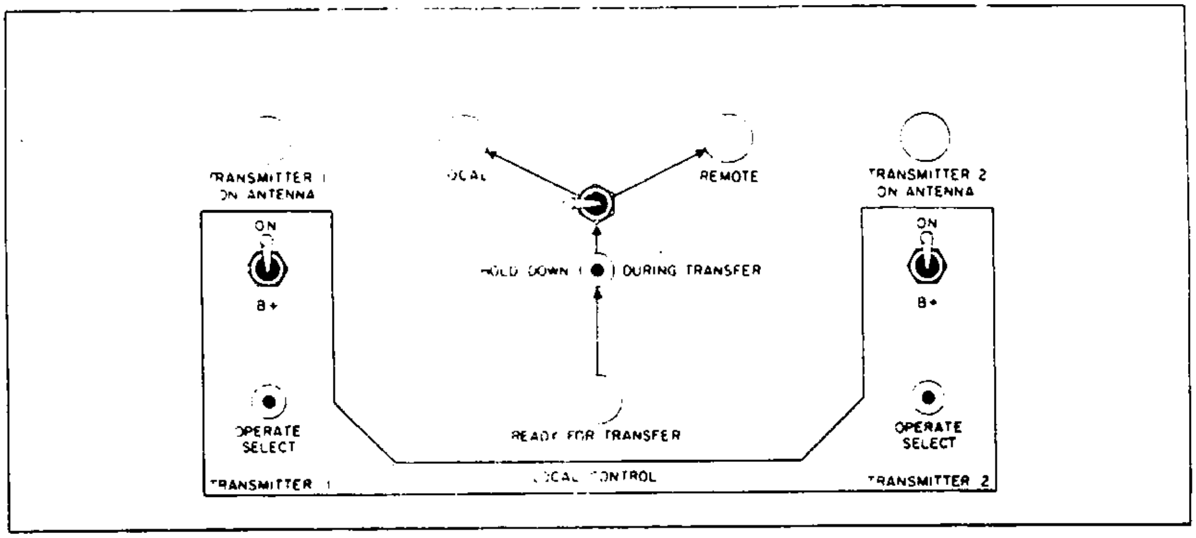


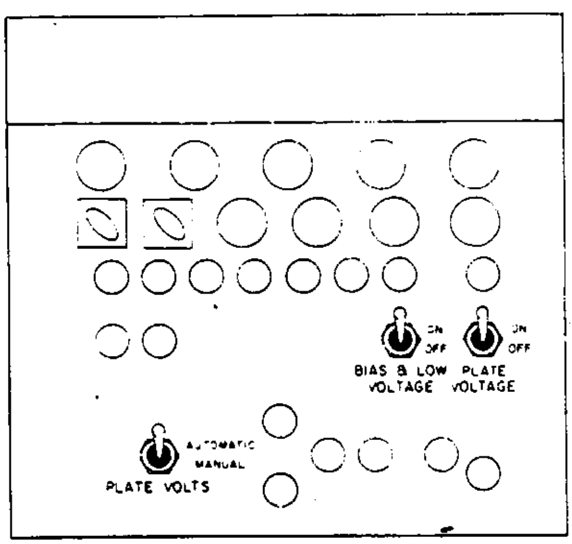
Figure 2.32. AN/FPN-42 Antenna Coupler and Power Supply Panels

FC 10/2 to AN/FPN-60(V)/60A(V)

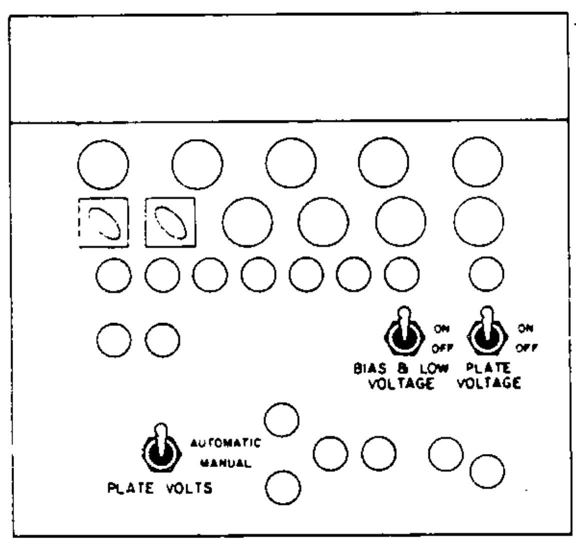
AN/FPN-44/45 TRANSMITTER



LOCAL CONTROL UNIT (UD5)



CONTROL INDICATOR C-4752 (1A3A2)
TRANSMITTER NO. 1



CONTROL INDICATOR C-4752 (1A3A2)
TRANSMITTER NO. 2

Figure 2.33. AN/FPN-44/45 Local Control and Control Indicator Panels

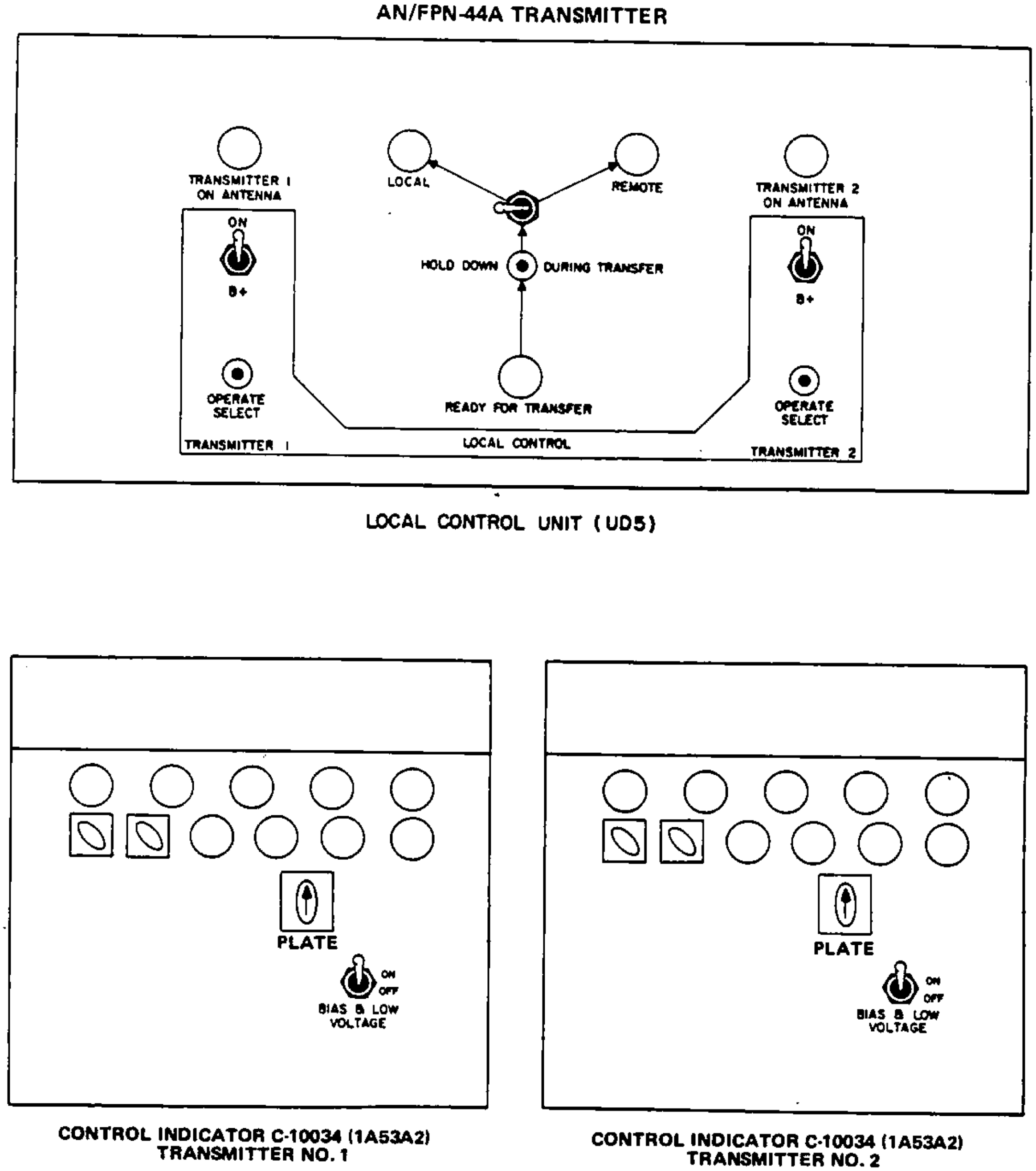


Figure 2.34. AN/FPN-44A Local Control and Control Indicator Panels

the LOCAL position.

(4) The BIAS switch turned on for both transmitters. The plate volts automatic switch in AUTOMATIC position. (both are on the transmitter, see Figures 2.32-2.33).

(5) Transmitter No.1 is the operate transmitter.

b. Press the LAMP TEST switch on the TCC, and the following should occur:

(1) All lights on the TCC illuminate.

(2) The Audio alarm sounds.

(3) The PGEN ALARM and OPERATE LEDs illuminate.

c. Release the LAMP TEST switch, and the following Lamps/LEDs remain lit:

(1) OPERATE LEDs on the operate PGENs.

(2) ON THE TCC: TRANSMITTER BUILDING CONTROL, TRANSMITTER 1 OPERATE,TRANSMITTER 2 STANDBY.

(3) ON THE LOCAL CONTROL PANEL: ~~READY FOR LOCAL OPERATION and LOCAL CONTROL (AN/FPN-42~~), and READY FOR TRANSFER (AN/FPN-~~39/44/44A/45~~).
44A/44B/45B

d. Record the present setting of the TRANSMITTER DRIVE ADJUST, for future reference. Turn the TRANSMITTER DRIVE ADJUST of the operate and standby PGENs, of the same rate, fully counterclockwise and observe the TCC OFF AIR and TRANSMITTER FAILURE lamps illuminate and the TRANSMITTER 2 STANDBY lamp extinguishes. Thirty seconds later the Audio alarm sounds.

e. Return the TRANSMITTER DRIVE ADJUST of the PGENs to the recorded settings of step d. The OFF AIR and TRANSMITTER FAILURE lamps extinguish, and the TRANSMITTER 2 STANDBY lamp illuminates.

f. Turn the standby transmitter BIAS switch off. The TRANSMITTER 2 STANDBY lamp extinguishes and the TRANSMITTER FAILURE lamp illuminates. The TRANSMITTER 1 OPERATE lamp blinks off for approximately 1 second.

g. Turn the standby transmitter BIAS switch on. The TRANSMITTER FAILURE lamp extinguishes. The TRANSMITTER 2 STANDBY lamp illuminates. The TRANSMITTER 1 OPERATE lamp blinks off for approximately 1 second.

h. Turn the TRANSMITTER DRIVE ADJUST of a standby PGEN fully counterclockwise. The NO TRANSMITTER DRIVE LED of the PGEN and the TRANSMITTER FAILURE lamp of the TCC illuminate. The TRANSMITTER 2 STANDBY lamp extinguishes.

i. Return the TRANSMITTER DRIVE ADJUST of the standby PGEN to its original position. The NO TRANSMITTER DRIVE LED of the PGEN and the TRANSMITTER FAILURE lamp of the TCC extinguish. The TRANSMITTER 2 STANDBY lamp illuminates.

