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EE162-AH-OMI-010/E110 URA17E

TECHNICAL MANUAL

INSTALLATION, OPERATION

AND MAINTENANCE

AN/URA-17E GROUP
SIGNAL DATA CONVERTER
MODEL CV-3510A/UG
SERIAL NUMBERS A001 THROUGH A462

Gould Defense Systems, Inc.
NavCom Systems Division

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INSTRUCTION SHEET

Permanent Change 3 to Technical Manual for AN/URA-17E Group Signal Data Converter, Model CV-3510A/UG, EE162-AH-OMI-010/E110 URA17E, is effective upo receipt.

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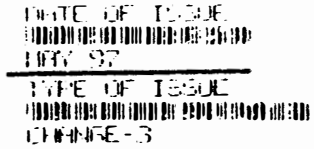

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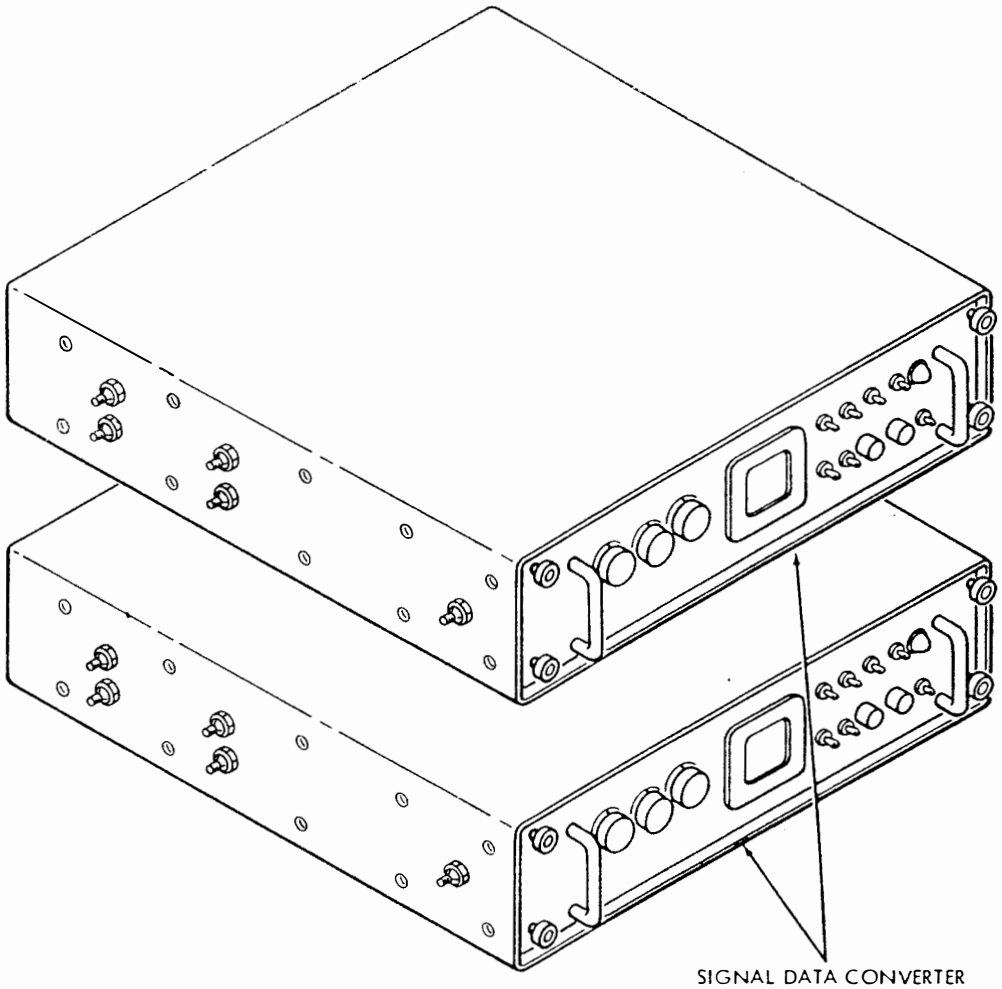


Figure 1-0. Signal Data Converter Group AN/URA-17E

SECTION I

INTRODUCTION

1-1. GENERAL

1-2. This manual provides installation, operation, and maintenance instructions for Signal Data Converter Group AN/URA-17E (figure 1-0), hereinafter called the converter group. The converter group is comprised of two Signal Data Converter(s) CV-3510A/UG, hereinafter calle the converter(s), and an accessory mounting kit (figure 1-1). Each converter converts frequency-shift-keyed (fsk) encoded input into teletype equipment output pulse drive or vice-versa. Used as a group, the two converters provide for diversity operation. (A functional description is provided in following paragraphs.) See figure 1-2 for converter group mounting configurations.

1-3. FUNCTIONAL DESCRIPTION

1-4. The converter can be used in both the transmit and receive functions of a radio teletype communication system. In transmission, teletype equipment output pulses are converted into fsk audio signals to modulate a transmitter. In reception, the audio fsk output of the receiver is converted into pulses that are used for teletype equipment operation. The system may be operated in either half duplex or full duplex mode, depending primarily on the radio equipment. In either mode, the converter may be used in a single receive path system or two converters may be used as a converter group, forming a diversity receive path system.

1-5. In fsk communication, messages are transmitted as audio modulated shifts in the carrier frequency. These shifts represent the mark and space pulses generated by the teletype equipment. The modulator in the converter may be used to produce this audio modulation for the transmitter. For the receive function, radio receivers are used to change the carrier frequency shifts into audio frequency shifts containing the same mark and space information. Communications transmitted at data rates up to 75 baud may be received and recorded on this system.

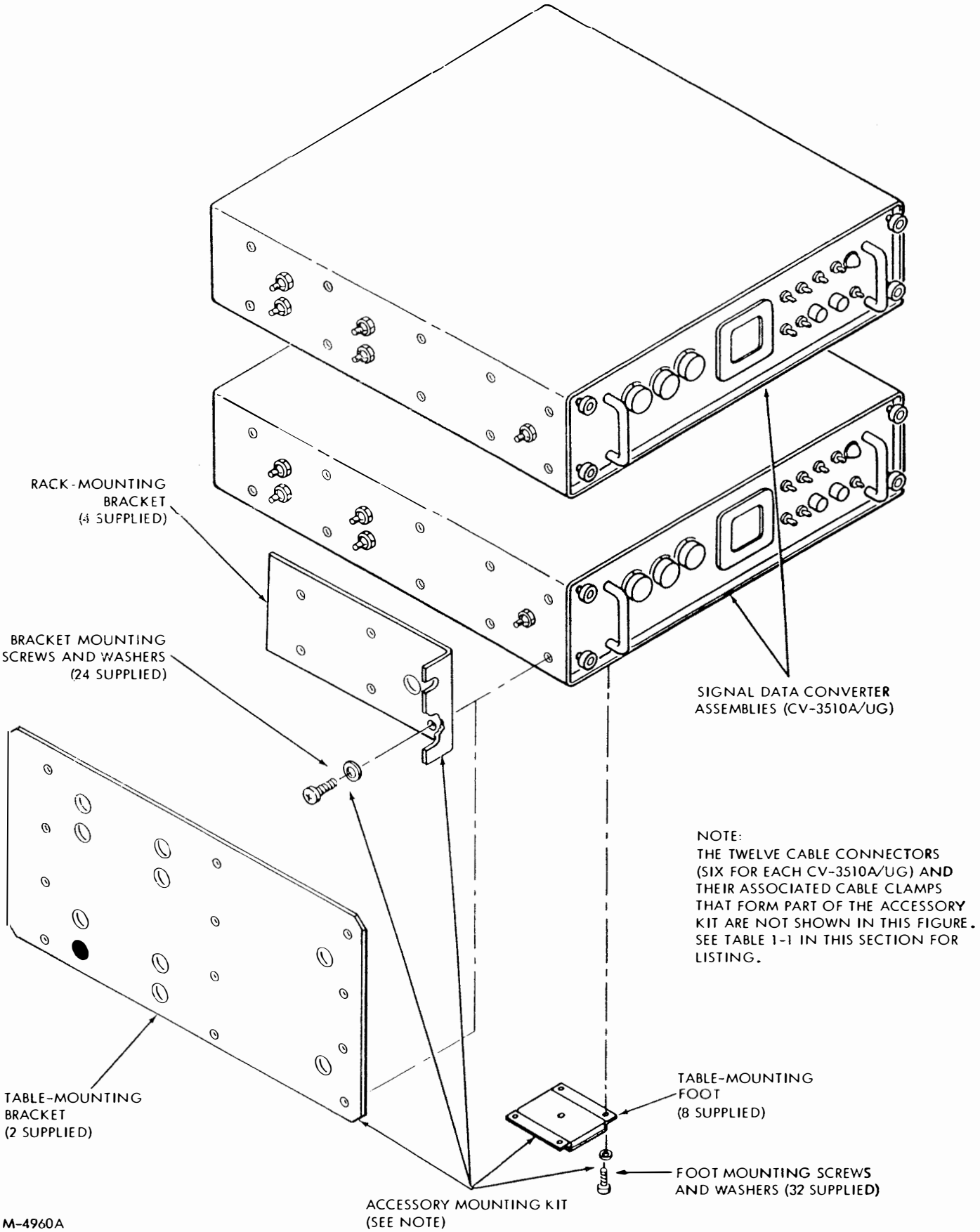


Figure 1-1. Signal Data Converter Group AN/URA-17E and Mounting Kit

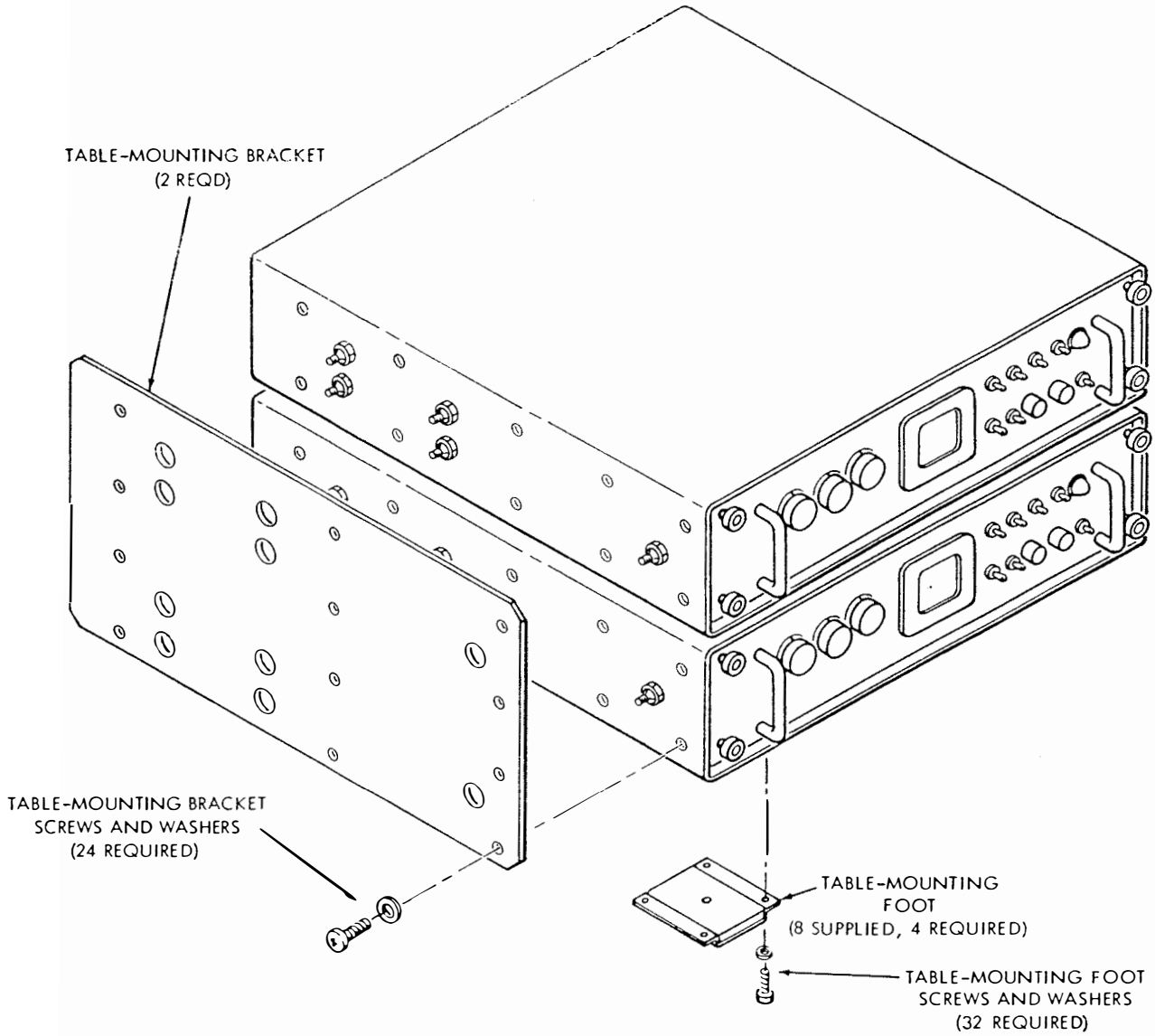


Figure 1-2. Signal Data Converter Group Mounting Configurations (sheet 1 of 2 sheets)

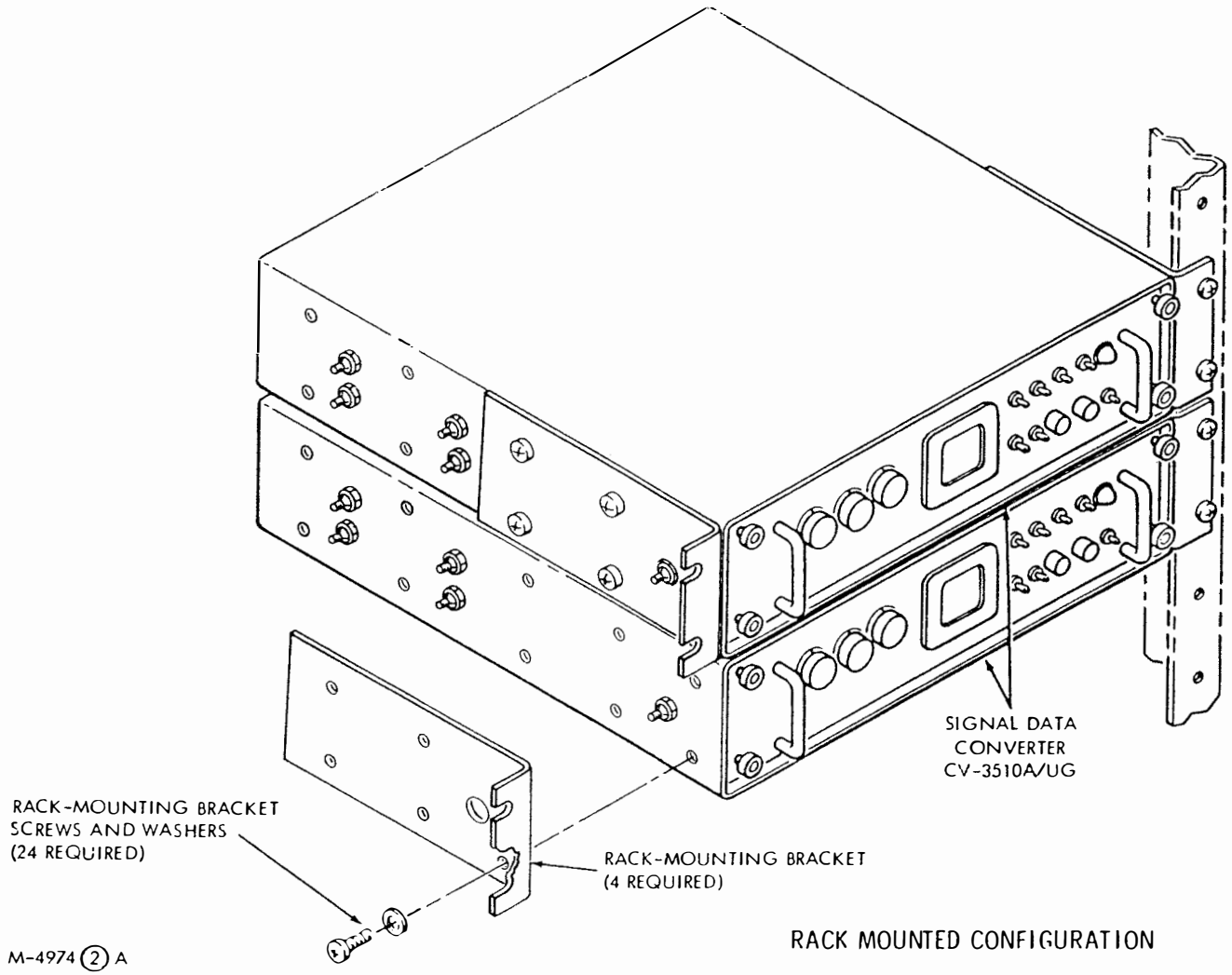


Figure 1-2. Signal Data Converter Group Mounting Configurations (sheet 2 of 2 sheets)

1-6. DUPLEX OPERATION

1-7. When the converter is used in the transmit and receive end of the system, it may be connected for either half duplex or full duplex operation. The mode is determined by the type of radio and teletype equipment.

1-8. HALF DUPLEX OPERATION. In half duplex operation, the system can only transmit or receive at any given time. This usually depends on the type of receiver and transmitter used in the system. If a transceiver is used, it can only be used in this mode, although a separate transmitter and receiver may be used in this mode. The half duplex mode requires only one channel for communication.

1-9. FULL DUPLEX OPERATION. In full duplex operation, the system can transmit and receive simultaneously. This mode of operation requires a separate transmitter and receiver. Also, separate teletype transmitting and receiving equipment is required. (Some teletype keyboard/printer units can be operated in a full duplex mode.) The full duplex mode requires two channels for communication.

1-10. DIVERSITY OPERATION

1-11. Two converters may be used to operate in a diversity system. Diversity operation provides an improvement over single-receiver operation by further reducing the effects of signal fading. Either space diversity or frequency diversity may be used.

1-12. SPACE DIVERSITY. In space diversity, two receivers are tuned to the same carrier frequency, but their receiving antennas are separated by several wavelengths. A carrier will not normally fade simultaneously at points so separated.

1-13. FREQUENCY DIVERSITY. In frequency diversity operation, two receivers are tuned to different carrier frequencies, each carrying the same fsk information. Carriers of different frequencies normally do not fade simultaneously at a given point.

1-14. The audio output from both receivers is applied to both converters of the group. The converters change the fsk audio signal into pulses representing the mark and space information. A signal processing circuit in each converter continuously compares the two

received signals, selecting the stronger signal for further processing and use by teletype equipment. The teletype equipment may be connected to the output of either converter.

1-15. In the transmit end of frequency diversity operation, the audio output of each converter goes to a separate transmitter.

1-16 SINGLE RECEIVER OPERATION

1-17. The circuit design of the converter permits the benefits of frequency diversity to be approached using a single converter and receiver. It is thus possible to achieve reliable communication using this simpler arrangement.

1-18. PHYSICAL DESCRIPTION

1-19. The converter is housed in a light gray aluminum case. A handle is provided on each side of the front panel. The case is equipped with ball-bearing slides that lock in the fully-extended position (figure 1-3). In this position, all chassis components and connectors are easily accessible. Each converter is a single unit with two printed circuit board assemblies. Each assembly consists of two boards connected by flexible cables and hinged standoffs for ease of access to test points. The left side assembly is the demodulator assembly. The right side assembly is the synthesizer assembly. For detailed electrical analysis of the assemblies, by section, refer to Section IV, Principles of Operation. Mounting details for the converter group are provided in Section II, Installation.

1-20. All external signals are connected by cables whose plugs mate with receptacles on the converter input/output assembly. This assembly is mounted at the rear of the case so that the receptacles slope downward 30 degrees for easy access. The input/output assembly is connected to the converter chassis by a single flat cable arranged to permit chassis extension and retraction.

1-21. A tuning indicator is located in the center of the converter front panel to allow visual monitoring of receiver tuning and propagation conditions. The tuning indicator displays the mark (low) tone as a vertical line, and the space (high) tone as a horizontal line. A remote tuning indicator output receptacle on the input/output assembly is also provided to drive an external indicator; it is used when the operator cannot see the converter indicator while tuning the receiver.

1-22. The converter group accessory mounting kit (figure 1-1) consists of four brackets wit required attaching hardware for mounting the converters in a standard 19-inch rack, and two mounting brackets and eight mounting feet with required attaching hardware for mounting the converter group on a table.

1-23. QUICK REFERENCE DATA

1-24. RECEIVE AUDIO INPUT. The receive audio input operates from 600 ohms or 150 ohms with input power of 60 microwatts to 60 milliwatts (30 dB). The input is isolated from system ground.

1-25. OPERATING FREQUENCIES. Operating frequencies are programmed as follows:

Mode	Mark (Hz)	Space (Hz)
VLF	1,000	1,050
LF	915	1,085
HF and HF (MP)	1,575	2,425
MMM	1,615	1,785

Note: Other frequencies may be programmed. See Appendix A for instructions.

1-26. DATA RATES. Data rates up to 75 baud may be used in the CLEAR function. In the SECURE function, data is regenerated at selected data rates of 45.5, 50 and 75 baud. The dat rates only apply to the receive operation.

1-27. RECEIVE OUTPUT (HIGH LEVEL). The output keys 100 mA maximum current from an external loop supply with an open circuit voltage of ± 140 Vdc maximum. High level output are isolated from the system ground. Either high level polar (positive and negative loop supplies) or neutral (single loop supply) loop configuration can be used. Positive current is marking; negative or no current is spacing.

1-28. RECEIVE OUTPUT (LOW LEVEL). The output switches + 6 ± 1 Vdc and - 6 ± 1 Vdc, referenced to the system ground, with up to 10 mA current capability. Short-circuit current i limited to 100 mA maximum. Positive voltage is marking; negative voltage is spacing.

1-29. TRANSMIT INPUT (HIGH LEVEL). The input keys on a 100 mA maximum current an external loop supply with an open-circuit voltage of ± 3 Vdc minimum. High-level polar or

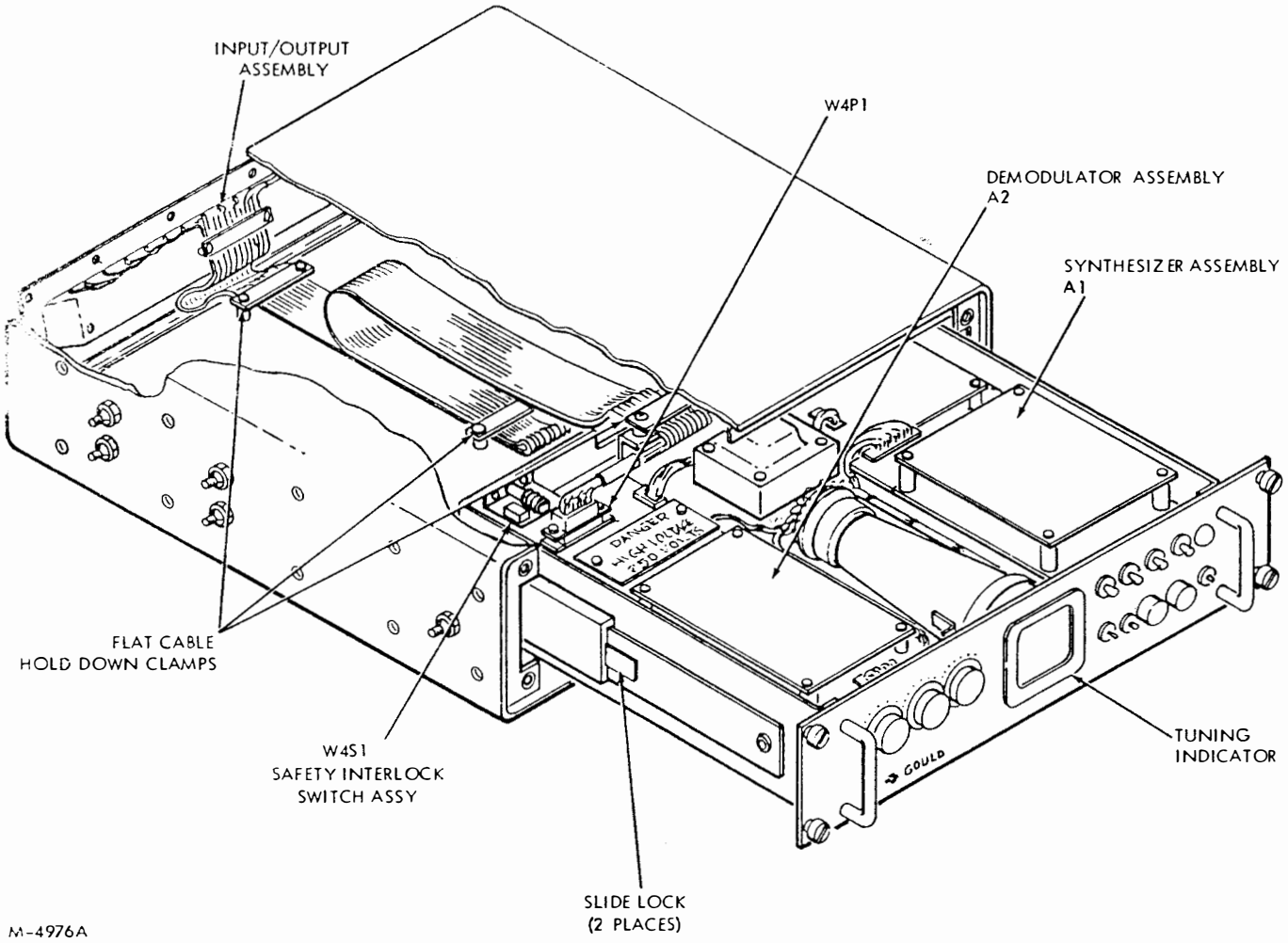


Figure 1-3. Signal Data Converter with Chassis Extended.

neutral may be used. The input is isolated from the system ground. Positive current is marking; negative or no current is spacing.

1-30. TRANSMIT INPUT (LOW LEVEL). The input is keyed on + 6 ± 1 Vdc and - 6 ± 1 Vdc supplied externally. Positive voltage is marking, negative voltage is spacing.

1-31. TRANSMIT AUDIO OUTPUT. The output level is 1 mW ± 4 percent into either 150 ohms or 600 ohms. The output is isolated from system ground.

1-32 TRANSMIT KEY OUTPUT. The transmit key output has a resistance of 10 ohms maximum when on and a resistance of 10 megohms minimum when off.

1-33. POWER REQUIREMENTS. The converter requires 115 or 230 Vac 10 percent at frequencies from 48 to 420 Hz. The maximum current required is 0.5A. However, 230 Vac is not normally available for shipboard use. Normally, 115 Vac, 60 Hz is used.

1-34. EQUIPMENT LISTS

1-35. EQUIPMENT SUPPLIED. Table 1-1 lists equipment supplied.

1-36. EQUIPMENT REQUIRED BUT NOT SUPPLIED. Table 1-2 lists equipment required but not supplied.

1-37. EQUIPMENT SIMILARITIES. The converter performs functions similar to CV-483D/URA-17 and CV-2460/SGC. The converter group performs functions similar to AN/URA-17D. The converter group is electrically and mechanically interchangeable with the AN/URA-17D; however, the converter group has expanded receive capability and transmit features.

1-38. WARRANTY INFORMATION. No warranty clause was included in the contract because the equipment exceeds mean time between failure (MTBF) requirements.

Table 1-1. Equipment Supplied

Quantity per Equipment	Item Name	Item Designation
	AN/URA-17E	8000000171-1
2	Signal Data Converter Assembly	8010000626-1
1	Interconnecting Cable	8190001349-1
1	Interconnecting Cable	8190001349-2
2	Technical Manual EE162-AH-OMI-010/E110 URA17E	
2	Accessory Kit:	8180000780-1
2	Mounting Bracket	8040003804-1
8	Mounting Foot	8040003650-1
4	Rack Mounting Bracket	8040003606-1
32	Screw, Binder Head	MS51957-44
24	Screw, Panhead	MS51958-62
32	Flatwasher	NAS620C8L
24	Flatwasher	NAS620C10L
2	Cable Connector	MS3106A14S-7S
2	Cable Connector	MS3106A14S-2S
2	Cable Connector	MS3106A14S-5P
2	Cable Connector	MS3106A14S-7P
2	Cable Connector	MS3106A10SL-3S
2	Cable Connector	MS3106A14S-9P
10	Cable Clamp	MS3057-6A
2	Cable Clamp	MS3057-4A
10	Clamp, Bushing	MS3420-6
2	Clamp, Bushing	MS3420-4

Table 1-2. Equipment Required But Not Supplied.

Quantity per Equipment	Item Name	Item Designation	Required Use	Required Characteristics
-	Standard Radio Receiver		To receive fsk signal and deliver fsk audio signals to the converter (VLF, LF, HF, MMM band receivers).	Audio output impedance of 600 or 150 ohms, and up to 60 mW of power, nominal 1 mW.
-	Standard Radio Transmitter		To transmit fsk audio signals received from the converter (VLF, LF, HF, MMM band transmitter).	Audio input impedance of 600 or 150 ohms, at 1 mW of power.
-	Teletype Receiving Equipment		To record messages received by the system.	Keying loop circuit of 60 mA on high level or ± 6V on low level.

Table 1-2. Equipment Required But Not Supplied (Continued)

Quantity per Equipment	Item Name	Item Designation	Required Use	Required Characteristics
			AN/URA-17E	
-	Teletype Transmitting Equipment		To key modulator in converter for fsk transmission.	Keying loop current of 60 mA on high level or ± 6 Vac output on low level.
-	Technical Manuals for above equipment		For operating and maintenance instructions.	
4	Mounting bolts		For table mounting the converter.	Socket head cap screw thread 1/4-28X mounting surface thickness + 3/8 inch long.
6	Cable Connector	M39012/16-0013	Mate J1, J2, J3.	

Table 1-2. Equipment Required But Not Supplied. (continued)

Quantity per Equipment	Item Name	Item Designation	Required Use	Required Characteristics
-	Teletype Transmitting Equipment		To key modulator in converter for fsk transmission	Keying loop current of 60 mA on high level or ± 6 Vac output on low level.
-	Technical Manuals for above equipment		For operating and maintenance instructions.	
4	Mounting bolts		For table mounting the converter.	Socket head cap screw thread 1/4-28X mounting surface thickness + 3/8 inch long.
6	Cable Connector	M39012/16-0013	Mate J1, J2, J3.	
2	Cable Connector	MS3106A14S-7S	Mate J4.	

SECTION II

INSTALLATION

2-1. UNPACKING AND HANDLING

2-2. The converter is packaged by first placing it in a plastic bag, then it is cushioned wi foam material and placed in a corrugated fiberboard carton. The technical manual is in an envelope, placed between the foam and the carton. To unpack the converter, proceed as follows:

1. Open the end of the carton and carefully slide out contents, including the foam cushioning.
2. Unwrap and remove the foam material.
3. Remove the converter from the plastic bag. Save packing material for future u (refer to paragraph 2-21).
4. Inspect the equipment for shipping damage.
5. Verify completeness of the equipment against table 1-1.

2-3. PRIMARY POWER REQUIREMENTS AND SELECTION

CAUTION

The converter may be severely damaged if correct input voltage is not selected.

2-4. The converter requires input power of 115 or 230 Vac ± 10 percent at 48 to 420 Hz. Before installing the converter, loosen the captive screws at the four corners of the front panel, fully extend the chassis, and set the voltage selector switch at the rear of the chassis (see figure 2-1) for the available voltage. Press chassis slide latches and push chassis into ca then secure captive screws.

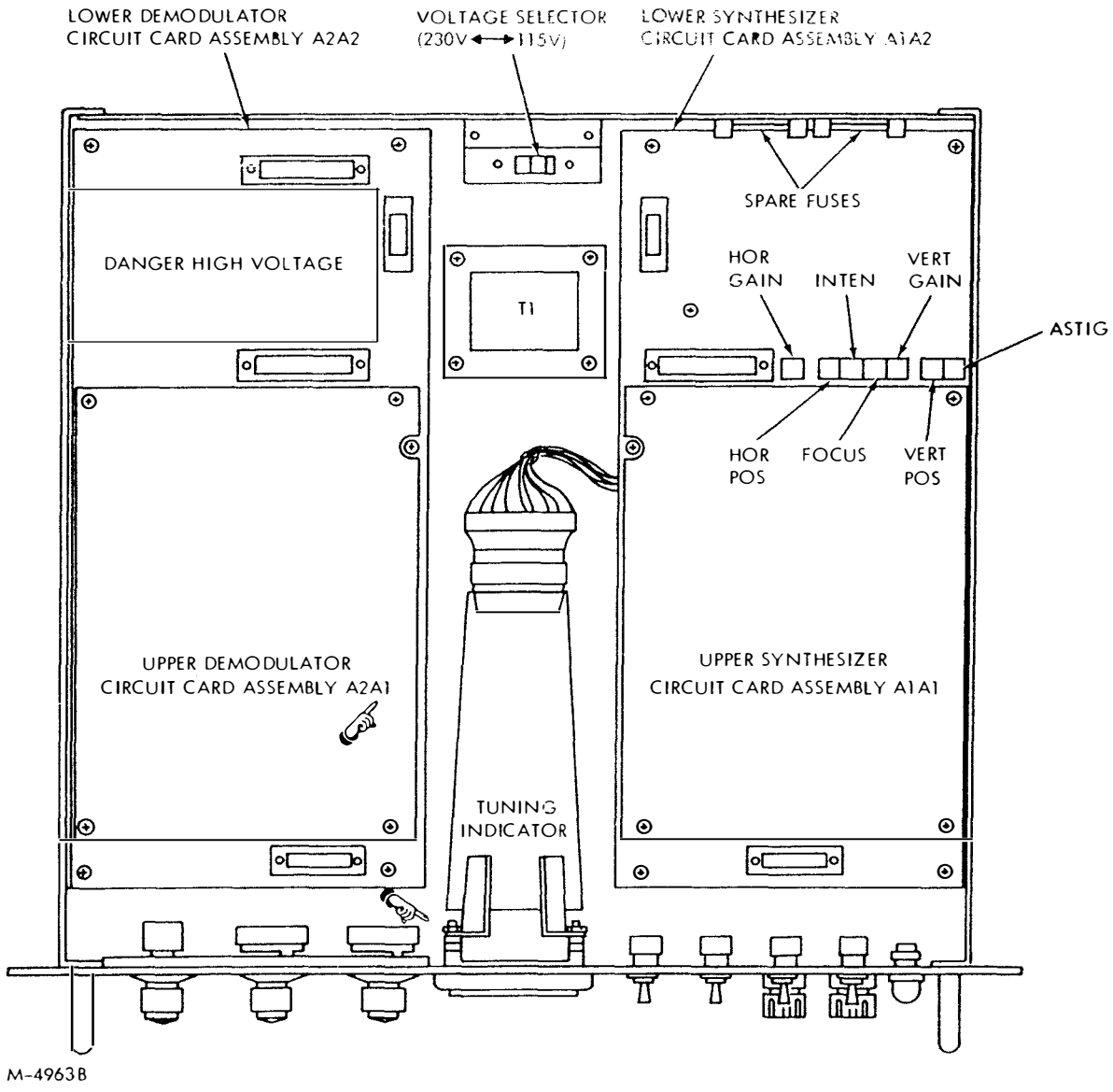


Figure 2-1. Chassis, Top View

2-5. INSTALLATION REQUIREMENTS

2-6. INSTALLATION LAYOUT. A single converter should be located near its associated receiver and transmitter. If two converters are used in a diversity arrangement, they should be mounted together. When tuning receivers, converters should be positioned so that their tuning indicators can be observed. If this is not feasible, an oscilloscope may be located near the receiver and used as a remote tuning indicator. The installation layout should allow sufficient space in front of the converter to permit extension of the chassis for servicing (figures 2-2, 2-3, and 2-4).

2-7. DIMENSIONS AND CLEARANCES. Figure 2-2 shows all mounting dimensions and clearances required for table mounting the converter group. Figure 2-3 shows all mounting dimensions and clearances required for table mounting a single converter. Figure 2-4 shows all mounting dimensions and clearances required for rack mounting a single converter.

2-8. TABLE MOUNTING. To table mount the converter group or a single converter, proceed as follows:

1. To mount a converter group, install the mounting brackets using hardware provided (figure 2-2).
2. Lay out and drill four 9/32 inch (0.714 cm) holes (figure 2-2 or 2-3) through the mounting surface. Allow sufficient clearance in front for chassis removal.
3. Install mounting feet on bottom of case using hardware provided.
4. Remove chassis from case (paragraph 6-4).
5. Insert a socket-head cap screw, 1/4-20 thread through each hole in bottom of the case. Cap screws must be long enough to extend through mounting surface and allow installation of a flatwasher, lockwasher, and a nut.
6. Pass the cap screws through the mounting surface and fasten with flatwashers, lockwashers, and nuts. Tighten securely.
7. Replace chassis in case (paragraph 6-16).