FC 10/2 to AN/FPN-60(V)/60A(V)

2.6.6.2 The following steps require switching transmitters.

a. On the Local Control Panel, turn off the operate transmitter B+ switch, couple transmitter No. 2 to the antenna, turn on the B+ switch for transmitter No. 2, and observe the following indications:

44A/44B/45B (1) On the Local Control Panel, the READY FOR TRANSFER (AN/FPN-~~39/44/44A/45~~), TRANSMITTER 2 ON ANTENNA (all), ~~READY FOR LOCAL OPERATION (AN/FPN-42)~~, and LOCAL (all) lamps illuminate.

(2) On the TCC, the TRANSMITTER BUILDING CONTROL, TRANSMITTER 2 OPERATE, and TRANSMITTER 1 STANDBY lamps illuminate.

b. On the TCC, press the SWITCH TRANSMITTERS switch. There is no effect, as the system is in local control. Press the STANDBY TRANSMITTER B+ switch. There is no effect, as the system is in local control.

c. Repeat steps d. through i. of the paragraph 2.6.6.1.

d. Press the HOLD DOWN TO TRANSFER switch. Place the LOCAL/REMOTE switch on the Local Control Panel in the REMOTE position. Then release the HOLD DOWN TO TRANSFER switch. Observe on the TCC, that the TRANSMITTER BUILDING CONTROL lamp extinguishes, and the AUTOMATIC CONTROL lamp illuminates.

e. Press the STANDBY TRANSMITTER B+ switch on the TCC. Observe that the STANDBY TRANSMITTER B+ lamp illuminates.

f. Press the STANDBY TRANSMITTER B+ switch again. Observe that the STANDBY TRANSMITTER B+ lamp extinguishes.

g. Turn the TRANSMITTER DRIVE ADJUST of an operate PGEN fully counterclockwise. The OFF AIR lamp on the TCC illuminates.

h. Within 30 seconds of the above step, return the TRANSMITTER DRIVE ADJUST of the operate PGEN to its original position. This must be done to stop the automatic transmitter switch sequence. The OFF AIR lamp extinguishes.

i. Turn the TRANSMITTER DRIVE ADJUST of a standby PGEN fully counterclockwise. Observe that the PGEN's ALARM LED and TRANSMITTER FAILURE lamp illuminate and the Audio alarm sounds.

j. Press the SWITCH TRANSMITTER switch and observe that a transmitter switch does not occur.

k. Press the STANDBY TRANSMITTER B+ switch and observe that the STANDBY TRANSMITTER B+ lamp on the TCC illuminates. Press the switch again to extinguish the lamp.

l. Return the TRANSMITTER DRIVE ADJUST of the standby PGEN to its original position. This extinguishes the TRANSMITTER FAILURE lamp and secures the Audio alarm.

m. Turn off the standby transmitter BIAS switch. Observe that the TRANSMITTER FAILURE lamp illuminates, Audio alarm sounds, and that the TRANSMITTER 1 STANDBY lamp extinguishes.

FC 10/2 to AN/FPN-60(V)/60A(V)

n. Press the SWITCH TRANSMITTERS switch. Observe that a transmitter switch did not occur. The standby transmitter bias was turned off in the previous step, therefore, the standby transmitter is inoperative.

o. Press the STANDBY TRANSMITTER B+ switch and observe that the STANDBY TRANSMITTER B+ lamp remains extinguished (no standby transmitter).

p. Turn on the standby transmitter BIAS switch. Observe that the TRANSMITTER FAILURE lamp extinguishes and the Audio alarm is secured. Also observe, that the TRANSMITTER 1 STANDBY lamp illuminates.

2.6.6.3 Perform the the following steps to check the automatic transmitter change sequence:

a. Turn the TRANSMITTER DRIVE ADJUST of an operate PGEN fully counterclockwise. Observe the OFF AIR lamp illuminate. Thirty seconds later, observe the following:

(1) Different operate PGENs indicated.

(2) The TRANSMITTER 2 OPERATE, TRANSMITTER 1 STANDBY, and TRANSMITTER 2 ON ANTENNA lamps extinguish.

(3) The TRANSMITTER 1 ON ANTENNA and TRANSMITTER FAILURE lamps illuminate and the Audio alarm sounds.

b. Eight seconds later, observe that the TRANSMITTER 1 OPERATE lamp illuminates.

c. Eight to sixteen seconds later, observe the OFF AIR lamp extinguish.

d. Return the TRANSMITTER DRIVE ADJUST of the now standby PGEN to its original position. This clears the TRANSMITTER FAILURE lamp and secures the Audio alarm.

e. Press the SWITCH TRANSMITTERS switch on the TCC. Observe the following:

(1) The SWITCH TRANSMITTERS lamp remains lit during the pressing of the switch.

(2) The TRANSMITTER 1 ON ANTENNA, TRANSMITTER 1 OPERATE, and TRANSMITTER 2 STANDBY lamps extinguish.

(3) The OFF AIR, TRANSMITTER 1 STANDBY, and TRANSMITTER 2 ON ANTENNA lamps illuminate.

(4) Eight seconds later, observe the TRANSMITTER 2 OPERATE lamp illuminate.

(5) Eight to sixteen seconds later, observe the OFF AIR lamp extinguish.

2.6.6.4 This completes the initial operation. Install other equipment of the Loran system.

2.6.7 TCS Input Signals. Table 2.6 is a list of the Input Signals to the Transmitter Control Set.

Table 2.6. AN/FPN-60(V) INPUT SIGNALS

	EQUIPMENT	JACK OR TERMINAL	SIGNAL
INPUTS TO TCS	EPA	J12	PCI High Rate
		J13	PCI Low Rate
	WP	J3	ENV TRIG +
		J4	ENV TRIG -
	I/F	J1	High Rate 100 kHz
		J2	High Rate MPT
		J3	High Rate PC Reset
		J4	High Rate PC Set
		J5	High Rate Local Interval
		J7	High Rate Local Interval
		J8	Low Rate 100 kHz
		J9	Low Rate MPT
		J10	Low Rate PC Reset
		J11	Low Rate PC Set
		J12	Low Rate ET & EMPT
		J14	Low Rate Local Interval
		J23A	XMTR No. 1 AC Control Voltage Common
		J23B	XMTR No. 1 Ready Relay
		J23D	XMTR No. 1 Plate on Return
		J23E	Antenna Switching, XMTR No. 2 to Antenna
		J23F	Antenna Switching, XMTR No. 1 to Antenna
		J23G	Remote DC Common
		J23H	Ready for Remote Common
		J23J	Standby XMTR AC Common
		J23L	XMTR No. 2 AC Control Voltage Common
		J23M	XMTR No. 2 Ready Relay
		J23P	XMTR No. 2 Plate on Return
		J23R	XMTR No. 2 Operate Relay
		J23S	XMTR No. 1 Ready for Remote
		J23T	XMTR No. 2 Ready for Remote
		J23U	Remote Relay
		J25	Operate RF
		J26	Standby RF

2.6.8 TCS Output Signals. Table 2.7 is a list of the Output Signals to the Transmitter Control Set.

Table 2.7. AN/FPN-60(V) OUTPUT SIGNALS

	EQUIPMENT	JACK OR TERMINAL	SIGNAL
OUTPUTS FROM TCS	I/F	J6	High Rate Operate RF
		J13	Low Rate Operate RF
		J19	TCS Alarm Data
		J28	XMTR No. 1 Drive Waveform
		J30	XMTR No. 2 Drive Waveform
		J32	M175 No. 1
		J34	M175 No. 2
		J36	XMTR No. 1 ET & EMPT
		J38	XMTR No. 2 ET & EMPT
	EPA	J10	ECD Chart Recorder Drive
		J11	LOCAL ENV X-OVER (+ TRIGGER ONLY)

2.7 Tail Drive Adjustment. Tail Drive adjustment procedures apply only to the W0678-19B/GR DROOP module for the AN/FPN-44/44A/45 Transmitters with feedback modification installed.

a. The Group Droop module (W0678-19B/GR-DR) is used to generate a tail drive signal for AN/FPN-44A/44B/45B Transmitters that have the Feedback modification installed. The Group Droop section of this module is not used.

b. The preliminary adjustments outlined in section 2.7.1.1 are performed on the Pulse Generators (PGENS) that are driving the standby transmitter. This will ensure a drive signal that requires a minimum of on-air adjustments. This will also verify that the module is operating properly.

c. Prior to beginning, confirm that the transmitted pulse shape meets all specifications for its leading edge. In addition, ensure that the transmitted pulse follows the Electrical Pulse Analyzer's (EPA) Reference Envelope as closely as possible, from 65-80 usec, as measured from the start of the pulse. It is essential that this portion of the transmitted pulse be properly adjusted to obtain the optimum level of tail drive.

2.7.1 Group Droop Module Programming and Initial Settings. Prior to installing a Group Droop module in the standby PGEN, perform Steps a through c below.

a. Ensure that no jumper wires are installed on Headers E2 and E4. These jumpers are not required.

b. Verify that Q4 and C10 are installed on the module (see figure 2.35). If Q4 or C10 are not installed obtain a replacement module.

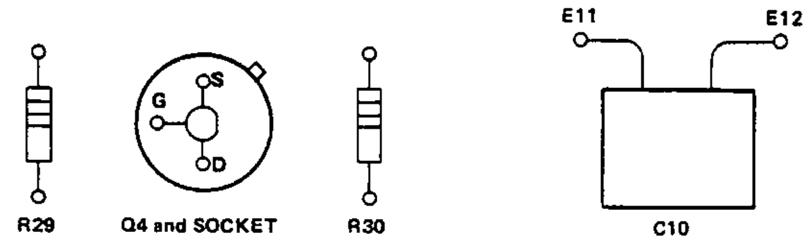


FIGURE 2.35 Q4 and C10 LOCATIONS

c. Adjust the potentiometers located on the edge of the Group Droop module (see figure 2.12) as follows:

(1) Rotate R25 fully clockwise (CW).

(2) R1, R3, R5, R10, R11 and R12 are not used and no adjustments are required to these potentiometers.

d. When steps a through c have been completed, the Group Droop module is ready to be installed. Place the transmitters in local control and set the Plate switch of the standby transmitter in the off position. Unplug the standby PGEN to be used, and install the Group Droop module in the middle slot. Set all PGEN DROOP thumbwheel switches to their normal settings and adjust the TRANSMITTER DRIVE ADJUST to its normal level. If the PGENs are operated in the FULL CYCLE mode set the 8th thumbwheel switch to zero. If the PGENs are operated in the 1/2 CYCLE mode set the 16th thumbwheel switch to zero. Apply power to the PGEN.