2-9. RACK MOUNTING. Prepare equipment for rack mounting as follows:

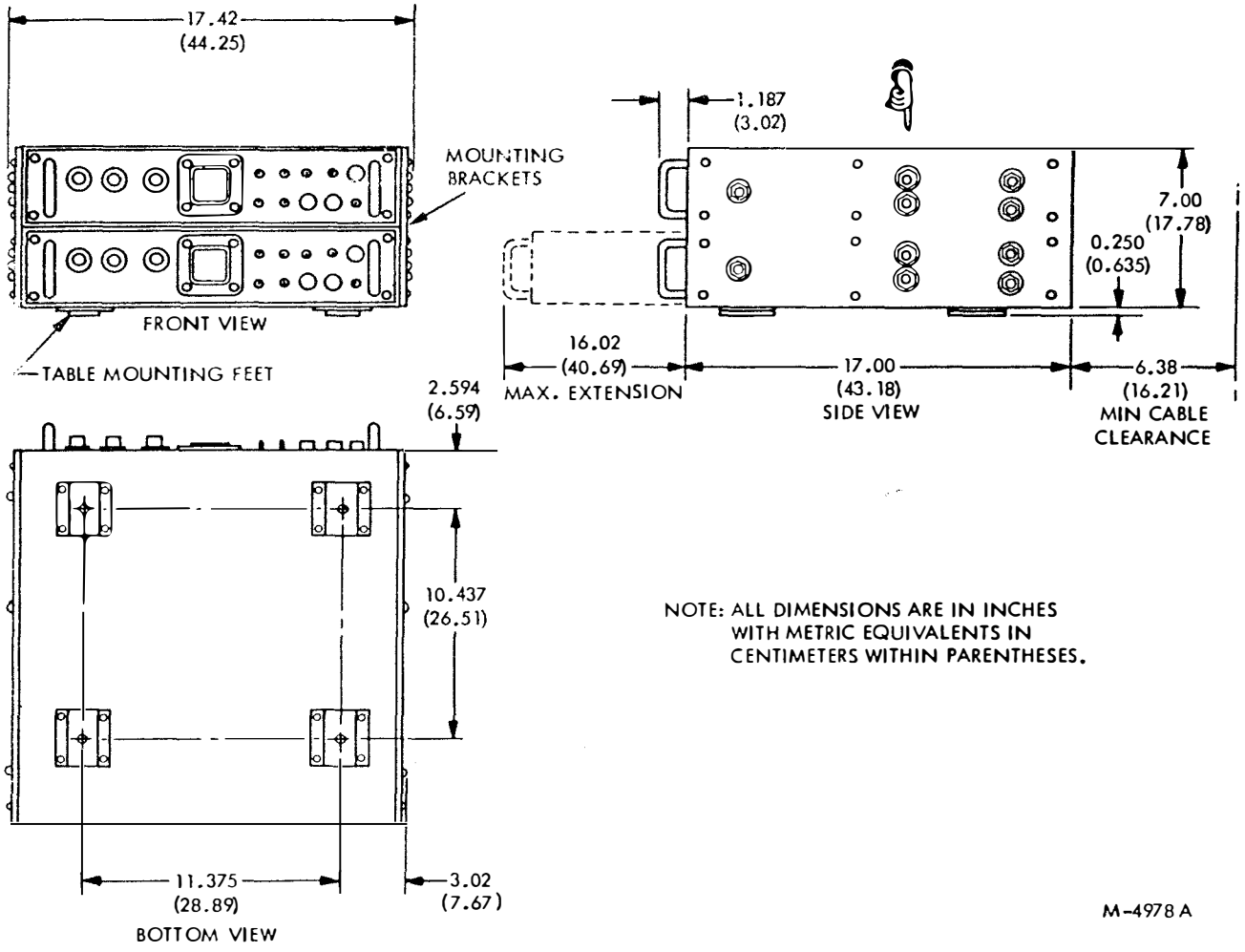


Figure 2-2. Signal Data Converter Group, Table Mounting

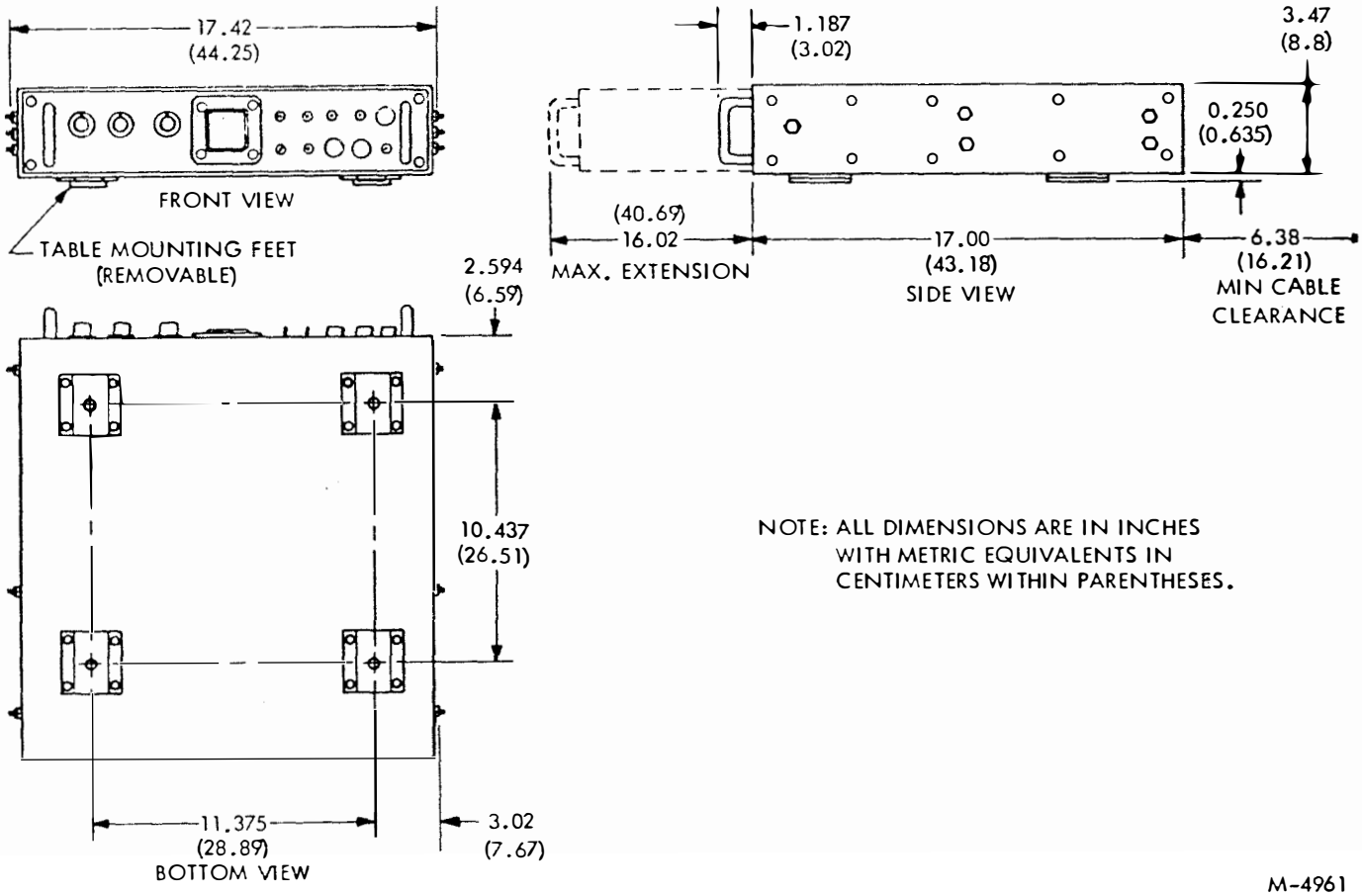
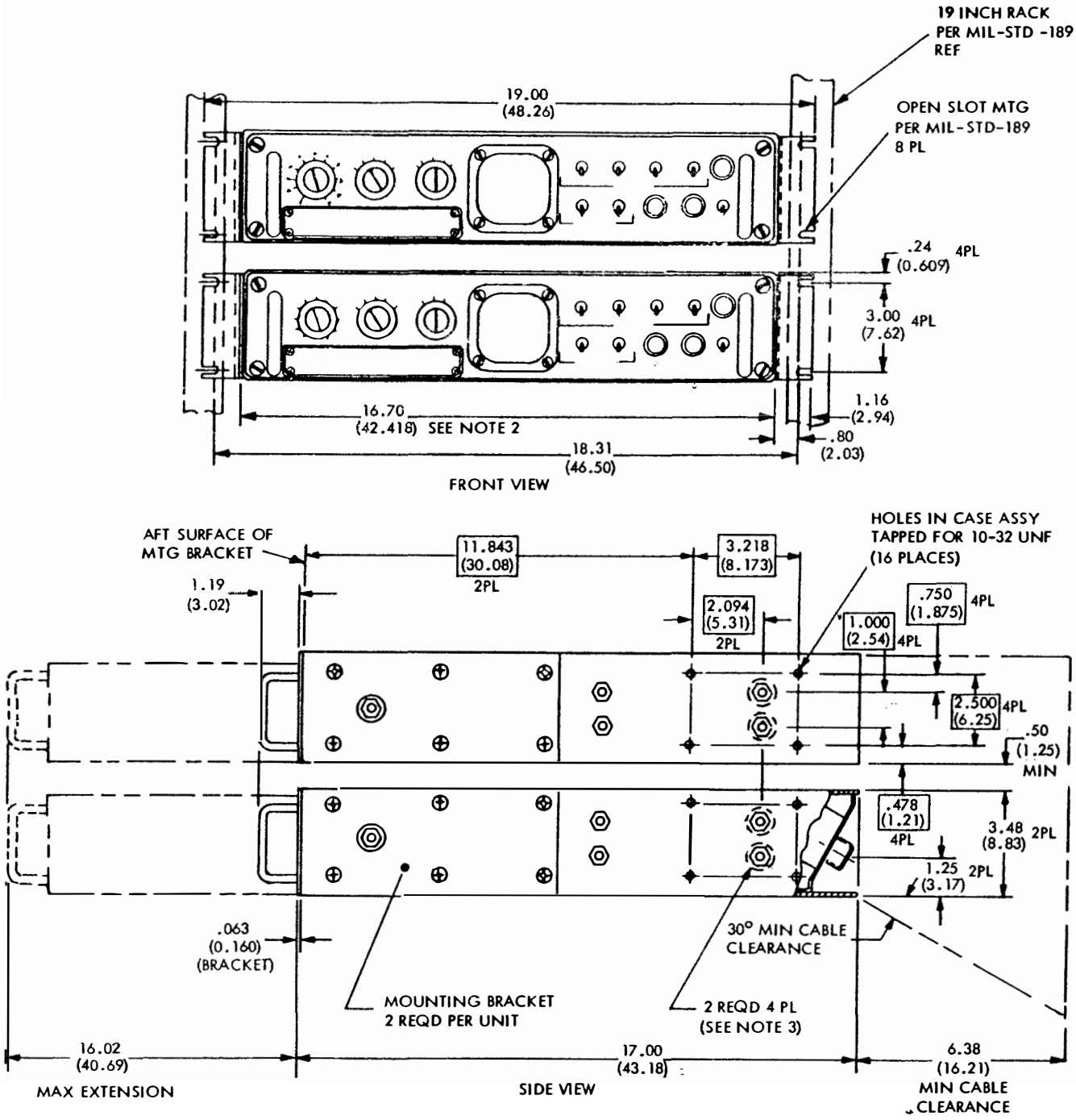


Figure 2-3. Signal Data Converter, Table Mounting



NOTES: UNLESS OTHERWISE SPECIFIED:

1. DIMENSIONS ARE IN INCHES WITH METRIC EQUIVALENTS IN CENTIMETERS SHOWN IN PARENTHESIS. BOXED-IN DIMENSIONS ARE SHOWN FOR REFERENCE WHEN FABRICATION OF REAR STABILIZING MOUNTING BRACKET IS REQUIRED.
2. INCREASE CASE WIDTH DIMENSION TO 17.42 INCHES (44.25 CENTIMETERS) TO COMPENSATE FOR ALL CASE ASSEMBLY PROTUBERANCES.
3. CLEARANCE HOLE OF 0.5 INCH (1.25 CENTIMETERS) DIAMETER (DASHED CIRCLE) REQUIRED AT THIS LOCATION WHEN FABRICATING REAR STABILIZING MOUNTING BRACKET.
4. WEIGHT OF GROUP: 55 POUNDS (24.75 KILOGRAMS . WEIGHT OF EACH UNIT OF GROUP: 27.5 POUNDS (12.375 KILOGRAMS).

M-4992

Figure 2-4. Signal Data Converter, Rack Mounting

NOTE

When the converter group is installed at a site where vibration may be encountered (moving ground vehicles, aircraft, or ships, for example) the rear area of the case assembly must be secured with rear mounting brackets that are fabricated by the using organization. Hole pattern dimensions are shown in figure 2-4 for matching brackets to case assembly. Overall configuration of the rear mounting brackets will depend on the particular site requirements.

1. Fasten rack-mounting brackets on case (figure 2-4) using hardware provided. Tighten screws securely.
2. Remove chassis from case (paragraph 6-4).
3. Hold case at desired level in rack, and fasten to rack with 10-32 screws through the ends of the mounting brackets. Tighten screws securely.
4. Replace chassis in case (paragraph 6-16).

2-10 INTERCONNECTION REQUIREMENTS

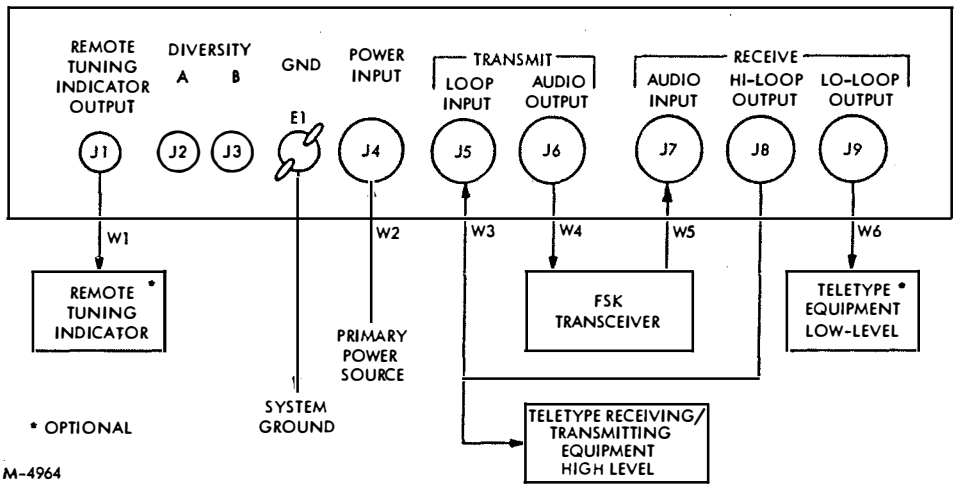
2-11. CABLE LAYOUT. All interconnecting cables attach to receptacles on the rear of the converter case. Converters may be connected for either single-receiver or diversity operation and for either half-duplex or full-duplex operation. Cabling arrangements for the possible conditions are shown in figures 2-5 through 2-8.

2-12. CABLE FABRICATION. Interconnecting cables must be fabricated during installation, in lengths determined by equipment layout. Required cable material, connectors, and terminal-to-terminal connections are specified in table 2-1 through 2-4. Interconnecting cable types may vary between installations. Refer to applicable ship or station plans to determine the correct cabling for the specific installation.

2-13. INSPECTION AND ADJUSTMENTS

2-14. Before releasing the converter to operating personnel, perform the following mechanical and electrical checks.

2-15. MECHANICAL CHECKS. Verify each control operates smoothly. Inspect chassis drawer slides and lubricate lightly with a dry lubricant such as LPS, manufactured by LPS Research Laboratories, Los Angeles, CA, or equivalent.

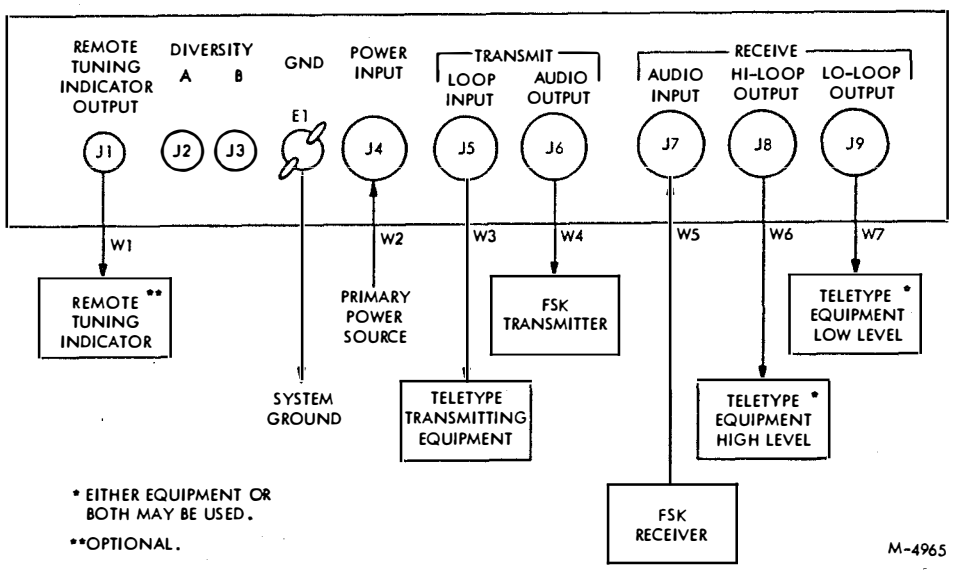


CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CAUTION

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Figure 2-5. Signal Data Converter Interconnection Data for Half-Duplex Operation

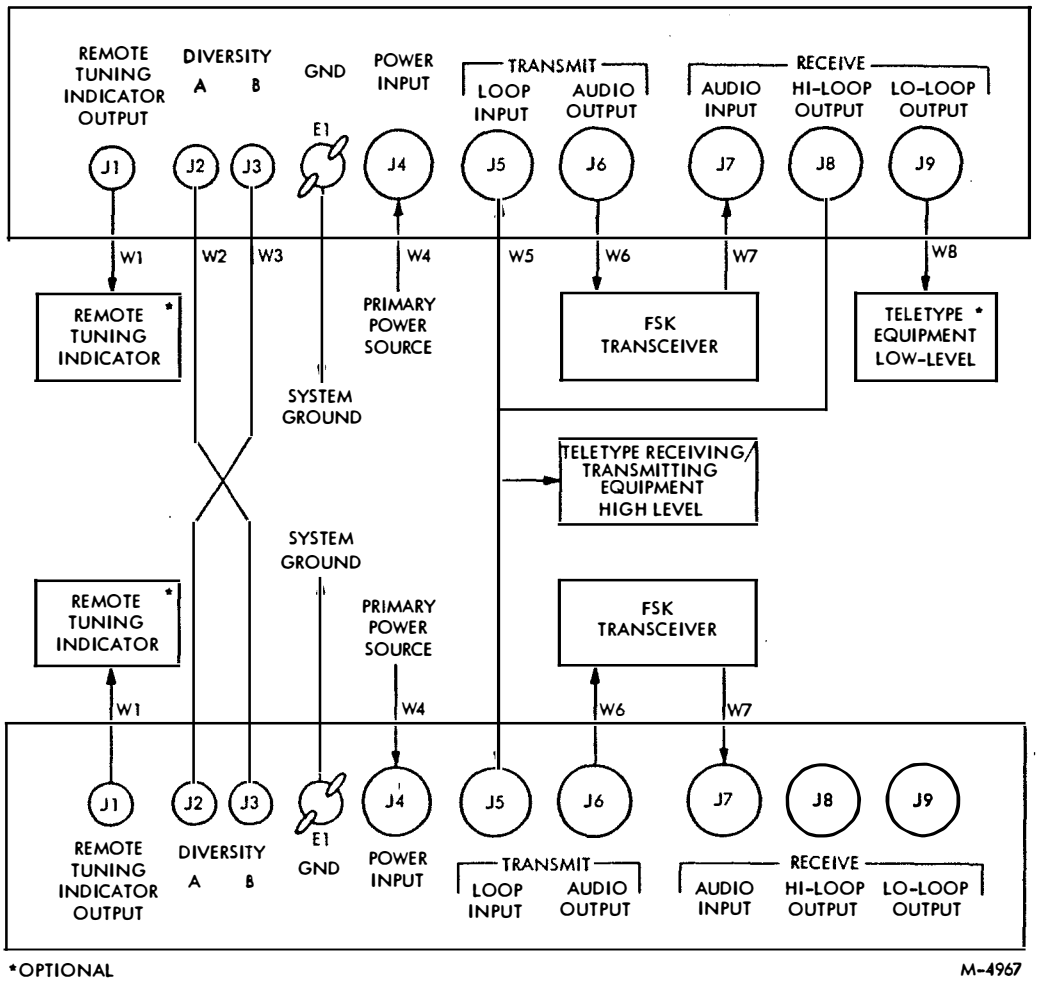


CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CAUTION

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Figure 2-6. Signal Data Converter Interconnection Data for Full-Duplex Operation.



*OPTIONAL

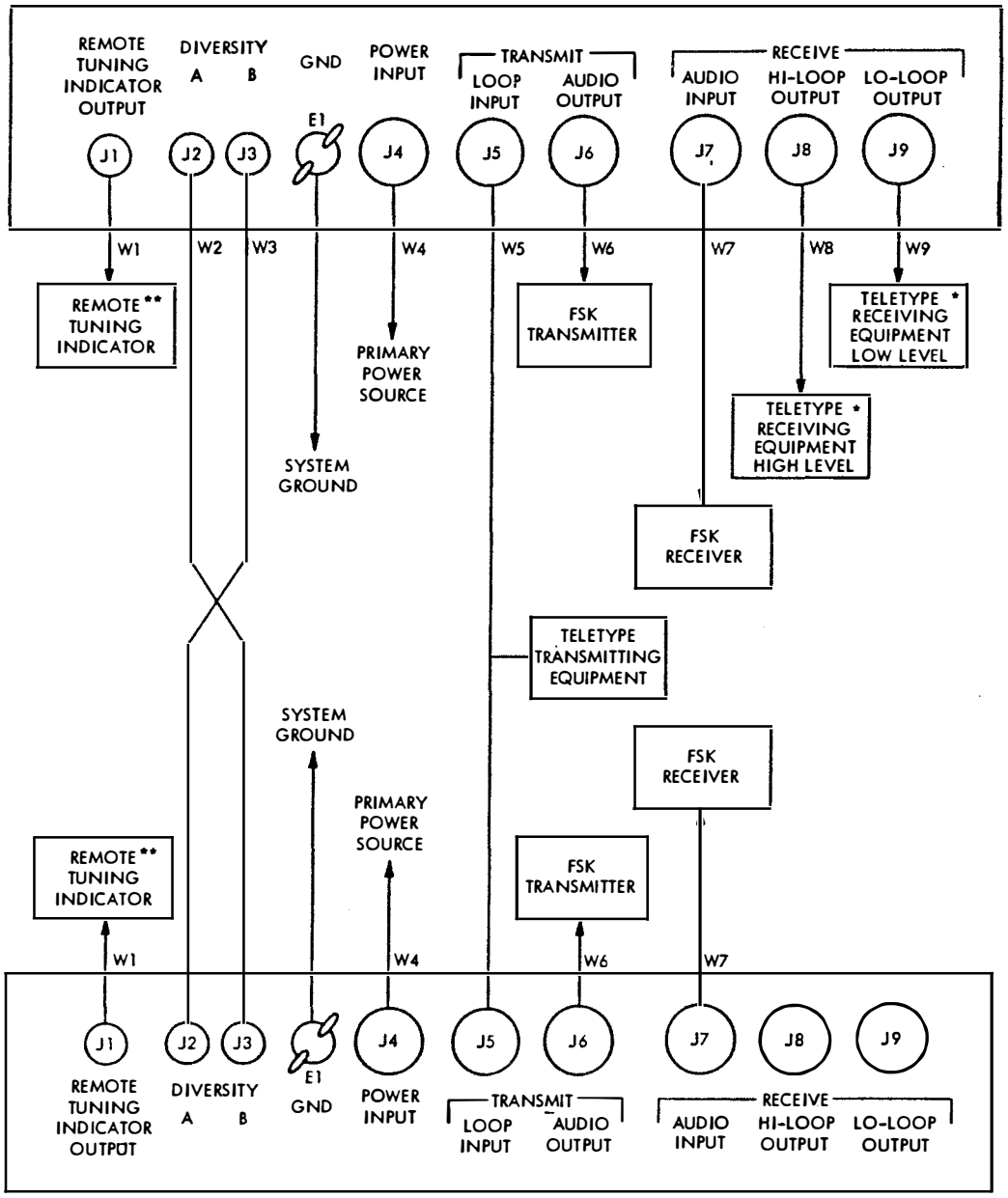
M-4967

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Figure 2-7. Signal Data Converter Interconnection Data for Half-Duplex Diversity Operation



*EITHER EQUIPMENT OR BOTH MAY BE USED
**OPTIONAL

M-4966

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Figure 2-8. Signal Data Converter Interconnection Data for Full-Duplex Diversity Operation.

2-16. TUNING INDICATOR ADJUSTMENT CONTROLS. Set POWER switch to ON and set AUTO/OPR/STANDBY switch to STANDBY. Set MODE selector to appropriate position and tune in a station transmitting fsk teletype signals. The tuning indicator display should be of suitable brightness, well focused, and centered on the screen. If not, proceed as follows:

1. Loosen captive screw at each corner of front panel.
2. Pull chassis forward until chassis slides lock.
3. Adjust INTEN, FOCUS, and ASTIG controls (see figure 2-1) to obtain the required trace characteristics.
4. Adjust HOR POS and VERT POS controls as required to center the trace pattern.
5. Press chassis slide latches, push chassis back into case, and tighten captive screws.

2-17. OPERATIONAL CHECK. Check equipment for operation as described in paragraphs 3-22 and 3-24. Verify as many operating modes as practicable. If operation is not correct, recheck all steps of installation. If cause cannot be found and corrected, request technical assistance as required.

2-18. PREPARATION FOR RESHIPMENT

2-19. INTERCONNECTING CABLES. Disconnect all cables from the converter receptacles. Remove connectors from converter ends of all cables for use at next installation.

2-20. DISMOUNTING EQUIPMENT. If table mounted, remove the converter chassis from case, (paragraph 6-4), and then remove bolts holding case to mounting surface. If rack mounted, remove screws holding brackets to rack and remove converter from rack.

2-21. PACKING FOR STORAGE OR RESHIPMENT. Packing for storage or reshipment is essentially the reverse of steps 1 through 3 of paragraph 2-2. Before packing, verify that all items are present per table 1-1 including the technical manual(s). Use the same packing material in which the equipment was received unless it was damaged during previous handling.

Table 2-1. CV-3510A/UG Interconnecting Data for Half Duplex Operation

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Twisted, shielded pair, 22 AWG (W6)	P9	MS3106A14S-9P*	White Black	A (± 6 V) B (GND)	Receive LO-loop output connector J9	Low-level teletype equipment
Twisted, shielded pair, 22 AWG (W5)	P7	MS3106A14S-7P*	White Black	A (600) B (600) C (C/T)	Receive audio input connector J7	fsk receiver audio output
Twisted, shielded pair, 22 AWG	P6	MS3106A14S-5P*	White Black	A (600)or B (150) C (COM)	Transmit audio output connector J6	fsk transmitter audio input
Twisted, shielded pair, 22 AWG (W4)	P6	MS3106A14S-5P*	White Black	D E		fsk transmitter key line

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CAUTION

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-1. CV-3510A/UG Interconnecting Data for Half Duplex Operation (continued)

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Twisted, shielded triplet, 22 AWG	P8	MS3106A10SL-3S**	White Red Black	A (+ loop) C (- loop) B (COM)	Receive HI-loop output connector J8	High-level teletype equipment keying loop (60 mA nom.)
22 AWG wire (W3)	P5	MS3106A14S-2S*	White Black	A (± loop) B (COM)	Transmit loop input connector J5	High-level teletype equipment keying loop (60 mA nom.)
Power cable with ground (W2)	P4	MS3106A14S-7S*	White Black Green	A (LOW) C (HIGH) B (GND)	Power input connector J4	Primary power source (see paragraph 2-3)
Copper strap	-	-	-	-	GND terminal E1	System ground
Coaxial cable(W1)	P1	MS39012/16-0013	-		Remote tuning indicator output connector J1	Remote tuning indicator

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

Note: Pin B - P8 and Pin A - P5 connected together at teletype patch panel for single power supply operation

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-2. CV-3510A/UG Interconnecting Data for Full Duplex Operation

Cable Type	Plug Symbol	Plug Designation	Connections Lead Color	Connections Pin No.	Terminations From	Terminations To
Twisted, shielded pair, 22 AWG (W7)	P9	MS3106A14S-9P*	White Black	A (± 6V) B (GND)	Receive LO-loop output connector J9	Low-level teletype equipment
Twisted, shielded pair, 22 AWG (W6)	P8	MS3106A10SL-3S**	White Red Black	A (+ loop) C (- loop) B (COM)	Receive HI-loop output connector J8	High-level teletype equipment (60mA nom)
Twisted, shielded pair, 22 AWG (W5)	P7	MS3106A14S-7P*	White Black	A (600) B (600) C (C/T)	Receive audio input connector J7	fsk receiver audio output

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CAUTION

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-2. CV-3510A/UG Interconnecting Data for Full Duplex Operation (continued)

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Twisted, shielded pair, 22 AWG (W4)	P6	MS3106A14S-5P*	White	A (600) or	Transmit audio	fsk transmitter
				B (150)	output connector	audio input
			Black	C (COM)	J6	
Twisted, shielded pair, 22 AWG (W4)	P6	MS310A14S-5P*	White	D		fsk transmitter
			Black	E		key line
Twisted, shielded pair, 22 AWG (W3)	P5	MS3106A14S-2S*	White	A (± loop)	Transmit loop	High-level
			Black	B (COM)	input connector	teletype
					J5	equipment keying
			or			loop (60 mA nom)
			White	C (± 6V)	Transmit loop	Low level
			Black	D (GND)	input connector	teletype
					J5	equipment

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-2. CV-3510A/UG Interconnecting Data for Full Duplex Operation (continued)

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Power cable with ground (W2)	P4	MS3106A14S-7S*	White Black Green	A (LOW) C (HIGH) B (GND)	power input connector J4	Primary power source (refer to paragraph 2-3).
Copper strap	–	–	–		GND terminal E1	System ground
Coaxial cable(W1)	P1	MS39012/16-0013	-		Remote tuning indicator output connector J1	Remote tuning indicator

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-3. AN/URA-17E Interconnection Data for Half Duplex Diversity Operation

(Each CV-3510A/UG)

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Twisted, shielded pair, 22 AWG (W8)	P9	MS3106A14S-9P*	White Black	A (± 6 V) B (GND)	Receive Lo-loop output connector J9	Low-level teletype equipment
Twisted, shielded pair, 22 AWG (W7)	P7	MS3106A14S-7P*	White Black	A (600) B (600) C (C/T)	Receive audio input connector J7	fsk receiver audio output
Twisted, shielded paie, 22 AWG	P6	MS3106A14S-5P*	White Black	A (600) or B (150) C COM	Transmit audio output connector J6	fsk transmitter audio input
Twisted, shielded pair, 22 AWG (W6)	P6	MS3106A14S-5P*	White Black	D E		fsk transmitter key line

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CAUTION

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Change 2

Table 2-3. AN/URA-17E Interconnection Data for Half Duplex Diversity Operation (continued)

(Each CV-3510A/UG).

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Twisted, shielded triplet, 22 AWG	P8	MS3106A10SL-3S**	White Red Black	A (loop) C (-loop) B (COM)	Receive Hi-loop output connector J8	High-level teletype equipment keying loop (60 mA nom)
22 AWG wire (W5)	P5	MS3106A14S-2S*	White Black	A (± loop) B (COM)	Transmit loop input connector J5	High-level teletype equipment keying loop (60 mA nom.)

Note: Pin B - P8 and Pin A - P5 connected together at teletype patch panel for single power supply operation

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-3 AN/URA-17E Interconnection Data for Half Duplex Diversity Operation (continued)
(Each CV-3510A/UG).

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Power cable with ground (W4)	P4	MS3106A14S-7S*	White Black Green	A (LOW) C (HIGH) B (GND)	Power input connector J4	Line power source (refer to Paragraph 2-3)
Copper strap	-	-	-	-	GND terminal E1	System ground
Coaxial cable(W3)	P3	M39012/16-0013	-	-	Diversity B connector J3	Diversity A connector J2 of other CV-3510A /UG

*with cable clamp No. MS3057-6A

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-3. AN/URA-17E Interconnection Data for Half Duplex Diversity Operation (continued)

(Each CV-3510A/UG).

	Plug		Connections		Terminations	
Cable Type	Symbol	Designation	Lead Color	Pin No.	From	To
Coaxial cable(W2)	P2	M39012/16-0013-	-		Diversity A connector J2	Diversity B connector J3 of other CV-3510A/UG
Coaxial cable(W1)	P1	M39012/16-0013	-	-	Remote tuning indicator output connector J1	Remote tuning indicator

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

TABLE 2-4. AN/URA-17E Interconnection Data for Full Duplex Diversity Operation

(Each CV-3510A/UG)

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Twisted, shielded pair, 22 AWG (W9)	P9	MS3106A14S-9P*	White Black	A (± 6 V) B (GND)	Receive Lo-loop output connector J9	Low-level teletype equipment
Twisted, shielded pair, 22 AWG (W8)	P8	MS3206A10SL-3S**	White Red Black	A (+ loop) C (- loop) B COM	Receive Hi-loop output connector J8	High-level teletype equipment (60 mA nom)
Twisted, shielded pair, 22 AWG (W7)	P7	MS3106A14S-7P*	White Black	A (600) B (600) C (C/T)	Receive audio input connector J7	fsk receiver audio output

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CAUTION

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

TABLE 2-4. AN/URA-17E Interconnection Data for Full Duplex Diversity Operation (continued)

(Each CV-3510A/UG).

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Twisted, shielded pair, 22 AWG	P6	MS3106A14S-5P*	White	A (600) or B (150)	Transmit audio output connector J6	fsk transmitter audio input
			Black	C (COM)		
Twisted, shielded pair, 22 AWG (W6)	P6	MS3106A14S-5P*	White	D		fsk transmitter keyline
			Black	E		
Twisted, shielded pair, 22 AWG (W5)	P5	MS3106A14S-2S*	White	A (± loop)	Transmit loop input connector J5	High-level equipment keying loop (60 mA nom)
			Black	B (COM)		
				or		
			White	C (± 6V)	Transmit loop input connector J5	Low-level teletype equipment
			Black	D (GND)		

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

TABLE 2-4. AN/URA-17E Interconnection Data for Full Duplex Diversity Operation (continued)

(Each CV-3510A/UG).

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Power cable with ground (W4)	P4	MS3106A14S-7S*	White Black Green	A (LOW) C (HIGH) B (GND)	Power input connector J4	Primary power source (refer to paragraph 2-3)
Copper strap	-	-	-	-	GND terminal E1	System ground
Coaxial cable(W3)	P3	M39012/16-0013	-	-	Diversity B Connector J3	Diversity A Connector J2 of other CV-3510A /UG

*with cable clamp No. MS3057-6A

**with cable clamp No. MS3057-4A

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

Table 2-4. AN/URA-17E Interconnection Data for Full Duplex Diversity Operation (continued)

(Each CV-3510A/UG)

Cable Type	Plug		Connections		Terminations	
	Symbol	Designation	Lead Color	Pin No.	From	To
Coaxial Cable(W2)	P2	M39012/16-0013	- -	- -	Diversity A Connector J2	Diversity B Connector J3 of other CV-3510A /UG
Coaxial cable(W1)	P1	M39012/16-0013	-	-	Remote tuning indicator output connector J1	Remote tuning indicator

CAUTION

CV-3510A	J1	J2	J3	J4	J5	J6	J7	J8	J9
CV-483D	J7	J4	J5	J3			J2	J6	J8

CV-3510A CONNECTIONS CORRESPOND TO THE CV-483D CONNECTIONS SHOWN IN CHART.

SECTION III

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION

3-2. This section provides operating procedures along with descriptions of controls. Included are pertinent adjustments and routine maintenance checks. Before attempting to operate this equipment the operator should be familiar with the functional description given in section I, paragraphs 1-2 through 1-17.

3-3 OPERATOR FAMILIARIZATION

3-4. Since the converter is part of a system for the transmission and reception of radio teletype communications, the operator must be familiar with all the components before attempting to operate the system. For detailed operating procedure, refer to paragraph 3-8.

3-5. DESCRIPTION OF CONTROLS

3-6. All controls normally used in operating the converter are located on the front panel (figure 3-1). Table 3-1 lists these controls by name and function. Other controls are to be adjusted only by qualified maintenance personnel.

3-7. SEQUENCE OF OPERATION

3-8. PREPARATION FOR USE. Make sure equipment is connected for proper operation: Full duplex diversity, full duplex single, half duplex diversity, or half duplex single receiver. Allow the associated system components to warm up (refer to applicable technical manuals). Turn the converter POWER switch to ON and allow a 5-minute warmup period.

3-9. DURING USE. Set converter controls and associated equipment as directed in paragraph 3-17.

3-10. AFTER USE. Set POWER switch to OFF.

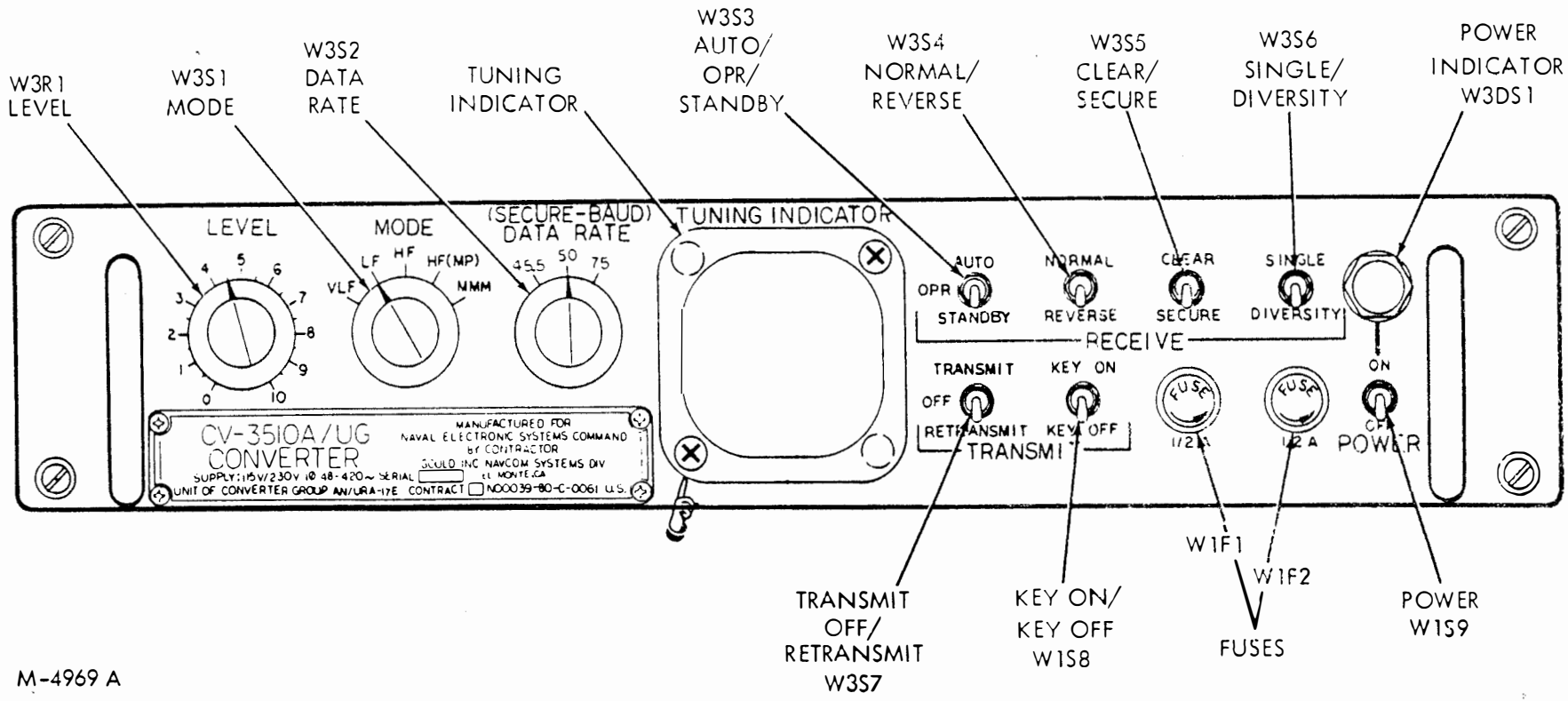


Figure 3-1. Signal Data Converter CV-3510A/UG, Front Panel

3-11. EMERGENCY PROCEDURE

3-12. In the event any abnormal indications are observed, such as repeated blowing of fuses, presence of smoke or noxious fumes, or other indications of overheating, immediately set power switch to OFF and disconnect all externally connected cables. Notify qualified maintenance personnel.

Table 3-1. Signal Data Converter CV-3510A/UG, Operating Controls

Control	Setting	Function
LEVEL(W3R1)	Variable, 0 to 10	Adjusts audio input levels between 60μ W and 60 mW for optimum operations.
MODE (W3S1)	VLF	Selects 1,000 Hz mark and 1,050 Hz space receive/transmit frequencies; selects proper receive filter characteristics.
	LF	Selects 915 Hz mark and 1,085 Hz space receive/transmit frequencies; selects proper receive filter characteristics.
	HF	Selects 1,575 Hz mark and 2,425 Hz space receive/transmit frequencies; selects proper receive filter characteristics.
	HF (MP)	Selects 1,575 Hz mark and 2,425 Hz space receive/transmit frequencies; selects proper receive filter characteristics for severe multipath propagation conditions.

Table 3-1 Signal Data Converter CV-3510A/UG, Operating Controls (continued)

Control	Setting	Function
	MMM	Selects 1615 Hz mark and 1785 Hz space receive/transmit frequencies; selects proper receive filter characteristics.
DATA RATE (SECURE-BAUD) (W3S2)	45.5	Selects internal clock frequency for processing integer length stop bit data at data rate of 45.5 baud.
	50	Selects internal clock frequency for processing integer length stop bit data at data rate of 50 baud.
	75	Selects internal clock frequency for processing integer length stop bit data at data rate of 75 baud.
AUTO/OPR/ STANDBY (W3S3)	AUTO	Converter goes into "mark hold" condition to inhibit any teletype equipment operation within 1.5 seconds after input is removed or after continuous mark or space input tone begins. Performs selected receive functions after receiving no more than two character inputs.
	OPR	Converter performs selected receive functions; there is no automatic mark hold.

Table 3-1. Signal Data Converter CV-3510A/UG, Operating Controls (continued)

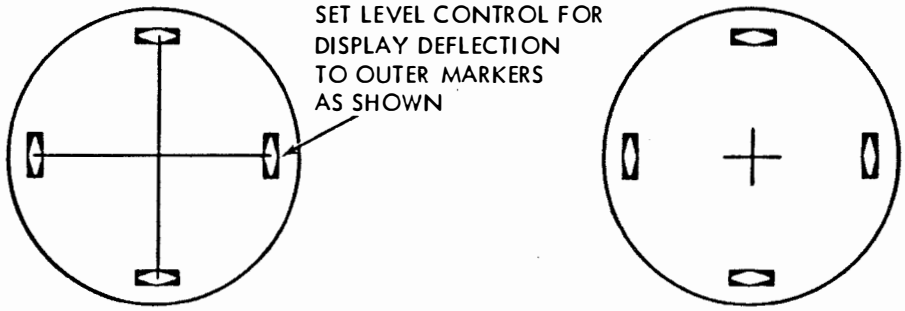
Control	Setting	Function
	STANDBY	Converter receive outputs are continuously in the mark hold condition.
NORMAL/REVERSE (W3S4)	NORMAL	Selects normal (low-tone-mark) polarity of keying pulses.
	REVERSE	Selects reverse (high-tone-mark) polarity of keying pulses.
CLEAR/SECURE (W3S5)	CLEAR	Disables data regeneration circuits for reception of noninteger and integer length stop bit data.
	SECURE	Enables data regeneration circuits for reception of integer length stop bit data, at the selected data rate.
SINGLE/DIVERSITY (W3S6)	SINGLE	Connects converter to operate with a single receiver in a nondiversity arrangement.
	DIVERSITY	Enables converter to operate with another converter in a diversity arrangement
TRANSMIT/ OFF/ RETRANSMIT (W3S7)	TRANSMIT	Transmit output signal is modulated from the transmit loop input in use.

Table 3-1. Signal Data Converter CV-3510A/UG, Operating Controls (continued)

Control	Setting	Function
	OFF	Transmit output signal is inhibited.
	RETRANSMIT	Transmit output signal is modulated by received signal that is present at the receive loop outputs.
KEY ON/ KEY OFF (W1S8)	KEY ON	Turns on transmitter from converter location.
	KEY OFF	Turns off transmitter from converter location.
POWER (W1S9)	ON	Applies primary power to the converter.
	OFF	Disconnects primary power from converter.

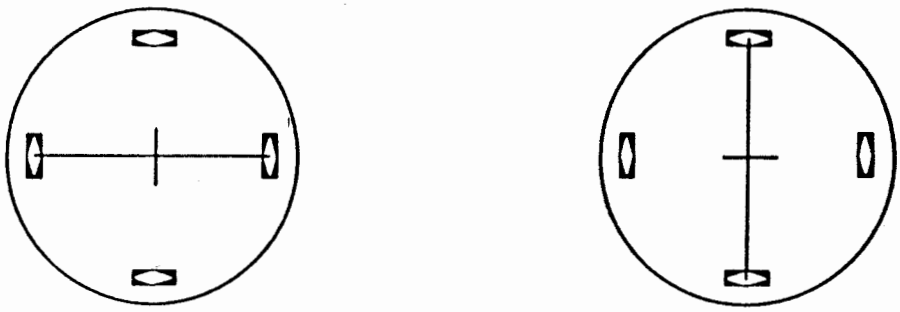
3-13. INDICATOR PRESENTATION

3-14. Typical tuning indicator displays for various reception conditions are shown in figure 3-2. When no carrier is tuned in, a dim dot is normally in the center of the display, though a noisy input may cause an indistinct bright area around the center. Figure 3-2, view a, shows correct tuning with the crossed traces of equal length. Correct tuning is indicated by maximum lengths of both crossed traces. Extreme fading of both mark and space frequencies is shown in figure 3-2, view b (flat fade). Fading of the mark (low) frequency only is shown in figure 3-2, view c (selective fade). Fading of the space (high) frequency is indicated by figure 3-2, view d. Presence of high noise levels with the signal is indicated by figure 3-2, view e, and the effects of severe multipath propagation are indicated by figure 3-2, view f.



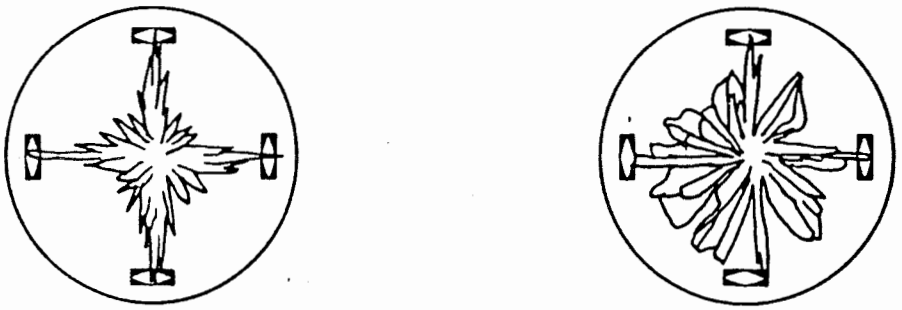
A. CORRECT TUNING
CROSSED TRACES OF EQUAL LENGTH.
TUNE FOR MAXIMUM LENGTH OF TRACE

B. EXTREME FADING
FADING OF BOTH MARK (VERTICAL)
AND SPACE (HORIZONTAL) FREQUENCIES.
(FLAT FADE)



C. LOW TONE FADE
MARK FREQUENCY (VERTICAL) FADING.
(SELECTIVE FADE)

D. HIGH TONE FADE
SPACE FREQUENCY (HORIZONTAL)
FADING. (SELECTIVE FADE)



E. NOISY SIGNAL
PRESENCE OF HIGH NOISE LEVEL
ACCOMPANYING DESIRED SIGNAL

F. MULTIPATH
RESULTS OF SEVERE MULTIPATH
PROPAGATION.

M-4968

Figure 3-2. Tuning Indicator Display

3-15. TUNING ADJUSTMENTS

3-16. If receivers used are subject to frequency drift, off-frequency operation can be detected by observing the tuning indicator display. The crossed lines will decrease in length until there is only a dot. To avoid further detuning with resultant degradation of communication, readjust receiver tuning in small increments.

3-17. CONVERTER OPERATION

3-18. Instructions for turning on and placing in operation one converter or two converters in diversity are provided below. Both full and half duplex operation are described. For the diversity connection, turn on the converter to which the teletype equipment is connected first.

1. Set POWER switch to ON.
2. Set AUTO/OPR/STANDBY switch to STANDBY. Set NORMAL/REVERSE switch to NORMAL.
3. If the received communication has an integer length stop bit (such as ASCII code or ciphered Baudot code) set CLEAR/SECURE switch to SECURE. Otherwise, set it to CLEAR.
4. Set LEVEL control to approximately 5.
5. Set MODE selector to correspond to carrier frequency band being used.
6. Set SINGLE/DIVERSITY switch to SINGLE.
7. Set TRANSMIT/OFF/RETRANSMIT switch to OFF. Set KEY ON/KEY OFF switch to KEY OFF.
8. Tune associated receiver to the desired carrier frequency and adjust bandwidth and audio output center frequency as follows:

Receiver	VLF	LF	HF	MMM
Bandwidth (approx. Hz)	800	800	3,000	800
Center Frequency (Hz)	1,025	1,000	2,000	1,700

Retune receiver for best indication on converter tuning indicator. Adjust receiver audio output to approximately 1 mW.

9. Adjust LEVEL control until the ends of the tuning indicator cross patterns are approximately at the heavy outside markers of the indicator.

10. Set AUTO/OPR/STANDBY switch as follows:
    a. If system operation involves reception of a single continuous tone, or no tone, for periods exceeding a few seconds (such as half-duplex), set to AUTO.
    b. If reception is not as described in a. above, set to OPR.
11. If teletype equipment is not recording properly, set NORMAL/REVERSE switch to REVERSE.

NOTE

For diversity arrangement only, perform following steps 12 through 14. For all other arrangements, proceed to step 15.

12. Set SINGLE/DIVERSITY switch to DIVERSITY. Set LEVEL control to 0.
13. Repeat steps 1 through 11 for the second converter of the group, except in step 6, set SINGLE/DIVERSITY switch to DIVERSITY.
14. Repeat step 9 for the first converter.
15. If the HF MODE is selected and severe multipath propagation exists (see figure 3-2, view f), set MODE switch to HF (MP).
16. For half duplex operation, set AUTO/OPR/STANDBY switch to AUTO. Set TRANSMIT/OFF/RETRANSMIT switch to TRANSMIT. Tune the transmitter to the desired frequency.
17. To transmit, set KEY ON/KEY OFF switch to KEY ON and send communication with teletype transmitting equipment. At end of transmission, set KEY ON/KEY OFF switch to KEY OFF.
18. For full duplex operation, set TRANSMIT/OFF/RETRANSMIT switch to TRANSMIT. Tune the transmitter to the desired frequency. Set KEY ON/KEY OFF switch to KEY ON. The system is now ready for transmission and reception of communications.
19. To retransmit the incoming data, set TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT. This will retransmit the data that is present at the receive output loops, modified by data regeneration if so select by CLEAR/SECURE switch, polarity as selected by NORMAL/REVERSE switch, and loop control selected by AUTO/OPR/STANDBY switch.

3-19 OPERATOR'S MAINTENANCE

3-20. The operator's maintenance responsibility is limited to (1) a daily monitoring of transmit, receive, and diversity operation, as installed, (2) monitoring equipment controls and the tuning indicators during operation, and (3) replacing indicator lamps and fuses, if required. If troubles develop in the system that cannot be remedied by the specific instructions in the following paragraphs, refer to Section V, Troubleshooting.

3-21. ROUTINE CHECK CHART

3-22. Table 3-2 outlines checks that should be made in the course of normal operation. If indications are other than normal, the operator should refer to the operator's troubleshooting chart, table 3-3. Troubles listed in table 3-3 should be considered and checked in the order given.

3-23. DAILY CHECK OF RECEIVE OPERATION

3-24. When the converter is used in a group for diversity operation, the signal from both converters is processed in the converter to which the teletype equipment is connected. Failure of one section of the processor will eliminate the advantage of diversity operation. To check for fault in the processor of each converter, perform the procedure below. If only a single receiver is used, perform only step 1.

1. Check each converter with teletype equipment connected to its output for single receiver operation per paragraph 3-18, steps 1 through 11.
2. Connect receiver (tuned for fsk reception) to AUDIO INPUT receptacle on one converter (see figure 3-3).
3. Connect teletype equipment to appropriate receive output loop receptacle on the other converter.
4. Set SINGLE/DIVERSITY switch on each converter of the group to DIVERSITY.
5. Tune POWER switch to ON. If teletype equipment records good copy, switch receiver and teletype equipment connections to converters of the group as shown by the broken lines in figure 3-3. If teletype equipment does not copy, refer to Section V, Troubleshooting.

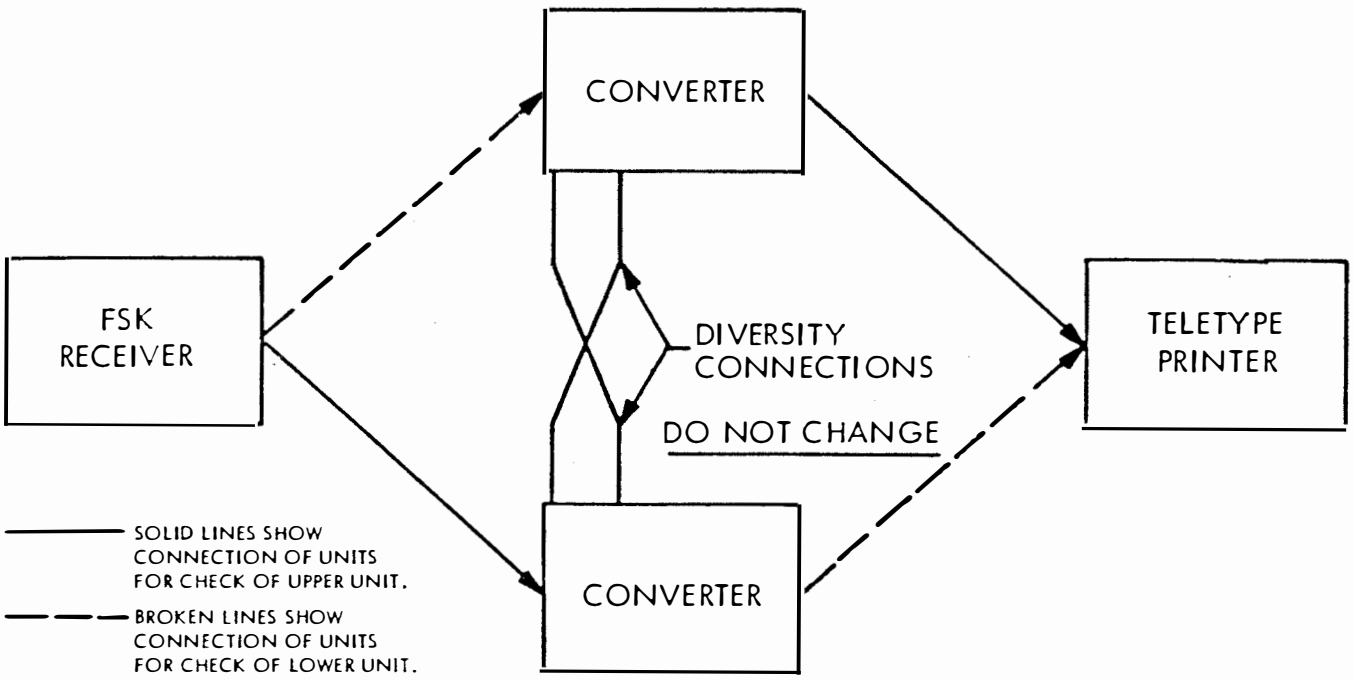


Figure 3-3. Daily Diversity Operation Check Connections

NOTE

If teletype equipment records good copy during one of the preceding tests, the equipment may be operated with teletype equipment so connected until maintenance personnel can make necessary repairs.

Table 3-2. Operator's Check Chart.

Control	Setting	Function
Receiver(s) POWER Switch	ON	Indicator light glows.
Receiver (s) Frequency Control	To desired carrier frequency	Audio in headphones or loudspeaker; converter tuning indicator display similar to figure 3-2, view a.
Converter(s) POWER Switch (W1S9)	ON	Indicator light glows.
Converter(s) LEVEL Control (W3R1)	----------	Tuning indicator pattern fills spaces between heavy marks on indicator (see figure 3-2, view a).
Teletype Equipment POWER Switches	ON	Teletype printer printing readable copy.
Transmitter(s) POWER Switch	ON	Indicator light glows.

Table 3-2. Operator's Check Chart (continued)

Control	Setting	Function
Transmitter(s) Frequency Control	To desired carrier frequency	Transmitter(s) Power Out
----------	Refer to applicable technical manual.	

Table 3-3. Operator's Troubleshooting Chart

Trouble Symptom	Probable Cause	Correction
Indicator light (W3DS1) off with POWER switch ON	Defective indicator lamp	Replace lamp. Refer to paragraph 3-27.
	Fuse blown	Replace fuse. Refer to CAUTION and fuse replacement, paragraph 3-29.
	defective power input cable or connector, ac power not on,	Turn ac power on; report power failure. Check power input cable and connectors.
Indicator (W3DS1) still does not light	----------	Notify qualified maintenance personnel.
No tuning indicator display	Blown fuse (W1F1 and/or W1F2)	Replace fuse. Refer to CAUTION and fuse replacement, paragraph 3-29.
Tuning indicator display incorrect	Receiver mistuned	Retune receiver. Refer to paragraph 3-15.

Table 3-3. Operator's Troubleshooting Chart (continued)

Trouble Symptom	Probable Cause	Correction
Tuning indicator display correct, but teletype printer is locked up	Converter AUTO/OPR/ STANDBY switch (W3S3) in STANDBY position	Set AUTO/OPR/STANDBY switch to OPR or AUTO position, as applicable.
Tuning indicator display correct, but teletype printer runs open	Receive output loop power supply defective	Notify qualified maintenance personnel.
	Teletype printer defective	Notify qualified maintenance personnel.
Not modulating transmitter	Converter KEY ON/KEY OFF switch (W1S8) in KEY OFF position.	Set KEY ON/KEY OFF switch to KEY ON position.
	Converter TRANSMIT OFF/RETRANSMIT switch (W3S7) in OFF position.	Set TRANSMIT/OFF/ RETRANSMIT switch to TRANSMIT or RETRANSMIT position as applicable.

3-25. DAILY CHECK OF TRANSMIT OPERATION

3-26. When the converter is used for transmit operation, a daily check should be made to ensure proper operation. Proceed as follows:

1. Tune the transmitter to the desired test frequency.
2. Set POWER switch to ON. Set TRANSMIT/OFF/RETRANSMIT switch to TRANSMIT. Set KEY ON/KEY OFF switch to KEY ON.
3. Look for indications of transmitted power (such as side tone in headset or transmit indicator lamp, refer to transmitter technical manual). If no indications are found, refer to Section V, Troubleshooting.

3-27. INDICATOR LAMP REPLACEMENT

3-28. To replace indicator lamp, unscrew lens assembly from the front panel. Remove lamp from rear of lens assembly. Insert new lamp and reinstall assembly.

3-29. FUSE REPLACEMENT

3-30. Two fuses are mounted on the front panel (see figure 3-1). Both fuses are 1/2A. Loosen captive screws at each corner of front panel and pull chassis forward to gain access to spare fuses at rear of chassis (figure 2-1).

CAUTION

Never replace fuse with one of higher rating unless continued operation of the equipment is more important than possible damage to the equipment. If a fuse blows immediately after replacement, do not replace it a second time until the cause has been corrected.

3-31. To replace a fuse, press in on the cap, turn counterclockwise, and pull out the cap with the fuse attached. Remove and discard the blown fuse. Insert a new fuse in the cap, insert cap in the holder, press in, and turn clockwise to lock. Replenish spare fuses from general stock. Press chassis slide latches, push chassis back into case, and secure with captive screws.

SECTION IV

PRINCIPLES OF OPERATION

4-1. GENERAL

4-2. This section provides principles of operation of the equipment. Refer to section I, paragraphs 1-3 through 1-17 for a general description of operation.

4-3. FUNCTIONAL ANALYSIS

4-4. BLOCK DIAGRAMS. The simplified block diagram of figure 4-1 illustrates the basic function of converting the fsk modulated carrier frequency into pulses for the control of teletype equipment. The audio fsk signal from the receiver is converted into mark and space pulses by the analog processor. These pulses are fed into the digital processor, which creates the pulses to control the teletype equipment.

4-5. The converter also provides for the transmission of fsk signals. The pulses from the teletype transmitting equipment are used to modulate a frequency shift oscillator. The output of the oscillator is fed into the radio transmitter. The frequency shift oscillator may also be modulated by the output of the digital processor, or turned off, by selection of the TRANSMIT/OFF/RETRANSMIT switch function.

4-6. Figure 4-2 is a block diagram representing the principal functions of the circuits of the complete equipment. Two receivers, two transmitters, teletype receive equipment, and teletype transmit equipment are shown connected for frequency diversity, full duplex operation. For space diversity, only one transmitter is required. Since the converters are identical, only one block diagram is shown for simplicity. Both high-level and low-level transmit inputs and receive outputs are provided. The converter circuits represented by the blocks are discussed separately in the following paragraphs. The discussion is separated into the two major assemblies. See the overall functional schematic, figure 5-2.

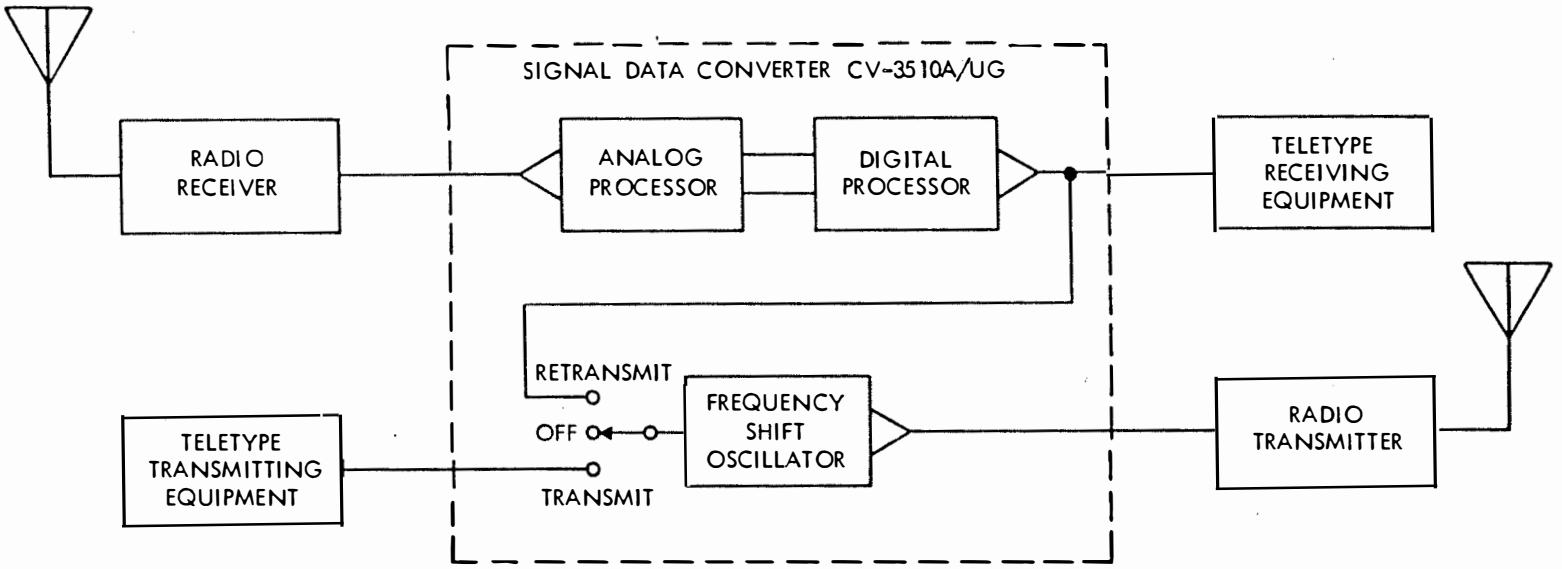


Figure 4-1. Frequency Shift Keyed Teletype Station, Simplified Block Diagram

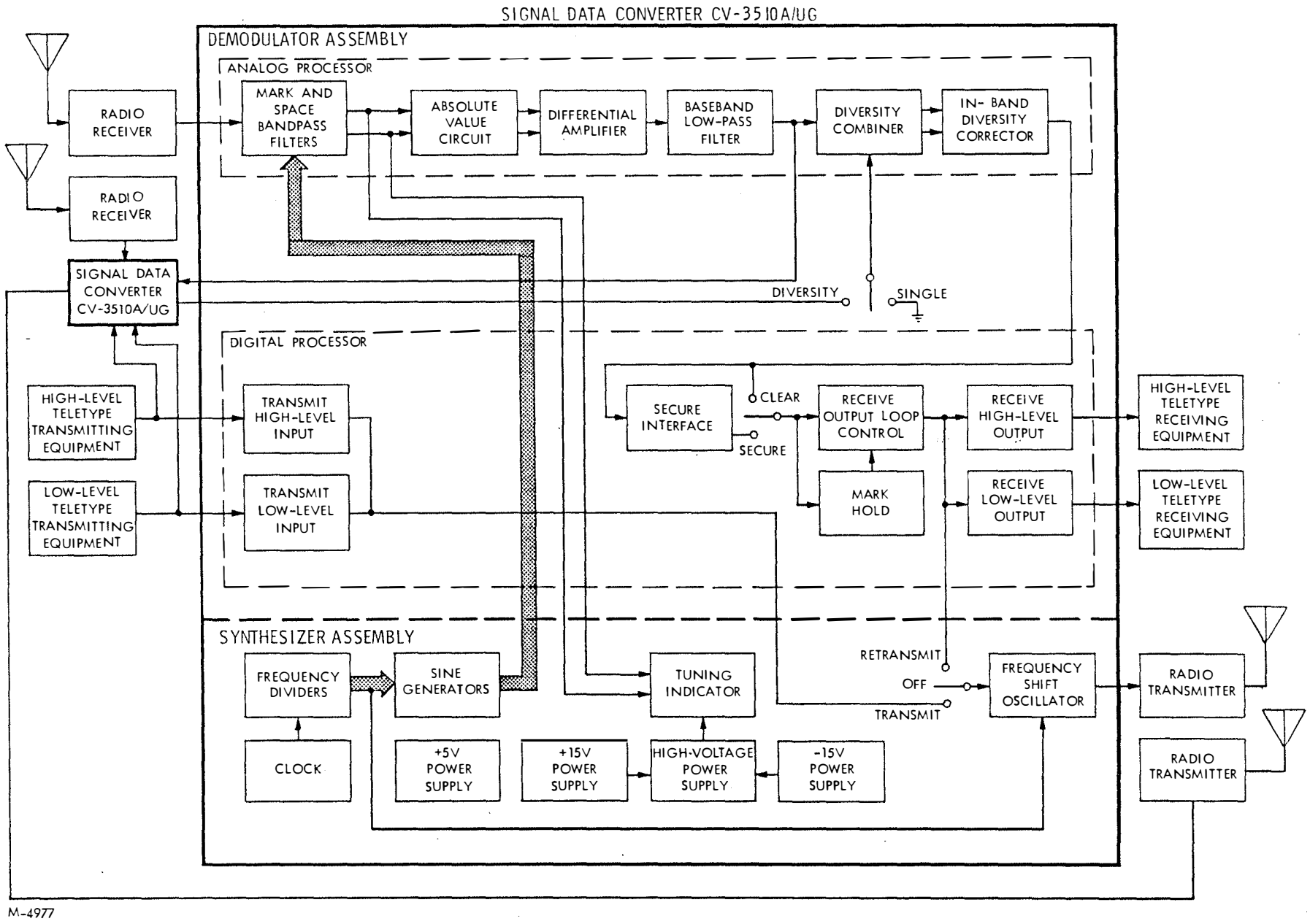


Figure 4-2. Signal Data Converter Functional Block Diagram

4-7. DEMODULATOR ASSEMBLY

4-8. The demodulator assembly contains the analog processor and digital processor of figure 4-1. The input signal from the receiver is applied to the AUDIO INPUT connector J7. The input transmformer, T1, provides either 600-ohm or 150-ohm input impedance. The level control, R1, adjusts the input gain for optimum system performance.

4-9. MARK AND SPACE BANDPASS FILTERS. The bandpass filters reject noise while allowing the mark and space signals to be passed unattenuated. In the converter, equivalent bandpass filters are constructed by use of mixers and low-pass filters. This allows both bandpass filter bandwidth and center frequency to be easily selected.

4-10. A buffer (U55) isolates the input signal from the mixers U89-92. The local oscillator for U89 and U90 is the synthesized mark frequency, but the two signals are separated in phase by 90 degrees. This mixes the incoming mark frequency down to zero frequency. Consequently, the bandpass filter can be implemented as a low-pass filter of half the band-width. Similar processing is performed with the space frequency in U91 and U92. R147 through R150 provide for offset adjustment.

4-11. The low-pass filters, U58-U63, have selectable cutoff frequencies controlled by S1 and U69-U78. In the VLF mode, the cutoff frequency is 38 Hz. In the LF mode, the cutoff frequency is 42 Hz. In the HF mode, the cutoff frequency is 75 Hz. In the HF(MP) mode, the cutoff frequency is 125 Hz. In the MMM mode, the cutoff frequency is 50 Hz.

4-12. The outputs of the two mark filters are then mixed a second time with a synthesized frequency of 2,159 Hz. Again, the two local oscillators are separated by 90 degrees in phase. The mark channel mixers are U64A and U64B. The same function is performed by the space channel mixers, U65A and U65B.

4-13. The two mark signals are then combined at U66A by R275 and R271. R275 provides adjustment to equalize the amplitude of each signal. The two space signals are combined at U66B by R273 and R276. R276 provides adjustment to equalize the amplitude of each signal. The mark channel signal is then band limited by the low-pass filter U67B. The space channel filter is band limited by low-pass filter U67A. The result is an equivalent selectable bandpass filter centered around a selectable space frequency.

4-14. ABSOLUTE VALUE CIRCUIT. The absolute value circuit is a full-wave rectifier used to prepare the mark and space channel signals for envelope detection. The mark channel absolute value circuit is formed by U14A and U15A combined with CR1 and CR2. The same function is performed in the space channel by U14B, U15B, CR3, and CR4.

4-15. DIFFERENTIAL AMPLIFIER. The differential amplifier combines the mark channel and space channel signals. U16 accomplishes this by subtracting the mark channel signal from the space channel signal. R82 provides mark and space balance control.

4-16. BASEBAND LOW-PASS FILTER. The baseband low-pass filter (U1 and U2) envelope detects the combined signal and also strips off any high-frequency noise or interference. At this point the baseband signal is formed. This signal is buffered (U13A) and used as the diversity output (DIVERSITY A, J2). The baseband signal is also buffered by U13B and used to drive a remote tuning indicator. (Remote Tuning Indicator Output, J1).

4-17. DIVERSITY COMBINER. The diversity input (DIVERSITY B, J3) is summed (switch S6 must be in DIVERSITY) with the baseband signal by U3, providing a differential output. During diversity operation, the baseband signals of both converters are combined and further processed by the in-band diversity corrector.

4-18. IN-BAND DIVERSITY CORRECTOR. The in-band diversity corrector examines the separate and distinct mark and space information. By this method, the space information becomes complementary to the information of the mark. Mark and space information are separated in frequency; so a form of frequency diversity is derived from the single-band information.

4-19. The differential output of the diversity combiner is fed into two peak detectors (U4-U6) that have the capability of being reset to zero. The output of these peak detectors is combined by U7. This forms a reference centered between the peaks of the baseband signal. R43 and R44 adjust this reference to the center position. The combined baseband signal is compared to the reference signal by U8 and the result is a digital signal. The peak detector reset circuit, consisting of U9 through U12, examines this digital signal and resets the mark peak detector after each positive-going transition, or the space peak detector after each negative-going transition. With the peak detectors reset in this manner, the reference output is based on the last mark and the last space peaks only. This variable reference provides the closest approximation to a real-time reference.

4-20. SECURE INTERFACE. The secure interface is a data regenerator for use when integer-length stop bit data is processed. The regenerator will not allow the transition timing of the incoming data to change at a rate greater than 1/10 of one bit per seven bits.

4-21. The frequency divider (U26, U27, and U30) is controlled by the data early (U22A) and data late (U25) detectors to slew the baud rate clock used for regeneration. This is accomplished by changing the divide ratio between 1,312, 1,296, and 1,280, with 1,296 producing the exact baud rate.

4-22. The data early detector uses the slewed baud rate clock to compare to the incoming data and detect early transitions. A similar process takes place in the data late detector.

4-23. The reference signal is subtracted from the baseband signal and the result is integrated in the resettable integrator, U17 and U19. At the end of the data rate clock period, flip-flop U22B is clocked, holding the output of the integrator. The integrator is then reset by the same clock signal. The output of the flip-flop is the regenerated data. Switch S5 selects either the CLEAR or the regenerated SECURE data.

4-24. MARK HOLD. The mark hold circuit, controlled by the STANDBY/OPR/AUTO switch, S3, determines the condition of the receive output loop control circuit. The timer, U33 and U34, is reset by transitions from the data. If no transitions occur (that is, if no signal is present or a continuous mark or space is present) the timer will time out. Logic circuit U32, controlled by S3, sends a dc level to the receive ouput loop control circuit, a high level if the loop is to operate and a low level if the loop is to stand by. Each converter is shipped with a jumper between E1 and E2 on the lower demodulator cca (figure FO-2, page FO-15). This jumper allows the mark-hold and normal-reverse functions to operate as described above and below. The connections between E1 and E3/E4 are to be used only when a semipermanent installation, such as a repeater, is established and the loop output is to be identical to the fsk input. E1 to E4 defeats both the STANDBY/OPR/AUTO switch and the NORMAL/REVERSE switch, while E1 to E3 defeats only the STANDBY/OPR/AUTO switch.

4-25. RECEIVE OUTPUT LOOP CONTROL If the data is in a reversed condition, mark for space and space for mark, the loop control corrects for inverted mark and space signals resulting from inverted frequency shift at converter audio input through the REVERSE position of

the NORMAL/REVERSE switch, S4. Logic U81 performs this function. Logic U82 combines the mark hold circuit output for ultimate control of the loop. If this signal is high, the data is transmitted; if low, the loop is held in standby or marking condition.

4-26. RECEIVE HIGH-LEVEL OUTPUT (J8). The receive output loops provide either neutral or polar keying of voltages up to 140 Vac and currents up to 100 mA. They are electrically isolated from the system ground. U87 isolates the positive loop. In the space condition, it cuts off Q3 and Q4 so that they cannot conduct. In the mark conditions, they are turned on. U86 isolates the negative loop. In the mark condition, it cuts off Q5 and Q6 so that they cannot conduct. In the space condition, they are turned on. CR16 and CR17 protect the transistors from reverse voltage if the loop current supply is reversed.

4-27. RECEIVE LOW-LEVEL OUTPUT (J9). The low-level output swings from +6 Vdc to -6 Vdc for a mark-to-space transition. U55B converts the digital level to this 6 Vdc level. Q1 and Q2 provide for current gain and limiting. The output can provide 10 mA at 6 Vdc, but no more than 100 mA in a short-circuit condition.

4-28. TRANSMIT LOW-LEVEL INPUT (J5). The low-level input converts the +6 Vdc mark signal into the plus voltage for digital control and the -6 Vdc space signal into zero volts for digital control. U84B provides this conversion. VR2 and VR3 provide circuit protection clamping the input signal at ±11 Vdc.

4-29. TRANSMIT HIGH-LEVEL INPUT (J5). The high-level input is electrically isolated from the system ground. It accepts either neutral or polar keying. U85 provides the isolation. VR1 provides the required keying voltage. U84A converts the keying input to levels used by the digital ciruitry.

4-30. U83 combines the digital signals from the high- and low-level transmit inputs and selects between them and retransmitting data at the output loop. This selection is made with S7, TRANSMIT/OFF/RETRANSMIT switch. In the OFF position, it disables transmission of any tone.

4-31. SYNTHESIZER ASSEMBLY

4-32. The synthesizer assembly contains the frequency shift oscillator, shown in figure 4-1. Also on this assembly are the power supplies and the digital synthesizer which produces all the control frequencies for the converter.

4-33. CLOCK. The clock is crystal controlled to a frequency of 17,690,400 Hz. It provides the signal to the frequency dividers. U1 is the clock with Y1 as the crystal control. C6 provides for exact setting of the frequency to 17,690,400 Hz. U13 is a buffer for the clock signal.

4-34. FREQUENCY DIVIDERS. The converter has four different frequency dividers: one to obtain the mark frequency, one to obtain the space frequency, one to obtain the baud rate frequency, and one to obtain the second mixer frequency. The first three dividers are diode matrix controlled. The input to the diode matrix comes from the MODE input switch, S1, and DATA RATE switch, S2.

4-35. The mark frequency divider is constructed of U2 through U5. Its diode matrix control comes from S1, the MODE switch.

4-36. The space frequency divider is constructed of U6 through U9. Its diode matrix is controlled by the same lines from S1, the MODE switch, as is the diode matrix above.

4-37. The data rate frequency divider is constructed of U10 through U12. Its diode matrix control comes from the DATA RATE switch (S2).

4-38. The second mixer frequency divider is made up of U14, U15, U22, and U23. This divider has a constant divide ratio which produces a frequency of 2,159 Hz. Frequency divider U15 generates two signals that are 90 degrees separated in phase.

4-39. SINE GENERATORS. The sine generators are digital-to-analog converters that convert the divided frequency to a sinusoidal waveform. A parallel channel also provides a sinusoidal waveform that is shifted 90 degrees in phase. The signals are used in the first mixer in the mark and space band-pass filters.

4-40. The mark sine generator is constructed of digital-to-analog converter U26, buffer U31A, and low-pass filter U31B. The cosine generator, shifted 90 degrees in phase from the sine generator, is constructed of digital-to-analog converter U27, buffer U32A, and low-pass filter U32B. The low-pass filters are used to smooth the waveform.

4-41. The space sine generator is constructed from digital-to-analog converter U29, buffer U34A, and low-pass filter U34B. The cosine generator is constructed from digital-to-analog converter U30, buffer U35A, and low-pass filter U35B.

4-42. FREQUENCY SHIFT OSCILLATOR. The frequency shift oscillator is identical to the sine generators, except the transmit data switches the clock into the digital-to-analog converter from the mark frequency divider to the space frequency divider. The digital-to-analog converter is U28, the buffer is U33A, and the low-pass filter is U33B. The switch for controlling whether mark or space frequency is selected is U39. The output of the filter is fed to the transformer T1 to match the output impedance to 600 ohms or 150 ohms isolated from system ground.

4-43. POWER SUPPLIES. The power supplies consist of three 4-terminal voltage regulators. U40 is the +15V regulator, with R65 used for adjusting. U41 is the -15V regulator, with R67 used for adjusting. U42 is the +5V regulator with R69 used for adjusting.

4-44. The high-voltage power supply is used to power the tuning indicator. The high-voltage supply is a switching, regulated supply. The outputs are +360 Vdc and -630 Vdc. Q7 is used to switch the current through the primary turns of T2. CR184 and C62 are used to filter the +360 Vdc. CR185 and C59 are used to rectify and filter the -630 Vdc.

4-45. TUNING INDICATOR. The tuning indicator displays the information in the mark and space channels. The mark channel is displayed as a vertical line, and the space channel is displayed as a horizontal line. The signal to drive these two axes is taken from the output of the mark and space band-pass filters and is displayed directly.

4-46. A differential amplifier is comprised of Q1 and Q2 with Q5 as a constant current source. These three transistors form the vertical amplifier. R160 controls the vertical gain and R180 controls the vertical position. The horizontal amplifier is formed with differential amplifiers Q3 and Q4 with Q6 as the constant current source. R185 controls the horizontal gain and R181 controls the horizontal position. R177 controls the focus. R176 controls the intensity and R175 corrects astigmatism.

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SECTION V

TROUBLESHOOTING

5-1. GENERAL

5-2 This section provides troubleshooting procedures that assist maintenance personnel in localizing malfunctioning assemblies (organizational level) and components (depot level) in the converter. Maintenance personnel should be thoroughly familiar with the operation of the overall fsk system, and the function of each equipment used. The receivers, transmitters, and teletype equipment used with the converter should be tested, adjusted, and maintained in accordance with their individual maintenance instructions.

5-3. Prior to troubleshooting the converter, the technician should become familiar with the equipment operation during normal conditions. By keeping records of discrepancies occurring during operation, it may be possible to prevent equipment breakdown by foreseeing failures. It is mandatory that maintenance personnel read sections, I, III, and IV of this technical manual before performing any troubleshooting procedures.

5-4. It is assumed that maintenance personnel are experienced in standard methods of testing and repairing electronic equipment; therefore, detailed descriptions of common tests are not given.

5-5. As a troubleshooting aid, tables and illustrations in this section and section VI list and show test point symbols. The test point symbol consists of the test point number enclosed within a circle. Figure 5-1 shows locations of all test points called out in this manual.