2.7.1.1 INITIAL ADJUSTMENT PROCEDURE The following are step by step instructions for adjusting the Group Droop module. Figures 2.36 through 2.37 referenced during these steps are signal waveforms for a dual-rated station. If you are unable to obtain any of the waveforms described in this procedure, first ensure correct test equipment setup. Return the module for repair if this doesn't correct the problem. Due to cross-rate blanking either rate signals may disappear momentarily.

a. Monitor the Transmitter Drive Waveform at the PGEN front panel jack. Using the delayed sweep mode of the oscilloscope (20usec/div), display the drive waveform for the 5th pulse (see figure 2.36).

b. Adjust the 8th/16th PGEN thumbwheel switch so that the first 1/2 cycle of tail drive does not exceed the level of the last 1/2 cycle of normal drive. (see figure 2.37).

c. Adjust R25 counter clockwise (CCW) so that the tail drive decays to zero ± 40 millivolts at approximately 140 usec from the start of the drive waveform. (see figure 2.37).

d. If the station is dual-rated repeat steps a,b, and c for the other rate PGEN.

2.7.1.2 This completes the initial adjustment procedure. Operate the standby transmitter into the dummy load and check for proper operation of the equipment.

2.7.1.3 <u>ON-AIR ADJUSTMENTS</u> The on-air adjustment of the Group Droop module will require that the operator be familiar with the effect that R25 has on the transmitter drive waveform. The following steps are the suggested method of performing the on-air adjustments to obtain optimum transmitted signal parameters. All adjustments are made to the operate PGENs. Place the transmitter to be adjusted on air.

a. Monitor the transmitted signal from the EPA front panel OPERATE jack. Trigger the oscilloscope from the PGEN of the rate to be adjusted.

b. Using the procedure outlined in Paragraph 2.7.1.1, set up the oscilloscope to monitor the Reference Envelope and the transmitted signals 5th pulse.

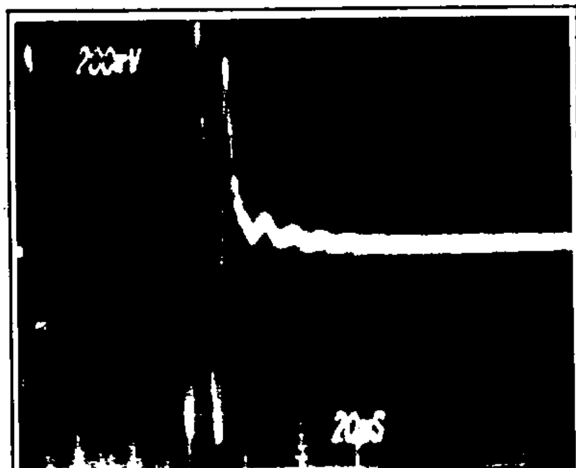
c. If the transmitted tail does not match the level of the Reference Envelope at 80 usec, adjust the 8th/16th thumbwheel switch to achieve the closest match. (see figures 2.38 and 2.39)

d. Adjust R25 in small increments so that the transmitted tail matches as closely as possible the Reference Envelope between 80-120 usec, measured from the start of the pulse. (see figure 2.39)

e. If the station is dual-rated, repeat steps a. through d. for the other rate PGEN.

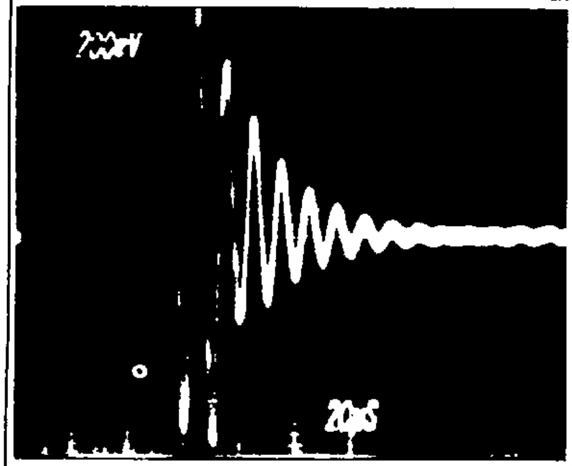
2.7.1.4 This completes the adjustment procedure for this transmitter /PGEN combination. Repeat steps 2.7.1.1 and 2.7.1.3 for the other transmitter/PGEN combination (if it has not been adjusted).

2.7.1.5 <u>REPLACEMENT OF EXISTING GROUP DROOP MODULES</u> The drive waveform for each Group Droop module should be recorded, using a scope camera if possible. When a Group Droop module fails, the replacement module can be adjusted to the recorded waveform while operating as standby equipment. This will reduce the amount of on-air adjustments required.



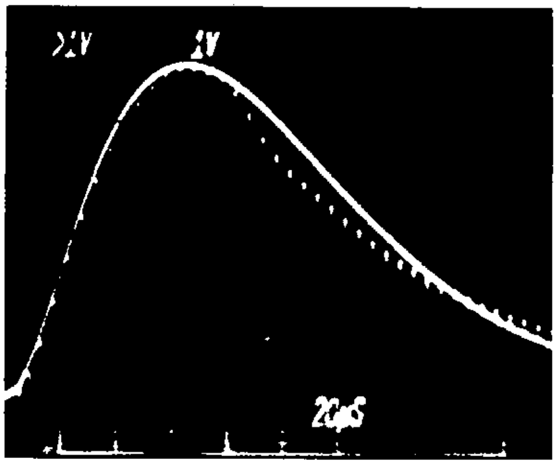
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center of Graticule	SIGNAL: PGEN Front Panel	TRIGGER: External (+)
		MODE: Delayed Sweep
	TRIGGER: PGEN Scope Trigger Jack	HORIZONTAL: Main 1mSec Delay 20uSec
		VERTICAL: 0.2 V/Div

Figure 2.36. Transmitter Drive Waveform without Tail Drive



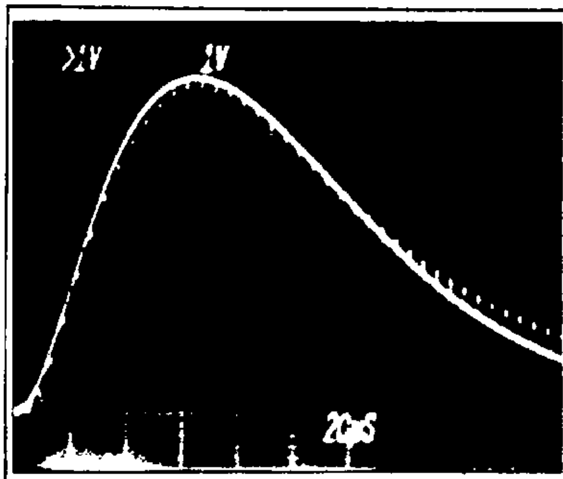
COMMENTS	SOURCE	SETTINGS
GROUND REF: Center of Graticule	SIGNAL: PGEN Front Panel Jack	TRIGGER: External (+)
		MODE: Delayed Sweep
	TRIGGER: PGEN Scope Trigger Jack	HORIZONTAL: Main 1mSec Delay 20uSec
		VERTICAL: 0.2 V/Div

Figure 2.37. Transmitter Drive Waveform with Tail Drive



COMMENTS	SOURCE	SETTINGS
GROUND REF:	SIGNAL: WP REF ENV WP Full Wave Rectified RF	TRIGGER: External (+)
		MODE: Delayed Sweep
	TRIGGER: PGEN Scope Trigger Jack	HORIZONTAL: Main 1mSec Delay 20uSec
		VERTICAL: 1.0 V/Div

Figure 2.38. RF Waveform and Reference Envelope without Tail Drive



COMMENTS	SOURCE	SETTINGS
GROUND REF:	SIGNAL: WP REF ENV WP Full Wave Rectified RF	TRIGGER: Extenal (+)
		MODE: Delayed Sweep
	TRIGGER: PGEN Scope Trigger Jack	HORIZONTAL: Main 1mSec Delay 20uSec
		VERTICAL: 1.0 V/Div

Figure 2.39. RF Waveform and Reference Envelope with Tail Drive

2.8 De-installation and Shipping. Paragragh 2.8.1 contains instructions for the complete de-installation of the TCS units. Paragraph 2.8.2 contains instructions for the de-installation of some of the TCS units, while maintaining operations. Paragraph 2.8.3 contains instructions for the shipping of the unit involved.

2.8.1 De-energize the unit to be de-installed. Disconnect all cables from the unit. Remove the unit from the equipment rack.

2.8.2 Below are procedures to de-install TCS units, while maintaining operations:

NOTE

Take local control prior to the removal of any unit. If the removal of the EPA or TCC takes too long, the cycle compensation loop will jump, due to OP RF load change and amplitude shift.

a. Standby PGEN(s) - unplug unit, disconnect all cables, and remove from the equipment rack.

b. Electrical Pulse Analyzer (EPA)

(1) Unplug AC power cord.

(2) Disconnect all cables.

(3) Reconnect W0678-8/PA Interconnect cable to dummy load (see Figure 2.40 for dummy load internal wiring).

(4) Remove from equipment cabinet.

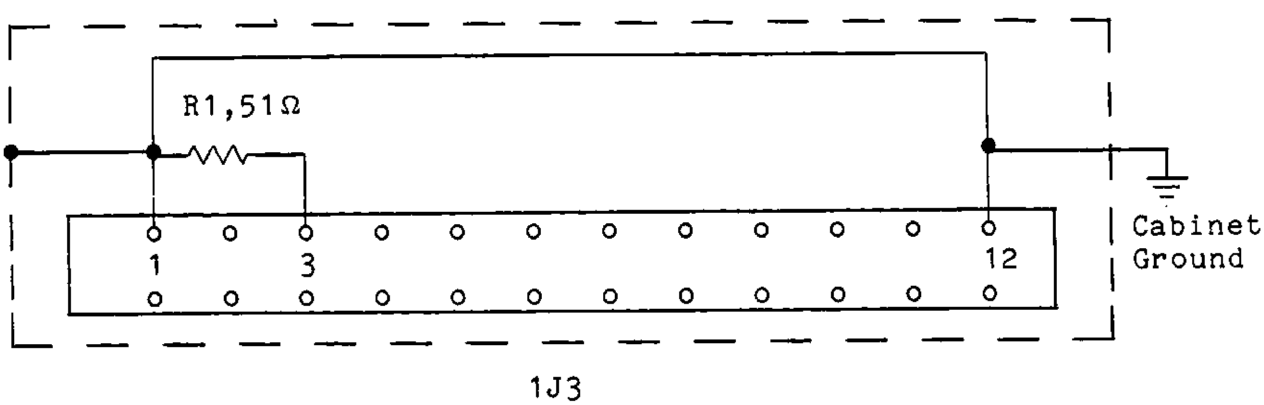


Figure 2.40. EPA Dummy Load Internal Wiring

2.8.2.c. Transmitter Coupler Control (TCC)

(1) Place transmitters in Transmitter Building Control.

(2) Unplug AC power cord.

(3) Disconnect all cables.

(4) Reconnect W0678-7/Interconnect cable to dummy load (see Figure 2.41 for dummy load internal wiring).

(5) Remove from equipment cabinet.