5-6. TEST EQUIPMENT AND TOOLS

5-7. TEST EQUIPMENT. The following test equipment or the equivalent will be required:

Oscilloscope	- AN/USM-368
Digital Multimeter	- 89536-8600A01 (John Fluke Mfg. Co., Inc.)
Frequency Counter	- 81350-500 (Joint Army/Navy) (Tektronix)

UPPER SYNTHESIZER ASSEMBLY 1A1A1

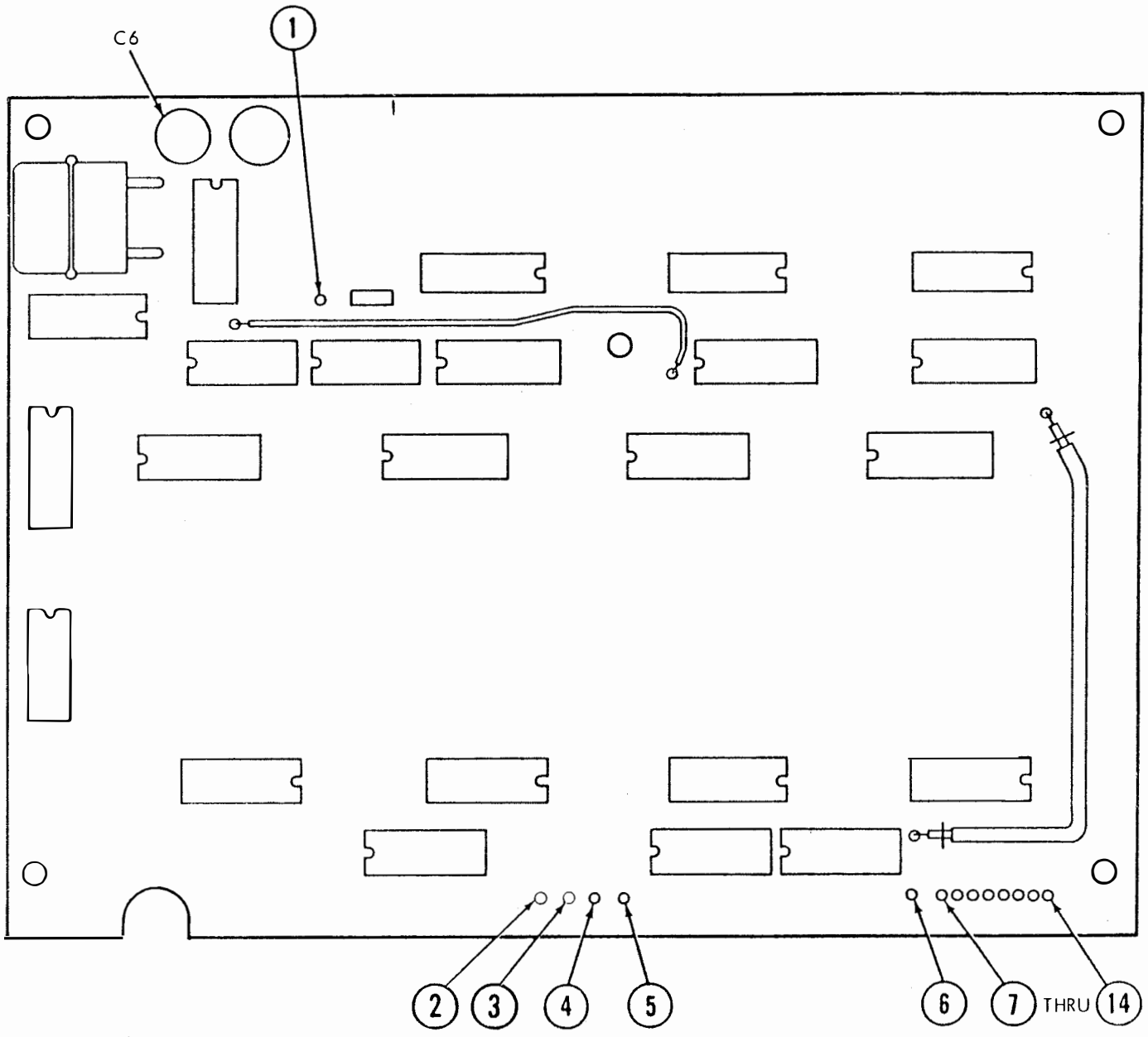


Figure 5-1. Test Points and Adjustment Controls.
(sheet 1 of 4 sheets)

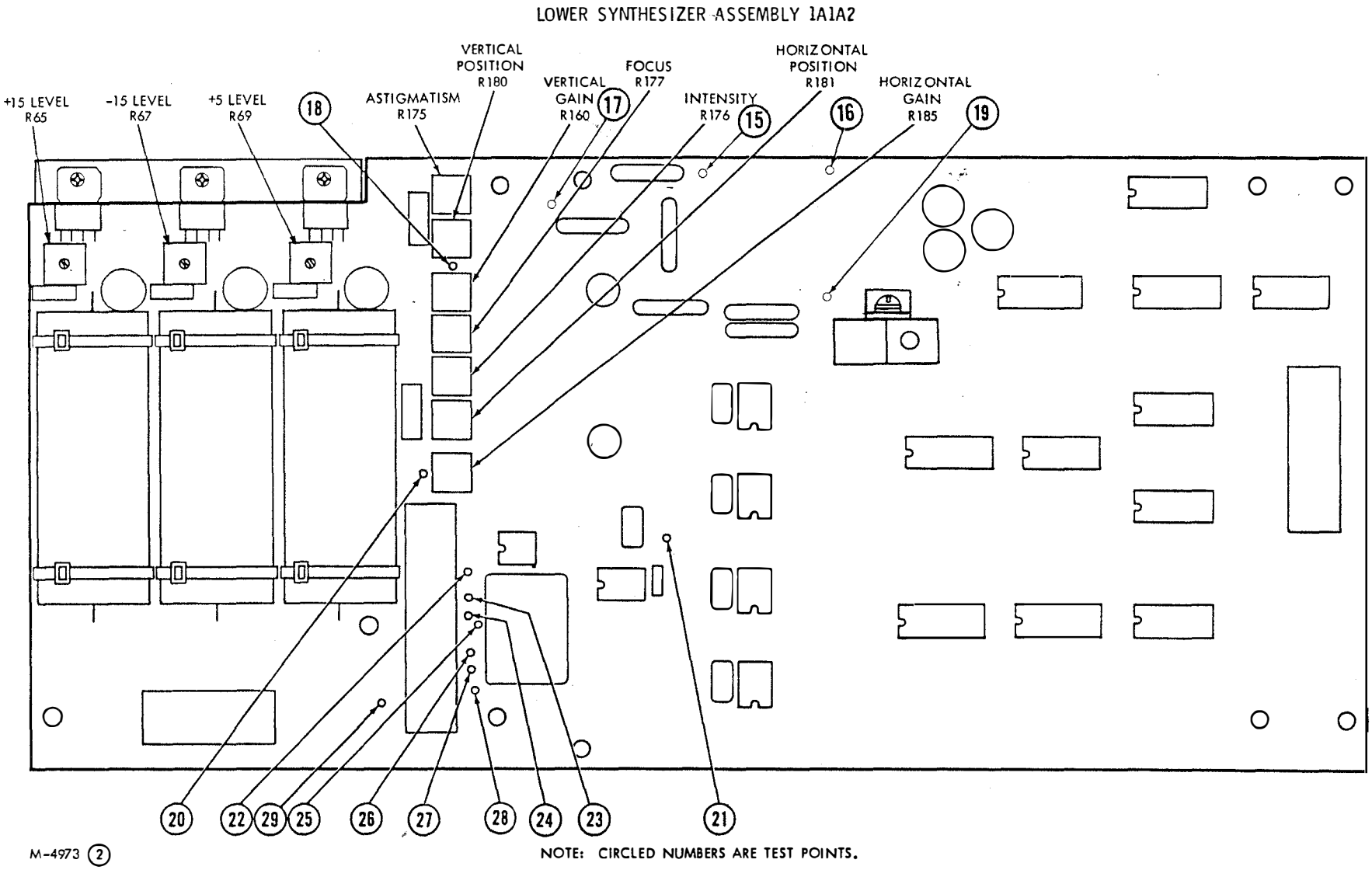


Figure 5-1. Test Points and Adjustment Controls (sheet 2 of 4 sheets)

UPPER DEMODULATOR ASSEMBLY 1A2A1

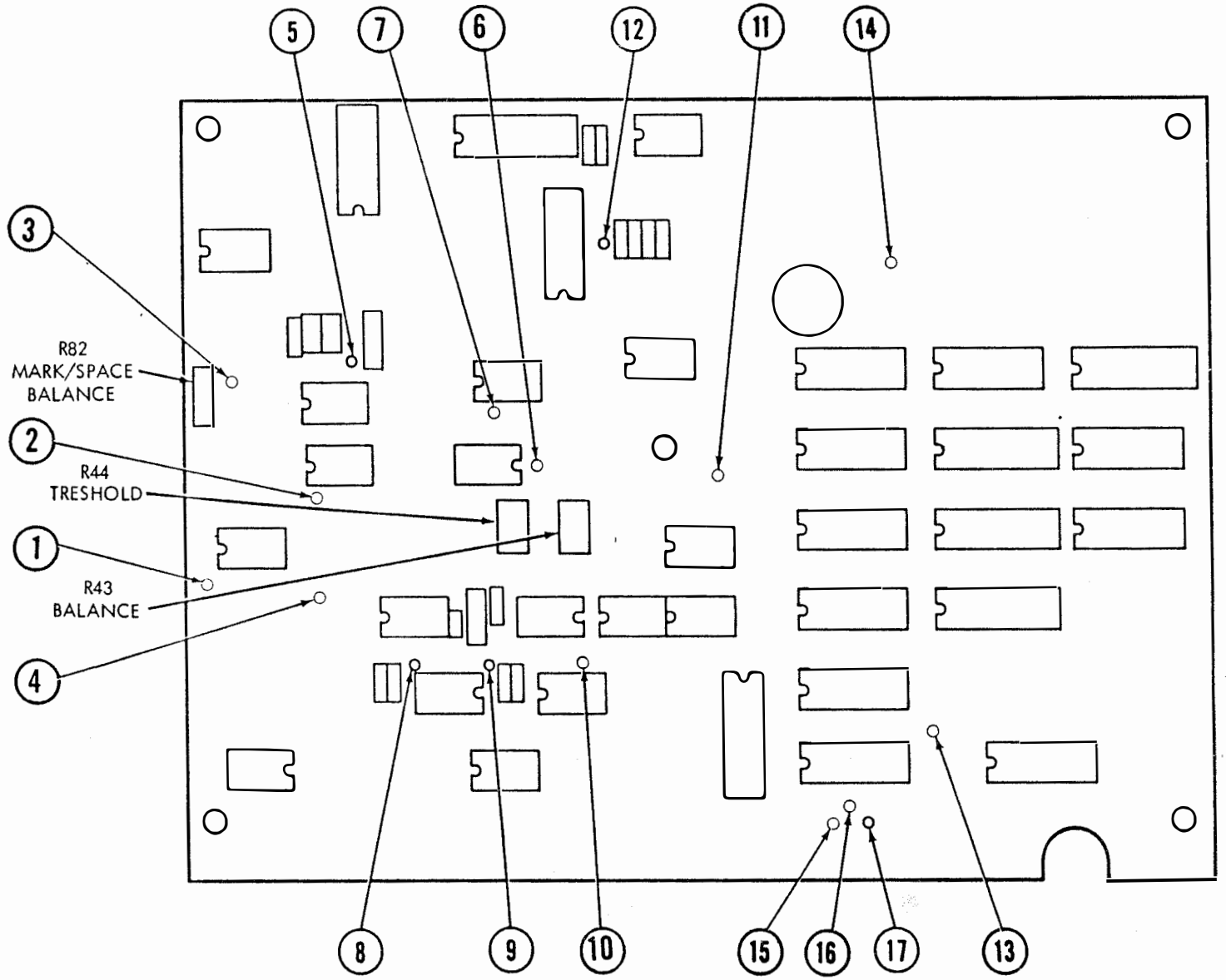


Figure 5-1. Test Points and Adjustment Controls
(sheet 3 of 4 sheets)

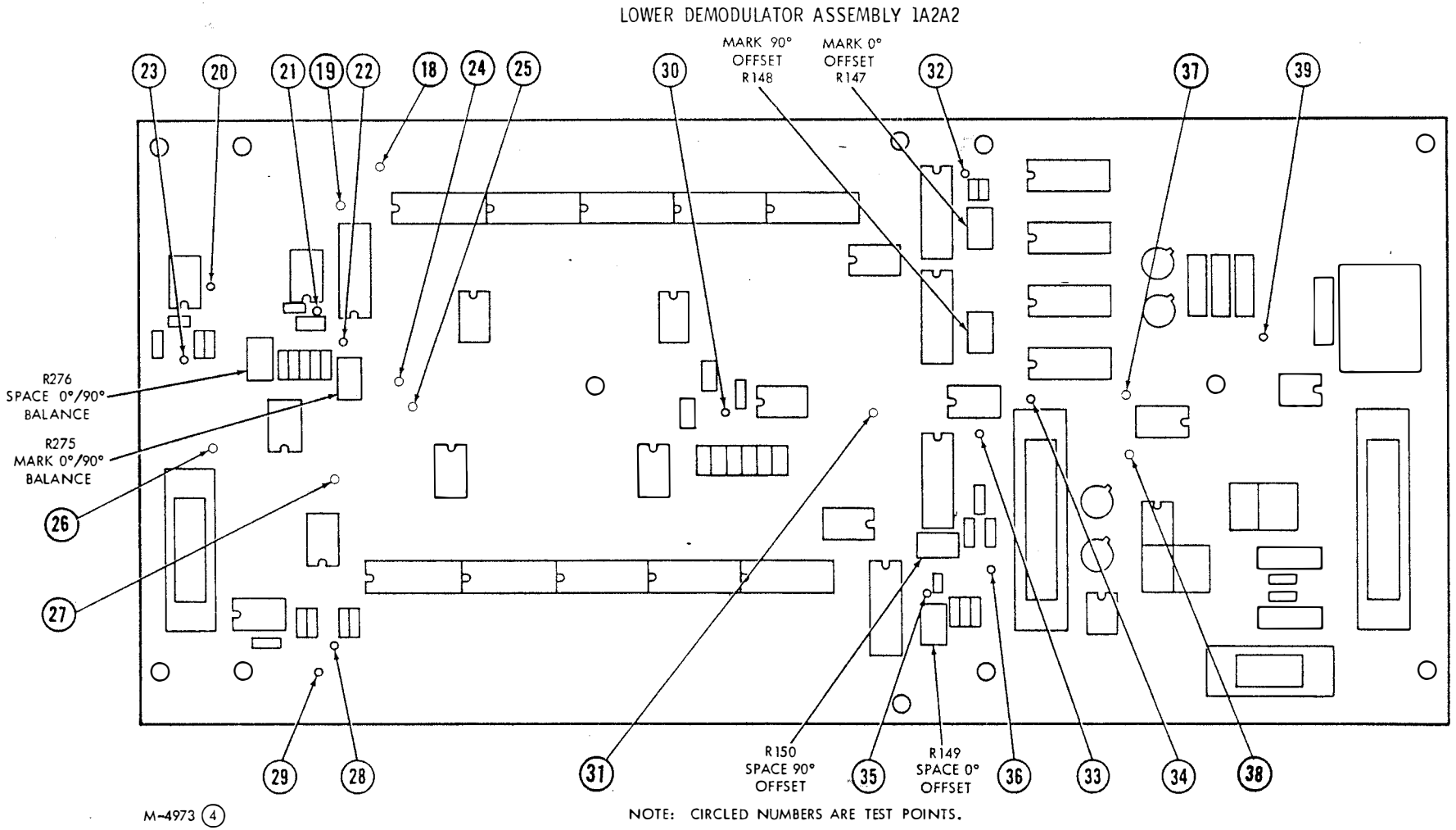


Figure 5-1. Test Points and Adjustment Controls (sheet 4 of 4 sheets)

5-8. TOOLS. The only tools required are those necessary for general electronic maintenance. No special tools are required.

5-9. OVERALL TROUBLESHOOTING

5-10. PRELIMINARY CHECK. A preliminary check of the equipment should be made before proceeding to the troubleshooting charts. The first and most natural step in troubleshooting is to analyze the symptoms of the equipment. Often the conclusions reached will aid the technician in selecting the test(s) that will help quickly locate the cause of trouble. The operator's maintenance tests in section III help in making this analysis. Normally, the malfunction can be traced to the receiver, the transmitter, the teletype equipment, or the converter.

5-11. When possible, use sensory tests, such as visually checking parts (fuses, resistors, capacitors, etc.) and smelling of odors or feeling for signs of overheating. Simple tests often will reveal the difficulty.

5-12. Malfunctions other than the result of faulty transmission, poor receiving conditions, or improper operating methods must be localized to one of the system components. If the evidence is not definite, a simple expedient is to substitute equipment known to be in proper operating condition for the suspected equipment.

5-13. The receiver may be tested independently by monitoring the audio output with a headset or loudspeaker and tuning in various signals.

5-14. The transmitter may be tested independently by voice modulating the carrier frequency.

5-15. The teletype equipment may be tested using signals from another source of known accuracy, such as another teletype circuit.

5-16. The best method of testing the converter is by recording its output with the associated teletype equipment.

5-17. During the test given in the following paragraphs, the converter is to be connected to a receiver and transmitter adjusted to receive and transmit fsk signals and teletype equipment

is to be connected to the output and input of the converter. The receiver, transmitter, and teletype equipment are to be in satisfactory operating condition.

5-18. CONTROL SETTINGS. Set the converter controls as follows:

CONTROL	SETTING
LEVEL	0
MODE	Select faulty baud position
DATA RATE	Select faulty baud position
AUTO/OPR/STANDBY	OPR
NORMAL/REVERSE	NORMAL
CLEAR/SECURE	CLEAR

5-19. SYSTEM TROUBLESHOOTING CHARTS. The system troubleshooting charts, tables 5-1 through 5-4, aid the technician in isolating a malfunction to a functional circuit. Refer to the overall functional schematic diagram, figure 5-2, and detailed maintenance schematic diagrams located in foldout section at back of manual during performance of the trouble-shooting procedure.

5-20. MALFUNCTION DURING SINGLE-RECEIVER OPERATION

5-21. If the equipment is rejected for malfunction during single-receiver operation, perform the procedures listed in tables 5-1 through 5-3 as applicable.

5-22. MALFUNCTION DURING DIVERSITY OPERATION

5-23. If the equipment is rejected for malfunction during diversity operation, proceed as follows:

1. Check each converter for single-receiver operation (paragraph 3-17). If operation is satisfactory, continue with step 2 below; if not, perform the procedure listed in tables 5-1 through 5-3 as applicable.

2. Perform steps in paragraph 3-23. If upon completion of the diversity check (listed in paragraph 3-23) the teletype equipment does not record properly, perform the steps in table 5-4.

5-24. MALFUNCTION DURING TRANSMIT OPERATION

5-25. If the equipment is rejected because of a malfunction during transmit operation, perform procedures listed in table 5-1, part F.

5-26. SIGNAL TRACING USING OSCILLOSCOPE PATTERNS

5-27. Tables 5-1 through 5-4 illustrate oscilloscope patterns to be used as guides during signal tracing. The detailed maintenance schematic diagrams in the foldout section at the back of the manual also provide additional oscilloscope patterns.

5-28. ALIGNMENT OF THE CONVERTER AFTER TROUBLESHOOTING

5-29. If repairs were made after troubleshooting the signal processing circuits, refer to paragraphs 6-24 through 6-29 for alignment procedures.

5-30. ARRANGEMENT OF TROUBLESHOOTING CHARTS.

5-31. Tables 5-1 through 5-4 provide step-by-step instructions for testing the various functions of the converter and troubleshooting to a functional circuit when an abnormal condition is observed at any of the functional test steps. Major test points are used for the functional tests and are listed in the test point column. Subordinate test points are also used to facilitate the troubleshooting steps. These are generally pins of components such as integrated circuits, resistors, capacitors, or connectors, but may include major test points. Tables 5-1 through 5-3 are broken down into subordinate parts in order to separate the major functional assemblies and circuits. The tables appear in the following order along with their individual subordinate breakdown:

Table 5-1. Frequency Shift Converter CV-3510A/UG, Functional Test and Troubleshooting Chart, Synthesizer Section.

Part A: Power Supply (including Power Harness)
Part B: Mark Frequency Circuit
Part C: Space Frequency Circuit
Part D: Data Rate Frequency Circuit
Part E: Second Mixer Frequency Circuit

Part F: Transmit and Retransmit Data Circuit

Part G: High Voltage Power Supply and Tuning Indicator Circuit

Table 5-2. Frequency Shift Converter CV-3510A/UG, Functional Test and Troubleshooting Chart, Demodulator Section.

Part A: Mark Frequency Function

Part B: Space Frequency Function

Part C: Mark and Space Frequency Function

Table 5-3 Frequency Shift Converter CV-3510A/UG, Front Panel Harness Troubleshooting Chart.

Part A: MODE Switch Circuit

Part B: DATA RATE Switch Circuit

Part C: TRANSMIT/OFF/RETRANSMIT Switch Circuit

Part D: NORMAL/REVERSE Switch Circuit

Part E: CLEAR/SECURE Switch Circuit

Table 5-4. Frequency Shift Converter CV-3510A/UG, Diversity Troubleshooting Chart

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section.

Part A: Power Supply (including Power Harness)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
SET-UP	NOTE See fig. 5-1 for location of all test points.	A. Connect fsk receiver to AUDIO INPUT jack (J7). B. Connect teletype equipment to appropriate OUTPUT jack (J8 or J9). Adjust receiver and converter for a single operation (paragraph 3-18, steps 1 through 11). NOTE In following measurement tests, all measurements are made in respect to chassis ground unless otherwise indicated.	Teletype equipment records readable copy.	Equipment is ready for normal operation.	Proceed to step 1.
1	21	Connect multimeter to TP21 on lower synthesizer assembly.	+15 ±0.5 Vdc	Proceed to step 2	Adjust R65 to obtain correct indication. If adjustment of R65 does not produce correct indication, proceed to step 3.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part A : Power Supply (including Power Harness) (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
2	22	Connect multimeter to TP22 on lower synthesizer assembly. **CAUTION** To prevent damage to regulators U40, U41, and U42, do not apply power to converter for more than 30 minutes when heat sink at right rear corner of lower synthesizer assembly is not securely attached to the chassis assembly.	-15 ±0.5 Vdc	Proceed to step 7	Adjust R67 to obtain correct indication. If adjustment of R67 does not produce correct indication, proceed to step 3. If adjustment of R67 produces correct indication, check TP21 (step 1) for its normal indication again and if necessary alternately adjust R65 and R67 to achieve a balanced condition.
3	--	Connect multimeter to pin 2 of U40.	+18.5 ±1.5 Vdc	Proceed to step 5	Proceed to step 4.
4	--	Connect oscilloscope to cathode of CR177.	50.0 ±5.0 Vac Peak to Peak	Check rectifiers CR178 and CR180. Replace as necessary. Repeat step 1.	Replace W1 power harness and repeat step 1. If replacement of W1 does not produce correct indication at step 1, replace transformer T1.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part A: Power Supply (including Power Harness) (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
5	--	Connect multimeter to pin 4 of U41.	-18.5 ±1.5 Vdc	Check voltage regulators U40 and U41 and associated components. Replace as necessary. Repeat step 1. If replacement of regulators does not produce correct indication at step 1, check for short circuits on synthesizer assembly circuit cards.	Proceed to step 6.
6	--	Connect oscilloscope to cathode of CR179.	50 ±5 Vac Peak to Peak	Check rectifiers CR177 and CR179. Replace as necessary. Repeat step 1.	Replace W1 power harness and repeat step 1. If replacement of W1 does not produce correct indication at step 1, replace transformer T1.
7	29	Connect multimeter to TP29 on lower synthesizer assembly.	+5 ±0.5 Vdc	Proceed to step 11	Adjust R69 to obtain correct indication. If adjustment of R69 does not produce correct indication, proceed to step 8.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part A: Power Supply (including Power Harness) (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
8	--	Connect multimeter to pin 2 of U42.	+8.5 ±1.5 Vdc	Check voltage regulator U42 and associated components. Replace components as necessary and repeat step 7. If replacement of regulator U42 does not produce correct indication, check for short circuits on synthesizer assembly circuit cards.	Proceed to step 9.
9	--	Connect oscilloscope to anode of CR181.	25.0 ±5.0 Vac peak to peak	Proceed to step 10.	Replace W1 power harness repeat step 7. If replacement of W1 does not produce correct indication, replace transformer T1.
10	--	Connect oscilloscope to anode of CR182.	25.0 ±5.0 Vac peak to peak	Check rectifiers CR181 and CR182. Replace as necessary and repeat step 7.	Replace W1 power harness repeat step 7.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section.

Part B: Mark Frequency Circuit

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
11	1	Connect frequency counter to TP1 on upper synthesizer assembly.	17.6904 MHz ±100 Hz	Proceed to Table 5-3, part A, step 1.	Adjust C6 to obtain correct indication. If adjustment of C6 does not produce correct indication, proceed to step 12.
12	--	Connect oscilloscope between pin 4 and pin 5 of U1.	AC waveform of same frequency as step 11 above but of much less amplitude. (Cannot be read on frequency counter).	Check U1 and associated components. Replace as necessary. Repeat step 11.	Replace crystal oscillator Y1 and repeat step 11.
13	2	Connect frequency counter to TP2 on upper synthesizer assembly. Set MODE switch per chart in Normal Indication Column.	MODE / Frequency (Hz): VLF 16000; LF 14640; HF 25200; MMM 25840 ✓	Proceed to step 22. 11.187	If the signal is missing at one or more settings of MODE switch, proceed to step 14. If signals are present at all MODE switch settings but any one or more is of incorrect frequency, proceed to step 18.
14	--	Connect frequency counter to pin 4 of U20A.	Same as step 13 above.	Check U20A and associated components. Replace as necessary and repeat step 13.	Proceed to step 15.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part B: Mark Frequency Circuit					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
15	--	Connect frequency counter to pin 6 of U13A.	17.6904 MHz ±100 Hz	Proceed to step 16.	Check U13A and associated components. Replace as necessary and repeat step 13.
16	--	Connect frequency counter to pin 15 of U5.	Same as step 13 above.	Proceed to step 17.	Check pin 15 of U4 for signal presence. If signal appears at this point, replace U5 and repeat step 13. Use similiar procedure to check U4, U3, and U2.
17	--	Connect frequency counter pin 12 of U16A.	Same as step 13 above.	Connect frequency counter to pin 7 of U17A. If signal is not present, replace U17 and repeat step 13.	Replace U16 and repeat step 13.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part B: Mark Frequency Circuit (Continued)

<table>
<tr><th>Step</th><th>Test Point</th><th>Procedure</th><th>Normal Indication</th><th>If Indication Is Normal</th><th>If Indication Is Abnormal</th></tr>
<tr><td>18</td><td>--</td><td>Set MODE switch to VLF. Connect multimeter to pins 3,4,5 and 6 of U2, U3, U4, and U5 as directed in Normal Indication column.</td><td>
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested*</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U2</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>U3</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>U4</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>U5</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
</table>
*0 = 0 ±1 Vdc
1 =+5 ±1 Vdc</td><td>Proceed to step 19.</td><td>Replace matrix component (diode CR49 through CR64) or jumper per following chart: (Repeat step 13).
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U2</td><td>--</td><td>--</td><td>CR51</td><td>Jmpr</td></tr>
<tr><td>U3</td><td>--</td><td>Jmpr</td><td>Jmpr</td><td>--</td></tr>
<tr><td>U4</td><td>CR57</td><td>CR58</td><td>CR59</td><td>--</td></tr>
<tr><td>U5</td><td>CR61</td><td>Jmpr</td><td>Jmpr</td><td>--</td></tr>
</table></td></tr>
<tr><td>19</td><td>--</td><td>Set MODE switch to LF. Connect multimeter to pins 3,4,5 and 6 of U2, U3, U4, and U5 as directed in Normal Indication column.</td><td>
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested*</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U2</td><td>1</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>U3</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>U4</td><td>1</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>U5</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
</table>
*0 = 0 ±1 Vdc
1 = +5 ±1 Vdc</td><td>Proceed to step 20.</td><td>Replace matrix component (diode CR33 through CR48) or jumper per following chart: (Repeat step 13).
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U2</td><td>--</td><td>CR34</td><td>CR35</td><td>Jmpr</td></tr>
<tr><td>U3</td><td>--</td><td>Jmpr</td><td>Jmpr</td><td>--</td></tr>
<tr><td>U4</td><td>--</td><td>--</td><td>--</td><td>CR44</td></tr>
<tr><td>U5</td><td>CR45</td><td>Jmpr</td><td>Jmpr</td><td>--</td></tr>
</table></td></tr>
</table>

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part B: Mark Frequency Circuit (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
20	--	Set MODE switch to HF. Connect multimeter to pins 3,4,5, and 6 of U2, U3, U4, and U5 as directed in Normal Indication column.	Pin Tested* Mckt: 3 4 5 6 U2: 1 1 1 0 U3: 1 0 0 1 U4: 0 1 0 0 U5: 1 0 0 1 *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Proceed to step 21.	Replace matrix component (diode CR17 through CR32) or jumper per the following chart: (Repeat step 13). Pin Tested Mckt: 3 4 5 6 U2: -- -- -- Jmpr U3: -- Jmpr Jmpr -- U4: CR25 -- CR27 CR28 U5: -- Jmpr Jmpr --
21	--	Set MODE switch to MMM. Connect multimeter to pins 3,4,5, or 6 of U2, U3, U4, or U5, as directed in Normal Indication column.	Pin Tested* Mckt: 3 4 5 6 U2: 0 0 ~~1~~ ~~0~~ U3: 1 0 0 0 U4: ~~1~~ ~~1~~ ~~0~~ 0 U5: ~~1~~ 0 0 ~~1~~ *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Return to step 17.	Replace matrix component (diode CR1 through CR16) or jumper per the following chart: (Repeat step 13). Pin Tested Mckt: 3 4 5 6 U2: CR1 CR2 -- Jmpr U3: -- Jmpr Jmpr CR8 U4: -- -- CR11 CR12 U5: -- Jmpr Jmpr --

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part B: Mark Frequency Circuit (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
22	25	Connect frequency counter to TP25 on lower synthesizer assembly. Set MODE switch per chart in Normal Indication column.	MODE / Frequency Hz: VLF 1000; LF 915; HF 1575; MMM 1615	Proceed to step 25.	Proceed to step 23.
23	--	Connect frequency counter to pin 3 of U31A.	Same as step 22 above.	Check U31 and associated components. Replace as necessary and repeat step 22.	Proceed to step 24.
24	--	Connect frequency counter to pin 2 of U26.	Same as step 22.	Check U26 and associated components. Replace as necessary and repeat step 22.	Check U37A, U37B, and U36. Replace as necessary and repeat step 22.
25	27	Connect frequency counter to TP27 of lower synthesizer assembly.	Same as step 22. NOTE This signal is nominally 90 degrees out of phase with that at step 22 Check with dual trace oscilloscope.	Proceed to step 28.	Proceed to step 26.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part B: Mark Frequency Circuit (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
26	--	Connect frequency counter to pin 3 of U32A.	Same as step 22. NOTE This signal is nominally 90 degrees out of phase with that at step 22 Check with dual trace oscilloscope.	Check U32 and associated components. Replace as necessary and repeat step 25.	Proceed to step 27.
27	--	Connect frequency counter to pin 2 of U27.	Same as step 22. NOTE This signal is nominally 90 degrees out of phase with that at step 22 Check with dual trace oscilloscope.	Check U27 and associated components. Replace as necessary and repeat step 25.	Check U26 and associated components. Replace as necessary and repeat step 25.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section.

Part C: Space Frequency Circuit

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
28	3	Connect frequency counter to TP3 on upper synthesizer assembly. Set MODE switch per chart in Normal Indication column.	MODE: VLF — Frequency Hz: 16,800; LF: 17,360; HF: 38,800; MMM: 28,560	Proceed to step 37.	If signal is missing at any one or all settings of MODE switch, proceed to step 29. If signal is present but incorrect at any one or all settings of MODE switch, proceed to step 33.
29	--	Connect frequency counter to pin 12 of U20B.	Same as step 28 above.	Check U20B and associated components. Replace as necessary and repeat step 28.	Proceed to step 30.
30	--	Connect frequency counter to pin 8 of U13B.	17.6904 MHz ±100 Hz	Proceed to step 31.	Replace U13 and repeat step 28.
31	--	Connect frequency counter to pin 15 of U9.	Same as step 28 above.	Proceed to step 32.	Check pin 15 of U8 for signal presence. If signal appears at this point, replace U9 and repeat step 28. Use similar procedure to check U8, U7, and U6.
32	--	Connect frequency counter to pin 6 of U16B.	Same as step 28 above.	Check for signal at pin 7 of U18A. If signal is not present, replace U18 and repeat step 28.	Replace U16 and repeat step 28.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part C: Space Frequency Circuit

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
33	--	Set MODE switch to VLF. Connect multimeter to pins 3,4,5, and 6 of U6, U7, U8, and U9 as directed in Normal Indication column.	Pin Tested* Mckt / 3 / 4 / 5 / 6 U6: 0 / 1 / 1 / 0 U7: 0 / 0 / 1 / 0 U8: 1 / 0 / 0 / 1 U9: 0 / 0 / 0 / 1 *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Proceed to step 34.	Replace matrix component (diode CR113 through CR128) or jumper per following chart: (Repeat step 28). Pin Tested Mckt / 3 / 4 / 5 / 6 U6: CR113 / -- / -- / Jmpr U7: Jmpr / Jmpr / -- / CR120 U8: -- / CR122 / CR123 / -- U9: CR125 / Jmpr / Jmpr / --
34	--	Set MODE switch to LF. Connect multimeter to pins 3,4,5, and 6 of U6, U7, U8, and U9 as directed in Normal Indication column.	Pin Tested* Mckt / 3 / 4 / 5 / 6 U6: 0 / 0 / 0 / 0 U7: 0 / 0 / 0 / 1 U8: 1 / 0 / 0 / 1 U9: 0 / 0 / 0 / 1 *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Proceed to step 35.	Replace matrix component (diode CR97 through CR112) or jumper per following chart: (Repeat step 28). Pin Tested Mckt / 3 / 4 / 5 / 6 U6: CR97 / CR98 / CR99 / Jmpr U7: Jmpr / Jmpr / CR103 / -- U8: -- / CR106 / CR107 / -- U9: CR109 / Jmpr / Jmpr / --

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part C: Space Frequency Circuit (Continued)

<table>
<tr><th>Step</th><th>Test Point</th><th>Procedure</th><th>Normal Indication</th><th>If Indication Is Normal</th><th>If Indication Is Abnormal</th></tr>
<tr><td>35</td><td>--</td><td>Set MODE switch to HF. Connect multimeter to pins 3,4,5, and 6 of U6, U7, U8, and U9 as directed in Normal Indication column.</td><td>
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested*</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U6</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>U7</td><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>U8</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>U9</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
</table>
*0 = 0 ±1 Vdc
1 = +5 ±1 Vdc</td><td>Proceed to step 36.</td><td>Replace matrix component (diode CR81 through CR 96) or jumper per following chart: (Repeat step 28)
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U6</td><td>--</td><td>--</td><td>CR83</td><td>Jmpr</td></tr>
<tr><td>U7</td><td>Jmpr</td><td>Jmpr</td><td>--</td><td>CR88</td></tr>
<tr><td>U8</td><td>--</td><td>CR90</td><td>--</td><td>CR92</td></tr>
<tr><td>U9</td><td>--</td><td>Jmpr</td><td>Jmpr</td><td>--</td></tr>
</table></td></tr>
<tr><td>36</td><td>--</td><td>Set MODE switch to MMM. Connect multimeter to pins 3,4,5, and 6 of U6, U7, U8 and U9 as directed in Normal Indication column.</td><td>
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested*</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U6</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>U7</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>U8</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>U9</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
</table>
*0 = 0 ±1 Vdc
1 = +5 ±1 Vdc</td><td>Proceed to step 37.</td><td>Replace matrix component (diode CR65 through CR 80) or jumper per following chart (Repeat step 28).
<table>
<tr><th rowspan="2">Mckt</th><th colspan="4">Pin Tested</th></tr>
<tr><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>U6</td><td>CR65</td><td>CR66</td><td>CR67</td><td>Jmpr</td></tr>
<tr><td>U7</td><td>Jmpr</td><td>Jmpr</td><td>CR71</td><td>--</td></tr>
<tr><td>U8</td><td>--</td><td>--</td><td>CR75</td><td>CR76</td></tr>
<tr><td>U9</td><td>--</td><td>Jmpr</td><td>Jmpr</td><td>--</td></tr>
</table></td></tr>
</table>

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part C: Space Frequency Circuit (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
37	26	Connect frequency counter to TP26 on lower synthesizer assembly. Set MODE switch per chart in Normal Indication column.	MODE / Frequency Hz: VLF 1050; LF 1085; HF 2425; MMM 1785	Proceed to step 40.	Proceed to step 38.
38	--	Connect frequency counter to pin 3 of U34A on lower synthesizer assembly.	Same as step 37 above.	Check U34 and associated components. Replace as necessary and repeat step 37.	Proceed to step 39.
39	--	Connect frequency counter to pin 2 of U29 on lower synthesizer assembly.	Same as step 37 above.	Check U29 and associated components. Replace as necessary and repeat step 37.	Check U37 and U25. Replace as necessary and repeat step 37.
40	28	Connect frequency counter to TP28 on lower synthesizer assembly.	Same as step 37. NOTE This signal is nominally 90 degrees out of phase with that at TP26. Check with dual-trace oscilloscope.	Proceed to table 5-3, part B, step 5.	Proceed to step 41.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part C: Space Frequency Circuit (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
41	--	Connect frequency counter to pin 3 of U35A.	Same as step 37. NOTE This signal is nominally 90 degress out of phase with that at TP26. Check with dual-trace oscilloscope.	Check U35 and associated components. Replace as necessary and repeat step 40.	Proceed to step 42.
42	--	Connect frequency counter to pin 2 of U30.	Same as step 37. NOTE This signal is nominally 90 degrees out of phase with that at TP26. Check with dual-trace oscilloscope.	Check U30 and associated components. Replace as necessary and repeat step 40.	Replace U29 and repeat step 40.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section.

PART D: Data Rate Frequency Circuit					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
43	6	Connect frequency counter to TP6 on upper synthesizer assembly. Set DATA RATE selector per chart in Normal Indication column.	DATA RATE / Frequency (Hz): 45.5 / 58,968; 50 / 64,800; 75 / 97,200	Proceed to step 51.	If any signal is not present proceed to step 44. If signal is present but incorrect, proceed to step 48.
44	--	Connect frequency counter to pin 4 of U21.	Same as step 43 above.	Check U21 and associated components. Replace as necessary and repeat step 43.	Proceed to step 45.
45	--	Connect frequency counter to pin 11 of U13C.	17.6904 MHz ±100 Hz	Proceed to step 46.	Check U13C. Replace if faulty and repeat step 43.
46	--	Connect frequency counter to pin 15 of U12.	Same as step 43 above.	Proceed to step 47.	Check for signal at pin 15 of U11. If signal is present, check U12 and replace if faulty. Repeat step 43. Use similar procedure to check U11 and U10.
47	--	Connect frequency counter to pin 8 of U16C.	Same as step 43 above.	Check for signal at pin 7 of U19. If signal is not present, replace U19 and repeat step 43.	Check U13C and replace if faulty. Repeat step 43.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part D: Data Rate Frequency Circuit (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
48	--	Set DATA RATE switch to 45.5. Connect multimeter to pins 3,4,5, and 6 of U10, U11, and U12 as directed in Normal Indication column.	Pin Tested* Mckt / 3 / 4 / 5 / 6 U10: 1 0 0 1 U11: 1 0 0 1 U12: 0 1 1 0 *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Proceed to step 49.	Replace matrix component (diode CR141 through CR152) or jumper per following chart: (Repeat step 43). Pin Tested Mckt / 3 / 4 / 5 / 6 U10: -- / CR142 / CR143 / -- U11: -- / CR146 / Jmpr / -- U12: CR149 / -- / -- / CR152
49	--	Set DATA RATE switch to 50.0. Connect multimeter to pin 3,4,5, and 6 of U10, U11, and U12 as directed in Normal Indication.	Pin Tested* Mckt / 3 / 4 / 5 / 6 U10: 0 1 1 0 U11: 0 1 0 0 U12: 1 1 1 0 *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Proceed to step 50.	Replace matrix component (diode CR153 through CR164) or jumper per following chart: (Repeat step 43). Pin Tested Mckt / 3 / 4 / 5 / 6 U10: CR153 / -- / -- / CR156 U11: CR157 / -- / Jmpr / CR160 U12: -- / -- / -- / CR164

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Part D: Data Rate Frequency Circuit (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
50	--	Set DATA RATE switch to 75.0. Connect multimeter to pin 3,4,5 and 6 of U10, U11, and U12 as directed in Normal Indication.	Pin Tested* Mckt / 3 / 4 / 5 / 6 U10: 1 / 1 / 1 / 0 U11: 1 / 0 / 0 / 0 U12: 0 / 0 / 0 / 1 *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Repeat step 43.	Replace matrix component (diode CR168 through CR175) or jumper per following chart: (Repeat step 43). Pin Tested Mckt / 3 / 4 / 5 / 6 U10: -- / -- / -- / CR168 U11: -- / CR170 / Jmpr / CR172 U12: CR173 / CR174 / CR175 / --

Part E: Second Mixer Frequency Circuit

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
51	4	Connect frequency counter to TP4 on upper synthesizer assembly.	2159 ±5 Hz	Proceed to step 56.	Proceed to step 52.
52	--	Connect frequency counter pin 3 of U13D.	17.6904 MHz ±100 Hz	Proceed to step 53.	Check U13. Replace if faulty and repeat step 51.
53	--	Connect frequency counter to pin 10 of U22B.	4.422600 MHz ±100 Hz	Proceed to step 54.	Check U22. Replace if faulty and repeat step 51.
54	--	Connect frequency counter to pin 10 of U23B	1.105650 MHz +100Hz	Proceed to step 55.	Check U23. Replace if faulty and repeat step 51.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
Part E: Second Mixer Frequency Circuit (Continued)					
55	--	Connect frequency counter pin 3 of U14.	8.637KHz ±20Hz	Check U15A. Replace if faulty and repeat step 51.	Check U14 and associated components. Replace as necessary and repeat step 51.
56	5	Connect frequency counter to TP5 on upper synthesizer assembly.	2159 ±5 Hz	Proceed to Table 5-3, part C, step 8.	Check U15. Replace if faulty and repeat step 56.
Part F: Transmit and Retransmit Data Circuit					
57	23 and 24	Connect oscilloscope probe to TP24 and ground to TP23 on lower synthesizer assembly.	Oscilloscope waveform as follows:  NOTE: Mark or space frequency depends on data input.	If no faults have been encountered with the display indicator and/or high voltage circuitry, proceed to table 5-2, step 1. Otherwise proceed to part G, step 64	Proceed to step 58.
58	--	Connect oscilloscope probe to pin 7 of U33B.	Same as step 57 above.	Check transformer T1. Replace if faulty and repeat step 57.	Proceed to step 59.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section. (Continued)

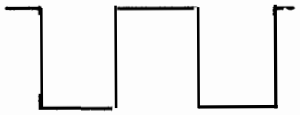
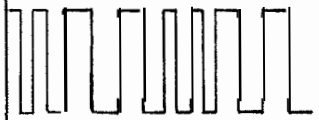
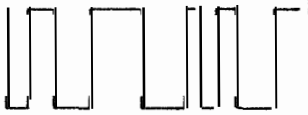
Part F: Transmit and Retransmit Data Circuit (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
59	--	Connect oscilloscope probe to pin 3 of U33A.	Same as step 57 above.	Check U33 and associated components. Replace as necessary and repeat step 57.	Proceed to step 60.
60	--	Connect multimeter to pin 11 of U38D.	+5 ±1 Vdc	Proceed to step 61.	Check U38D and associated components. Replace as necessary and repeat step 57.
61	--	Connect oscilloscope probe to pin 9 of U39D.	Oscilloscope waveform: 	Proceed to step 62.	Check for faulty Demodulator Assembly by performing procedure in Table 5-2. After fault in Demodulator Assembly is corrected, repeat step 57.
62	--	Connect oscilloscope probe to pin 4 of U39B.	Oscilloscope waveform: 	Proceed to step 63.	Check U39 and associated components. Replace as necessary and repeat step 57.
63	--	Connect oscilloscope probe to pin 2 of U28.	Oscilloscope waveform: 	Check U28 and associated components and repeat step 57.	Check U38. Replace if faulty and repeat step 57.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

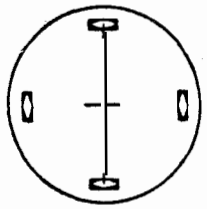
Part G: High Voltage Power Supply and Tuning Indicator Circuit.					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
64	--	Connect jumper between AUDIO OUTPUT jack (J6) pin A and AUDIO INPUT jack (J7) pin A. Connect a jumper also between pins B likewise. Set MODE switch to HF; TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT; NORMAL/REVERSE switch to NORMAL; AUTO/OPR/STANDBY switch to OPR; and connect oscilloscope probe to AUDIO OUTPUT jack (J6) pin A and ground clip to pin B.	Oscilloscope waveform: sine wave at frequency of 1575 Hz.	Proceed to step 65.	Disconnect jumper between J6-A and J7-A. Connect oscilloscope to TP25 (located on lower synthesizer circuit card). If the indication is normal per Normal Indication column, connect a jumper between TP25 and pin A of AUDIO INPUT jack (J7) and proceed to step 65. If the signal is not normal at TP25, troubleshoot the synthesizer assembly per table 5-1, part A.
65	--	Observe tuning indicator display.	Tuning Display: 	Proceed to step 86.	Adjust the following internal controls as required to obtain correct indication: R175 - Astigmatism R176 - Intensity R177 - Focus R160 - Vertical Gain R180 - Vertical Position R181 - Horizontal Position If adjustments do not produce correct indication, proceed to step 66.

Table 5-1. Frequency Shift Conver[illegible] CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

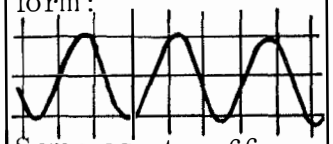
Part G: High Voltage Power Supply and Tuning Indicator Circuit. (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
66	18	Connect oscilloscope to TP18 on lower synthesizer assembly.	Oscilloscope waveform: 	Proceed to step 69.	Proceed to step 67.
67	28 (on lower demodulator assembly).	Connect oscilloscope to TP28 on lower demodulator assembly.	Same as step 66 above.	Proceed to step 68.	Troubleshoot demodulator assembly per table 5-2, part A and repeat step 65.
68	--	Connect oscilloscope to pin 7 of U68 on synthesizer assembly.	Same as step 66 above.	Replace cable assembly W2 and repeat step 65.	Check U68 and associated components. Replace as necessary and repeat step 65.
69	20	Connect oscilloscope to TP20 on lower synthesizer assembly.	Oscilloscope display of straight horizontal line (with slight ac component possible) centered on zero baseline having no dc component.	Proceed to step 72.	Proceed to step 70.
70	29 (on lower demodulator assembly).	Connect oscilloscope to TP29 on lower demodulator assembly.	Same as step 69 above.	Proceed to step 71.	Troubleshoot demodulator assembly per table 5-2, part A and repeat step 65.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

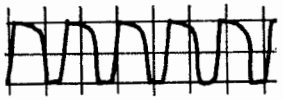
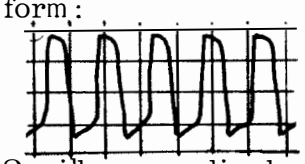
Part G: High Voltage Power Supply and Tuning Indicator Circuit. (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
71	--	Connect oscilloscope to pin 1 of U68 on synthesizer assembly.	Same as step 69 above.	Replace cable assembly W2 and repeat step 65.	Check U68 and associated components. Replace as necessary and repeat step 65.
72	16	Connect oscilloscope to TP16 on lower synthesizer assembly.	Oscilloscope waveform: 	Proceed to step 73.	Check high voltage transformer T2 and associated components. Replace as necessary and repeat step 65.
73	19	Connect oscilloscope to TP19 on lower synthesizer assembly.	Oscilloscope waveform: 	Proceed to step 74.	Check transistor Q7 and associated components. Replace as necessary and repeat step 65.
74	15	Connect oscilloscope to TP15 on lower synthesizer assembly.	Oscilloscope display of waveform similar in shape to step 73 above but of high P-P amplitude (approximately 400 V peak-to-peak).	Proceed to step 75.	Check high voltage transformer T2 and associated components. Replace as necessary and repeat step 65.
75	17	Connect oscilloscope to TP17 on lower synthesizer assembly.	Oscilloscope display of straight horizontal line (some ac component possible) having a positive d.c. level of approximately 360 Vdc.	Proceed to step 76.	Check CR184 and associated components. Replace as necessary and repeat step 65.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

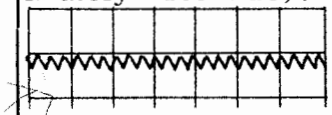
Part G: High Voltage Power Supply and Tuning Indicator Circuit (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
76	--	Connect oscilloscope to E2 on lower synthesizer assembly.	Oscilloscope display of horizontal line with negative polarity and amplitude of approximately -630 Vdc (with some ac component possible).	Proceed to step 77.	Check CR185, CR186, and associated components. Replace as necessary and repeat step 65.
77	--	Connect oscilloscope to E9 on lower synthesizer assembly.	Oscilloscope waveform: (at positive dc level of approximately +100 Vdc). 	Proceed to step 78.	Check transistors Q3, Q6, and associated components. Replace as necessary and repeat step 65.
78	--	Connect oscilloscope to E10 on lower synthesizer assembly.	Same as step 77 above.	Proceed to step 79.	Check transistors Q4, Q6 and associated components. Replace as necessary and repeat step 65.
79	--	Connect oscilloscope to E7 on lower synthesizer assembly.	Oscilloscope waveform: (at average positive dc amplitude of approximately 100 Vdc). 	Proceed to step 80.	Check Q1, Q5, and associated components. Replace as necessary and repeat step 65.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

Part G: High Voltage Power Supply and Tuning Indicator Circuit (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
80	--	Connect oscilloscope to E6 on lower synthesizer assembly.	Same as step 79 above.	Proceed to step 81.	Check transistor Q2, Q5, and associated components. Replace as necessary and repeat step 65.
81	--	Connect oscilloscope to E1 on lower synthesizer assembly.	Oscilloscope display of horizontal line with approximately -500 Vdc level (with tuning indicator heater ac voltage superimposed).	Proceed to step 82.	Turn POWER switch to OFF and disconnect W1P7 from 1A1A2J7 temporarily. Check continuity of transformer W1T1 filament winding circuit at P7 pins 8 and 9 (pin 7 centertap). Replace transformer T1 if faulty and repeat step 65.
82	--	Connect oscilloscope to E12 on lower synthesizer assembly.	Same as step 81 above.	Proceed to step 83.	Same as step 81 above.
83	--	Connect oscilloscope to E4 on lower synthesizer assembly.	Oscilloscope display of horizontal line (slight ac component possible) with a negative dc level that varies with adjustment of R177 focus control.	Proceed to step 84.	Check R177 (focus) R176 (intensity) and associated components. Replace as necessary and repeat step 65.
84	--	Connect oscilloscope to E3 on lower synthesizer assembly.	Same as step 83 above except varies with adjustment of R176 intensity control.	Proceed to step 85.	Check U45, R176 and associated components. Replace as necessary and repeat step 65.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

Part G: High Voltage Power Supply and Tuning Indicator Circuit (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
85	--	Connect oscilloscope to E8 on lower synthesizer assembly.	Same as step 83 above except varies with adjustment of R175 astigmatism control.	Replace tuning indicator (cathode ray tube) and repeat step 65.	Replace R175 and repeat step 65.
86	--	Set TRANSMIT/OFF/RE-TRANSMIT switch to TRANSMIT.	Oscilloscope waveform: Sine wave at frequency of 2425 Hz. AT pin A, B J-6	Proceed to step 87.	Disconnect jumper between J6-A and J7-A. Connect oscilloscope to TP26, (located on lower synthesizer circuit card). If the indication is normal per Normal Indication column, connect a jumper between TP26 and pin A of AUDIO INPUT jack (J7) and proceed to step 87. If the signal is not normal at TP26 troubleshoot the synthesizer assembly per table 5-1, Part B.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

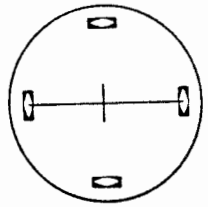
Part G: High Voltage Power Supply and Tuning Indicator Circuit (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
87	--	Observe tuning indicator display.	Tuning Display: 	Synthesizer section is operating normally.	Adjust the following internal controls as required to obtain correct indication: R175 - Astigmatism R176 - Intensity R177 - Focus R185 - Horizontal Gain R180 - Vertical Position R181 - Horizontal Position If adjustments do not produce correct indication, proceed to 88.
88	18	Connect oscilloscope to TP18 on lower synthesizer assembly.	Oscilloscope display of straight horizontal line (with slight ac component possible) centered on on zero baseline having no dc component.	Proceed to step 91.	Proceed to step 89.
89	28 (on lower demodulator assembly).	Connect oscilloscope to TP28 on lower demodulator assembly.	Same as step 88 above.	Proceed to step 90.	Troubleshoot demodulator assembly per table 5-2, part B and repeat step 87.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

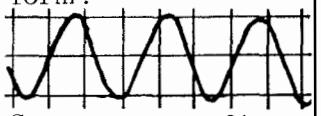
Part G: High Voltage Power Supply and Tuning Indicator Circuit (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
90	--	Connect oscilloscope to pin 7 of U68 on synthesizer assembly.	Same as step 88 above.	Replace cable assembly W2 and repeat step 87.	Check U68 and associated components. Replace as necessary and repeat step 87.
91	20	Connect oscilloscope to TP20 on lower synthesizer assembly.	Oscilloscope waveform: 	Proceed to step 94.	Proceed to step 92.
92	29 (on lower demodulator assembly).	Connect oscilloscope to TP29 on lower demodulator assembly.	Same as step 91 above.	Proceed to step 93.	Troubleshoot demodulator assembly per table 5-2, part B and repeat step 87.
93	--	Connect oscilloscope to pin 1 of U68.	Same as step 91 above.	Replace cable assembly W2. Repeat step 87.	Check U68 and associated components. Replace as necessary and repeat step 87.
94	--	Perform steps 72 through 76 above.	See steps 72 through 76.	Proceed to step 95.	See steps 72 through 76 except repeat step 87.

Table 5-1. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Synthesizer Section (Continued)

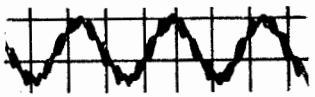
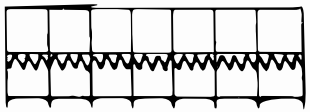
Part G: High Voltage Power Supply and Tuning Indicator Circuit (Cont.)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
95	--	Connect oscilloscope to E9 on lower synthesizer assembly.	Oscilloscope waveform: (at average positive dc amplitude of approximately 100 Vdc). 	Proceed to step 96.	Check Q3, Q6, and associated components. Replace as necessary and repeat step 87.
96	--	Connect oscilloscope to E10 on lower synthesizer assembly.	Same as step 95 above.	Proceed to step 97.	Check Q4, Q6, and associated components. Replace as necessary and repeat step 87.
97	--	Connect oscilloscope to E7 on lower synthesizer assembly.	Oscilloscope waveform: (at positive dc level of approximately +100 Vdc) 	Proceed to step 98.	Check Q1, Q5, and associated components. Replace as necessary and repeat step 87.
98	--	Connect oscilloscope to E6 on lower synthesizer assembly.	Same as step 97 above.	Proceed to step 99.	Check Q2, Q5, and associated components. Replace as necessary and repeat step 87.
99	--	Perform steps 81 through 85 above.	Same as steps 81 through 85 above.	Same as steps 81 through 85 above, except when instructed to repeat step 65, substitute step 87.	Same as steps 81 through 85 except when instructed to repeat step 65, substitute step 87.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section

Part A: Mark Frequency Function					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
1	--	Connect jumper between AUDIO OUTPUT jack (J6) pin A and AUDIO INPUT jack (J7) pin A. Connect a jumper also between pins B likewise. Set MODE switch to HF; TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT; NORMAL/REVERSE switch to NORMAL; AUTO/OPR/STANDBY switch to OPR; CLEAR/SECURE switch to CLEAR and connect oscilloscope probe to AUDIO OUTPUT jack (J6) pin A and ground clip to pin B.	Oscilloscope waveform: sine wave at frequency of 1575 Hz.	Proceed to step 2.	Disconnect jumper between J6-A and J7-A. Connect oscilloscope to TP25 (located on lower synthesizer circuit card). If the indication is normal per Normal Indication column, connect a jumper between TP25 and pin A of AUDIO INPUT jack (J7) and proceed to step 2. If the signal is not normal at TP25, troubleshoot the synthesizer assembly per table 5-1. NOTE: An alternate method for expediting troubleshooting of demodulator assembly, if synthesizer assembly is faulty, is as follows: Connect output of an audio frequency signal generator to AUDIO INPUT jack J7. Set generator for a frequency

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
					of 1575 Hz at an amplitude of 18VP-P (sine wave) and proceed to step 2.
2	30	Connect oscilloscope to TP30 on lower demodulator assembly.	Same as step 1 above.	Proceed to step 6.	Adjust LEVEL control to obtain correct indication. If adjusting LEVEL control does not produce correct indication proceed to step 3.
3	--	Connect oscilloscope to R132.	Same as step 1 above.	Check U55 and associated components. Replace as necessary and repeat step 2.	Proceed to step 4.
4	--	Connect oscilloscope across R156 on lower demodulator assembly (polarity not significant).	Same as step 1 above.	Check front panel harness and W3R1 (LEVEL control). Repair or replace as necessary and repeat step 2.	Proceed to step 5.
5	--	Connect oscilloscope probe to pin 25 of W4P1 and ground clip to pin 23.	Same as step 1 above.	Replace audio transformer T1 and repeat step 2.	Check jumper connections (step 1).

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
6	32	Connect oscilloscope to TP32 on lower demodulator assembly.	18VP-P sine wave (1575 Hz).	Proceed to step 8.	Proceed to step 7.
7	25 (syn assem).	Connect oscilloscope to TP25 on lower synthesizer assembly.	Same as step 6 above.	Check W2 cable (synthesizer/demodulator cable). Replace if faulty and repeat step 6.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 6.
8	33	Connect oscilloscope to TP33 on lower demodulator assembly.	18VP-P sine wave (1575 Hz).	Proceed to step 10.	Proceed to step 9.
9	27 (syn assem).	Connect oscilloscope to TP27 on lower synthesizer assembly.	Same as step 8 above.	Check W2 cable (synthesizer/demodulator cable) Replace if faulty. and repeat step 8.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 8.
10	32 and 33	Connect oscilloscope channel A to TP32 and channel B to TP33.	18VP-P sine waves with 90 degree phase difference.	Proceed to step 11.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 10.
11	35	Connect oscilloscope to TP35 on lower demodulator assembly.	18VP-P sine wave (2425 Hz).	Proceed to step 13.	Proceed to step 12.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
12	26 (syn assem).	Connect oscilloscope to TP26 on lower synthesizer assembly.	Same as step 11 above.	Replace W2 cable (synthesizer/demodulator cable) and repeat step 11.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 11.
13	36	Connect oscilloscope to TP36 on lower demodulator assembly.	Same as step 11 above.	Proceed to step 15.	Proceed to step 14.
14	28 (syn assem).	Connect oscilloscope to TP28 on lower synthesizer assembly.	Same as step 11 above.	Replace W2 cable (synthesizer/demodulator cable and repeat step 13.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 13.
15	35 and 36	Connect oscilloscope channel A to TP35 and channel B to TP36.	Same as step 11 except signals display a 90 degree phase difference.	Proceed to step 16.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 15.
16	--	Connect multimeter to pins 10, 9 and 6 of U69 through U78 per chart in Normal Indication column.		Proceed to step 17.	Check and replace matrix component (diode CR8 through CR15 as follows: (Repeat step 16)

	Pin Tested *		
MODE	10	9	6
VLF	0	0	0
LF	1	0	0
HF	1	1	0
MMM	0	1	0

* 0 = 0± 1 Vdc
1 = +5±1 Vdc

	Pin Tested		
MODE	10	9	6
VLF	CR13	CR14	CR15
LF		CR11	CR12
HF			CR 8
MMM	CR 9		CR10

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

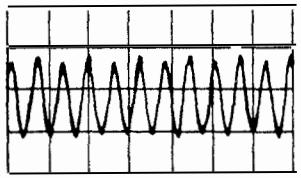
Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
17	19	Connect oscilloscope to TP19 on lower demodulator assembly. Set MODE switch to HF.	Oscilloscope display of straight horizontal line either above or below zero base line (polarity not significant) with slight ac component possible.	Proceed to step 21.	Proceed to step 18.
18	--	Connect oscilloscope to pin 3 of U71B.	Same as step 17 above.	Check U62(A) and U75 and associated components. Replace as necessary and repeat step 17.	Proceed to step 19.
19	--	Connect oscilloscope to pin 3 of U69B.	Same as step 17 above.	Check U60(A) and U71 and associated components. Replace as necessary and repeat step 17.	Proceed to step 20.
20	--	Connect oscilloscope to pin 2 of U89.	Oscilloscope waveform: 	Check U58(A) and U69 and associated components. Replace as necessary and repeat step 17.	Check U89 and associated components. Replace as necessary and repeat step 17.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

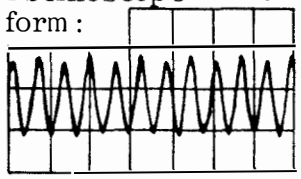
Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
21	18	Connect oscilloscope to TP18 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (polarity about baseline insignificant) but with slight ac component possible.	Proceed to step 25.	Proceed to step 22.
22	--	Connect oscilloscope to pin 3 of U72.	Same as step 21 above.	Check U62(B) and U76 and associated components. Replace as necessary and repeat step 21.	Proceed to step 23.
23	--	Connect oscilloscope to pin 13 of U69.	Same as step 21 above.	Check U60(B) and U72 and associated components. Replace as necessary and repeat step 21.	Proceed to step 24.
24	--	Connect oscilloscope to pin 2 of U90.	Oscilloscope waveform: 	Check U58(B) and U69 and associated components. Replace as necessary and repeat step 21.	Check U90 and associated components. Replace as necessary and repeat step 21.
25	24	Connect oscilloscope to TP24 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc component	Proceed to step 29.	Proceed to step 26.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

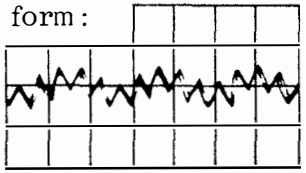
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
26	--	Connect oscilloscope to pin 3 of U73.	Same as step 25 above.	Check U63(B) and U77 and associated components. Replace as necessary and repeat step 25.	Proceed to step 27.
27	--	Connect oscilloscope to pin 3 of U70.	Same as step 25 above.	Check U61(B) and U73 and associated components. Replace as necessary and repeat step 25.	Proceed to step 28.
28	--	Connect oscilloscope to pin 2 of U91.	Oscilloscope waveform: 	Check U59(B) and U70 and associated components. Replace as necessary and repeat step 25.	Check U91 and associated components. Replace as necessary and repeat step 25.
29	25	Connect oscilloscope to TP25 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc component.	Proceed to step 33.	Proceed to step 30.
30	--	Connect oscilloscope to pin 3 of U74.	Same as step 29 above.	Check U63(A) and U78 and associated components. Replace as necessary and repeat step 29.	Proceed to step 31.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

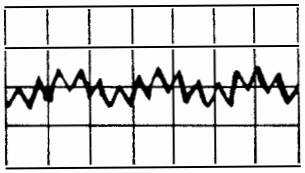
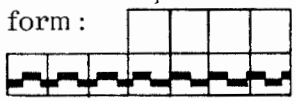
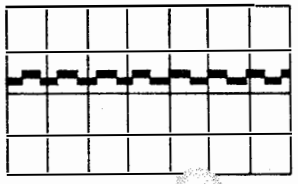
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
31	--	Connect oscilloscope to pin 13 of U70.	Same as step 29 above.	Check U61(A) and U74 and associated components. Replace as necessary and repeat step 29.	Proceed to step 32.
32	--	Connect oscilloscope to pin 2 of U92.	Oscilloscope waveform: 	Check U59(A) and U70 and associated components. Replace as necessary and repeat step 29.	Check U92 and associated components. Replace as necessary and repeat step 29.
33	22	Connect oscilloscope to TP22 on lower demodulator assembly.	Oscilloscope waveform: 	Proceed to step 35.	Proceed to step 34.
34	--	Connect oscilloscope to pin 16 of U79A.	Oscilloscope display of 2159 Hz ±5 Hz square wave centered on zero baseline.	Check U64(A) and U79(A) and associated components. Replace as necessary and repeat step 33.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit) and repeat step 33.
35	21	Connect oscilloscope to TP21 on lower demodulator assembly.	Oscilloscope waveform: 	Proceed to step 37.	Proceed to step 36.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

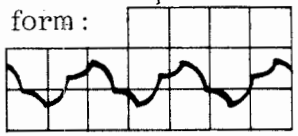
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
36	--	Connect oscilloscope to pin 1 of U79.	Oscilloscope display of 2159 Hz ±5 Hz square wave centered on zero baseline. (90° phase shift from step 34).	Check U64(B) and U79 and associated components. Replace as necessary and repeat step 35.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit). Repeat step 35.
37	27	Connect oscilloscope to TP27 on lower demodulator assembly.	Oscilloscope waveform: 	Proceed to step 38.	Check U66(A) and associated components. Replace as necessary and repeat step 37.
38	28	Connect oscilloscope to TP28 on lower demodulator assembly.	Oscilloscope display of sine wave centered on zero baseline.	Proceed to step 39.	Check U67(B) and associated components. Replace as necessary and repeat step 38.
39	23	Connect oscilloscope to TP23 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc component.	Proceed to step 41.	Proceed to step 40.
40	--	Connect oscilloscope to pin 8 of U79.	Oscilloscope display of 2159 Hz ±5 Hz square wave centered on zero baseline.	Check U65(B) and U79 and associated components. Replace as necessary and repeat step 39.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit) and repeat step 39.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

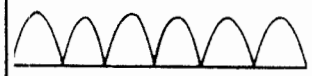
Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
41	20	Connect oscilloscope to TP20 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc component.	Proceed to step 43.	Proceed to step 42.
42	--	Connect oscilloscope to pin 9 of U79.	Oscilloscope display same as step 36.	Check U65(A) and U79 and associated components. Replace as necessary and repeat step 41.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit) and repeat step 41.
43	26	Connect oscilloscope to TP26 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc component.	Proceed to step 44.	Check U66(B) and associated components. Replace as necessary and repeat step 43.
44	29	Connect oscilloscope to TP29 on lower demodulator assembly.	Same as step 43 above.	Proceed to step 45.	Check U67(A) and associated components. Replace as necessary and repeat step 44.
45	1	Connect oscilloscope to TP1 on upper demodulator assembly.	Oscilloscope waveform: 	Proceed to step 47.	Proceed to step 46.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

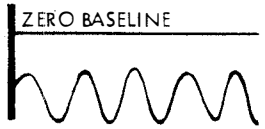
Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
46	--	Connect oscilloscope to pin 7 of U68B.	Oscilloscope display of sine wave centered on zero baseline.	Check U14(A), U15(A), and associated components. Replace as necessary and repeat step 45.	Check U68(B) and associated components. Replace as necessary and repeat step 45.
47	2	Connect oscilloscope to TP2 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc component.	Proceed to step 49.	Proceed to step 48.
48	--	Connect oscilloscope to pin 1 of U68A.	Same as step 47.	Check U14(B), U15(B), and associated components Replace as necessary and repeat step 47.	Check U68(A) and associated components. Replace as necessary and repeat step 47.
49	3	Connect oscilloscope to TP3 on upper demodulator assembly.	Oscilloscope display of sine wave with negative dc component as follows: 	Proceed to step 50.	Check U16(A) and associated components. Replace as necessary and repeat step 49.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
50	5	Connect oscilloscope to TP5 on upper demodulator assembly.	Oscilloscope display of straight horizontal line with positive dc polarity (and slight ac component possible).	Proceed to step 52.	Proceed to step 51.
51	--	Connect oscilloscope to pin 7 of U1B.	Same as step 50 above except positive dc level may not be of same amplitude.	Check U2(B) and associated components. Replace as necessary and repeat step 50.	Check U1(B) and associated components. Replace as necessary and repeat step 50.
52	6	Connect oscilloscope to TP6 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (with slight ac component possible) following zero baseline with no dc component.	Proceed to step 54.	Proceed to step 53.
53	--	Connect oscilloscope to pin 7 of U4B.	Oscilloscope display of straight horizontal line with negative dc level. (slight ac component possible).	Check U6(B), U5(B), U9, U12(B) and associated components Replace as necessary and repeat step 52.	Check U2(A), U3(B), U4(B), and associated components. Replace as necessary and repeat step 52.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

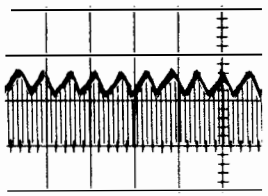
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
54	7	Connect oscilloscope to TP7 on upper demodulator assembly.	Oscilloscope display of straight horizontal line with positive dc level. (slight ac component possible).	Proceed to step 56.	Proceed to step 55.
55	--	Connect oscilloscope to pin 1 of U4A.	Oscilloscope wave form: 	Check U6(A), U5(A), U9, U12(A) and associated components. Replace as necessary and repeat step 54.	Check U3(A), U4(A) and associated components. Replace as necessary and repeat step 54.
56	8	Connect oscilloscope to TP8 on upper demodulator assembly.	Same as step 50 above.	Proceed to step 57.	Check U3(A) and associated components. Replace as necessary and repeat step 56.
57	9	Connect oscilloscope to TP9 on upper demodulator assembly.	Oscilloscope display of straight horizontal line with positive dc level (slight ac component possible).	Proceed to step 58.	Check U7 and associated components. Replace as necessary and repeat step 57.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

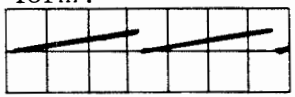
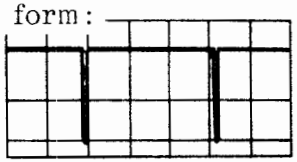
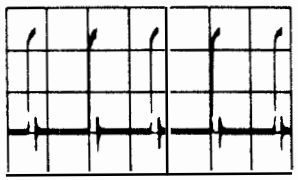
Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
58	10	Connect oscilloscope to TP10 on upper demodulator assembly.	Oscilloscope waveform: 	Proceed to step 60.	Proceed to step 59.
59	--	Connect oscilloscope to pin 2 of U19.	Same as step 58 above.	Replace U17 and repeat step 58.	Check U19 and associated components. Replace as necessary and repeat step 58.
60	11	Connect oscilloscope to TP11 on upper demodulator assembly.	Oscilloscope waveform: 	Proceed to step 61.	Check U18 and associated components. Replace as necessary and repeat step 60.
61	12	Connect oscilloscope to TP12 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (with slight ac component possible) following zero baseline with no dc component.	Proceed to step 62.	Replace U9 and repeat step 61.
62	13	Connect oscilloscope to TP13 on upper demodulator assembly.	Oscilloscope wave form:  See table 5-1, step 43.	Proceed to step 64.	Proceed to step 63.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

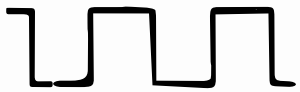
Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
63	6 (syn assem).	Connect oscilloscope to TP6 on lower synthesizer assembly.	Same as step 62 above.	Replace W2 cable (synthesizer/demodulator cable) and repeat step 62.	Troubleshoot synthesizer assembly per table 5-1, part D (data rate frequency circuit). Repeat step 62.
64	14	Connect oscilloscope to TP14 on upper demodulator assembly.	Oscilloscope waveform: 	Proceed to step 67.	Proceed to step 65.
65	--	Connect oscilloscope to pin 1 of U30.	Oscilloscope waveform: 	Replace U30 and repeat step 64.	Proceed to step 66.
66	--	Connect oscilloscope to pin 13 of U26.	Oscilloscope waveform: 	Check U27, U28, and U29. Replace as necessary and repeat step 64.	Check U21, U22, U23, U26, U25 and U22. Replace as necessary and repeat step 64.
67	17	Connect oscilloscope to TP17 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) with positive dc level.	Proceed to step 68.	Check U22(B), U31, and associated components. Replace as necessary and repeat step 67.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
68	15	A. Connect oscilloscope to TP15 on upper demodulator board. Set AUTO/OPR/STANDBY switch to OPR. B. Set AUTO/OPR/STANDBY switch to AUTO and then to STANDBY.	A. Oscilloscope display of straight horizontal line with positive dc level. B. Same as A except with zero dc level at both positions.	Return AUTO/OPR/STANDBY switch to OPR and proceed to step 71.	Proceed to step 69.
69	--	A. Connect oscilloscope to pin 6 of U32B. Set AUTO/OPR/STANDBY switch to OPR. B. Set AUTO/OPR/STANDBY switch to AUTO and then to STANDBY.	A. Same as step 68A above. B. Same as step 68B above.	Proceed to step 70.	Check W3S3 (AUTO/OPR/STANDBY switch) and front panel harness W3. Repair or replace as necessary. Repeat step 68.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
70	--	A. Connect oscilloscope to pin 13 of U32B. Set AUTO/OPR/STANDBY switch to STANDBY. B. Set AUTO/OPR/STANDBY switch to AUTO and then to OPR.	A. Oscilloscope display of straight horizontal line with no dc level. B. Same as A above except with a positive dc level.	Check U33, U34, U32, U29 and associated components. Replace as necessary and repeat step 68.	Check W3S3 (AUTO/OPR/STANDBY switch) and front panel harness. Repair or replace as necessary and repeat step 68.
71	16	Connect oscilloscope to TP16 on upper demodulator assembly.	Oscilloscope display of straight horizontal line with positive dc level (slight ac component possible).	Perform step 9 of table 5-3, (part D).	Check U13, U35, and associated components. Replace as necessary and repeat step 71.
72	31	Connect oscilloscope to TP31 on lower demodulator assembly.	Oscilloscope display of straight horizontal line with positive dc level (slight ac component possible).	Proceed to step 73.	Check U80, U81, and U82. Replace as necessary and repeat step 72.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part A: Mark Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
73	39	Connect oscilloscope to TP 39 on lower demodulator assembly.	Same as step 72 above except of higher positive dc level.	Proceed to step 74.	Check U55(B), Q1, Q2, and associated components. Replace as necessary and repeat step 73.
74	37	Connect oscilloscope to TP 37 on lower demodulator assembly.	Same as step 73 above except of higher positive dc level.	Proceed to step 75.	Check U85, U84, and associated components. Replace as necessary and repeat step 74.
75	38	Connect oscilloscope to TP 38 on lower demodulator assembly.	Same as step 74 above.	Proceed to step 76.	Check U84(B) and associated components. Replace as necessary and repeat step 75.
76	34	Connect oscilloscope to TP 34 on lower demodulator assembly.	Oscilloscope display of straight horizontal line with positive dc level (slight ac component possible).	End of Mark Frequency Function test. Proceed to Space Frequency Function test, table 5-2, part B.	Check U82 and U83. Replace as necessary and repeat step 76.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
77	--	Connect jumper between AUDIO OUTPUT jack (J6) pin A and AUDIO INPUT jack (J7) pin A. Connect a jumper also between pins B likewise. Set MODE switch to HF; TRANSMIT/OFF/RETRANSMIT switch to TRANSMIT; NORMAL/REVERSE switch to NORMAL; AUTO/OPR/STANDBY switch to OPR; CLEAR/SECURE switch to CLEAR and connect oscilloscope probe to AUDIO OUTPUT jack (J6) pin A and ground clip to pin B.	Oscilloscope waveform: sine wave at frequency of 2425 Hz.	Proceed to step 78.	Disconnect jumper between J6-A and J7-A. Connect oscilloscope to TP26 (located on lower synthesizer circuit card). If the indication is normal per Normal Indication column, connect a jumper between TP26 and pin A of AUDIO INPUT jack (J7) and proceed to step 78. If the signal is not normal at TP26 troubleshoot the synthesizer assembly per per table 5-1. NOTE: An alternate method for expediting troubleshooting of demodulator assembly, if synthesizer assembly is faulty, is as follows: Connect output of an audio frequency signal generator to AUDIO INPUT jack J7. Set generator for a frequency of 2425 Hz at an amplitude of 18VP-P (sine wave) and proceed to step 77.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
78	30	Connect oscilloscope to TP30 on lower demodulator assembly.	Same as step 77 above.	Proceed to step 82.	Adjust LEVEL control to obtain correct indication. If adjusting LEVEL control does not produce correct indication proceed to step 79.
79	--	Connect oscilloscope to R132.	Same as step 77 above.	Check U55 and associated components. Replace as necessary and repeat step 78.	Proceed to step 80.
80	--	Connect oscilloscope across R156 on lower demodulator assembly (polarity not significant).	Same as step 77 above.	Check front panel harness and W3R1 (LEVEL control). Repair or replace as necessary and repeat step 78.	Proceed to step 81.
81	--	Connect oscilloscope probe to pin 25 of W4P1 and ground clip to pin 23.	Same as step 77 above.	Replace audio transformer T1 and repeat step 78.	Check jumper connections (step 77).
82	32	Connect oscilloscope to TP32 on lower demodulator assembly.	18VP-P sine wave (1575 Hz).	Proceed to step 84	Proceed to step 83.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
83	25 (syn assem).	Connect oscilloscope to TP25 on lower synthesizer assembly.	Same as step 82 above.	Check W2 cable (synthesizer/demodulator cable). Replace if faulty and repeat step 82.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 82.
84	33	Connect oscilloscope to TP33 on lower demodulator assembly.	18VP-P sine wave (1575 Hz).	Proceed to step 86.	Proceed to step 85.
85	27 (syn assem).	Connect oscilloscope to TP27 on lower synthesizer assembly.	Same as step 84 above.	Check W2 cable (synthesizer/demodulator cable). Replace if faulty and repeat step 84.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 86.
86	32 and 33	Connect oscilloscope channel A to TP32 and channel B to TP33.	18VP-P sine waves with 90 degree phase difference.	Proceed to step 87.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 86.
87	35	Connect oscilloscope to TP35 on lower demodulator assembly.	18VP-P sine wave (2425 Hz).	Proceed to step 89.	Proceed to step 88.
88	26 (syn assem).	Connect oscilloscope to TP26 on lower demodulator assembly.	Same as step 87 above.	Replace W2 cable (synthesizer/demodulator cable) and repeat step 87.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 87.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
89	36	Connect oscilloscope to TP36 on lower demodulator assembly.	Same as step 87 above.	Proceed to step 91.	Proceed to step 90.
90	28 (syn assem).	Connect oscilloscope to TP28 on lower synthesizer assembly.	Same as step 87 above.	Replace W2 cable (synthesizer/demodulator cable and repeat step 89.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 89.
91	35 and 36	Connect oscilloscope channel A to TP35 and channel B to TP36.	Same as step 87 except signals display a 90 degree phase difference.	Proceed to step 92.	Troubleshoot synthesizer assembly per table 5-1 and repeat step 91.
92	--	Connect multimeter to pins 10, 9, and 6 of U69 through U78 per chart in Normal Indication column.	Pin Tested* MODE | 10 | 9 | 6 VLF | 0 | 0 | 0 LF | 1 | 0 | 0 HF | 1 | 1 | 0 MMM | 0 | 1 | 0 *0 = 0 ±1 Vdc 1 = +5 ±1 Vdc	Set MODE switch to HF and proceed to step 93.	Check and replace matrix component (diode CR8 through CR15 as follows: (Repeat step 92). Pin Tested MODE | 10 | 9 | 6 VLF | CR13 | CR14 | CR15 LF | | CR11 | CR12 HF | | | CR 8 MMM | CR 9 | | CR10
93	19	Connect oscilloscope to TP19 on lower demodulator assembly.	Same as step 25.	Proceed to step 97.	Proceed to step 94.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