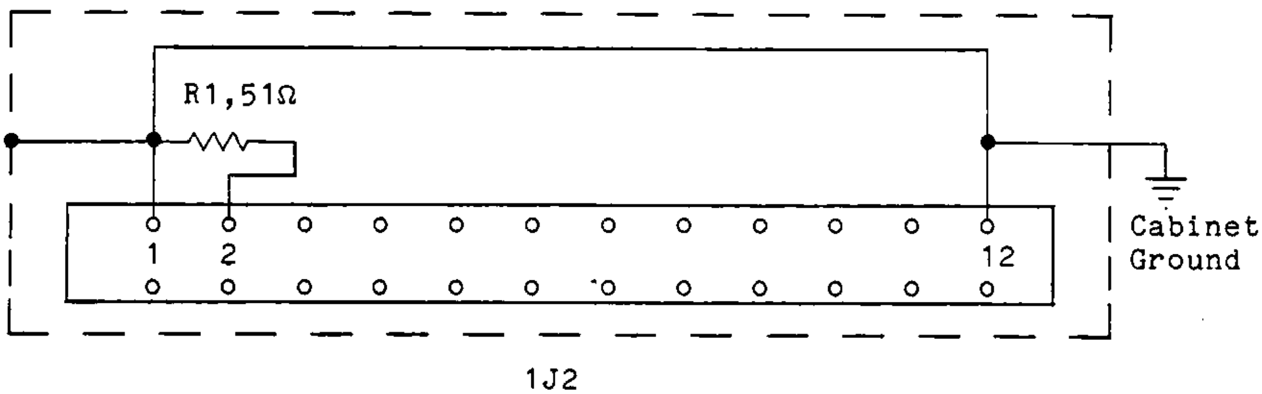


Figure 2.41. TCC Dummy Load Internal Wiring

2.8.3 Return the defective unit in the accordance with applicable instructions. Refer to MIL-E-17555G for packing instructions.

CHAPTER 3

OPERATION

3.1 Introduction. The Transmitter Control Set provides various alarm and transmitter status information to the watchstander. It also routes the drive signal to the transmitter and monitors various parameters of the transmitted signal. The Switch Assembly, TCC, EPA, PGENs, and Waveform Panel have controls and/or indicators listed in the following paragraphs. The following units either provide information to, or act as an interface for, the TCS:

a. AN/FPN-54A Loran Timing Set(s) (PCI, LI, 100 kHz, PC Set, PC Reset)

b. Automatic Blink System(s) (MPT's)

c. Current Transformer, Pearson Model 1705 (antenna and dummy load RF).

d. Status Alarm Unit (displays alarm information).

e. Time Interval Counter Panel (displays timing information).

f. Transmitter/coupler (allows for remote/local control).

3.2 Controls and Indicators.

3.2.1 Switch Assembly. The Switch Assembly (Figure 3.1) contains the following controls:

REFERENCE DESIGNATION		DESCRIPTION
1	EMERGENCY STOP SWITCH	These switches (S1 for transmitter #1, S2 for transmitter #2) provide for the shutdown of power to the transmitters to prevent injury to personnel or damage to equipment. The switches are connected in series with other emergency stop switches located on the station. The switch is reset by the activation of the transmitter START button.

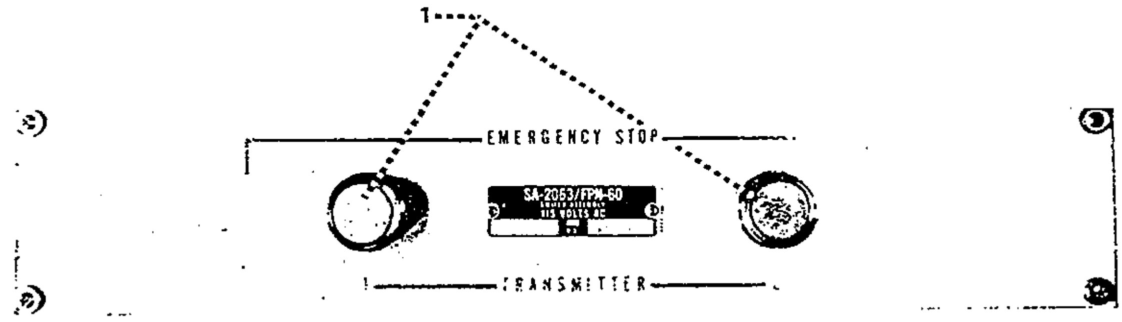


Figure 3.1. Switch Assembly

3.2.2 Transmitter Coupler Control. The following is a list of the controls and indicators of the TCC (see Figure 3.2):

REFERENCE	DESIGNATION	DESCRIPTION
1	SWITCH TRANSMITTERS switch/lamp (S1)	Activation of this pushbutton switch remotely switches the transmitters. When illuminated, this lamp is amber.
2	AUTOMATIC CONTROL lamp (DS1)	This lamp indicates that the transmitter switching function is controlled by the TCC. When illuminated, this lamp is green.
3	TRANSMITTER 1 OPERATE/STANDBY (DS2)	These lamps indicate whether Transmitter 1 is coupled to the antenna or is in a ready state, with the associated PGEN(s) providing TDW(s). When illuminated, OPERATE is green and STANDBY is white.
4	OFF AIR lamp (DS6)	This lamp indicates the failure of the operate PGEN(s) or that the transmitted signal is below the prescribed antenna current level. This lamp is normally off. When illuminated, this lamp is red.
5	Audio alarm	This audio alarm sounds when a TRANSMITTER FAILURE, OFF AIR, or LOW POWER indication is observed. This alarm is normally off.
6	LAMP TEST switch/lamp (S4)	Activation of this pushbutton switch tests all the lamps/LEDs of the TCC and PGENs. When illuminated, the lamp is yellow.

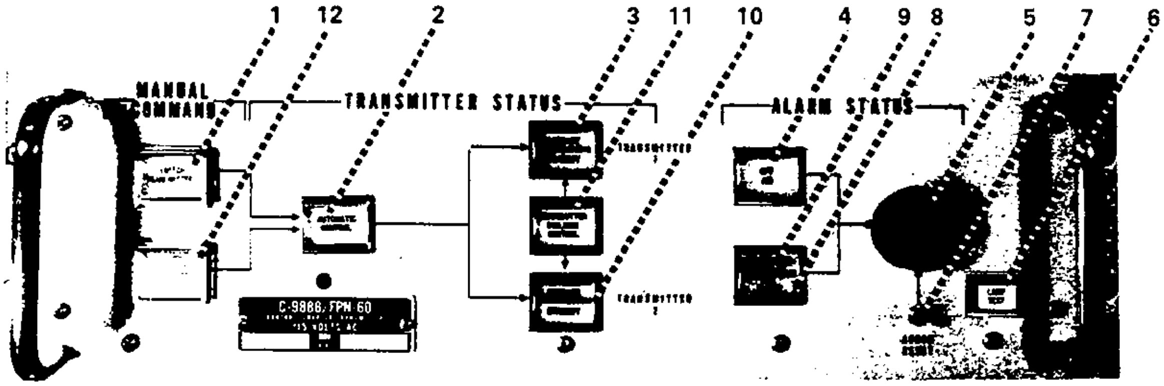


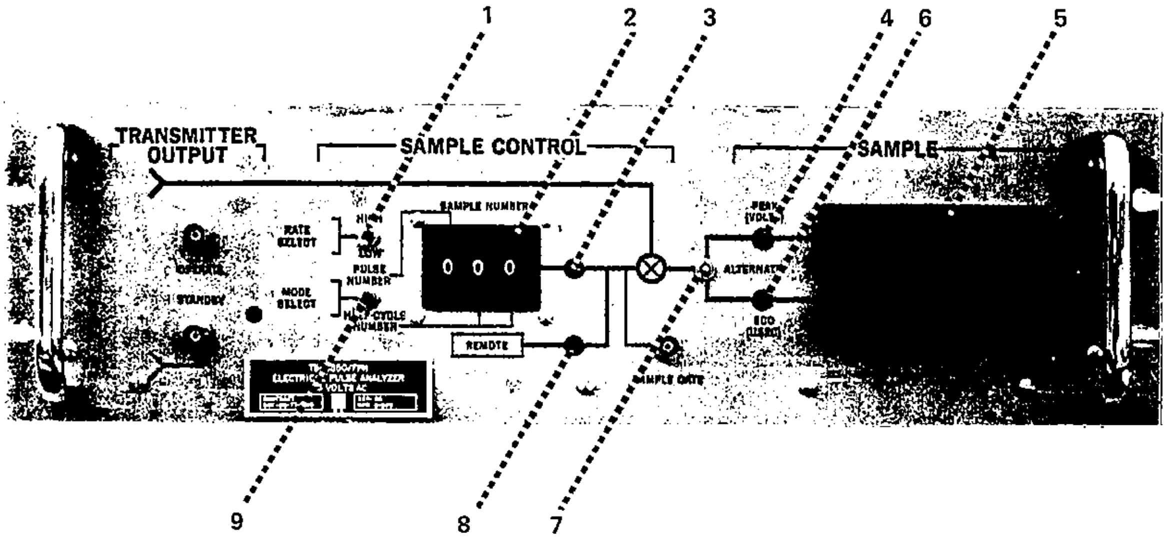
Figure 3.2. TCC Controls and Indicators

REFERENCE	DESIGNATION	DESCRIPTION
7	AUDIO RESET (S3)	This pushbutton switch secures the audio alarm.
8	LOW POWER lamp (DS5)	This lamp indicates a transmitter low power or PGEN low drive level condition that occurred prior to a transmitter switch. This lamp is normally off. When illuminated, this lamp is red.
9	TRANSMITTER FAILURE lamp (DS5)	This lamp indicates the failure of the standby PGEN(s), or that the operate transmitter has been off air for at least 30 seconds, or that the standby transmitter is not in a ready status. This lamp is normally off. When illuminated, this lamp is red.
10	TRANSMITTER 2 OPERATE/STANDBY (DS4)	These lamps indicate whether Transmitter 2 is coupled to the antenna or is in a ready state, with the associated PGEN(s) providing TDW(s). When illuminated, OPERATE is green and STANDBY is white.
11	TRANSMITTER BUILDING CONTROL lamp (DS3)	This lamp indicates that the transmitter switching function is controlled from the transmitter building. When illuminated, this lamp is yellow.

REFERENCE	DESIGNATION	DESCRIPTION
12	STANDBY TRANSMITTER B+ switch/lamp (S2)	This pushbutton switch is used to energize or de-energize the standby transmitter's B+ voltage. If the standby transmitter is not in a ready status, the B+ voltage cannot be energized. When illuminated, the lamp is yellow.