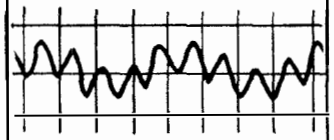
Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
94	--	Connect oscilloscope to pin 3 of U71B.	Same as step 93 above.	Check U62(A) and U75 and associated components. Replace as necessary and repeat step 93.	Proceed to step 95.
95	--	Connect oscilloscope to pin 3 of U69B.	Same as step 93 above.	Check U60(A) and U71 and associated components. Replace as necessary and repeat step 93.	Proceed to step 96.
96	--	Connect oscilloscope to pin 2 of U89.	Oscilloscope waveform: 	Check U58(A) and U69 and associated components. Replace as necessary and repeat step 93.	Check U89 and associated components. Replace as necessary and repeat step 93.
97	18	Connect oscilloscope to TP18 on lower demodulator assembly.	Same as step 25.	Proceed to step 101.	Proceed to step 98.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
98	--	Connect oscilloscope to pin 3 of U72.	Same as step 97 above.	Check U62(B) and U76 and associated components. Replace as necessary and repeat step 97.	Proceed to step 99.
99	--	Connect oscilloscope to pin 13 of U69.	Same as step 97 above.	Check U60(B) and U72 and associated components. Replace as necessary and repeat step 97.	Proceed to step 100.
100	--	Connect oscilloscope to pin 2 of U90.	Oscilloscope waveform: same as step 96 above.	Check U58(B) and U69 and associated components. Replace as necessary and repeat step 97.	Check U90 and associated components. Replace as necessary and repeat step 97.
101	24	Connect oscilloscope to TP24 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) with dc level.	Proceed to step 105.	Proceed to step 102.
102	--	Connect oscilloscope to pin 3 of U73.	Same as step 101 above.	Check U63(B) and U77 and associated components. Replace as necessary and repeat step 101.	Proceed to step 103.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
103	--	Connect oscilloscope to pin 3 of U70.	Same as step 101 above.	Check U61(B) and U73 and associated components. Replace as necessary and repeat step 101.	Proceed to step 104.
104	--	Connect oscilloscope to pin 2 of U91.	Oscilloscope waveform: 	Check U59(B) and U70 and associated components. Replace as necessary and repeat step 101.	Check U91 and associated components. Replace as necessary and repeat step 101.
105	25	Connect oscilloscope to TP25 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) with dc level.	Proceed to step 109.	Proceed to step 106.
106	--	Connect oscilloscope to pin 3 of U74.	Same as step 105 above.	Check U63(A) and U78 and associated components. Replace as necessary and repeat step 105.	Proceed to step 107.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
107	--	Connect oscilloscope to pin 13 of U70.	Same as step 105 above.	Check U61(A) and U74 and associated components. Replace as necessary and repeat step 105.	Proceed to step 108.
108	--	Connect oscilloscope to pin 2 of U92.	Oscilloscope waveform: same as step 104 above.	Check U59(A) and U70 and associated components. Replace as necessary and repeat step 105.	Check U92 and associated components. Replace as necessary and repeat step 105.
109	22	Connect oscilloscope to TP22 on lower demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc components.	Proceed to step 111.	Proceed to step 110.
110	--	Connect oscilloscope to pin 16 of U79A.	Oscilloscope display of 2159 ±5 Hz square wave centered on zero baseline.	Check U64(A) and U79(A) and associated components. Replace as necessary and repeat step 109.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit) and repeat step 109.
111	21	Connect oscilloscope to TP21 on lower demodulator assembly.	Oscilloscope display: same as step 109 above.	Proceed to step 113.	Proceed to step 112.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

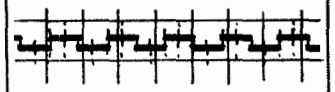
Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
112	--	Connect oscilloscope to pin 1 of U79.	Oscilloscope display of 2159 Hz ±5 Hz square wave centered on zero baseline. (90° phase shift from step 110).	Check U64(B) and U79 and associated components. Replace as necessary and repeat step 111.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit). Repeat step 111.
113	27	Connect oscilloscope to TP27 on lower demodulator assembly.	Oscilloscope display: same as step 109 above.	Proceed to step 114.	Check U66(A) and associated components. Replace as necessary and repeat step 113.
114	28	Connect oscilloscope to TP28 on lower demodulator assembly.	Same as step 43.	Proceed to step 115.	Check U67(B) and associated components. Replace as necessary and repeat step 114.
115	23	Connect oscilloscope to TP23 on lower demodulator assembly.	Oscilloscope waveform: 	Proceed to step 117.	Proceed to step 116.
116	--	Connect oscilloscope to pin 8 of U79.	Same as step 34.	Check U65(B) and U79 and associated components. Replace as necessary and repeat step 115.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit) and repeat step 115.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

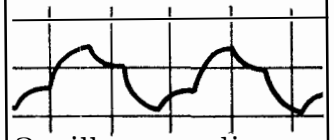
Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
117	20	Connect oscilloscope to TP20 on lower demodulator assembly.	Oscilloscope display: same as step 115 above.	Proceed to step 119.	Proceed to step 118.
118	--	Connect oscilloscope to pin 9 of U79.	Oscilloscope display same as step 36.	Check U65(A) and U79 and associated components. Replace as necessary and repeat step 117.	Troubleshoot synthesizer assembly per table 5-1, part E (second mixer frequency circuit) and repeat step 117.
119	26	Connect oscilloscope to TP26 on lower demodulator assembly.	Oscilloscope waveform: 	Proceed to step 120.	Check U66(B) and associated components. Replace as necessary and repeat step 119.
120	29	Connect oscilloscope to TP29 on lower demodulator assembly.	Oscilloscope display of sine wave centered on zero baseline.	Proceed to step 121.	Check U67(A) and associated components. Replace as necessary and repeat step 120.
121	1	Connect oscilloscope to TP1 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline having no dc component.	Proceed to step 123.	Proceed to step 122.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
122	--	Connect oscilloscope to pin 7 of U68B.	Oscilloscope display of low level ac component centered on zero baseline.	Check U14(A), U15(A), and associated components. Replace as necessary and repeat step 121.	Check U68(B) and associated components. Replace as necessary and repeat step 121.
123	2	Connect oscilloscope to TP2 on upper demodulator assembly.	Oscilloscope display of full wave rectified, unfiltered sine wave.	Proceed to step 125.	Proceed to step 124.
124	--	Connect oscilloscope to pin 1 of U68A.	Oscilloscope display of sine wave centered on zero baseline.	Check U14(B), U15(B), and associated components. Replace as necessary and repeat step 123.	Check U68(A) and associated components. Replace as necessary and repeat step 123.
125	3	Connect oscilloscope to TP3 on upper demodulator assembly.	Oscilloscope display of sine wave with positive dc component.	Proceed to step 126.	Check U16(A) and associated components. Replace as necessary and repeat step 125.
126	5	Connect oscilloscope to TP5 on upper demodulator assembly.	Oscilloscope display of straight horizontal line with negative dc polarity (and slight ac component possible).	Proceed to step 128.	Proceed to step 127.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

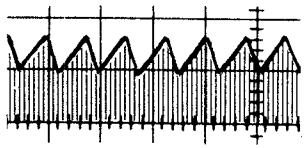
Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
127	--	Connect oscilloscope to pin 7 of U1B.	Same as step 126 above except negative dc level may not be of same amplitude.	Check U2(B) and associated components. Replace as necessary and repeat step 126.	Check U1(B) and associated components. Replace as necessary and repeat step 126.
128	6	Connect oscilloscope to TP6 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (with slight ac component possible) with positive dc level.	Proceed to step 130.	Proceed to step 129.
129	--	Connect oscilloscope to pin 7 of U4B.	Oscilloscope waveform: 	Check U6(B), U5(B), U9, U12(B) and associated components. Replace as necessary and repeat step 128.	Check U2(A), U3(B), U4(B), and associated components. Replace as necessary and repeat step 128.
130	7	Connect oscilloscope to TP7 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc level.	Proceed to step 132.	Proceed to step 131.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

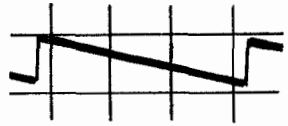
Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
131	--	Connect oscilloscope to pin 1 of U4A.	Oscilloscope display of straight horizontal line (slight ac component possible) following zero baseline with no dc component.	Check U6(A), U5(A), U9, U12(A) and associated components. Replace as necessary and repeat step 130.	Check U3(A), U4(A) and associated components. Replace as necessary and repeat step 130.
132	8	Connect oscilloscope to TP8 on upper demodulator assembly.	Same as step 126 above.	Proceed to step 133.	Check U3(A) and associated components. Replace as necessary and repeat step 132.
133	9	Connect oscilloscope to TP9 on upper demodulator assembly.	Oscilloscope display of straight horizontal line with negative dc level (slight ac component possible).	Proceed to step 134.	Check U7 and associated components. Replace as necessary and repeat step 132.
134	10	Connect oscilloscope to TP10 on upper demodulator assembly.	Oscilloscope waveform: 	Proceed to step 136.	Proceed to step 135.
135	--	Connect oscilloscope to pin 2 of U19.	Same as step 134 above.	Replace U17 and repeat step 134.	Check U19 and associated components. Replace as necessary and repeat step 134.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

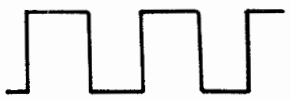
Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
136	11	Connect oscilloscope to TP11 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) with positive dc level.	Proceed to step 137.	Check U18 and associated components. Replace as necessary and repeat step 136.
137	12	Connect oscilloscope to TP12 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (with slight ac component possible) with positive dc level.	Proceed to step 138.	Replace U9 and repeat step 137.
138	13	Connect oscilloscope to TP13 on upper demodulator assembly.	Same as step 62 above.	Proceed to step 140.	Proceed to step 139.
139	--	Connect oscilloscope to pin 25 of 1A1A2J6 on lower synthesizer assembly.	Same as step 138 above.	Replace W2 cable (synthesizer/demodulator cable) and repeat step 138.	Troubleshoot synthesizer assembly per table 5-1, part D (data rate frequency circuit). Repeat step 138.
140	14	Connect oscilloscope to TP14 on upper demodulator assembly.	Oscilloscope waveform: 	Proceed to step 143.	Proceed to step 141.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

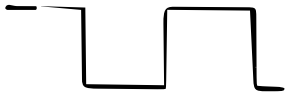
Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
141	--	Connect oscilloscope to pin 1 of U30.	Oscilloscope waveform: 	Replace U30 and repeat step 140.	Proceed to step 142.
142	--	Connect oscilloscope to pin 13 of U26.	Oscilloscope waveform: 	Check U27, U28, and U29. Replace as necessary and repeat step 140.	Check U21, U22, U23, U26, U25 and U22. Replace as necessary and repeat step 140.
143	17	Connect oscilloscope to TP17 on upper demodulator assembly.	Oscilloscope display of straight horizontal line (slight ac component possible) with negative dc level.	Proceed to step 144.	Check U22(B), U31, and associated components. Replace as necessary and repeat step 143.
144	15	A. Connect oscilloscope to TP15 on upper demodulator board. Set AUTO/OPR/STANDBY switch to OPR. B. Set AUTO/OPR/STANDBY switch to AUTO and then to STANDBY.	A. Oscilloscope display of straight horizontal line with positive dc level. B. Same as A except with zero dc level at both positions.	Return AUTO/OPR/STANDBY switch to OPR and proceed to step 147.	Proceed to step 145.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
145	--	A. Connect oscilloscope to pin 6 of U32B. Set AUTO/OPR/STANDBY switch to OPR. B. Set AUTO/OPR/STANDBY switch to AUTO and then to STANDBY.	A. Same as step 144A above. B. Same as step 144B above.	Proceed to step 146.	Check W3S3 (AUTO/OPR/STANDBY switch) and front panel harness W3. Repair or replace as necessary. Repeat step 144.
146	--	A. Connect oscilloscope to pin 13 of U32B. Set AUTO/OPR/STANDBY switch to STANDBY. B. Set AUTO/OPR/STANDBY switch to AUTO and then to OPR.	A. Oscilloscope display of straight horizontal line with no dc level. B. Same as A above except with a positive dc level.	Check U33, U34, U32, U29 and associated components. Replace as necessary and repeat step 144.	Check W3S (AUTO/OPR/STANDBY switch) and front panel harness. Repair or replace as necessary and repeat step 144.
147	16	Connect oscilloscope to TP16 on upper demodulator assembly.	Oscilloscope display of straight horizontal line with positive dc level (slight ac component possible).	Proceed to step 148.	Check U13, U35, and associated components. Replace as necessary and repeat step 147.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

Part B: Space Frequency Function (Continued)					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
148	31	Connect oscilloscope to TP31 on lower demodulator assembly.	Oscilloscope display of straight horizontal line with negative dc level (slight ac component possible).	Proceed to step 149.	Check U80, U81, and U82. Replace as necessary and repeat step 148.
149	39	Connect oscilloscope to TP39 on lower demodulator assembly.	Same as step 148 above except of higher negative dc level.	Proceed to step 150.	Check U55(B), Q1, Q2, and associated components. Replace as necessary and repeat step 149.
150	37	Connect oscilloscope to TP37 on lower demodulator assembly.	Same as step 149 above except of positive dc level.	Proceed to step 151.	Check U85, U84, and associated components. Replace as necessary and repeat step 150.
151	38	Connect oscilloscope to TP38 on lower demodulator assembly.	Same as step 150 above.	Proceed to step 152.	Check U84(B) and associated components. Replace as necessary and repeat step 151.
152	34	Connect oscilloscope to TP34 on lower demodulator assembly.	Oscilloscope display of straight horizontal line with zero dc level (slight ac component possible).	End of Space Frequency Function test. Proceed to Mark and Space Frequency Function test, table 5-2, part C.	Check U82 and U83. Replace as necessary and repeat step 76.

Table 5-2. Frequency Shift Converter CV-3510A/UG Function Test and Troubleshooting Chart, Demodulator Section (Continued)

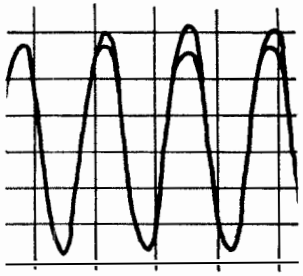
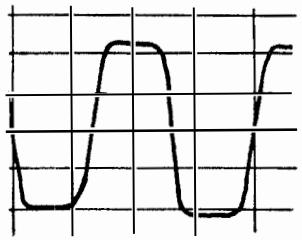
Part C: Mark and Space Frequency Function					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
153	5	Connect jumper between AUDIO OUTPUT jack (J6) pin A and AUDIO INPUT jack (J7) pin A. Connect a jumper also between pins B likewise. Set MODE switch to HF, TRANSMIT/OFF/RE-TRANSMIT switch to RETRANSMIT, NORMAL REVERSE switch to REVERSE, CLEAR/SECURE switch to CLEAR, and AUTO/OPR/STAND-BY switch to OPR. Connect oscilloscope to TP5 on upper demodulator assembly.	Oscilloscope waveform: 	Proceed to step 154.	Troubleshoot demodulator assembly per table 5-2.
154	5	Set CLEAR/SECURE switch to SECURE.	Oscilloscope waveform: 	Converter is ready for normal operation.	Proceed to table 5-3, part E and perform step 10.

Table 5-3. Frequency Shift Converter CV-3510A/UG, Front Panel Harness Troubleshooting Chart.

Part A: MODE Switch Circuit					
Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
1	(8)	A. Set MODE switch to VLF. Connect multimeter to TP8 on upper synthesizer assembly.	0 ±1 Vdc	Proceed to step 2.	Replace W3S1 and repeat test.
		B. Set MODE switch to each of remaining positions.	+5 ±1 Vdc		
2	(7)	A. Set MODE switch to LF. Connect multimeter to TP7 on upper synthesizer assembly.	0 ±1 Vdc	Proceed to step 3.	Replace W3S1 and repeat test.
		B. Set MODE switch to each of remaining positions.	+5 ±1 Vdc		
3	(10)	A. Set MODE switch to HF. Connect multimeter to TP10 on upper synthesizer assembly.	0 ±1 Vdc	Proceed to step 4.	Replace W3S1 and repeat test.
		B. Set MODE switch to each of remaining positions.	+5 ±1 Vdc		
4	(9)	A. Set MODE switch to MMM. Connect multimeter to TP9 on upper synthesizer assembly.	0 ±1 Vdc	Perform step 13 in Table 5-1, part B.	Replace W3S1 and repeat test.

Table 5-3. Frequency Shift Converter CV-3510A/UG, Front Panel Harness Troubleshooting Chart. (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
Part A: MODE Switch Circuit					
4 Cont.	(9)	B. Set MODE switch to each of remaining positions.	+5 ±1 Vdc		
Part B: DATA RATE Switch Circuit					
5	(14)	A. Set DATA RATE switch 45.5. Connect multimeter to TP14 on upper synthesizer assembly.	0 ±1 Vdc	Proceed to step 6.	Replace W3S2 and repeat test.
		B. Set DATA RATE switch to each of remaining positions.	+5 ±1 Vdc		
6	(13)	A. Set DATA RATE switch to 50. Comment multimeter to TP13 on upper synthesizer assembly.	0 ±1 Vdc	Proceed to step 7.	Replace W3S2 and repeat test.
		B. Set DATA RATE switch to each of remaining positions.	+5 ±1 Vdc		
7	(12)	A. Set DATA RATE switch to 75. Connect multimeter to TP12 on upper synthesizer assembly.	0 ±1 Vdc	Perform step 43 in table 5-1, Part D.	Replace W3S2 and repeat 7.

Table 5-3. Frequency Shift Converter CV-3510A/UG,
Front Panel Harness Troubleshooting Chart.(Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
Part B: DATA RATE Switch Circuit					
7 Cont.	(12)	B. Set DATA RATE switch to each of remaining positions.	+5 ±1 Vdc		
Part C: TRANSMIT/OFF/RETRANSMIT Switch Circuit					
8	--	A. Set TRANSMIT/OFF/RETRANSMIT switch to switch to TRANSMIT. Connect multimeter to pin 13 of U38D	0 ±1 Vdc	Connect jumpers between AUDIO OUTPUT jack J6, pins A and B and AUDIO INPUT jack J7, pins A and B respectively. Set MODE switch to HF; TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT; NORMAL/REVERSE switch to REVERSE; AUTO/OPR/STANDBY switch to OPR; and perform step 57 in table 5-1, part F.	Replace W3S7 and repeat test.
		B. Set TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT.	0 ±1 Vdc		
		C. Set TRANSMIT/OFF/RETRANSMIT switch to to off.	+5 ±1 Vdc		

Table 5-3. Frequency Shift Converter CV-3510A/UG, Front Panel Harness Troubleshooting Chart. (Continued)

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
Part D: NORMAL/REVERSE Switch Circuit					
9	--	A. Set NORMAL/REVERSE to NORMAL and connect multimeter to pin 2 of U80 on Lower Demodulator Assembly.	0 ±1 Vdc	Perform step 72 in table 5-2, part A.	Replace W3S4 and repeat test.
		B. Set NORMAL/REVERSE switch to REVERSE.	+5 ±1 Vdc		
Part E: CLEAR/SECURE Switch Circuit					
10	--	A. Set CLEAR/SECURE switch to CLEAR and connect multimeter to pin 1 of U31 on Lower Demodulator Assembly.	+5 ±1 Vdc	Replace U83 and perform step 154 in table 5-2, part C.	Replace W3S5 and repeat test.
		B. Set CLEAR/SECURE switch to SECURE.	0 ±1 Vdc		

Table 5-4. Frequency Shift Converter CV-3510A/UG
Diversity Troubleshooting Chart.

Step	Test Point	Procedure	Normal Indication	If Indication Is Normal	If Indication Is Abnormal
1	--	Connect jumper between AUDIO OUTPUT jack (J6) pin A and AUDIO INPUT jack (J7) pin A. Connect a jumper also between pins B likewise. Set MODE switch to HF, TRANSMIT/OFF/RE-TRANSMIT switch to RETRANSMIT, NORMAL REVERSE switch to REVERSE, CLEAR/SECURE switch to CLEAR, and AUTO/OPR/STANDBY switch to OPR. Connect oscilloscope to DIVERSITY A on converter with receiver connected.	Oscilloscope waveform: 	Troubleshoot demodulator assembly of that converter that has the teletype equipment connected to it.	Troubleshoot demodulator assembly of that converter that has the receiver connected to it. If problem still exists, replace W4 (input/output harness).

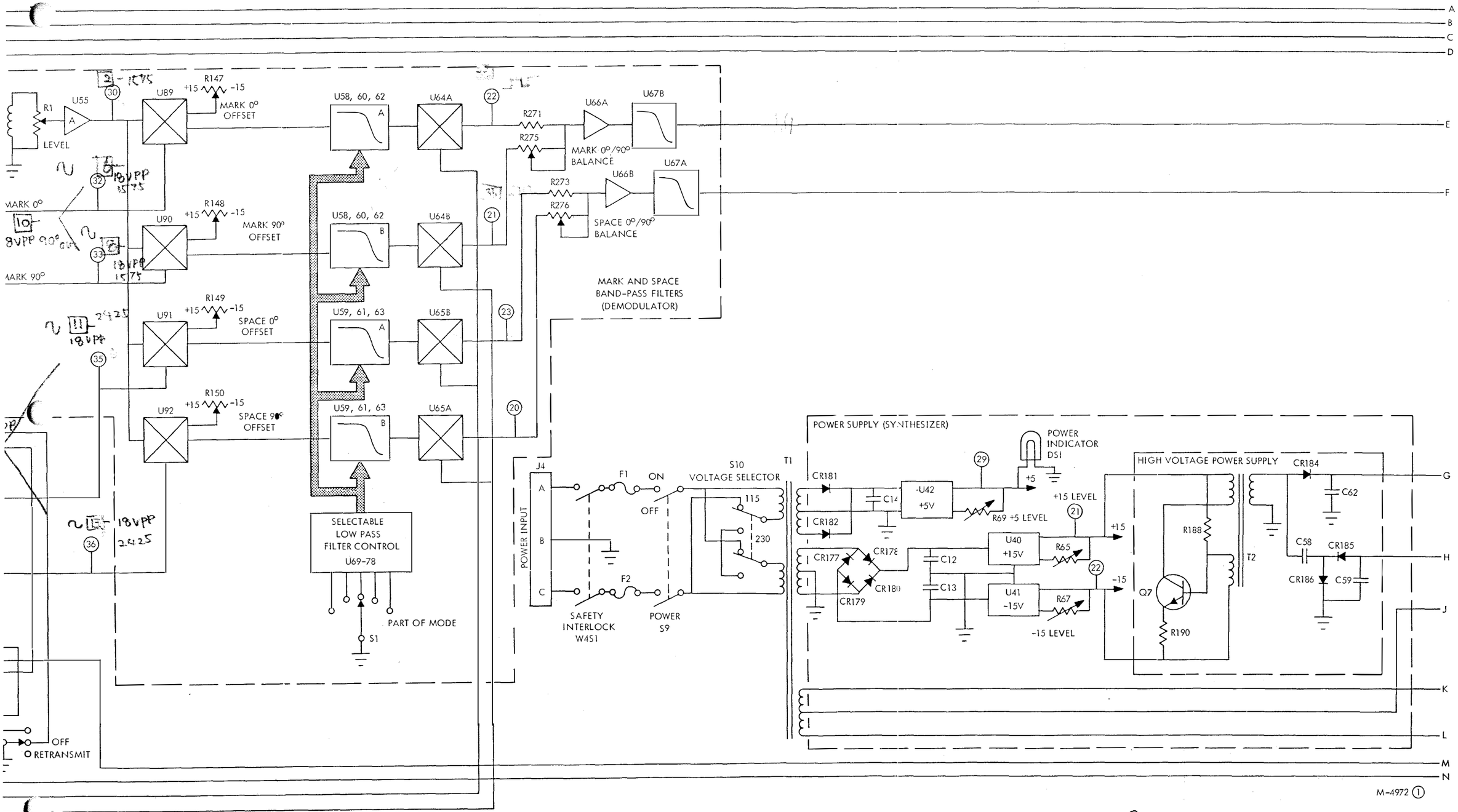


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Figure 5-2. Functional Schematic (Sheet 1 of 2)

CHANGE 2

DIVERSITY BD

J3

J7

AUDIO INPUT

A
B
C

FREQUENCY DIVIDERS (SYNTHESIZER)

SINE GENERATORS (SYNTHESIZER)

C6

Y1

U1

CLOCK

U13 A

PART OF MODE S1

VLF
LF
HF
HF (MP)
MMM

DIODE CONTROL MATRIX

MARK FREQUENCY DIVIDER U2-5

U13 B

SPACE FREQUENCY DIVIDER U6-9

DATE RATE S2

45.5
50
75

DIODE CONTROL MATRIX

U13 C

DATA RATE FREQUENCY DIVIDER U10-12

U13 D

SECOND MIXER FREQUENCY DIVIDER U14, 22, 23

U15 0° 90°

DIGITAL TO ANALOG CONVERTER U26

U31A

U31B

DIGITAL TO ANALOG CONVERTER U27

U32A

U32B

FREQUENCY SHIFT OSCILLATOR

U39

DIGITAL TO ANALOG CONVERTER U28

U33A

U33B

T1

DIGITAL TO ANALOG CONVERTER U29

U34A

U34B

SPACE 0°

DIGITAL TO ANALOG CONVERTER U30

U35A

U35B

SPACE 90°

J5 TRANSMIT HIGH LEVEL INPUT

LOOP INPUT

A
B
C
D

R313

VR1

U85

U84 A

R323

VR2 VR3

U84 B

TRANSMIT LOW LEVEL INPUT (DEMODULATOR)

U83

TRANSMIT

S7

OFF
RETRANSMIT

T1

R1 LEVEL

U55 A

MARK 0°

18VPP 1575

MARK 90°

18VPP 90° OUT

18VPP 1575

18VPP 2425

18VPP 90° OUT

18VPP 2425

U89

R147 +15 -15 MARK 0° OFFSET

U90

R148 +15 -15 MARK 90° OFFSET

U91

R149 +15 -15 SPACE 0° OFFSET

U92

R150 +15 -15 SPACE 90° OFFSET

U58, 60, 62 A

U64A

U66A

R271

R275

MARK 0° BALANCE

U58, 60, 62 B

U64B

R273

R276

SPACE BALANCE

U59, 61, 63 A

U65B

U59, 61, 63 B

U65A

SELECTABLE LOW PASS FILTER CONTROL U69-78

PART OF MODE

S1

J4

POWER INPUT

A
B
C

SAFETY INTERLOCK W4S1

Fig 5-2

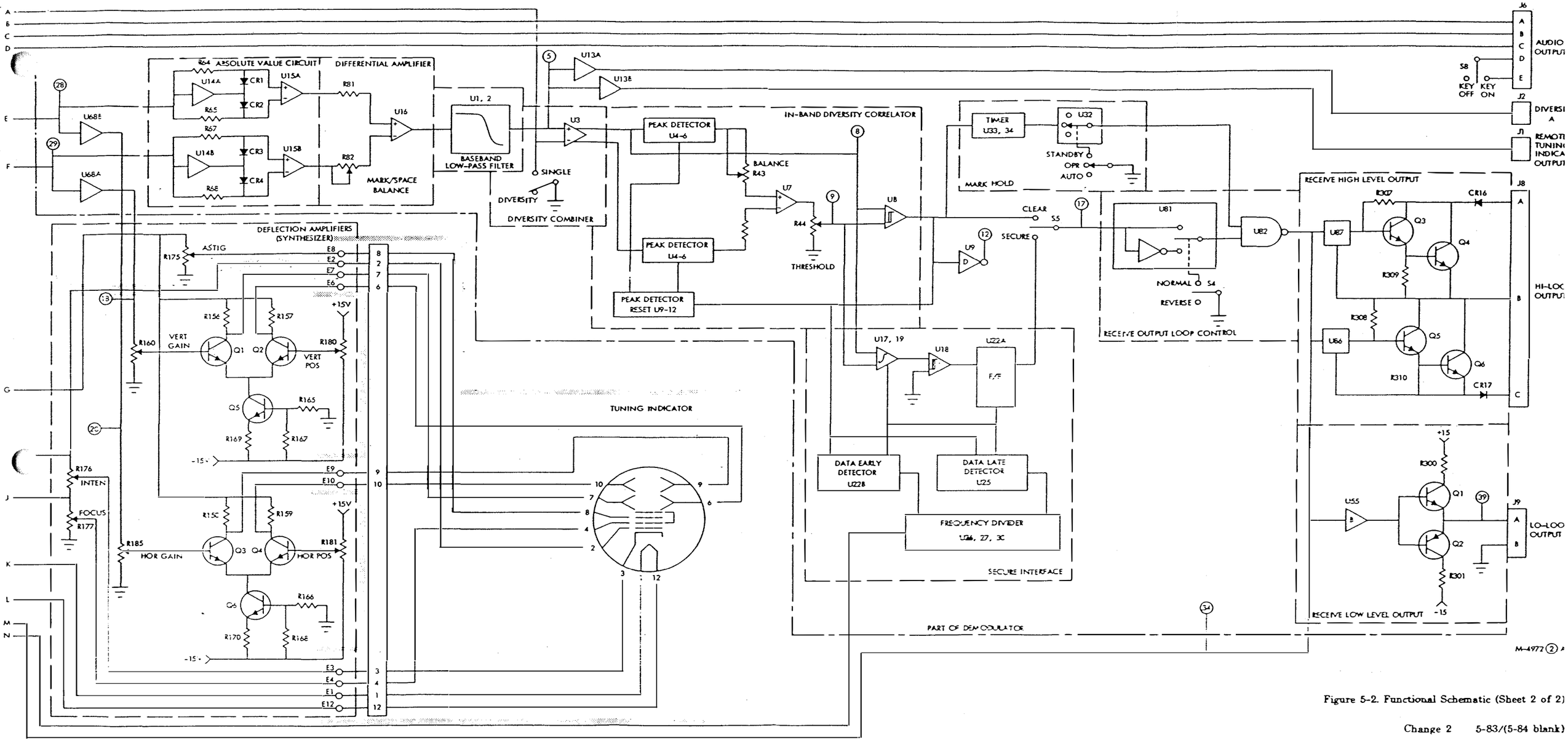

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Figure 5-2. Functional Schematic (Sheet 2 of 2)

SECTION VI

REPAIR

6-1. INTRODUCTION

6-2. The converter contains two printed circuit board assemblies, three wiring harnesses and one wiring cable. This section describes the removal and replacement of each of these assemblies. Procedures are included for piece part removal and replacement to effect repair of the assemblies, as well as adjustment of the converter after repair and replacement has be accomplished.

6-3. ASSEMBLY REMOVAL AND REPLACEMENT

WARNING

Dangerous voltages exist within the converter when it is connected to the line voltage source, even when the POWER switch is OFF. Always remove the power connector from J4 on rear of converter prior to removal and replacement.

6-4. CHASSIS REMOVAL. Perform the following steps to remove the chassis from the case:

1. Loosen the captive screws at the four corners of the front panel and pull fully forward until slides lock.
2. Loosen the captive screws at the ends of connector W4P1 (figure 6-1).
3. Remove screws in clamp at back of chassis.
4. Move clamp and unplug connector.
5. Remove and retain screws on both sides in slides at front of chassis.

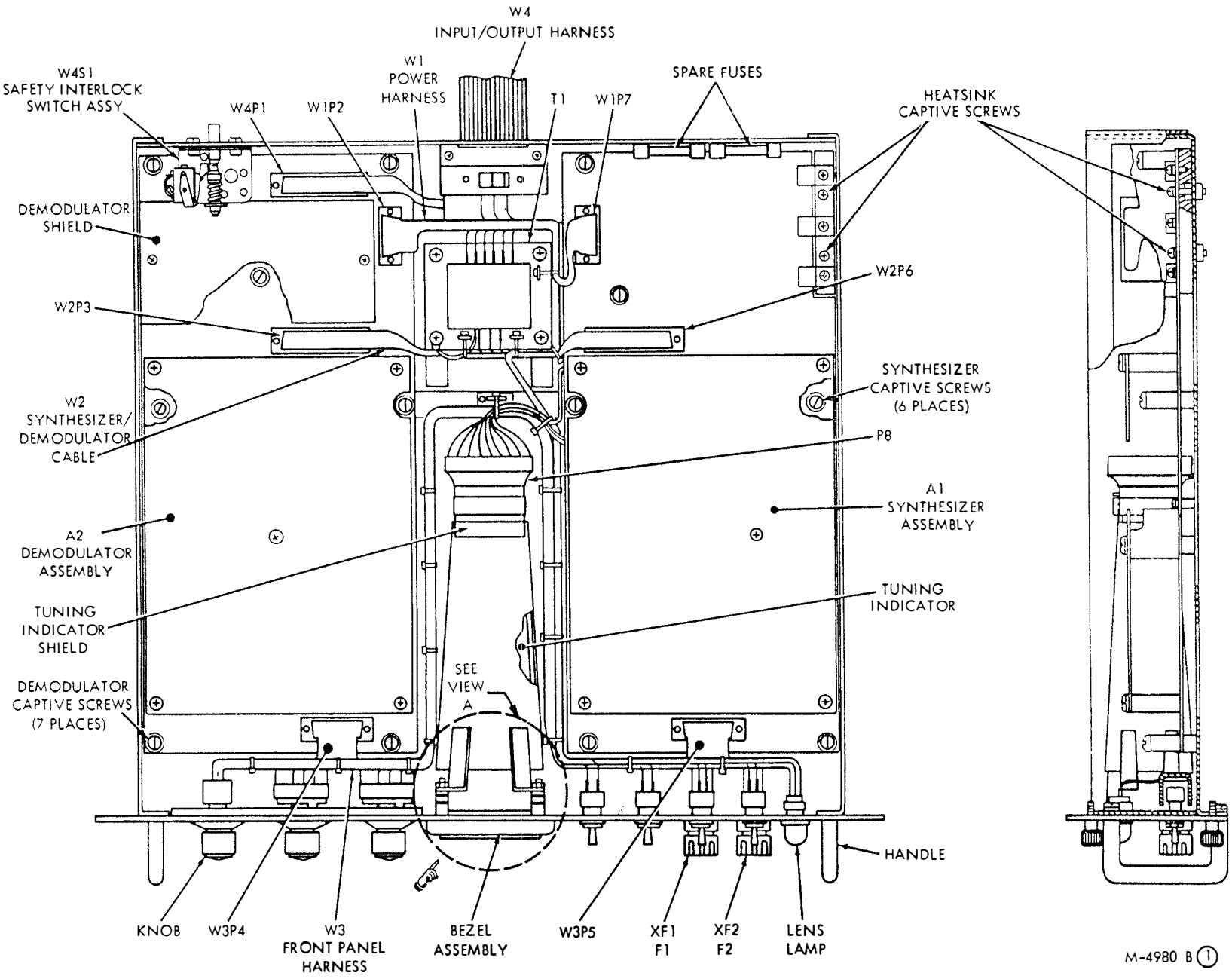

Figure 6-1. Converter parts location. (Sheet 1 of 2)

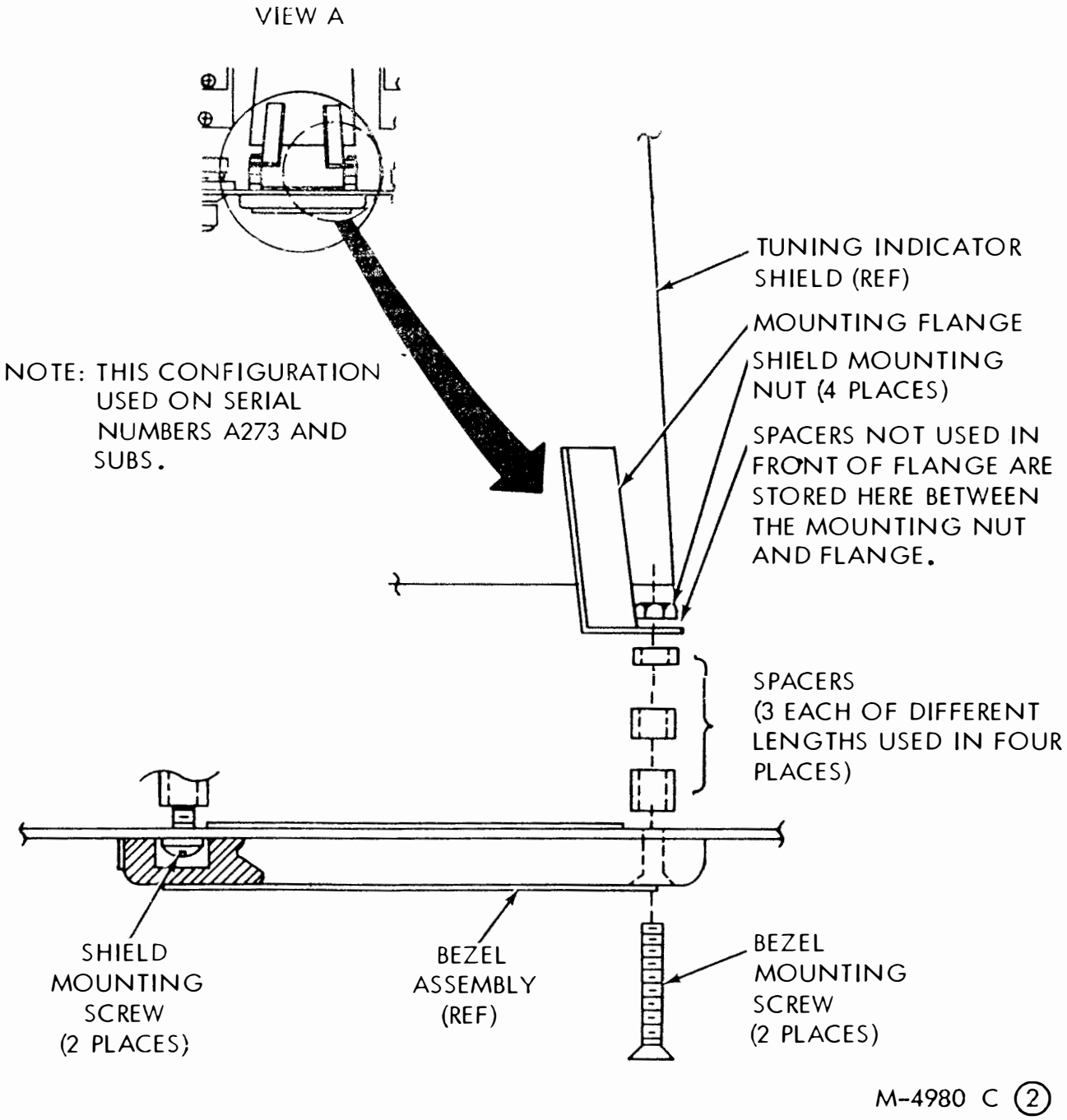

Figure 6-1. Converter parts location. (Sheet 2 of 2)

6. Lift front of chassis until tabs disengage slides. Slide chassis forward until tabs at back of chassis disengage the slides. Lift back of chassis free from slides.

6-5. SYNTHESIZER ASSEMBLY (A1) REMOVAL. Perform the following steps, as required, to gain access to for repair purposes or to remove the synthesizer assembly from the chassis:

1. Loosen the three captive screws nearest to outer edge of upper synthesizer assembly A1A1 (figure 6-1). Raise upper synthesizer assembly. Observe that removal and replacement of components mounted on upper synthesizer assembly card can be performed at this point without further disassembly. See paragraph 6-12.
2. Loosen captive screws from both ends of connectors W1P7, W2P6, and W3P5. Remove connectors from their receptacles.
3. Remove connector P8 from tuning indicator. Cut cable ties holding cabling for P8.
4. Loosen the two heat sink captive screws from the chassis.
5. Loosen the six captive screws in lower synthesizer assembly A1A2.
6. Lift synthesizer assembly free from chassis. See paragraph 6-12 for component removal and replacement procedures.

6-6. DEMODULATOR ASSEMBLY (A2) REMOVAL. Perform the following steps to remove the demodulator assembly from the chassis:

1. Loosen two captive screws in outer edge and one near center area of upper demodulator A2A1 (figure 6-1) and lift it up. Observe that removal and replacement of components of upper circuit card can be accomplished without further disassembly. See paragraph 6-12.
2. Loosen captive screws at both ends of connectors W2P3, and W3P4. Remove connectors from their receptacles.
3. Remove the two demodulator shield mounting screws. Remove shield.
4. Loosen seven captive screws in lower demodulator A2A2.
5. Lift demodulator free from chassis. See paragraph 6-12 for component removal and replacement procedures.

6-7. POWER HARNESS ASSEMBLY (W1) REMOVAL. Perform the following steps to remove power harness assembly, W1, from the chassis:

1. Loosen captive screws at both ends of connectors W1P2 and W1P7. Remove connectors from their receptacles.
2. Unsolder wires from fuse holders XF1 and XF2.

3. Remove S8 and S9 from front panel.
4. Remove screws holding bracket for switch W4S1 to rear of chassis (figure 6-1).
5. Remove screws from transformer T1.
6. Cut cable ties holding harness W1 and remove harness from chassis.

6-8. DEMODULATOR/SYNTHESIZER CABLE ASSEMBLY (W2) REMOVAL. Perform the following steps to remove the synthesizer/demodulator cable assembly from the chassis:

1. Loosen captive screws at both ends of connectors W2P3 and W2P6. Remove connectors from their receptacles.
2. Cut cable ties holding cable W2 and remove cable from chassis.

6-9. FRONT PANEL HARNESS ASSEMBLY (W3) REMOVAL. Perform the following steps to remove the front panel harness assembly from the chassis:

1. Loosen captive screws at both ends of connectors W3P4 and W3P5. Remove connectors from their receptacles.
2. Remove knobs from R1, S1, and S2. Unscrew lens from XDS1.
3. Remove R1, S1, S2, S3, S4, S5, S6, S7, and XDS1 from front panel.
4. Cut cable ties holding harness W3 and remove harness from chassis.

6-10. INPUT/OUTPUT ASSEMBLY REMOVAL. Perform the following steps to remove the input/output harness assembly from the case:

1. Remove chassis from cabinet per paragraph 6-4.
2. Remove flathead screws holding cable clamps to bottom of case.
3. Remove two screws and washers that secure interlock switch assembly (W4S1) to rear bulkhead of chassis assembly.
4. Remove screws around edge of sloping back panel.

CAUTION

To prevent damage, do not force the terminals against the case.

5. Remove the back panel with the input/output harness.

6-11. TUNING INDICATOR REMOVAL. Perform the following steps to remove the tuning indicator from the chassis.

1. Remove connector P8 from the rear of the tuning indicator.

2. Remove two flathead screws from the tuning indicator bezel assembly.

3. Remove bezel assembly.

4. Unfasten clamp at rear end of tuning indicator shield and remove tuning indicator through front panel.

6-12. COMPONENT REMOVAL AND REPLACEMENT. Removal and replacement of the components associated with the power harness assembly (paragraph 6-7) or the front panel harness assembly (paragraph 6-9) does not normally require removal of the complete assembly from the chassis nor require any special procedures beyond commonly accepted elecronic repair shop practices. General instructions for removing and replacing component parts that are mounted on the circuit card assemblies are as follows:

1. Locate printed circuit pads on soldered side of circuit card that secure faulty component.

2. Sharpen an orange stick to a chisel point with emery cloth. Use the sharpened stick to scrape off excess conformal coating from printed circuit pads and surrounding area (both sides of circuit board, if applicable). A small amount of Freon TMC applied to conformal coating before scraping will soften coating and aid in removal.

3. Moisten a stiff acid brush with isopropyl alcohol and scrub pad area vigorously. Keep applying alcohol and scrubbing until there is no evidence of conformal coating on or around solder joints.

4. Wipe off cleaned area with a lint-free cloth or paper tissue to remove any remaining coating residue or solvent.

5. Unsolder faulty component and remove. Refer to paragraph 6-13 for further cleaning procedures and in-process inspections.

6. Bend leads of relacement component, as applicable, to match leads of removed component. Insert leads of replacement component into circuit card, seating component firmly against circuit board or in the same way as removed component was positioned.

7. Solder replacement component leads to circuit card solder pads.

8. Clip leads from components that protrude through circuit card to 0.015-inch to 0.025-inch length.

9. Reapply conformal coating as follows:

Use of solvents other than isopropyl alcohol for flux removal can severely affect the surrounding conformal coating, the adhesion of the new coating, and the degree of cleanliness achieved.

a. After new component is installed and soldered, scrub repair area for 15 seconds with an acid brush dipped in isopropyl alcohol. Use plenty of alcohol and flood the area to wash away all residual rosin flux left during soldering.

b. While waiting for repair area to completely dry of alcohol, prepare a solution of 1:1 weight/weight ratio of naptha and insulating compound. Naptha should be per Federal Specification TT-N-95 for aliphatic naptha. Insulating compound should be per MIL-I-46058, Type SR (Dow-Corning 3144 RTV, or equivalent). Stir solution well until a smooth consistency is obtained. Place solution into a sealed container to avoid solvent evaporation.

c. After repair area has dried for approximately 15 minutes, apply conformal coating solution. Build up coating on lead ends and under components. Work coating until no bubbles, voids, or pinholes penetrate coating thickness. Allow conformal coating solution to air dry for at least 1 hour.

d. If experience shows that conformal coating solution (prepared in step b. above) is too thick, or too thin, increase or decrease amount of aliphatic naptha thinner used.

6-13. CLEANING AND IN-PROCESS INSPECTION.

6-14. CLEANING. The following general cleaning instructions are provided for use, as applicable. Do not clean any component that inspection does not indicate needs cleaning.

1. Remove dust and loose dirt from outside surfaces with a clean, soft cloth.

WARNING

Trichloroethane fumes are toxic. Provide adequate ventilation. DO NOT use near a flame. Trichloroethane is not flammable, but exposure to high heat can convert fumes to a highly toxic gas.

6-13. CLEANING AND IN-PROCESS INSPECTION.

6-14. CLEANING. The following general cleaning instructions are provided for use, as applicable. Do not clean any component that inspection does not indicate needs cleaning.

1. Remove dust and loose dirt from outside surfaces with a clean, soft cloth.
2. Remove grease and ground-in dirt from outside surfaces with a cloth dampened (not wet) with a solution of water and a light duty detergent.
3. Remove dust and dirt from electrical connectors with a soft-bristled brush.
4. During removal and replacement procedures, remove any collected dust from exposed inner parts of converter(s) by loosening with a soft-bristled brush and blowing with a jet of dry air at no more than 15 psi.

6-15. IN-PROCESS INSPECTION. After disassembly, removal, replacement, or reassembly, subject the converter(s) and associated accessories to an in-process inspection as follows:

1. Inspect parts, components, or hardware to ensure that they are assembled, mounted, and secured so as to satisfactorily accomplish their intended purpose.
2. Inspect circuit cards, chassis assembly, cases, covers, etc., for absence of breaks, cracks, dents, or other damage. Where conformal coating has been used, ensure that coating material has not covered areas purposely left unpainted or uncoated for electrical contact purposes. Circuit cards should show no evidence of lifting or separation of plating from the conductor pattern or of conductors from the base laminate. Remove any metal slivers or whiskers. Inspect components, especially resistors, coils, transformers, etc., for evidence of burns.
3. Inspect screws, nuts, bolts, etc., for evidence of cross-threading, detrimental or hazardous burrs, or mutilation.
4. Inspect all screw-type fasteners for tightness. They should be firmly secure with no relative movement possible between them and attached parts.
5. Inspect soldered wires and leads to see that they are tightly crimped to terminals and that they show no signs of having been moved during soldering. Soldered joints should show only enough solder to cover the joint, and should show no evidence of being burned.

6-16. CHASSIS REPLACEMENT. Perform the following steps to replace chassis:

1. With chassis slides fully extended, place chassis between slides from forward and above. Engage rear tabs with slide, move chassis backward, and engage forward chassis tabs with slides.

2. Replace screws through front of slides into chassis.

3. Place W4 cable clamp in place at rear of chassis and secure with two screws.

4. Insert connector W4P1 into J1 of demodulator (A2) assembly and secure with captive screws.

5. Press slide latches and slide chassis into case. Secure with captive panel screws.

6-17. SYNTHESIZER ASSEMBLY (A1) REPLACEMENT. Perform the following steps to replace synthesizer assembly:

1. Apply heat transfer compound to aluminum heat sink on bottom of assembly at right rear and to top of small standoff in right center of assembly mounting area.

2. Place synthesizer assembly in mounting position in chassis.

3. Tighten six captive mounting screws at edges of lower synthesizer circuit card.

4. Tighten the two captive heat sink mounting screws at right rear edge of card.

5. Move upper synthesizer circuit card to horizontal position and secure with three captive mounting screws.

6. Mate connector A2P8 with tuning indicator. Replace cable ties to secure indicator cable to other cabling.

7. Mate connectors W1P7, W2P6, W3P5 with A1J7, A1J6, and A1J5, respectively. Secure with captive screws.

6-18. DEMODULATOR ASSEMBLY (A2) REPLACEMENT. Perform the following steps to replace demodulator assembly:

1. Place demodulator assembly in mounting position in chassis.

2. Tighten seven captive mounting screws in lower demodulator circuit card.

3. Position the HIGH VOLTAGE cover and secure with two screws.

4. Move upper demodulator circuit card to horizontal position and secure with three captive screws.

5. Mate connectors W1P2, W2P3, and W3P4 with A1J2, A1J3, and A1J4, respectively. Secure with captive screws.

6-19. POWER HARNESS ASSEMBLY (W1) REPLACEMENT. Perform the following steps to replace power harness W1:

1. Place harness assembly in position in chassis.

2. Pass four screws through cable tie clips and secure transformer T1 with these screws.

3. Place bracket for switch S10 in position at rear of chassis and secure with two screws.

4. Pass switches S8 and S9 through front panel and secure with nuts.

5. Solder wires to fuse holders XF1 and XF2 as tagged.

6. Mate connectors W1P2 and W1P7 with connectors A2J2 and A1J7, respectively. Secure with captive screws.

7. Apply cable ties to secure cable to other wiring in chassis.

6-20. DEMODULATOR/SYNTHESIZER CABLE ASSEMBLY (W2) REPLACEMENT. Perform the following steps to replace cable assembly W2:

1. Place cable assembly in position in chassis.

2. Mate connectors W2P3 and W2P6 with connectors A2J3 and A1J6, respectively. Secure with captive screws.

3. Apply cable ties to secure cable to other wiring in chassis.

6-21. FRONT PANEL HARNESS ASSEMBLY (W3) RELACEMENT. Perform the following steps to replace the front panel harness W3:

1. Place harness assembly in position in chassis.

2. Pass R1, S1, S2, S3, S4, S5, S6, S7 and XDS1 through front panel. Apply locking compound to the threads of R1, S1 and S2; secure R1 and the switches with nuts. Secure XDS1 with nut and install lens.

3. Install knobs on R1, S1, and S2. Ensure that knobs are properly positioned on the shafts.

4. Mate connectors W3P4 and W3P5 with connectors A2J4 and A1J5, respectively. Secure with captive screws.

6-22. INPUT/OUTPUT ASSEMBLY REPLACEMENT. Perform the following steps to replace the input/output assembly:

CAUTION

To prevent damage, do not force terminals of input/output assembly against the case.

1. Place the input/output assembly into position at rear of cabinet and secure with 14 screws around edge of rear panel.
2. Apply locking compound to threads of four screws and secure W4 cable clamps at bottom of case.
3. Place interlock switch assembly (W4S1) in position against rear bulkhead of chassis assembly and secure with two screws.
4. Depending upon installation configuration requirements, mount converter case(s) per paragraph 2-8 or 2-9.
5. Install chassis in case per paragraph 6-16.

NOTE

The tuning indicator tubes (2BP1) vary as much as 0.400 inch in length as manufactured. Effective with converter CV-3510A/UG serial number A273 and subsequent, three spacers of differing lengths (12 total) are used to secure each of the four tuning indicator shield mounting flanges (see figure 6-1, sheet 2). Thus the position of the shield can be adjusted to compensate.

6-23. TUNING INDICATOR REPLACEMENT. Perform the following steps to replace the tuning indicator in the chassis:

1. Insert tuning indicator into shield through front panel and replace connector P8 at back of tuning indicator.
2. Replace tuning indicator bezel assembly with two flathead screws. Apply locking compound to threads of screws. In units serial number A273 and subsequent, reinstall the spacers between the indicator shield flanges and the front panel. Position the spacers as required to compensate for length of new indicator tube. Be sure to adjust all four corners equally.
3. Push tuning indicator forward against the bezel assembly and fasten clamp at rear end of the shield.

6-24. ADJUSTMENT

6-25. After replacement of either the synthesizer assembly, demodulator assembly, or power harness assembly, the converter should be adjusted.

6-26. TEST EQUIPMENT AND TOOLS. The following test equipment, or equivalent, will be required:

Digital Multimeter	-	89536-8600A-01
Oscilloscope	-	AN/USM-368
Electronic Counter	-	81350-500

Only standard electronic repair shop tools will be required. No special tools will be required.

6-27. TEST POINTS AND ADJUSTMENT CONTROL. All test points and adjustment controls used are shown in figure 5-1.

6-28. CABLING. To adjust the converter, the AUDIO OUT must be connected to the AUDIO IN. Connect J6, Pin A, to J7, Pin A and J6, Pin B to J7, Pin B. Connect POWER INPUT, J4, to the power source (refer to paragraph 2-3).

6-29. ADJUSTMENT PROCEDURE. Perform the following steps to adjust the converter:

1. Turn POWER switch to ON. Let converter warm up 30 minutes.

2. Loosen captive screws at the four corners of the front panel and fully withdraw the chassis.

WARNING

HIGH VOLTAGE is present in this equipment when interlocks are defeated. DEATH or SERIOUS injury may result if personnel fail to observe safety precautions.

3. Defeat interlock at the back left-hand side of the converter.

4. Adjust R69 to obtain +5.05 V ±.05 at TP29 on synthesizer assembly.

5. Adjust R65 and R67 respectively to obtain +15 Vdc ±.1 Vdc at TP21 and -15 Vdc ±.1 Vdc at TP22 on synthesizer assembly.

6. Adjust C6 to obtain a frequency of 17,690,400 ±40 Hz at TP1 on synthesizer assembly.

7. Set the TRANSMIT/OFF/RETRANSMIT switch to OFF.

8. Adjust R147 using oscilloscope to obtain minimum AC signal at TP22 on the demodulator assembly.

9. Adjust R148 using oscilloscope to obtain minimum AC signal at TP21 on the demodulator assembly.

10. Adjust R150 using oscilloscope to obtain minimum AC signal at TP20 on the demodulator assembly.

11. Adjust R149 using oscilloscope to obtain minimum AC signal at TP23 on the demodulator assembly.

12. Set the TRANSMIT/OFF/RETRANSMIT switch to TRANSMIT and set the LEVEL control to obtain 0.60 Vac at TP30 on the demodulator assembly.

13. Set the MODE switch to VLF, NORMAL/REVERSE switch to REVERSE, and adjust R275 on demodulator assembly for minimum P-P AC ripple at TP5 using an oscilloscope.

14. Set the TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT and the AUTO/OPR/STANDBY switch to STANDBY and adjust R276 on the demodulator assembly for minimum P-P AC ripple at TP5 using an oscilloscope.

15. Change the AUTO/OPR/STANDBY switch to OPR, CLEAR/SECURE switch to SECURE, and MODE switch to HF. Using an oscilloscope, adjust R82 on the demodulator assembly for an average minus voltage equal to the average plus voltage at TP5.

16. Change AUTO/OPR/STANDBY switch to STANDBY and TRANSMIT/OFF/RETRANSMIT to TRANSMIT. Next, measure the voltage at TP8 on the demodulator assembly and adjust R44 to obtain half of that measured value at TP9 on the demodulator assembly.

17. Change the TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT. Measure the voltage at TP8 on the demodulator assembly and adjust R43 to obtain half of that measured value at TP9 on the demodulator assembly.

18. Switch the TRANSMIT/OFF/RETRANSMIT switch to TRANSMIT and repeat steps 16 and 17 until no further adjustment is required.

19. Set the DATA RATE switch to 75, the CLEAR/SECURE switch to SECURE, the TRANSMIT/OFF/RETRANSMIT switch to RETRANSMIT, and the NORMAL/REVERSE switch to REVERSE.

20. Set the intensity of the tuning indicator by adjusting R176 on the synthesizer assembly.

21. Focus the display on the tuning indicator by adjusting R177 on the synthesizer assembly.

22. Adjust the astigmatism of the tuning indicator by adjusting R175 on the synthesizer assembly.

23. Center the display vertically on the tuning indicator by adjusting R180 on the synthesizer assembly.

24. Center the display horizontally on the tuning indicator by adjusting R181 on the synthesizer assembly.

25. Set the vertical gain for a deflection out to the lines on the screen of the tuning indicator by adjusting R160 on the synthesizer assembly.

26. Set the horizontal gain for a deflection out to the lines on the screen of the tuning indicator by adjusting R185 on the synthesizer assembly.

27. Repeat steps 20 through 26 until no further adjustment is necessary.

SECTION VII

PARTS LIST

7-1. GENERAL.

7-2. This parts list for converter Group AN/URA-17E lists, describes, and illustrates the units, assemblies, and detail parts that compose the AN/URA-17E, Part Number 8000000171-1. The AN/URA-17E is manufactured by Gould Defense Electronics, Inc., NavCom Systems Division, A Wholly Owned Subsidiary of Gould Inc, El Monte, California 91731.

7-3. The purpose of the parts list is to provide parts information for use by supply and maintenance personnel when they are requisitioning, storing and issuing replaceable parts for the AN/URA-17E. The parts lists show disassembly relationship but they are not the authority for assembly and disassembly procedures. Such procedures are provided in Section VI of this manual.

7-4. ARRANGEMENT OF PARTS LIST

7-5. This parts list is divided into four parts: Part 1, Introduction; Part 2, Group Assembly Parts List; Part 3, Numerical Index; and Part 4, Reference Designation Index.

7-6. PART 1, INTRODUCTION.

7-7. Part 1 explains the purpose and the arrangement of the parts list. In addition, this part provides (1) direction for use, (2) directions for locating parts and part numbers, (3) explanation of usable on codes and (4) list of names and addresses of manufacturers supplying parts used in the manufacture of the AN/URA-17E.

7-8. PART 2, GROUP ASSEMBLY PARTS LIST.

7-9. Part 2 contains the complete breakdown of the AN/URA-17E, separated into figures by main groups and assemblies, and keyed to associated illustrations by figure, index numbers and legends. Parts are listed in disassembly sequence, except where the sequence of disassembly cannot be maintained.

7-10. FIGURE AND INDEX NUMBER COLUMN. Each breakdown is accompanied by an illustration showing the items listed. This column contains the figure number for the illustration in which the breakdown is shown, and index numbers to locate the detail parts on the illustration.

7-11. LEGEND. Each Circuit card illustration is accompanied by a legend in component reference designation sequence, C1, R1, Q1, etc. Parts that are identified on the circuit card illustration are found on the legend. Adjacent to the component reference designation is the item number that corresponds to the index number in the Group Assembly Parts List. Thus, part information can be found rapidly and positively.

7-12. PART NUMBER COLUMN. This column contains the contractor's part number, a government standard, or another manufacturer's identifying number. The term "COML" is used for items that are procurable from normal commercial sources, and have no part number assigned. The term "NO NUMBER" is used to indicate that the item has no part number assigned. In either case, a complete description of the item is given in the description column.

7-13. DESCRIPTION COLUMN. The description column contains the nomenclature and descriptive modifiers necessary to identify each item, except for government standard parts which are listed by noun name only. Manufacturers of vendor items are identified by including their five-digit federal manufacturers code following the description of the item. When a manufacturer does not have an assigned code, the name and address is given instead of the code. Codes are not included for government standard parts and parts manufactured by Gould Inc. The parenthentical term "(AP)" following the description indicates an attaching part. Gould Inc. assigned 10-digit part numbers for specification control, vendor, and commercial parts are shown parenthetically at the end of the description. Items with too many parts to be broken down in place are referred to a separate figure for breakdown, and cross referenced to their next higher assembly.

7-14. INDENTURE. The descriptions of assemblies, subassemblies, and detail parts are properly indented to show relationship to their next higher assemblies. In the figure-title indenture column, detail parts of the figure-title assembly are listed following, and one indenture to the right of, their next higher assembly. The next higher assembly for a part may be determined by locating the first item that is one indenture to the left and preceding that detail part (except attaching parts). Attaching parts are the exception to this indenture procedure, and are listed immediately following and at the same indenture as the item that they attach.

Following is an example of the next higher assembly relationship produced by this method of indenture.

1 2 3 4 5 6
Figure Title
. Subassembly
(Attaching Parts) for subassembly
. . Detail Parts of subassembly
(Attaching Parts) for detail parts of subassembly
. . . Subassembly

7-15. UNITS PER ASSEMBLY COLUMN. Quantities specified in this column are the total number of each part required per assembly or subassembly at the location indicated, and not necessarily the total number used.

The letters "AR" indicate "as required" and are used whenever a precise quantity cannot be determined. The entry "REF" in this column indicates the requirement for the item was listed under its next higher assembly. When the total number used is in excess of 999, the letter A is used in the first column to indicate 10, B indicates 11, C indicates 12 and D indicates 13.

7-16. USABLE ON CODE COLUMN. This column shows the usability of parts on different models of the equipment covered by the parts list. The absence of a code in this column indicates the part is used in all models. The usable on codes are for the specific figure where they appear and are defined at the end of the listing for that figure.

7-17. PART 3, NUMERICAL INDEX.

7-18. Part 3 is a tabulation of the part numbers for all parts that compose the articles covered in this parts list. The tabulation forms an index that enables the user to locate, within the Group Assembly Parts List, any part of the article for which the part number is known.

7-19. PART NUMBER COLUMN. The Part Number column contains, in alphanumerical order, all part numbers listed in Part 2, Group Assembly Parts List. The order of precedence for initial character of the part number (first position on left) is A through Z for alphabetical letters, and 0 through 9 for numerals. The order of precedence in continuing the part number arrangement for the second and subsequent characters (positions) is as follows: (1) blank

(space), (2) dash (-), (3) letters A through Z, and (4) numerals 0 through 9. Parts listed as "COML" or "NO NUMBER" are listed in this column by their identifying noun name. Government standard parts (AN, JAN, MS, and NAS) are listed only by their first appearance in the Group Assembly Parts List and do not reflect other succeeding listings of the part.

7-20. FIGURE AND INDEX NUMBER COLUMN. This column reflects the figure and index number for the part listed. When an item has not been assigned an index number, only the figure number appears.

7-21. PART 4, REFERENCE DESIGNATION INDEX .

7-22. Part 4 contains an alphanumerical list of all reference designations assigned to the electrical parts of the articles covered by this parts list.

7-23. REFERENCE DESIGNATION COLUMN. This column contains, in alphanumerical order, all reference designations shown on schematic diagrams in the maintenance manuals and reflected in the rest of parts list.

7-24. FIGURE AND INDEX NUMBER COLUMN. This column gives the location of each Reference Designated part by figure and index number contained in part 2.

7-25. PART NUMBER COLUMN. This column contains the part number of the item identified by the Reference Designation.

7-26. HOW TO USE THE PARTS LIST.

7-27. Refer to the last two pages in part 1 for instructions on how to use the parts list when the part number is not known, or how to use the parts list when the part number or reference designation is known.

7-28. MANUFACTURER'S CODES. Manufacturers of vendor items are identified by a five-digit code in the description column of the Group Assembly Parts List. Following is a complete list, in numerical order, of the manufacturer's codes in accordance with Federal Supply Code for Manufacturer's cataloging Handbook H4-1 and H4-2.

Code	Manufacturer's Name and Address
00141	Pic. Design, Corp Sub. of Wells Benrus Corp. Benrus Center P.O. Box 335 Ridgefield, CT 06877
00144	Magnetic Controls Co. 4900 West 78th St. Minneapolis, MN 55435
00540	Kramer Mfg. Co. San Francisco, CA
01121	Allen-Bradley Co. 1201 South 2nd St. Milwaukee, WI 53204
01295	Texas Instruments Inc. Semiconductor Group 13500 N. Central Expressway P.O. Box 225012 M/S 49 Dallas, TX 75265
02735	R.C.A. Corp Solid State Division Route 202 Somerville, NJ 08876
04713	Motorola, Inc. Semiconductor Products Group 5005 E. McDowell Road Phoenix, AZ 85008
06383	Panduit Corp. 17301 Ridgeland Tinley Park, IL 60477
06540	Mite Corp. Amatom Electronic Hardware Div. 446 Blake Street New Haven, CT 06515
07014	Asquith S A Co. Glendale, CA
07047	Ross Milton Co. The 511 Second Street Pike Southampton, PA 18966
07263	Fairchild Camera and Instrument Corp. Semiconductor Div. 464 Ellis St. Mountain View, CA 94042
08289	Blinn Delbert Co. Inc. The 1678 E. Mission Blvd. P.O. Box 2007 Pomona, CA 91766
08524	Deutsch Fasteners Corp. P.O. Box 92925 Los Angeles, CA 90009
15912	T and B/Ansley Corp. Subsidiary of Thomas and Betts Corp. 3208 Humboldt St. Los Angeles, CA 90031
24355	Analog Devices Inc. Rt. 1 Industrial Pk. Norwood, MA 02062
26769	Mepco/Electra Inc. A North American Philips Co. 5900 Australian Ave. West Palm Beach, FL 33407
28984	Component Specialties Corp. 9143 E. La Rosa Drive Temple City, CA 91780
29372	Rexnord, Inc. - Tridair Ind. A Rexnord Company 3000 W. Lomita Blvd. Torrance, CA 90505
29604	Stackpole Components Co. P.O. Box 14466 Raleigh, NC 27610
34341	ABC Hanger and Supply Inc. 712 Stewart Ave. Garden City, NY 11530
50157	Midwest Components Inc. 1981 Port City Blvd. P.O. Box 787 Muskegon, MI 49443

Code	Manufacturer's Name and Address
51212	Bomco Inc. Rt. 128 Blackburn Circle Gloucester, MA 01930
55104	Tri-Star Electronics Inc. 362 Main St. Venice, CA 90291
55112	Plessey Capacitors Div. of Plessey Inc. 5334 Sterling Center Dr. Westlake Village, CA 91361
55335	JKL Components Corp. 2226 Barry Ave. Los Angeles, CA 90064
55552	Ribbon Cable Co. 4711-C Arrow Hwy. Montclair, CA 91763
55566	RAF Electronic Hardware Inc. 260 Hathaway Dr. Stratford, CT 06497
56289	Sprague Electric Co. 87 Marshall St. North Adams, MA 01247
57057	Gould Inc., NavCom Syst. Div. 4323 Arden Drive El Monte, CA 91731
71468	ITT Cannon Electric Div. International Telephone and Telegraph Co. 666 E. Dyer Rd. Santa Ana, CA 92702
71785	TRW Inc. TRW Cinch Connectors 1501 Morse Ave. Elk Grove Village, IL 60007

Code	Manufacturer's Name and Address
72619	Dialight Division Amperex Electronic Div. 203 Harrison Place Brooklyn, NY 11237
72962	Esna Div. of Amerace Corp. 2330 Vauxhall Road Union, NJ 07083
72982	Erie Technological Products Inc. 645 W. 11th St. Erie, PA 16512
75915	Littlefuse Inc. 800 E. Northwest Hwy. Des Plaines, IL 60016
77089	Packless Metal Hose Inc. DBA Packless Ind. 8401 Imperial Dr. P.O. Box 8799 Waco, TX 76710
82389	Switchcraft Inc. Sub of Raytheon Co. 5555 N. Elston Ave. Chicago, IL 60630
91929	Honeywell, Inc. Micro Switch Div. 11 W. Spring Street Freeport, IL 61032
99813	Jan Hardware Mfg. Co. Inc. 47-27 36th St. Long Island City, NY 11101
99942	Globe - Union Inc. Centralab Semiconductor Centralab Electronics Div. 5757 N. Green Bay Rd. P.O. Box 591 Milwaukee, WI 53201

PART 2
GROUP ASSEMBLY PARTS LIST

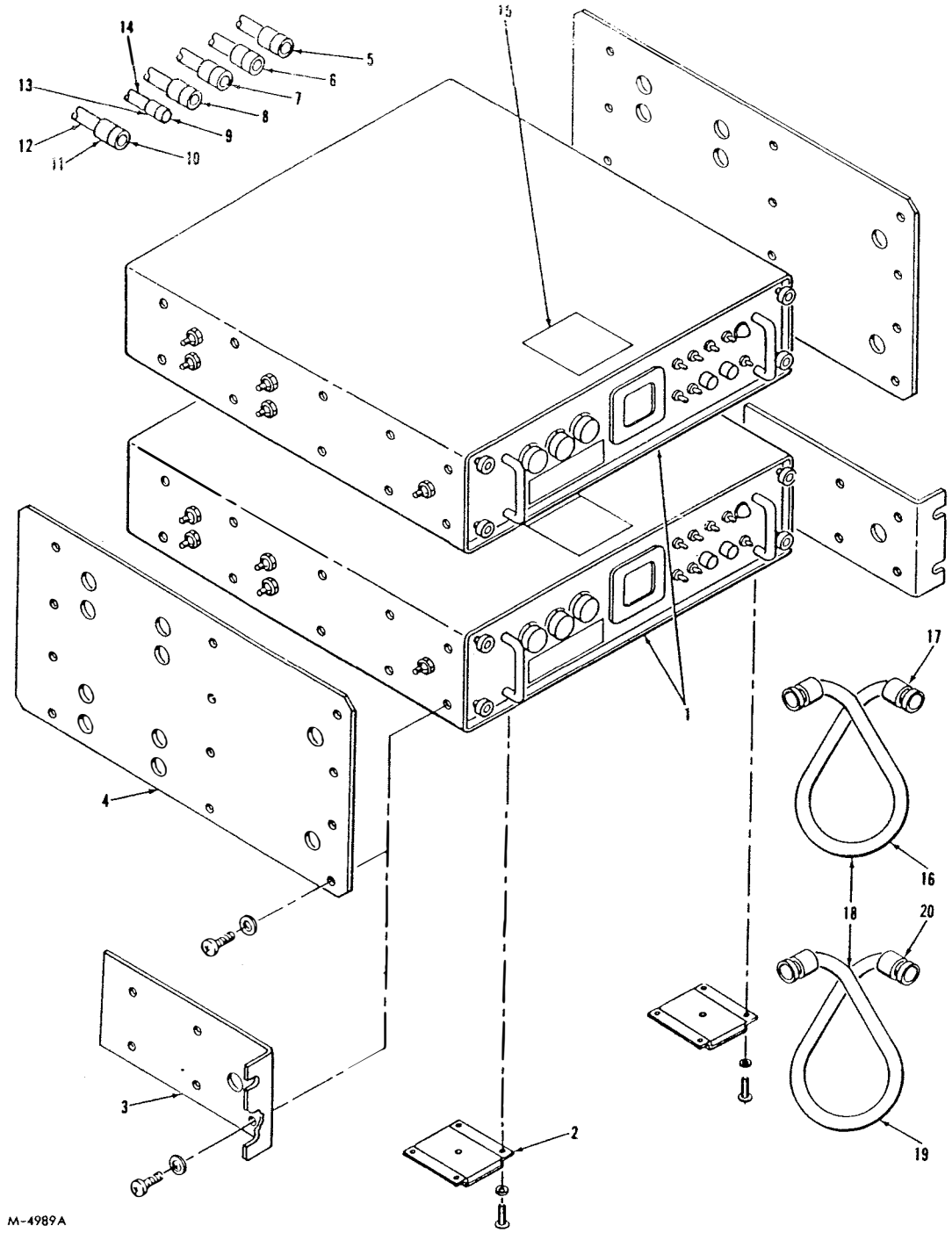

Figure 7-1. Converter Group AN/URA-17E

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
1 -	8000000171-1	CONVERTER GROUP AN/URA-17(E)	1	
-1	8010000626-1	(SEE FIG. 2 FOR BREAKDOWN)	2	
	8180000780-1	. . ACCESSORY KIT CONVERTER	2	
-2	8040003650-1	. . . FOOT,MOUNTING	4	
	MS-5195744	. . . SCREW (AP)	16	
	NAS620C8L	. . . WASHER (AP)	16	
-3	8040003606-1	. . . BRACKET,RACK MOUNTING	2	
-4	8040003804-1	. . . BRACKET,TABLE MOUNTING	1	
	MS-51958-62	. . . SCREW (AP)(USED WITH INDEX 3 AND 4)	12	
	NAS620C10L	. . . WASHER (AP)(USED WITH INDEX 3 AND 4)	12	
-5	MS3106A14S-7S	. . . CONNECTOR	1	
-6	MS3106A14S-2S	. . . CONNECTOR	1	
-7	MS3106A14S-5P	. . . CONNECTOR	1	
-8	MS3106A14S-7P	. . . CONNECTOR	1	
-9	MS3106A10SL-3S	. . . CONNECTOR	1	
-10	MS3106A14S-9P	. . . CONNECTOR	1	
-11	MS3057-6A	. . . CLAMP,CABLE (USED WITH INDEX 5,6,7,8,AND 10)	5	
-12	MS3420-6	. . . BUSHING (USED WITH INDEX 5,6,7,8,AND 10)	5	
-13	MS3057-4A	. . . CLAMP,CABLE (USED WITH INDEX 9)	1	
-14	MS3420-4	. . . BUSHING (USED WITH INDEX 9)	1	
-15	8110000833-1	. PLATE,IDENTIFICATION	2	
-16	8190001349-1	. CABLE ASSEMBLY	1	
-17	M39012/16-0013	. . CONNECTOR	2	
-18	RG-580/U	. . CABLE	AR	
-19	8190001349-2	. CABLE ASSEMBLY	1	
-20	M39012/16-0013	. . CONNECTOR	1	

2 -	8010000626-1	SIGNAL DATA CONVERTER (SEE FIG. 1 INDEX 1 FOR NHA)	REF	
-1	8020000841-1	. SIGNAL DATA CONVERTER ASSEMBLY 1	1	
-2	8030003706-1	. . CASE ASSEMBLY	1	
-3	8040003602-1	. . . CASE	1	
-4	370068	. . . SLIDE,CHASSIS (MFD BY 72962)(8882300005-1)	2	
	MS24694C8	. . . SCREW (AP)	10	
	NAS620C8L	. . . WASHER (AP)	10	
	22K1-82	. . . NUT,CAP (MFD BY 72962)(592-031-001)	10	
-5	8030003708-1	. . INPUT-OUTPUT ASSEMBLY 1A2	1	
	MS51957-28	. . SCREW (AP)	14	
-6	8040003621-1	. . . PANEL	1	
	NAS620C6L	. . . WASHER (AP)	14	
-7	8833300022-1	. . . FILTER,INPUT-OUTPUT 1A2FL1 (NO BREAKDOWN)	1	
-8	MS35425-17	. . . NUT,WING	1	
-9	8030004103-1	. . . CABLE ASSEMBLY,INPUT-OUTPUT 1A2W4 (SEE FIG. 10. FOR BREAKDOWN)	1	
	MS24693-26	. . . SCREW (AP)	10	
	MS51957-28	. . . SCREW (AP)	2	
	MS35338-136	. . . WASHER (AP)	11	
	NAS620C6L	. . . WASHER (AP)	2	
-10	8030004084-1	. . CHASSIS,ELECTRONIC ASSEMBLY 1A1 (SEE FIG. 3 FOR BREAKDOWN)	1	
	MS51957-43	. . SCREW (AP)	2	

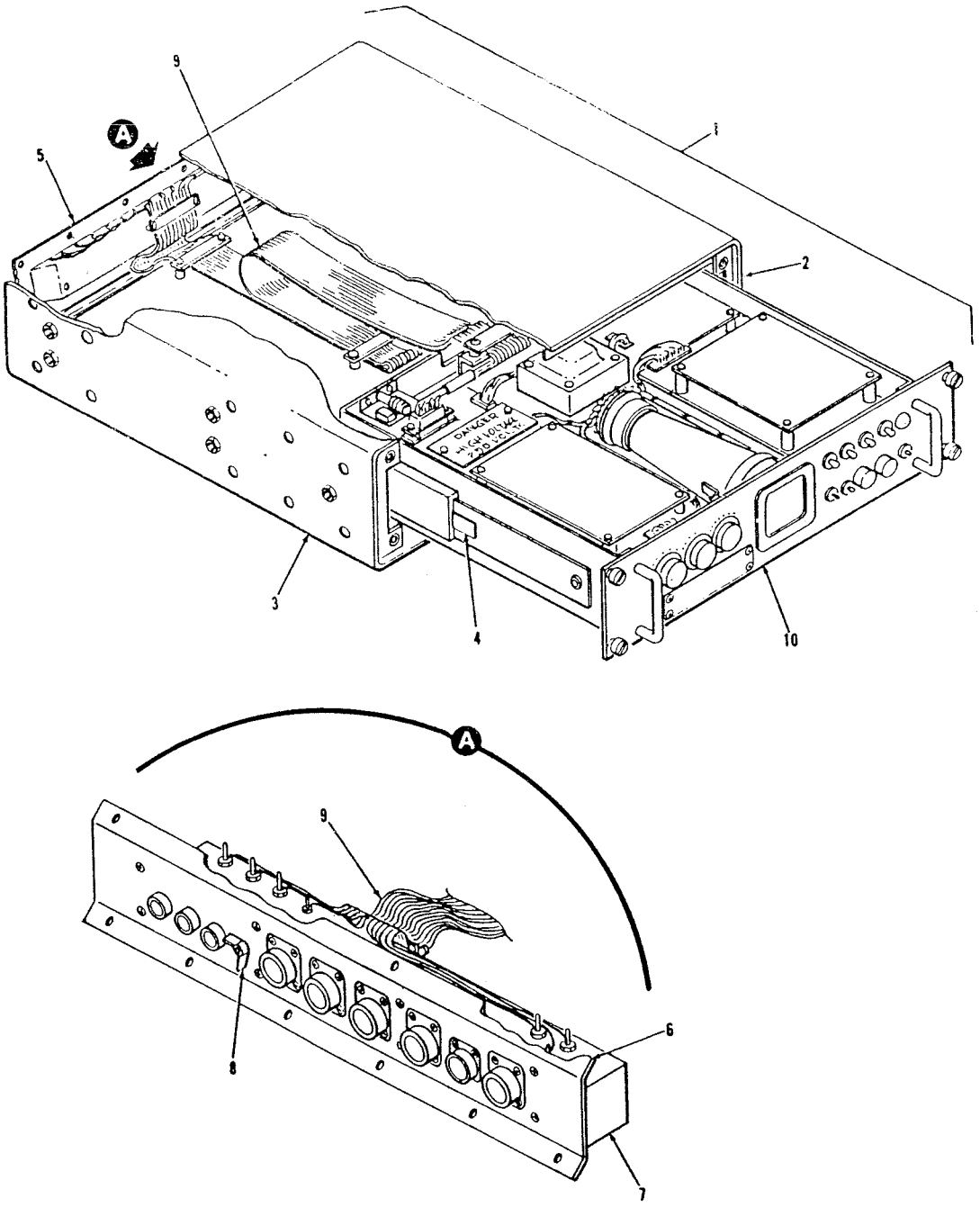

Figure 7-2. Signal Data Converter CV-3510A/UG

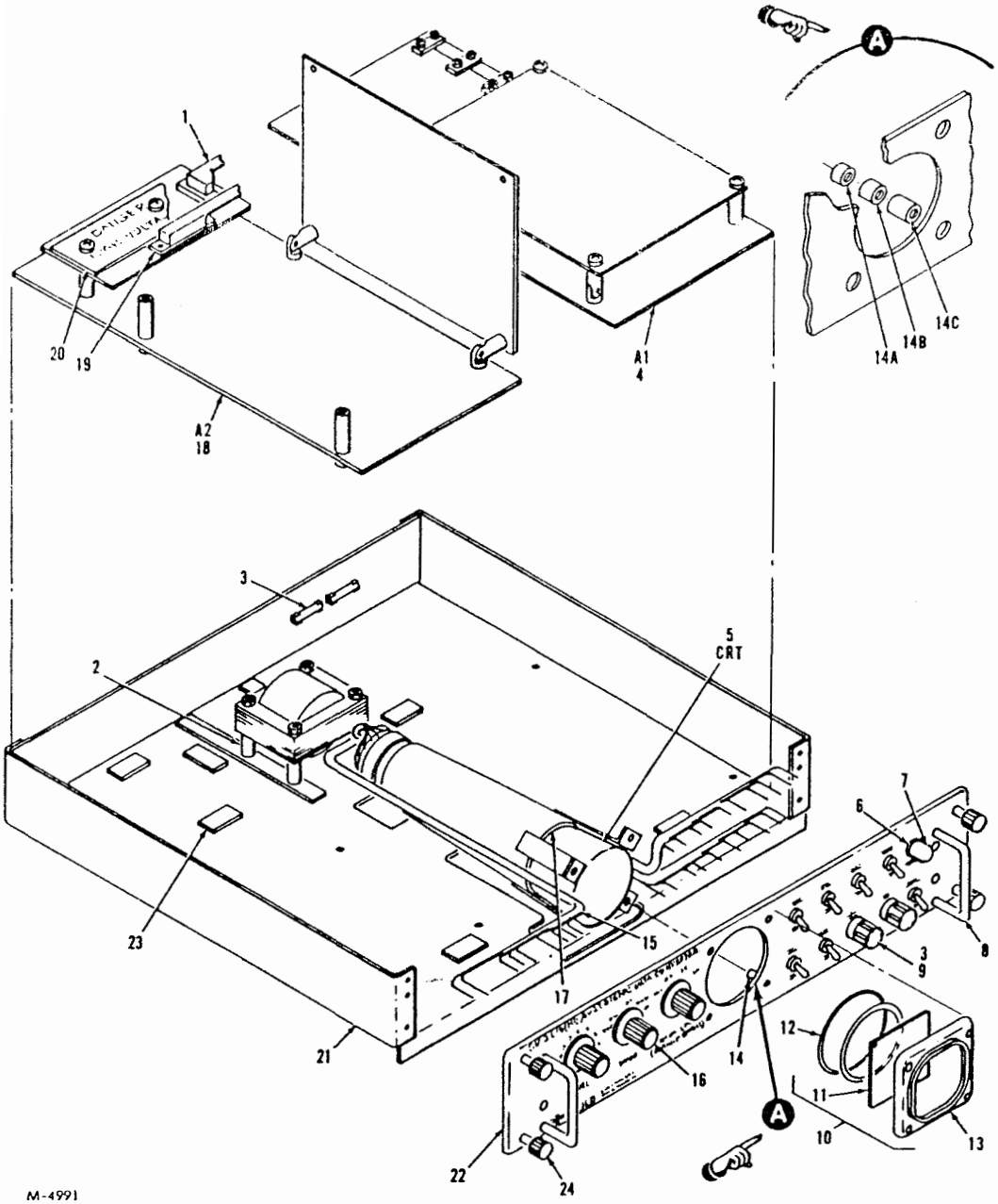

Figure 7-3. Electronic Assembly Chassis (1A1)