3.2.3 Electrical Pulse Analyzer. The following are the controls and indicators of the EPA (see Figure 3.3):

REFERENCE	DESIGNATION	DESCRIPTION
1	RATE SELECT switch (S1)	This switch is provided for use at dual-rated stations. At single-rated stations, actuation of the switch does not affect operation.
2	SAMPLE NUMBER switch (S3)	This is a three digit thumbwheel switch. The pulse number to be sampled is selected by the setting of the left most thumbwheel. The half-cycle number is selected by the setting of the center and right thumbwheels.
3	Local control indicator (DS1)	This indicator is illuminated (yellow) when the EPA is in local control. This indicator is normally on.
4	PEAK (VOLTS) (DS3)	This indicator is illuminated (green) when a peak voltage measurement is being displayed.
5	Display	This DPM displays the value of the quantity measurement.
6	ECD (μsec) (DS4)	This indicator is illuminated (green) when an ECD measurement is being displayed.
7	PEAK/ALTERNATE/ECD switch (S6)	This toggle switch provides for a selection of the quantitative value of the pulse or half-cycle peak voltage samples. The results are displayed on the Digital Panel Meter. The switch can be set to PEAK (measures peak amplitude in volts), ECD (takes average of



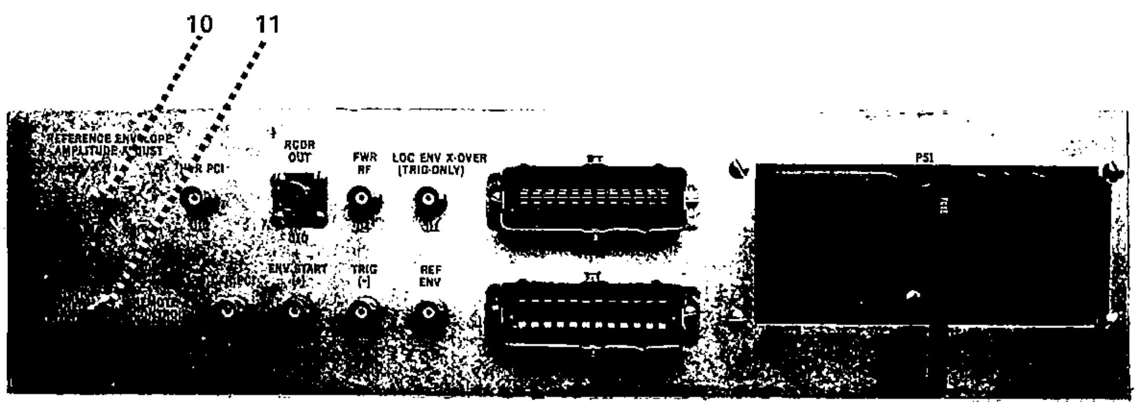


Figure 3.3. EPA Controls and Indicators

REFERENCE	DESIGNATION	DESCRIPTION
		first pulse and third pulse (for master) or seventh pulse (for secondary) in uSec or ALTERNATE (alternates between the two). The ALTERNATE and ECD (uSec) settings result in a blank SAMPLE display unless the MODE SELECT switch is in the PULSE NUMBER position.
8	REMOTE control indicator (DS2)	This indicator is illuminated (green) when the EPA is in remote control. This indicator is normally off.
9	MODE SELECT switch (S2)	This switch is a two-position toggle switch which selects between PULSE NUMBER and HALF-CYCLE NUMBER mode of operation. In the PULSE NUMBER position, the SAMPLE display indicates peak voltage or ECD of the pulse selected, depending on the position of the PEAK/ALTERNATE/ ECD switch. In the HALF-CYCLE NUMBER position, the SAMPLE display indicates the peak voltage of the half-cycle of the pulse selected by the SAMPLE NUMBER thumbwheel switch. The PEAK/ALTERNATE/ECD switch must be placed in the PEAK voltage position when the mode switch is in the HALF-CYCLE position.
10	REFERENCE ENVELOPE AMPLITUDE ADJUST	This is a potentiometer on the rear of the EPA that allows the adjustment of the amplitude of the Reference Envelope signal available at J9. Refer to Figure 5.18 for the adjustment of this potentiometer.
11	FRONT PANEL CONTROL/ REMOTE CONTROL switch (S5)	This switch is on the rear of the EPA and selects EPA control via either the front panel or remote control.

3.2.4 Pulse Generator. The following is a list of the controls and indicators of the PGEN (see Figure 3.4):

REFERENCE	DESIGNATION	DESCRIPTION
1	1st MPT (NON Ø CODED) 2nd MPT (Ø CODED) switch (S1)	This two position toggle switch is used to select the oscilloscope trigger for the SCOPE TRIGGER jack on the front panel. The selectable triggers are the first MPT or the second MPT.
2	PULSE SYNTHESIZER switches (S2)	The PULSE SYNTHESIZER switches are used to adjust the amplitude of the sixteen half-cycles of the Transmitter Drive Waveform or of the eight full cycles (using the first eight thumbwheel switch sections from the left) of the Transmitter Drive Waveform. The S1 switch on the PCON module is used to select half-cycle or full cycle control.
3	Ø CODE BALANCE potentiometer	This potentiometer is used to minimize the amplitude variation (bounce) in alternating phase-coded pulses.
4	ALARM - NO TRANSMITTER DRIVE (DS2)	This light emitting diode (red) illuminates when the TDW signal level falls below 1 volt peak-to-peak.
5	TRANSMITTER DRIVE ADJUST	This potentiometer is used to adjust the amplitude of the Transmitter Drive Waveform (TDW).
6	OPERATE (DS1)	This light emitting diode (green) indicates that the PGEN is supplying the drive signal to the transmitter.
7	DROOP switches (S3)	This seven section thumbwheel switch is used to adjust the amplitude of the second through the eighth pulses. This switch is not used with the Group Droop module (set all switches to "0").

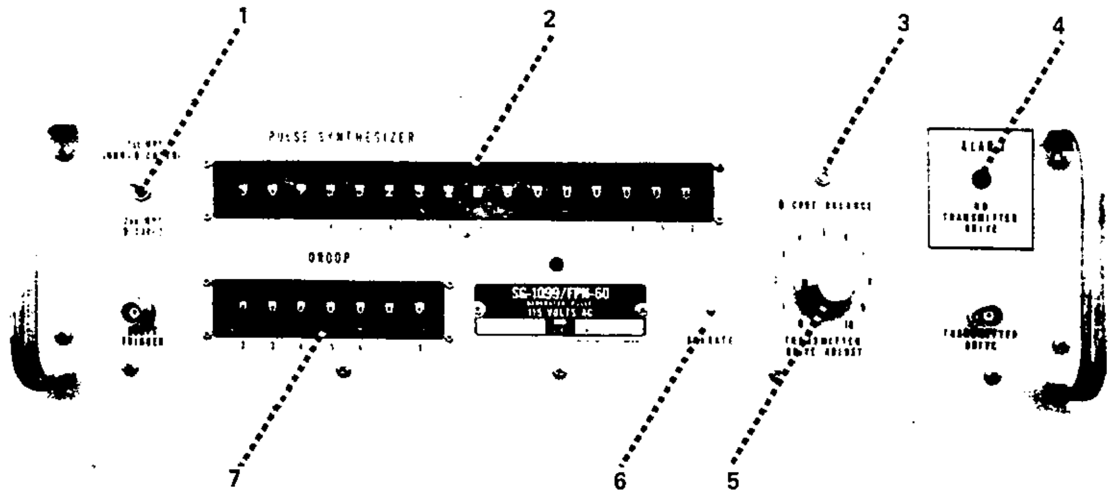


Figure 3.4. PGEN Controls and Indicators

3.2.5 Waveform Panel. The Waveform Panel (Figure 3.5) has the following control:

REFERENCE	DESIGNATION	DESCRIPTION
1	SCOPE TRIGGER switch	This switch allows for the selection of the oscilloscope trigger for the high or low rate signal(s).

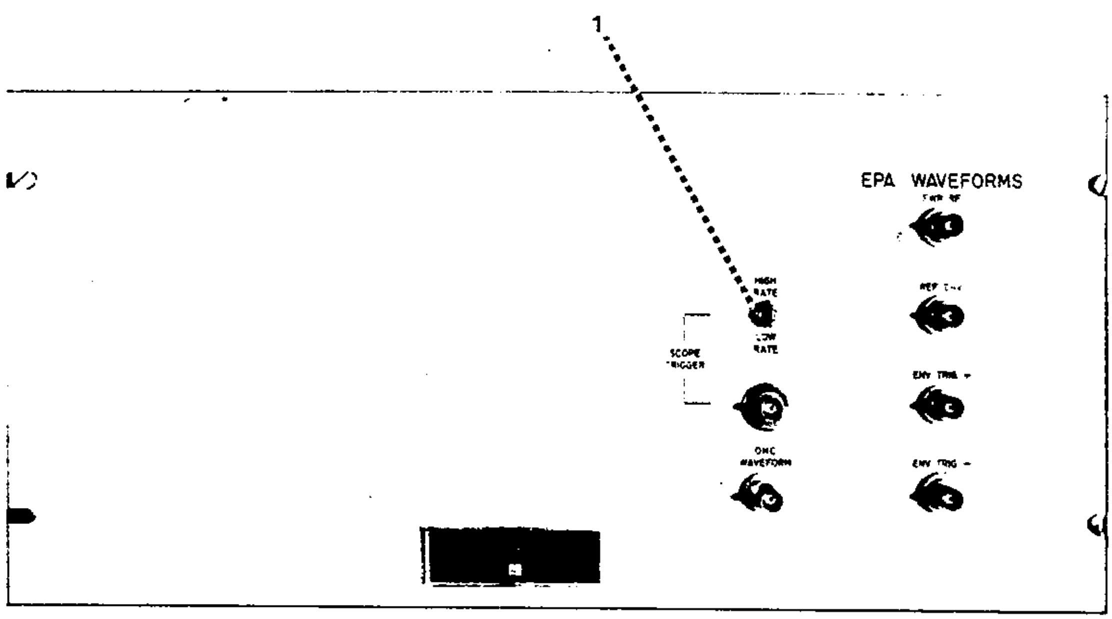


Figure 3.5. Waveform Panel Control

3.3 Operating Procedures. Ensure that all units of the TCS are installed in the cabinet and all programming and operational checks have been made prior to performing any steps in the following paragraphs.

3.3.1 Equipment turn-on. The TCC, EPA, and PGENS are turned on by plugging the power cords into the power strip in the electrical equipment cabinet. Energise the PP-7839/G Standby DC Power Supply by placing the AC and Battery switches to "ON".

3.3.2 Modes of operation. The TCS has only the local mode of operation.

3.3.2.1 Pulse shape monitoring. Refer to Figure 3.6 and the following steps to monitor the pulse shape:

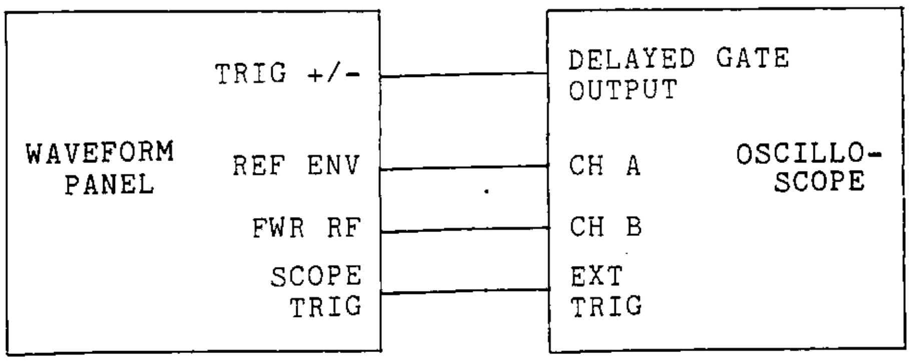


Figure 3.6. Equipment Setup for Pulse Shape Monitoring

a. Set vertical Channels A and B to 0.5 volts per division.

b. Set the oscilloscope to External Trigger mode, Display Trigger Source to alternate, and Time Base to 1 millisecond per division.

c. Using the Delay Vernier Control, set the Reference Envelope waveform on the pulse to be checked.

d. With the Reference Envelope set on the desired pulse, set the Delay Sweep Control to 10 microseconds per division.

e. The amplitude of the Reference Envelope may be adjusted by the Reference Amplitude Adjust potentiometer on the rear of the EPA.

3.3.2.2 Pulse amplitude monitoring. Refer to Figure 3.7 and the following steps to monitor the pulse amplitude:

a. Set vertical Channel A to 2 volts per division.

b. Set vertical Channel B to 5 volts per division.

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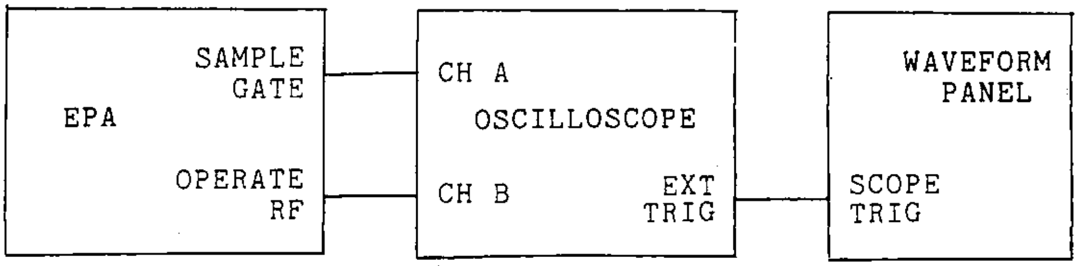

Figure 3.7. Equipment Setup for Pulse Amplitude Monitoring

c. Connect the Waveform Panel Scope Trigger jack to the external Trigger input of the oscilloscope. Set the PEAK/ALTERNATE/ECD switch to ALTERNATE.

d. Set the MODE SELECT switch to the Pulse Number position.

e. Set the left-hand thumbwheel of the SAMPLE NUMBER switch to the number of the desired pulse.

f. Set the oscilloscope Time Base to 1 millisecond per division.

g. As the SAMPLE NUMBER switch is changed, the Sample Gate will move across the oscilloscope to the corresponding pulse, and the peak voltage/ECD will alternately be displayed.

3.3.2.3 Half-cycle amplitude monitoring. Refer to Figure 3.8 and the following steps to monitor the half-cycle amplitude:

a. Set vertical Channel A to 2 volts per division.

b. Set vertical Channel B to 5 volts per division.

c. Connect the Waveform Panel SCOPE TRIGGER jack to the External Trigger input of the oscilloscope.

d. Set the EPA PEAK/ALTERNATE/ECD switch to PEAK (VOLTS).

e. Set the EPA MODE SELECT switch to the HALF-CYCLE position.

f. Set the EPA SAMPLE NUMBER switch to the desired half-cycle number.

g. As the SAMPLE NUMBER switch is changed, the Sample Gate will move across the scope to the corresponding half-cycle.

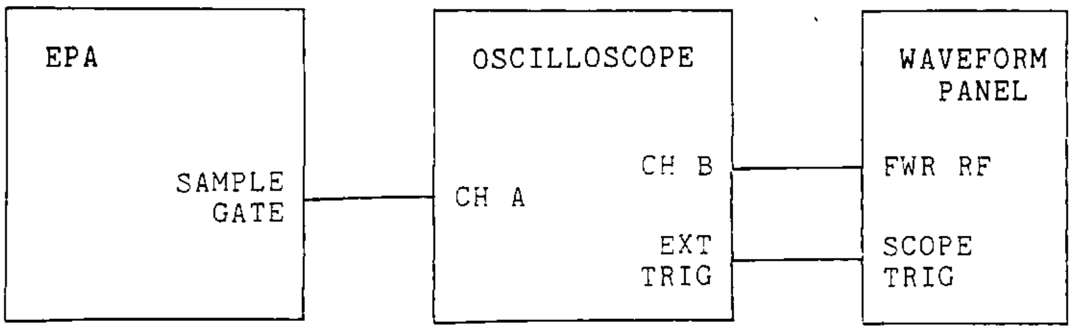

Figure 3.8. Equipment Setup for Half-Cycle Amplitude Monitoring

3.3.2.4 Droop and Phase Code monitoring. Refer to Figure 3.9 and the following steps to monitor droop and phase code:

a. Connect the Waveform Panel SCOPE TRIGGER jack to the External Trigger input of the oscilloscope.

b. Set vertical Channel A to 5 volts per division.

c. Set the oscilloscope Time Base to 1 millisecond per division.

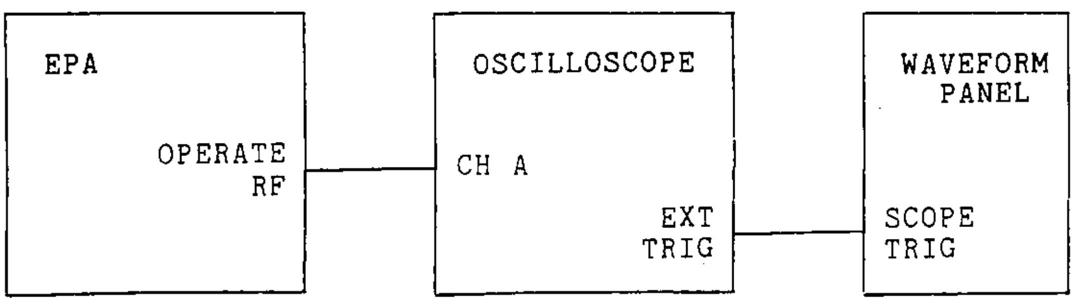

Figure 3.9. Equipment Setup for Droop and Phase Code Monitoring

3.3.3 Equipment turn-off. The TCC, EPA, and PGENs are secured by removing the plugs from their electrical receptacles. The power to the cabinet is secured at the wall circuit breaker. Power to the PP-7039/G is secured by placing the AC and BATTERY switches to the OFF position and unplugging the unit from the electrical receptacle.

3.3.4 Emergency turn-off. In the event of an emergency, power to the TCS equipment can be secured at the wall circuit breaker.

FC 10/2 to FPN-60/60A

CHAPTER 4

THEORY OF OPERATION

4.1 Introduction. The Transmitter Control Set (TCS) receives signals from the Loran Timing Set(s) and the Automatic Blink System, processes these signals, and generates the drive signals for the transmitters. The TCS monitors the Operate RF and the status of the transmitters, and provides a means of emergency shut down of the transmitters. The TCS also displays various alarm information for the station watchstander. Figure 7.1 shows the Loran-C System Block Diagram. Figure 7.2 shows the Transmitter Control Set Functional Block Text Diagram.

4.2 Functional Description.

4.2.1 Switch Assembly. There is a normally closed, manually actuated, pushbutton switch on this panel for each transmitter. The switches are connected-in series with the transmitter stop and emergency stop switches in the associated transmitting equipment (refer to applicable transmitting set technical manual for location). Depressing a switch interrupts the control voltage to the holding coil of the transmitter blower control relays (refer to applicable transmitting set technical manual). The switches are used to secure power to the transmitters to prevent injury to personnel or damage to equipment.

4.2.2 Transmitter Coupler Control. The TCC monitors the Operate RF and the status of the transmitters. With the standby transmitter in a ready status, the standby PGEN(s) providing drive waveform(s), and the antenna coupler in remote control, the TCC controls the switching of the transmitters. When the TCC detects a drop below a preset level of the Operate RF or an operate PGEN failure, the TCC will automatically switch transmitters. Otherwise, the switching of transmitters is accomplished by the actuation of the SWITCH TRANSMITTERS switch. The standby transmitter's B+ voltage is controlled by the TCC when the antenna coupler is in remote control. The TCC displays OFF AIR, TRANSMITTER FAILURE, and LOW POWER conditions.

4.2.3 Electrical Pulse Analyzer. The EPA displays half-cycle amplitude, pulse amplitude, and ECD information. The EPA receives signals from the I/F Unit and Loran Timing Set(s). The EPA also receives an oscilloscope (via the Waveform Panel) trigger, which is used to generate the Reference Envelope. The EPA provides for oscilloscope viewing of a Local Envelope Crossover trigger, a Full Wave Rectified RF, a Reference Envelope, and RF signals.

4.2.4 Pulse Generator. The PGEN generates the drive signal required by the transmitter in order to radiate the standard LORAN-C pulse. The drive signal shape is adjustable by the 16-section PULSE SYNTHESIZER digital thumbwheel switch. The PGEN also controls droop compensation and phase code balance. Another output of the PGEN is an oscilloscope trigger.

4.2.5 Waveform Panel. The Waveform Panel provides a convenient access to the Full Wave Rectified RF, the Reference Envelope, and a Scope Trigger. The Envelope Triggers (+ and -) are inputs to the Waveform Panel which are used by the EPA to develop the Reference Envelope. The Waveform Panel has an "optional" waveform jack that is not used.

4.2.6 Interface Unit. The Interface-Unit is an interface between the transmitters and the Loran-C Timing Set(s) and the Automatic Blink System. The Interface Unit receives signals from the PGENs, TCC, Switch Assembly, Loran-C Timing Set(s), the Automatic Blink System and current transformers. Signals are passed to the transmitters, PGENs, EPA, TCC, and Status Alarm Unit.

4.2.7 PP-7839/G Standby DC Power Supply. Refer to Paragraph 1.3.9 page 1.8

4.3 Unit Description.

4.3.1 Transmitter Coupler Control (see Figure 7.14).

4.3.1.1 WO678-5/XMTR CON module (see Figure 7.16). The TTL active low Transmitter 1 & 2 Operate, Transmitter 1 & 2 Ready & Ready, Remote and Local signals are inputs to the Transmitter Status section on this module. These signals are inputs to set-reset circuits, and become active high signals. The transmitter operate signals are then routed to the Status Steerage, Loss of Signal Detector, and Transmitter Selector sections and the WO678-6/XMTR CON DVR module. The loss of transmitter drive alarms from the PGENs and Operate RF are inputs to the Loss of Signal Detector section. In this section, these signals are compared to detect an off air condition and triggers the timer chip to start counting the 30 seconds before a transmitter failure condition is indicated. This 30 second time period is to prevent a transmitter switch as a result of a transient overload condition. At single-rated stations, the PGEN I & II High Rate lines are tied to ground. The Initialize section resets the OFF AIR and TRANSMITTER FAILURE circuits on power up or a transmitter switch. The actuation of the standby transmitter's B+ switch turns on the standby transmitter's B+ voltage via the WO678-6/XMTR CON DVR module and the WO678-13/Relay Assembly. The transmitter (from the Transmitter Status section) and PGEN (from the Loss of Signal Detector section) signals are inputs to the Status Steerage section. This section generates alarm condition signals and signals for the lamp driver circuits on the WO678-6/XMTR CON DVR module. Outputs of this section are inputs to the Visual Alarm Generator, Audio Alarm Generator, and Interrupt Timer Start sections. Other outputs of the Status Steerage section are signals to the TRANSMITTER 1 STANDBY and TRANSMITTER 2 STANDBY lamp driver circuits on the WO678-6/XMTR CON DVR module. Outputs from the Loss of Signal Detector, Status Steerage, and Interrupt Timer Start sections are used in the Visual Alarm Generator section to generate the signals for the TRANSMITTER FAILURE and LOW POWER circuits, in the WO678-6/XMTR CON DVR module. The LOW POWER signal becomes active when the TCC is in remote control and a switch has been made to a transmitter which has low PGEN drive, but not an alarm condition. In the Audio Alarm Generator section, when the transmitter is in local control, the Audio alarm sounds when the LOW POWER and TRANSMITTER FAILURE circuits are enabled. When the transmitter is in remote control, the Audio alarm sounds when the TRANSMITTER FAILURE circuit is enabled. The Loss of Signal Detector, Status Steerage, and Manual Transmitter Command sections input signals to the Interrupt Timer Start section. The output of this section triggers the 8 Second

Interrupt Timer section, generating an eight second delay in switching transmitters. During this eight second delay, the high voltage in the standby transmitter is brought up to the proper level. This delayed signal is an input to the W0678-6/XMTR CON DVR module and the Transmitter Selector section. The SWITCH TRANSMITTERS switch on the front panel controls the inputs to the Manual Transmitter Command section. The Transmitter Selector section inputs are the Remote and Operate signals from the Transmitter Status section, the 8 second delayed signal from the 8 Second Interrupt Timer section, and the Initialize signal. This section generates the Latch and Reset signals for the W0678-6/XMTR CON DVR module and Standby B+ Control section of this module. The STANDBY TRANSMITTER B+ switch on the front panel provides the other inputs to the Standby B+ Control section. The output turns on/off the standby transmitter's B+ voltage, when the TCC is displaying AUTOMATIC CONTROL.

4.3.1.2 <u>W0678-6/XMTR CON DVR (see Figure 7.18)</u>. This module contains nine lamp drivers, one alarm driver, and four relay driver circuits. Each circuit generates two outputs. One output latches or resets a relay, lights a lamp, or sounds an alarm. The other output is provided for computer control. The computer control outputs are not presently used. The inputs to the circuits are generated on the W0678-5/XMTR CON module. The C-LDR-2 and C-LDR-5 Lamp Drivers also have inputs from the respective Relay Drivers. The LAMP TEST switch on the front panel also activates the lamp drivers and the alarm driver.

4.3.1.3 <u>W0678/Relay Assembly (see Figure 7.15)</u>. The Relay Assembly acts as a DC/AC convertor for the signals to the transmitter from the TCC and as an AC/DC convertor for the signals to the TCC from the transmitter. The signals from the TCC, to switch the transmitters, are sent through relays K1 and K3. Relay K3 is a latching relay that is used to place the transmitters in remote or local control. Relays K4 through K7 are the AC/DC converting relays. The Xmtr No. 1 & 2 Ready and Xmtr No. 2 Operate AC signals are sent to the TCC through these relays.

4.3.2 <u>Electrical Pulse Analyzer (see Figure 7.20)</u>.

4.3.2.1 <u>W0678-3A/GATCON module (see Figure 7.22)</u>. Local Interval (high and low rate) and Remote and Local Rate Select signals are inputs to the Rate Select Circuit section of this module. The Local and Remote Rate Select signals are used to generate the Rate Select signal. The Rate Select and Local Interval signals are used to generate the Strobe Enable and Initiate Sequence signals. Local Mode Select, Local/Remote Select, and Remote Mode Select signals are routed to the Mode Select Circuit section to generate the Mode Select signal. The ½ Cycle From Bi-Directional 1-Shot, Initiate Sequence, ½ Cycle Pulse Select (from ECD module), and Selected MPTs (from ECD module) signals are also sent to the Mode Select Circuit section. The Count Waveform is generated from these signals. The binary bits of the pulse or half cycle selected for measurement are inputs to the Address Control Circuit section. The Strobe Enable and Relatch signals are sent to this section to transfer the binary bit information to the Data Strobe Generator section. Inputs to the Data Strobe Generator section (Count Waveform, Pulse/½ Cycle/(Remote) Select, Strobe Enable, Initiate Sequence, and binary bits from the Address Control Circuit section) are used to generate the Data Strobe signal (see Figure 5.22). Data Strobe occurs once each interval and corresponds in time to the particular pulse (or half-cycle of the pulse) selected by the SAMPLE NUMBER switches. Sixty-four Data Strobes are generated prior to the start of the DPM measurement. Mode Select, Rate Select, and a trigger from the Address Control Circuit section are used to generate the Relatch signal in the Data Control Circuit section. Also generated in this section are Convert (for the DPM to start measurement), Data Ready (not used), ECD/VP Toggle (for the ECD module), and Peak Detector Reset (see Figure 5.21), from Initate Sequence, EOC, $\overline{EOC}$, Relatch, and the divide-by-64 output signals. The divide-by-64 circuit is used to count the sixty-four Data Strobes generated on this module.

4.3.2.2 W0678-18C/ECD module (see Figure 7.24). The ATTN RF from the W0678-11A/CLP ATTN module enters the RF Deriver section of the ECD module, which is an active allpass filter-and-add. This filter-and-add produces a derived LORAN-C pulse having an amplitude null and a phase reversal on the leading edge. This occurs at 18 microseconds after the start of a pulse having an ECD of zero. The ATTN RF is also hardlimited in the Pulse Hard Limiter section. The resulting TTL signal is used to gate the programmable amplifier of the RF Detector section and to synchronously detect the derived pulse. The detected signal enters a two-pole lowpass active filter with 11 kHz cutoff, which smooths the signal, to form a derived envelope (see Figure 5.27). This derived envelope is initially negative, crossing zero at forty microseconds, then becoming positive, for a zero ECD pulse. The Envelope Hard Limiter section converts the derived envelope to TTL levels; low before the crossover and high after. The hardlimited envelope is outputted at pin 51 of the module, where it is "wire ANDed" with the Clip Attenuator Gate generated on the W0678-11A/CLP ATTN module. The "ANDed" signal is jumpered to the Envelope Start Cycle Stop Generator section via pin 42 of the ECD module. On the pulse selected by the Sample Strobe Generator, MPT Count and Select, and PCI Synchronizer sections; the Envelope Start Cycle Stop Generator section generates a Local Envelope Crossover trigger, which goes high at the crossover and returns low at the next RF zero crossing. The ECD Voltage Generator section converts the 0 to 10 microsecond pulse width of the trigger (which corresponds to an ECD of -5 to +5 microseconds) to a -5 to +5 volt level to drive the Digital Panel Meter via the DPM Combiner Driver section. This level is also shifted and scaled to provide a chart recorder drive signal of either 0 to 1 milliampere or 0 to 5 volts full scale. The DPM Combiner Driver section selects either the ECD or pulse peak voltage for display by the DPM, scales the DPM voltage to a range of -1 to +1 volts, sets the decimal point location on the DPM, and lights the ECD (μsec) or PEAK (VOLTS) indicators, as controlled by the PEAK/ALTERNATE/ECD switch. The center position (ALTERNATE) of this switch allows the ECD/VP Toggle waveform from the W0678-3A/GATCON module to toggle the state of this section and alternately display ECD and peak volts. The high-going Initiate Sequence signal from the W0678-3A/GATCON module enables the MPT Count and Select section to count the MPTs from the start of PCI interval A of the selected rate. The MPT Count and Select section also enables the Sample Strobe Generator section to initiate an ECD measurement on the first pulse of PCI interval B (positive phase code) and the negatively coded seventh pulse (secondary) or third pulse (master) of PCI interval A. The grounding of E4 or E5 to E3 programs, respectively, the HI or LOW rate for master. A selected MPT corresponding to the setting of the pulse number, on the SAMPLE NUMBER switch, is output to the Peak Detector module.

4.3.2.3 W0678-4/PK DET module (see Figure 7.26). In response to an externally applied trigger (positive or negative), the Reference Envelope Generator section generates the adjustable Reference Envelope waveform. A Clipped RF signal from the W0678-11A/CLP ATTN module is sent to one of the active two-pole Butterworth low-pass filters. The output of this filter is a clipped filtered RF of 10V positive and 8V negative amplitude. This clipped filtered RF is sent to the Tri-State Discriminator section. This section generates two hardlimited RF signals (180 degrees out-of-phase) to control the Fullwave Rectifier section. The Count Waveform (see Figure 5.30) and the Count Waveform (for the Peak Detect and Hold section) are also outputs of the Tri-State Discriminator section. These outputs consist of a hard limited signal of +4V amplitude. An Operate RF (Attenuated) from the W0678-11A/CLP ATTN module is sent to the other low-pass filter on this module. The output of this filter is a filtered attenuated RF of 6V positive and 8V negative amplitude. This signal is then sent to the Fullwave Rectifier section. A full wave rectified RF is developed in this section and is sent to the Peak Detect and Hold section. This full wave rectified RF is also fed through a voltage follower (buffered), then is sent to the EPA rear panel jack, J4. The Peak Detect and Hold section generates a Sample Gate signal from the Data Strobe, Peak Detector Reset, and Count Waveform signals. This section also uses an inverted Sample Gate signal, a full wave rectified RF (from the Fullwave Rectifier section), and the Peak Detector Reset signal to detect and hold the peak value of the full wave rectified RF during the sample period. This DC level (see Figure 5.29) is then sent to the W0678-18C/ECD module.

4.3.2.4 W0678-11A/CLP ATTN module (see Figure 7.28). The resistors and potentiometer in the Attenuator section provide passive attenuation of the Operate RF and a means of calibrating the DPM. In the Limiter section of this module are five resistors (R1, R2, R3, R7, and R8). Four of these resistors (R1, R2, R3, and R8) are used to limit the current through the front panel LED indicators (DS1 through DS4). R7 forms a voltage divider with R1, located on the EPA rear panel. When the Operate RF input to the EPA exceeds 30V peak-to-peak, the Clipper section of the W0678-11A/CLP ATTN module clips the operate RF to 30V peak-to-peak. The Selected MPTs signal from the W0678-18C/ECD module is sent to the Delay Gate Generator section. In this section, a 15 sec gate (see Figure 5.31) is generated and coupled to the output of the Envelope Hard Limiter section of the W0678-18C/ECD module. This is done to ensure that spurious transitions of the hardlimited envelope cannot cause erroneous ECD indications.

4.3.2.5 Digital Panel Meter. Upon receipt of the Convert signal from the W0678-3A/GATCON module, peak volts or ECD analog voltages received from the W0678-18C/ECD module are measured. The DPM converts and displays the peak volts or ECD on a three-and-a-half digit panel display. After the DPM completes the conversion, it sends an EOC signal to the W0678-3A/GATCON module.

4.3.3 Pulse Generator (see Figure 7.30).

4.3.3.1 W0678-1/PSYN module (see Figure 7.32). The Multiplying Digital to Analog Convertor section of this module receives the 100-kHz sine wave input from the timer set. Data control words from the Cycle Data Control section of the Pulse Control module are also inputs to the Multiplying Digital to Analog Convertor section. These control words control the amplitude of the individual 100-kHz cycles. The output of this section is a preshaped version of the Transmitter Drive Waveform. This waveform is an input to the Switched Inverting Amplifier section, where it is phase coded. Phase code balance is provided via the front panel Ø CODE BALANCE potentiometer, which provides an amplitude balance between the positive and negative half cycles. The output is a phase coded signal, which along with data control words from the Pulse Data Control section of the Pulse Control module are inputs to the Gain Control Amplifier section. This section acts as a multiplying analog-to-digital convertor to provide pulse droop compensation and an ungated, amplitude modulated Transmitter Drive Waveform (TDW) is outputted. This signal is buffered in the Amplifier section and output to the front panel TRANSMITTER DRIVE potentiometer via the W0678-19B/GR DROOP module (at single-rated stations, the signal is output directly to the front panel). The signal returns to the Amplifier section where it is again buffered, then enters the Gating Power Amplifier section. This section controls the start of the TDW by using the 500-μsec Gate-H and Gate-L signals from the Tail Gate Generator section of the W0678-19B/GR DROOP module. The timing of the Gate-H and Gate-L signals is controlled by the Envelope Timing Adjust (ETA) switch on the timer or Remote Control Interface (RCI) by controlling the MPT timing. This section outputs a balanced Transmitter Drive Waveform to the transmitters via the Interface Unit, and signals to the Lost Signal Detector section (see Figures 5.34 and 5.35). A loss of the drive waveform generates a No Transmitter Drive signal to the TCC and will light the ALARM-NO TRANSMITTER DRIVE LED on the front panel of the PGEN. The Transmitter 1 & 2 Operate and Lamp Test signals are also inputs to the Lost Signal Detector section. These signals light the correct LED (ALARM or OPERATE).

4.3.3.2 W0678-19B/GR DROOP module (see Figure 7.34). The MPTs of both rates are inputs to the Droop Generator and Filter section. The programming (paragraph 2.6.2) and adjustments (paragraph 2.7.2) of the low pass filters generate the droop compensating waveforms in this section. Pulse droop compensation is produced by using the rate of interest MPTs. The other rate MPTs are used to produce a dynamic compensation waveform as the two rates move with respect to each other. The droop compensating waveforms are inputs to the Group Droop Summing Amplifier section. This section produces a 1-volt reference level and sums the compensating waveforms with the 1-volt reference level to produce a composite, compensation waveform (see paragraph 2.7.2). Inputs to the Tail Gate Generator section are Local Interval and the 80-μsec Gate-L signal from the Control section of the W0678-2/PCON module. The 80-μsec Gate-L signal is used to generate two 500-μsec gates (Gate-H, Figure 5.36, and Gate-L) used by the Gating Power Amplifier section of the W0678-1/PSYN module. The 500-μsec Gate-L signal and Local Interval are used to generate a tail gate signal for the Pulse Tail Generator section of this module. This section uses the tail gate signal to superimpose an exponentially decaying, tail shaping waveform on the composite, compensation waveform from the Group Droop Summing Amplifier section. The decay time constant is varied by the adjustment of R25. This signal is used to modulate the ungated, amplitude modulated TDW in the Hundred Kilohertz Modulator section. This provides dynamic droop compensation and a controlled tail for the drive pulses. The 500-μsec Gate-L signal and the Phase Code-H signal from the Phase Code Control section of the W0678-2/PCON module are used to produce a Reclocked Phase Code-H signal in the Phase Code Reclock section. This signal is an input to the Switched Inverting Amplifier section of the W0678-1/PSYN module. Also present on this module is the Deccajector Summing Amplifier section. ~~This section is only wired for use on the W0686-20/GR DROOP module. The Deccajector Summing Amplifier section sums the deccajector outphasing signals with the 100-kHz used to produce the drive waveform. This prevents interference to DECCA navigation equipment by LORAN-C transmitters.~~

4.3.3.3 W0678-2/PCON module (see Figure 7.36). The Local Interval (see Figure 5.40), 100-kHz sine wave (see Figure 5.39), and MPT-H (see Figure 5.46) signals are inputs to the Control section of this module. These inputs are used to generate the Gate-L and Gate-H signals. At single-rated stations not employing tail drive, both signals are inputs to the W0678-1/PSYN module. At dual-rated stations, the 80-μsec Gate-H signal is not used, and the 80-μsec Gate-L signal is a W0678-19B/GR DROOP module input. The switch, S1, allows for the selection of half drive cycle or full drive cycle control with the PULSE SYNTHESIZER thumbwheel switches. A threshold detector is used to determine the zero crossing of the 100-kHz sine wave. This is used to generate a timing control waveform for the Cycle Selection section. This section uses the timing control waveform to select the front panel PULSE SYNTHESIZER switch digit to be read. The Pulse Selection section uses the timing control waveform to select the proper front panel DROOP switch digit. The Cycle Data Control section has inputs from the PULSE SYNTHESIZER thumbwheel switches and outputs data control words to the Multiplying Digital to Analog Convertor section of the W0678-1/PSYN module. The Pulse Data Control section has inputs from the DROOP thumbwheel switches and outputs data control words to the Gain Control Amplifier section of the W0678-1/PSYN module. The Scope Trigger Generator section uses inputs from the Pulse Selection section, the Gate-L signal and the position of the front panel SCOPE TRIGGER switch (S1) to generate a scope trigger from the 1st or 2nd MPT. The Phase Code Control section uses Phase Code Set and Reset (see Figures 5.42 through 5.45) from the Loran Timing Set(s) and the inverted Local Interval from the Control section to generate the Phase Code-H signal for the Phase Code Reclock section of the W0678-19B/GR DROOP module (at stations with tail drive). At stations without tail drive, the Phase Code-H signal is generated for the Switched Inverting Amplifier section of the W0678-1/PSYN module.

4.3.4 Interface Unit (see Figure 7.38). The Interface Unit distributes signals to other units. This unit receives the Operate RF from the Current Transformer through a balanced, 100-ohm, double shielded cable. Two hybrid power splitters receive this signal. One splitter outputs two in-phase RF signals to the Loran Timing Set(s) (for the cycle compensation loop); the EPA and TCC receive an inverted RF signal from the other splitter. If either in-phase output is unused (single-rated operation), it must be terminated in 50 ohms.

4.3.5 PP-7839/G Standby DC Power Supply. Refer to Page 1.8 paragraph 1.3.9

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4.4 Time-ladder Diagrams. Figures 4.1 and 4.2 are the time-ladder diagrams for master and secondary stations, respectively. The signals are received by the TCS equipment from the Loran Timing Set(s). The Local Interval starts 500 μsec before the first MPT and ends 1,400 μsec after the last MPT. The master station's Local Interval is 10,900 μsec long, and the secondary station's Local Interval is 8,900 μsec long. Phase Coding of the MPTs occur between the Phase Code Reset (starts the negative Ø code) and Phase Code Set (starts the positive Ø code) pulses.

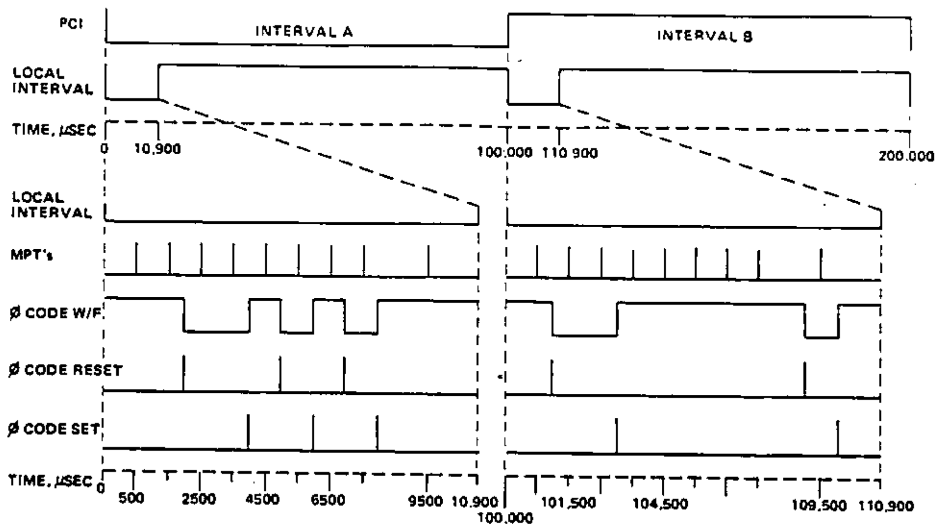

Figure 4.1. Master Station Time-Ladder Diagram (Non-Existing Rate 10,000)

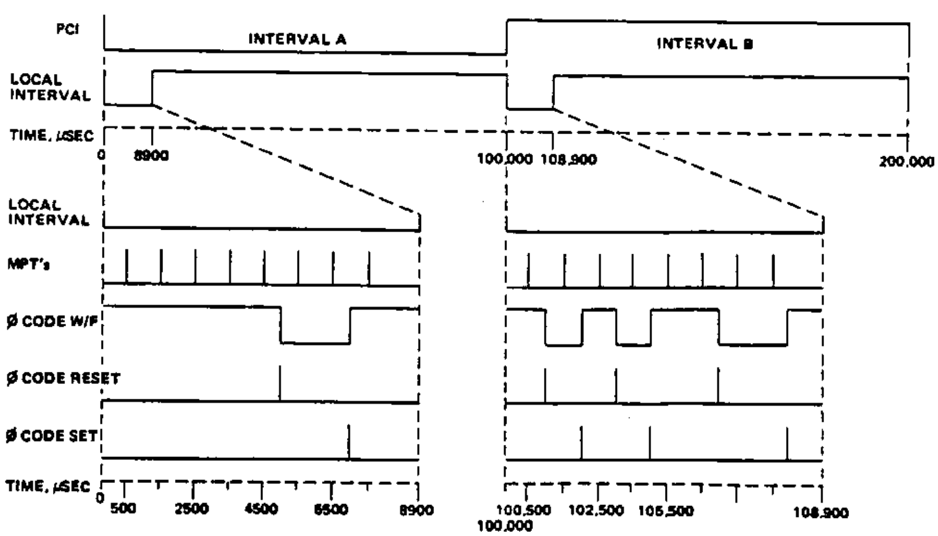

Figure 4.2. Secondary Station Time-Ladder Diagram (Non-Existing Rate 10,000)