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
3 -	8030004084-1	CHASSIS,ELECTRONIC ASSEMBLY,CONVERTER 1A1 (SEE FIG..2. INDEX 10 FOR NHA)	REF	
-1	8030003714-1	. HARNESS ASSEMBLY,POWER 1A1W1 (SEE FIG. 10 FOR BREAKDOWN).	1	
	8892400051-1	TRANSFORMER 1A1W1T1 (SEE FIG. 10 INDEX 5 FOR 1A1W1T1).	REF	
	MS51957-38	. SCREW (AP).	4	
	MS35338-136	. WASHER (AP)	4	
	NAS620C6L	. WASHER (AP)	8	
	NAS671C6	. NUT (AP).	4	
-2	NAS1786C06-10	. POST.	4	
	MBMSS10	. MOUNT,CABLE TIE (MFD BY 06383)(644-007-001)	6	
	MS3367-5-9	. STRAP,TIEDOWN	25	
-3	F02B250V1-2A	. FUSE (INCLUDES 2 SPARES).	4	
-4	8030004072-1	. SYNTHESIZER ASSEMBLY 1A1A1 (SEE FIG. 4 FOR BREAKDOWN)	1	
-5	2BP1	. TUBE,CRT (MFD BY 77089)(8929400309-1)	1	
-6	102001	. LAMP,INDICATOR (MFD BY 55335)(8850800006-1)	1	
	AN960C816L	. WASHER (AP)	1	
-7	101-0932	. LENS CAP ASSEMBLY (MFD BY 72619)(494-003-001)	1	
-8	10321A0B32-2	. HANDLE (MFD BY 06540)(388-006-001).	2	
	MS51957-45	. SCREW (AP).	4	
	MS35338-137	. WASHER (AP)	4	
	NAS620C8L	. WASHER (AP)	4	
-9	342004L	. FUSEHOLDER (MFD BY 75915)(8834400001-1)	2	
-10	8030003817-1	. BEZEL ASSEMBLY.	1	
-11	DS500	. . WINDOW,PLASTIC (8898400005-1).	1	
	MS51959-31	. SCREW (AP).	2	A
	MS51959-35	. SCREW (AP).	2	B
-12	MS9021-225	. . PACKING,O-RING	2	
-13	B100729	. . BEZEL (MFD BY 99813)(066-001-001).	1	
-14	S739A0632-16	. STANDOFF (MFD BY 06540)(859-004-148).	4	A
-14A	S284-A-140-17	. SPACER,ROUND (MFD BY 06540)(843-006-002).	4	B
-14B	9285-A-140-17	. SPACER,ROUND (MFD BY 06540)(843-006-003).	4	B
-14C	9286-A-140-17	. SPACER,ROUND (MFD BY 06540)(843-006-004).	4	B
	MS51957-28	. SCREW (AP).	2	A
	MS51957-34	. SCREW (AP).	2	B
-15	8030004085-1	. HARNESS ASSEMBLY 1A1W3 (SEE FIG. 10 FOR BREAKDOWN).	1	
-16	MS91528-1F2B	. KNOB,CONTROL.	3	
-17	102001	. SHIELD,CRT (MFD BY 51212)(8881000002-1)	1	
	NAS671C6	. NUT (AP).	8	
-18	8030004075-1	. DEMODULATOR ASSEMBLY 1A1A2 (SEE FIG. 7 FOR BREAKDOWN)	1	
-19	8030003786-1	. CABLE ASSEMBLY 1A1W2 (SEE FIG. 10 FOR BREAKDOWN).	1	
-20	8080003925-1	. SHIELD DEMODULATOR (HV)	1	
	MS51957-13	. SCREW (AP).	2	
	MS35338-135	. WASHER (AP)	2	
	NAS620C4L	. WASHER (AP)	2	
	8885800007-1	SWITCH,SLIDE 1A1W1S10 (SEE FIG.10 INDEX 3 FOR 1A1W1S10).	REF	
	MS51957-27	. SCREW (AP).	2	
	MS35338-136	. WASHER (AP)	2	
	NAS620C6L	. WASHER (AP)	2	
-21	8C40004002-2	. CHASSIS	1	
-22	8C80003906-1	. . PANEL,CHARACTER.	1	
-23	8C40004002-56	. . PAD,STOP	7	
-24	D7500-8B4	. . SCREW (MFD BY 08524)(785-013-002).	4	

A SERIAL NO. 0001 THRU 0272
B SERIAL NO. 0273 AND SUBS

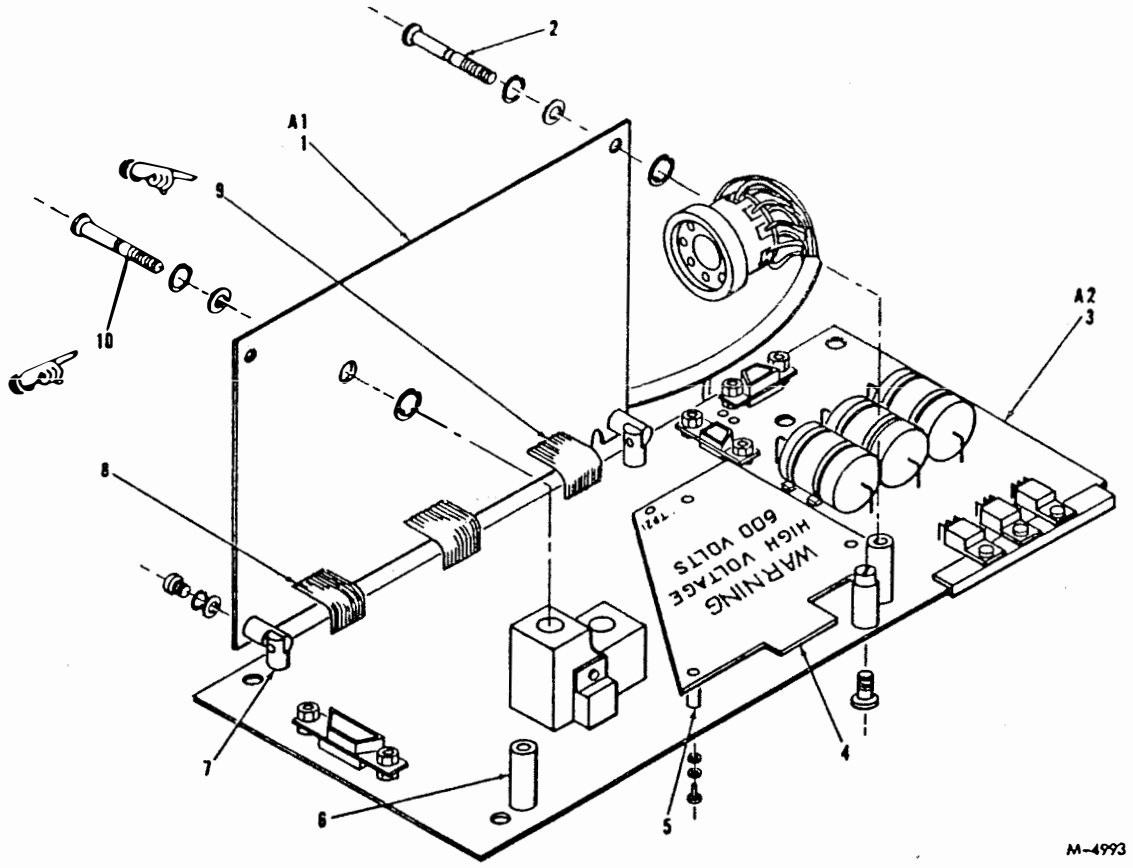

Figure 7-4. Synthesizer Assembly (1A1A1)

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
4 -	8030004072-1	SYNTHESIZER ASSEMBLY 1A1A1 (SEE FIG. 3 INDEX 4 FOR NHA)	REF	
-1	8030004073-1	. CIRCUIT CARD ASSEMBLY 1A1A1A1 (SEE FIG. 5 FOR BREAKDOWN)	1	
-2	8060004261-1	. SCREW,CAPTIVE	2	
	NAS620C8L	. WASHER (AP)	2	
	MS35338-137	. WASHER (AP)	2	
	MS16633-1012	. RING,RETAINING (AP)	2	
	8060004254-1	. NUT,RETAINER (AP)	6	
	CA2B48-7S	. SCREW,CAPTIVE (AP)(MFD BY 29372)(7B5-004-004)	6	
-3	8C3CCC4074-1	. CIRCUIT CARD ASSEMBLY 1A1A1A2 (SEE FIG. 6 FOR BREAKDOWN)	1	
-4	8080004133-1	. SHIELD,HIGH VOLTAGE	1	
	MS51957-3	. SCREW (AP)	3	
	NAS620C2	. WASHER (AP)	3	
	MS35333-69	. WASHER (AP)	3	
-5	1642-256SS20	. STANDOFF (MFD BY 55566)(859-002-226)	3	
	MS51957-3	. SCREW (AP)	3	
-6	8060004256-1	. SPACER	2	
	MS51957-43	. SCREW (AP)	2	
	MS35338-137	. WASHER (AP)	2	
	NAS620C8L	. WASHER (AP)	2	
-7	17347A0832-16	. STANDOFF,HINGED (MFD BY 06540)(859-012-002)	2	
	MS51957-43	. SCREW (AP)	4	
	MS35338-137	. WASHER (AP)	4	
	NAS620C8L	. WASHER (AP)	4	
-8	FSN-21A-10	. CABLE,FLEXIBLE (MFD BY 15912)(8812400018-2)	3	A
-8	FSN-21A-10	. CABLE,FLEXIBLE (MFD BY 15912)(8812400018-2)	2	B
-9	FLSP1.5-1.00-108/A26T	. CABLE,FLEXIBLE (MFD BY 33798)(8812400018-2)	1	B
-10	8060004257-1	. SCREW,CAPTIVE	1	
	MS16633-1012	. RING,RETAINING	1	
	MS35338-137	. WASHER (AP)	1	
	NAS620C8L	. WASHER (AP)	1	

A SERIAL NO. 0001 THRU 0040
B SERIAL NO. 0041 AND SUBS

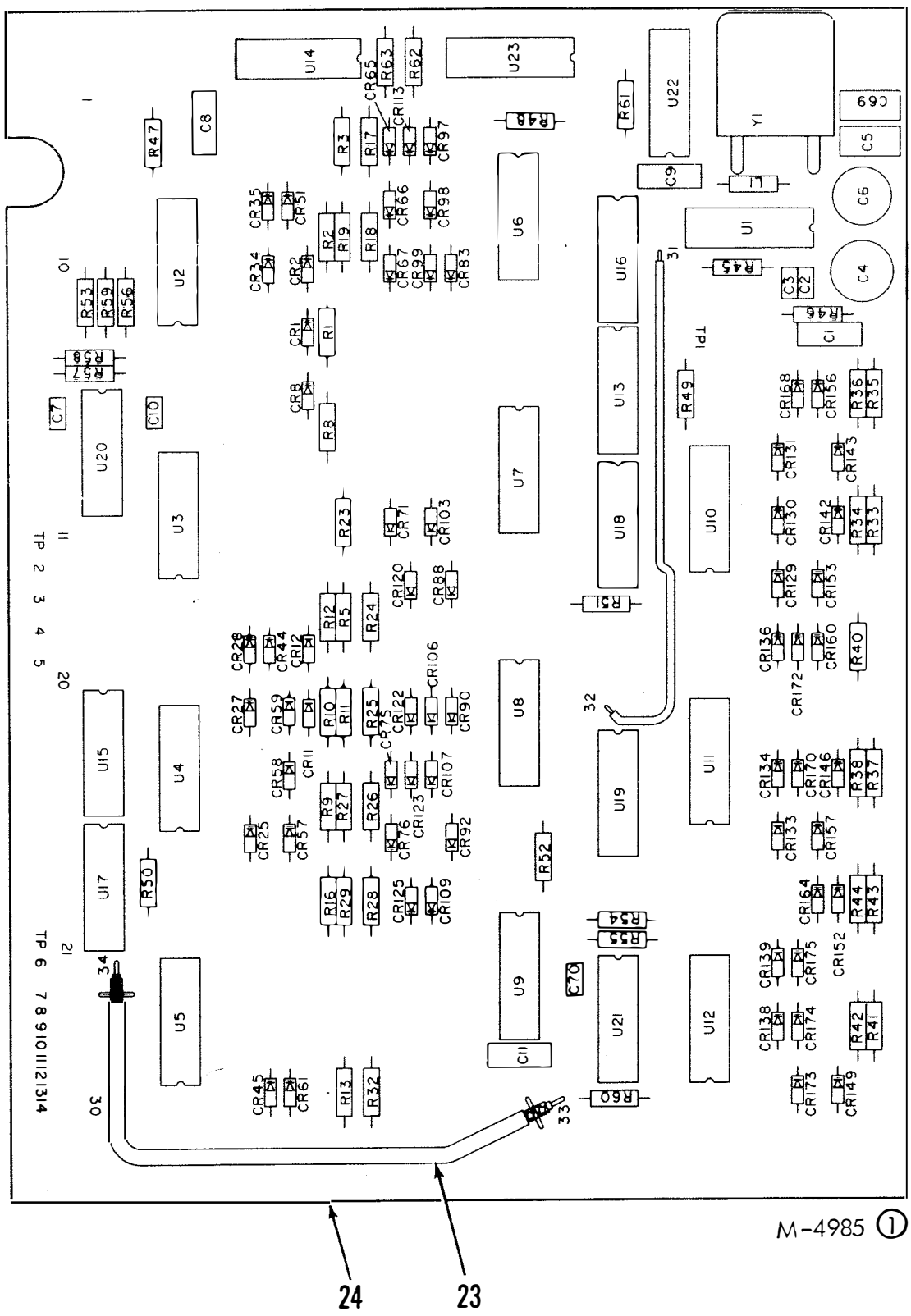

Figure 7-5. Circuit Card Assembly (1A1A1A1) (Sheet 1 of 3)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A1A1

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
C1	1	CR27	7	CR71	7	CR120	7	CR168	7
C2	2	CR28	7	CR72	7	CR123	7	CR170	7
C3	2	CR30	7	CR73	7	CR125	7	CR172	7
C4	3	CR31	7	CR76	7	CR129	7	CR173	7
C5	4	CR34	7	CR77	7	CR130	7	CR174	7
C6	5	CR35	7	CR83	7	CR131	7	CR175	7
C7	2	CR36	7	CR84	7	CR133	7	L1	8
C8	1	CR44	7	CR85	7	CR134	7	R1	9
C9	1	CR45	7	CR88	7	CR136	7	R2	9
C10	2	CR46	7	CR92	7	CR138	7	R3	9
C11	1	CR47	7	CR97	7	CR139	7	R4	9
C69	4	CR51	7	CR98	7	CR142	7	R5	9
C70	6	CR52	7	CR99	7	CR143	7	R8	9
CR1	7	CR57	7	CR100	7	CR146	7	R9	9
CR2	7	CR58	7	CR101	7	CR149	7	R10	9
CR3	7	CR59	7	CR103	7	CR152	7	R11	9
CR5	7	CR61	7	CR107	7	CR153	7	R12	9
CR12	7	CR62	7	CR109	7	CR156	7	R13	9
CR16	7	CR63	7	CR113	7	CR157	7	R14	9
CR20	7	CR66	7	CR116	7	CR160	7	R15	9
CR25	7	CR67	7	CR117	7	CR164	7	R16	9

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Figure 7-5. Circuit Card Assembly (1A1A1A1) (Sheet 2 of 3)

LEGEND

NOTE:

PREFIX ALL REFERENCE
DESIGNATIONS WITH 1A1A1A1

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
R17	9	R35	9	R49	11	R62	11	U12	15
R18	9	R36	9	R50	9	R63	13	U13	16
R19	9	R37	9	R51	9	U1	14	U14	17
R20	9	R38	9	R52	9	U2	15	U15	18
R21	9	R40	9	R53	9	U3	15	U16	19
R23	9	R41	9	R54	9	U4	15	U17	20
R24	9	R42	9	R55	12	U5	15	U18	20
R25	9	R43	9	R56	12	U6	15	U19	20
R27	9	R44	9	R57	12	U7	15	U20	21
R28	9	R45	9	R58	13	U8	15	U21	21
R29	9	R46	10	R59	13	U9	15	U22	20
R32	9	R47	11	R60	13	U10	15	U23	20
R33	9	R48	11	R61	11	U11	15	Y1	22
R34	9								

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Figure 7-5. Circuit Card Assembly (1A1A1A1) (Sheet 3 of 3)

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
5 -	8030004073-1	CIRCUIT CARD ASSEMBLY 1A1A1A1 (SEE FIG. 4 FOR NHA)	REF	
-1	6081049100	. CAPACITOR (MFD BY 55112)(8814100009-303).	4	
-2	CK058X471M	. CAPACITOR	4	
-3	6720107H015DC5C	. CAPACITOR (MFD BY 56289)(8813200005-1).	1	
-4	CM04ED390J03	. CAPACITOR	2	
-5	538-011CB25	. CAPACITOR,VAR. (MFD BY 72982)(8815300009-6)	1	
-6	CK058X101M	. CAPACITOR	1	
-7	1N4454	. DIODE,SIGNAL (MFD BY 07263)(8879000092-1)	63	
-8	MS75084-4	. COIL,RF	1	
-9	RCR07G472JS	. RESISTOR.	39	
-10	RCR07G4R7JS	. RESISTOR.	1	
-11	RCR07G102JS	. RESISTOR.	5	
-12	RCR07G393JS	. RESISTOR.	3	
-13	RCR07G222JS	. RESISTOR.	4	
-14	SN74S124N00	. MCKT,OSCILLATOR (MFD BY 01295)(8855400439-1).	1	
-15	SN74LS160AN00	. MCKT,DECADE COUNTER (MFD BY 01295)(8855400440-1).	11	
-16	SN74LS00N00	. MCKT,QUAD 2 INPUT NAND (MFD BY 01295)(8855400437-1)	1	
-17	CD4024BE	. MCKT,7 STAGE COUNTER (MFD BY 02735)(8855400425-2)	1	
-18	CD4027BE	. MCKT,DUAL,JK,FF (MFD BY 02735)(8855400424-2).	1	
-19	SN74LS10N00	. MCKT,TRIP 3 INPUT NAND (MFD BY 01295)(8855400437-2)	1	
-20	SN74LS109AN00	. MCKT,DUAL,JK,FF (MFD BY 01295)(8855400438-1).	5	
-21	96LS2PC	. MCKT,DUAL ONE SHOT (MFD BY 07263)(8855400446-1)	2	
-22	CR85U17.6904MHZ	. CRYSTAL	1	
-23	RG178BU	. CABLE,COAXIAL	AR	
-24	8080004124-1	. PRINTED WIRING BOARD.	1	

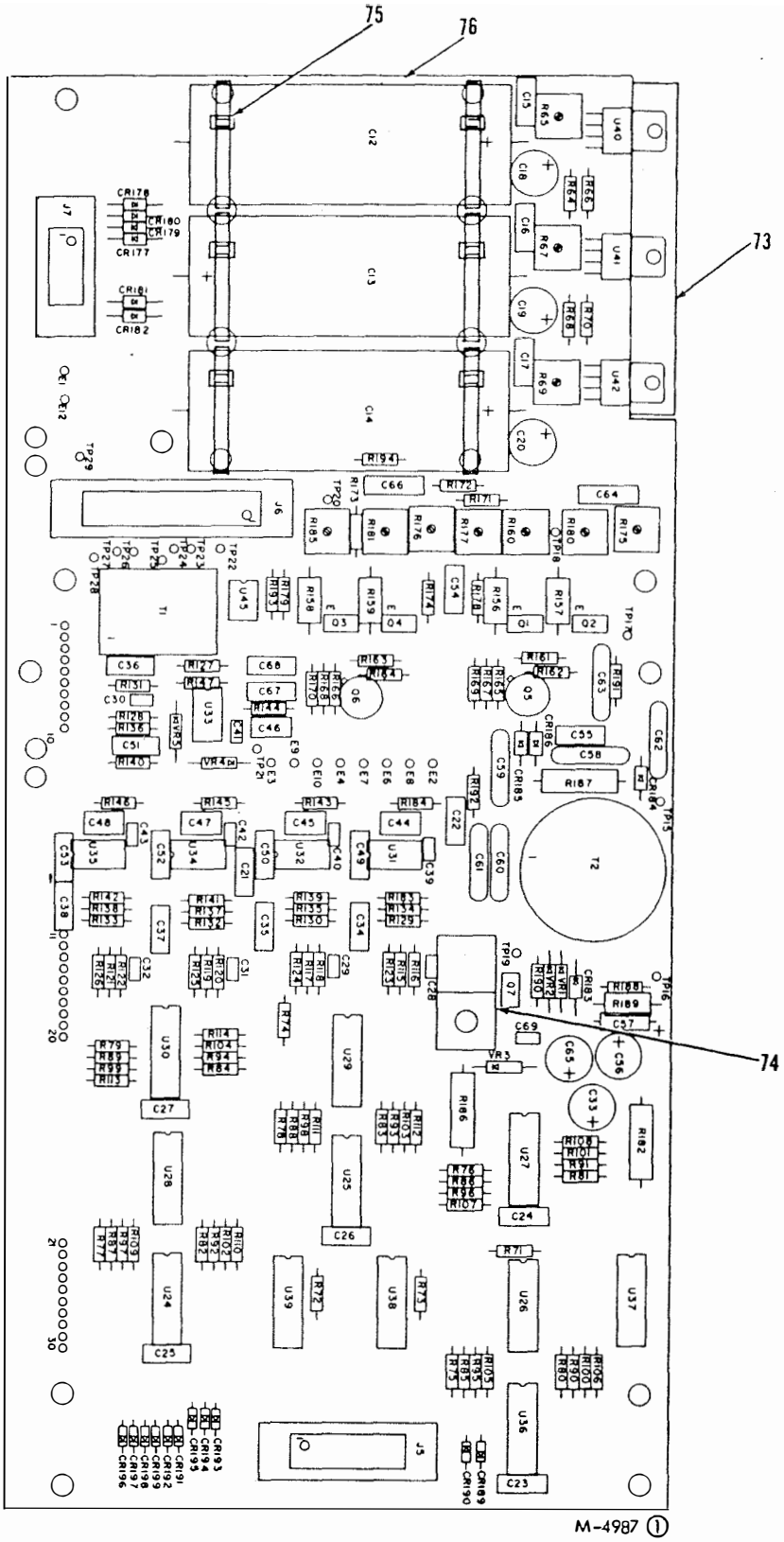

Figure 7-6. Circuit Card Assembly (1A1A1A2) (Sheet 1 of 4)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A1A2

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
C12	1	C33	7	C54	3	CR182	16	Q2	23
C13	1	C34	8	C55	3	CR183	16	Q3	23
C14	2	C35	8	C56	4	CR184	17	Q4	23
C15	3	C36	8	C57	12	CR185	17	Q5	24
C16	3	C37	8	C58	13	CR186	17	Q6	24
C17	3	C38	8	C59	13	CR189	18	Q7	25
C18	4	C39	9	C60	13	CR190	18	R64	26
C19	4	C40	9	C61	13	CR191	18	R65	27
C20	4	C41	9	C62	13	CR192	18	R66	28
C21	3	C42	9	C63	13	CR193	18	R67	27
C22	3	C43	9	C64	14	CR194	18	R68	29
C23	5	C44	10	C65	4	CR195	18	R69	30
C24	5	C45	10	C66	14	CR196	18	R70	28
C25	5	C46	10	C67	3	CR197	18	R71	31
C26	5	C47	10	C68	3	CR198	18	R72	31
C27	5	C48	10	C69	15	CR199	18	R73	31
C28	6	C49	11	CR177	16	J5	19	R74	31
C29	6	C50	11	CR178	16	J6	20	R75	32
C30	6	C51	11	CR179	16	J7	21	R76	32
C31	6	C52	11	CR180	16	P8	22	R77	32
C32	6	C53	11	CR181	16	Q1	23	R78	32

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Figure 7-6. Circuit Card Assembly (1A1A1A2) (Sheet 2 of 4)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A1A2

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
R79	32	R100	34	R121	36	R142	40	R171	48
R80	32	R101	34	R122	36	R143	41	R172	48
R81	32	R102	34	R123	37	R144	41	R173	48
R82	32	R103	34	R124	37	R145	41	R174	48
R83	32	R104	34	R125	37	R146	41	R175	49
R84	32	R105	35	R126	37	R147	42	R176	50
R85	33	R106	35	R127	35	R156	43	R177	49
R86	33	R107	35	R128	35	R157	43	R178	51
R87	33	R108	35	R129	38	R158	43	R179	52
R88	33	R109	35	R130	38	R159	43	R180	27
R89	33	R110	35	R131	38	R160	44	R181	27
R90	33	R111	35	R132	38	R161	38	R182	53
R91	33	R112	35	R133	38	R162	38	R183	40
R92	33	R113	35	R134	39	R163	42	R184	41
R93	33	R114	35	R135	39	R164	42	R185	44
R94	33	R115	36	R136	39	R165	45	R186	54
R95	34	R116	36	R137	39	R166	45	R187	54
R96	34	R117	36	R138	39	R167	46	R188	35
R97	34	R118	36	R139	40	R168	46	R189	55
R98	34	R119	36	R140	40	R169	47	R190	56
R99	34	R120	36	R141	40	R170	47	R191	57

M-4987 (3)

Figure 7-6. Circuit Card Assembly (1A1A1A2) (Sheet 3 of 4)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A1A2

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
R192	57	U25	62	U31	64	U37	65	U45	69
R193	58	U26	63	U32	64	U38	65	VR1	70
R194	59	U27	63	U33	64	U39	66	VR2	70
T1	60	U28	63	U34	64	U40	67	VR3	71
T2	61	U29	63	U35	64	U41	68	VR4	72
U24	62	U30	63	U36	62	U42	67	VR5	72

M-4987 (4)

Figure 7-6. Circuit Card Assembly (1A1A1A2) (Sheet 4 of 4)

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	ON CODE USABLE
6 -	8030004074-1	CIRCUIT CARD ASSEMBLY 1A1A1A2 (SEE FIG. 4 INDEX 3 FOR NHA) . . .	REF	
-1	350248G030JP4	. CAPACITOR (MFD BY 56289)(8813200006-4).	2	
-2	39D538G015JP4	. CAPACITOR (MFD BY 56289)(8813200006-3).	1	
-3	608104M100	. CAPACITOR (MFD BY 55112)(8814100009-303).	9	
-4	6720826H0200C5C	. CAPACITOR (MFD BY 56289)(8813200005-2).	5	
-5	608222J630	. CAPACITOR (MFD BY 56289)(8814100009-94)	5	
-6	CK05BX102M	. CAPACITOR	5	
-7	6720107H015CD5C	. CAPACITOR (MFD BY 56289)(8813400005-1).	1	
-8	608103J400	. CAPACITOR (MFD BY 55112)(8814100009-64)	5	
-9	CK05BX471K	. CAPACITOR	5	
-10	CM04ED330J03	. CAPACITOR	5	
-11	608123J400	. CAPACITOR (MFD BY 55112)(8814100009-65)	5	
-12	SNS475A010MI	. CAPACITOR (MFD BY 26769)(8815100013-251).	1	
-13	2DD03	. CAPACITOR (MFD BY 99942)(8813400018-1).	6	
-14	6CD224M100	. CAPACITOR (MFD BY 55112)(8814100009-308).	2	
-15	CK058X103M	. CAPACITOR	1	
-16	1N4005	. DIODE (MFD BY 04713)(8879000090-1).	7	
-17	MR818	. DIODE (MFD BY 04713)(8879700012-1).	3	
-18	1N4454	. DIODE,SIGNAL (MFD BY 07263)(8879000092-1)	11	
-19	DA15PV	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468). . . . . (8819200033-2)	1	
-20	DB25PV	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468). . . . . (8819200033-3)	1	
-21	DE9PV	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468). . . . . (8819200033-1)	1	
	D20418-2	. SCREW,CAPTIVE (AP)(MFD BY 71468)(508-001-001) . . . . . (USED WITH INDEX 19,20,21)	6	
	350-1300-10-0700	. STANDOFF (AP)(MFD BY 06540)(859-003-014). . . . . (USED WITH INDEX 19,20,21)	6	
-22	3M12143-24-12013	. CONNECTOR,SOCKET (MFD BY 71785)(8882500006-2)	1	
-23	MJE3439	. TRANSISTOR (MFD BY 04713)(8880300052-1)	4	
-24	2N2222A	. TRANSISTOR (MFD BY 04713)(8880300053-1)	2	
	10124DAP	. MOUNTING PAD (MFD BY 07047)(571-001-015).	2	
-25	FT50	. TRANSISTOR (MFD BY 07263)(8880200035-1)	1	
	MS51957-15	. SCREW (AP).	1	
	MS35338-135	. WASHER (AP)	1	
	NA5620C4L	. WASHER (AP)	1	

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
6 -	NY04-040NGF	WASHER,SHOULDER (AP)(MFD BY 08289)(975-004-012)	1	
	SK66-52-14	INSULATOR (AP)(MFD BY 08299)(443-010-001)	1	
-26	RL07S303G	RESISTOR.	1	
-27	E2A502	RESISTOR,VARIABLE (MFD BY 01121)(8872000007-9).	4	
-28	RL07S203G	RESISTOR.	2	
-29	RL07S393G	RESISTOR.	1	
-30	E2A107	RESISTOR,VARIABLE (MFD BY 01121)(8872000007-7).	1	
-31	RCR07G393JS	RESISTOR.	4	
-32	RL07S513G	RESISTOR.	10	
-33	RL07S183G	RESISTOR.	10	
-34	RL07S123G	RESISTOR.	10	
-35	RL07S103G	RESISTOR.	13	
-36	RL07S153G	RESISTOR.	8	
-37	RL07S752G	RESISTOR.	4	
-38	RL07S512G	RESISTOR.	7	
-39	RL07S473G	RESISTOR.	5	
-40	RL07S562G	RESISTOR.	5	
-41	RL07S563G	RESISTOR.	5	
-42	RL07S272G	RESISTOR.	3	
-43	RL20S104G	RESISTOR.	4	
-44	E2A103	RESISTOR ,VARIABLE (MFD BY 01121)(8872000007-10).	2	
-45	RL07S243G	RESISTOR.	2	
-46	RL07S682G	RESISTOR.	2	
-47	RL07SB21G	RESISTOR.	2	
-48	RL07S133G	RESISTOR.	4	
-49	E2A504	RESISTOR,VARIABLE (MFD BY 01121)(8872000007-15)	2	
-50	E2A104	RESISTOR,VARIABLE (MFD BY 01121)(8872000007-13)	1	
-51	RCR07G514JS	RESISTOR.	1	
-52	RCR07G225JS	RESISTOR.	1	
-53	RCR32G561JS	RESISTOR.	1	
-54	RCR32G2R7JS	RESISTOR.	2	
-55	RCR20G151JS	RESISTOR.	1	
-56	RCR07G4R7JS	RESISTOR.	1	
-57	RCR07G332JS	RESISTOR.	2	
-58	RCR07G515JS	RESISTOR.	1	
-59	RCR07G105JS	RESISTOR.	1	
-60	4-0100	TRANSFORMER (MFD BY 00141)(8892400052-1).	1	
-61	8030003796-1	TRANSFORMER (MFD BY 57057)(8892400050-1).	1	
-62	CD4078BE	MCKT,8 INPUT OR-NOR (MFD BY 02735)(8855400431-1).	3	
-63	CD4094BE	MCKT,8 STAGE REGULATOR (MFD BY 02735)(8855400432-1)	5	
-64	MC4558CPI	MCKT,DUAL OP AMP (MFD BY 04713)(8855400436-1)	5	
-65	CD4001BE	MCKT,QUAD 2 INPUT NOR (MFD BY 04713)(8855400423-1).	2	
-66	MC14011BCP	MCKT,QUAD 2 INPUT NAND (MFD BY 04713)(8855400422-1)	1	
-67	UA78DU1C	MCKT,TADJ V REGULATOR (MFD BY 07263)(8855400443-1).	2	
	MS51957-15	SCREW (AP).	2	
	MS35338-135	WASHER (AP)	2	
	NA5620C4L	WASHER (AP)	2	
-68	UA79OU1C	MCKT,-ADJ REGULATOR (MFD BY 07263)(8855400444-1).	1	
	NAS1352-02-6	SCREW (AP).	1	
	MS35338-134	WASHER (AP)	1	
	NY02-055G	WASHER,SHOULDER (AP)(MFD BY 08289)(975-004-021)	1	
	NA5620C2L	WASHER (AP)	1	
	SK66-52-14	INSULATOR (AP)(MFD BY 08299)(443-010-001)	1	
-69	4N38	MCKT,OP ISOLATOR (MFD BY 04713)(8855400445-1)	1	
-70	1N5258B	DIODE,ZENER (MFD BY 04713)(8879400020-1).	2	
-71	1N5226B	DIODE,ZENER (MFD BY 04713)(8879400019-1).	1	
-72	1N5241B	DIODE,ZENER (MFD BY 04713)(8879400018-1).	2	
-73	8060004259-1	HEATSINK,TRANSISTOR	1	
	8060004258-1	SCREW,CAPTIVE (AP).	2	
	NAS620C4L	WASHER (AP)	2	
-74	8060004255-1	SPACER.	1	
	NAS620CL4	WASHER (AP)	1	
	MS51957-17	SCREW (AP).	1	
	MS35338-135	WASHER (AP)	1	
-75	MS3367-5-9	STRAP,TIEDOWN	8	
-76	8080004125-1	PRINTED WIRING BOARD.	1	

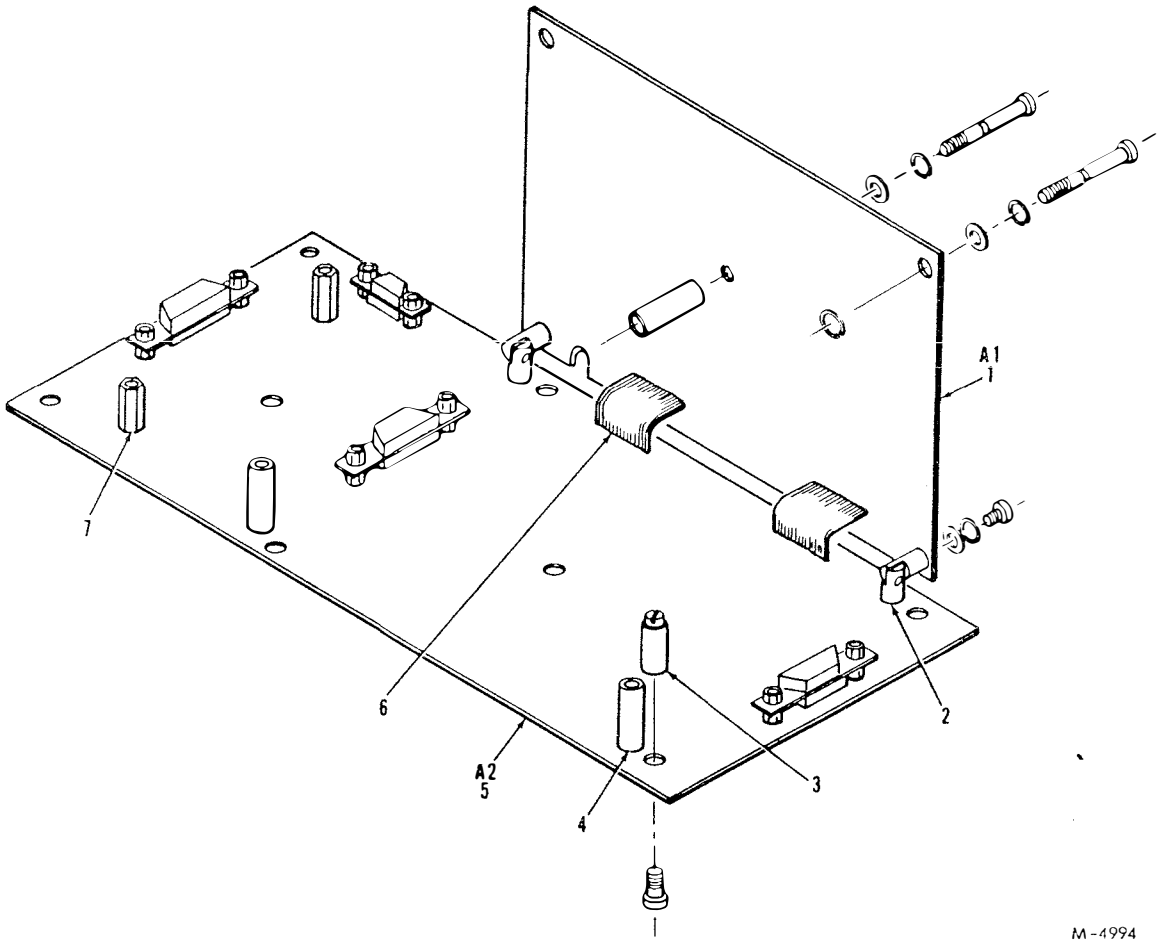

Figure 7-7. Demodulator Assembly (1A1A2)

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
7 -	8030004075-1	DEMODULATOR ASSEMBLY 1A1A2 (SEE FIG. 3 INDEX 18 FOR NHA)	REF	
-1	8030004076-1	. CIRCUIT CARD ASSEMBLY 1A1A2A1 (SEE FIG. 8 FOR BREAKDOWN)	1	
-2	17347A0832-16	. STANDOFF,HINGED (MFD BY 0654)(859-012-002)	2	
	NAS620C8L	. WASHER (AP)	4	
	MS35338-137	. WASHER (AP)	4	
	MS51957-43	. SCREW (AP)	4	
-3	CA2848-7S	. SCREW,CAPTIVE (MFD BY 29372)(785-004-004)	7	
	8060004254-1	. NUT,RETAINER (AP)	7	
-4	8060004256-1	. SPACER,RELIEVED	3	
	MS51957-43	. SCREW (AP)	2	
	8060004261-1	. SCREW,CAPTIVE (AP)	2	
	MS35338-137	. WASHER (AP)	6	
	NAS620C8L	. WASHER (AP)	6	
	8060004257-1	. SCREW,CAPTIVE (AP)	1	
	MS16633-1012	. RING,RETAINING (AP)	2	
-5	8030004077-1	. CIRCUIT CARD ASSEMBLY 1A1A2A2 (SEE FIG. 9 FOR BREAKDOWN)	1	
-6	FSK138-14	. CABLE,FLEXIBLE (MFD BY 15912)(8812400018-2)	2	
-7	218A0440-17	. STANDOFF (MFD BY 0654)(859-002-076)	2	
	MS51957-13	. SCREW (AP)	2	
	NAS620C4L	. WASHER (AP)	2	
	MS35338-135	. WASHER (AP)	2	

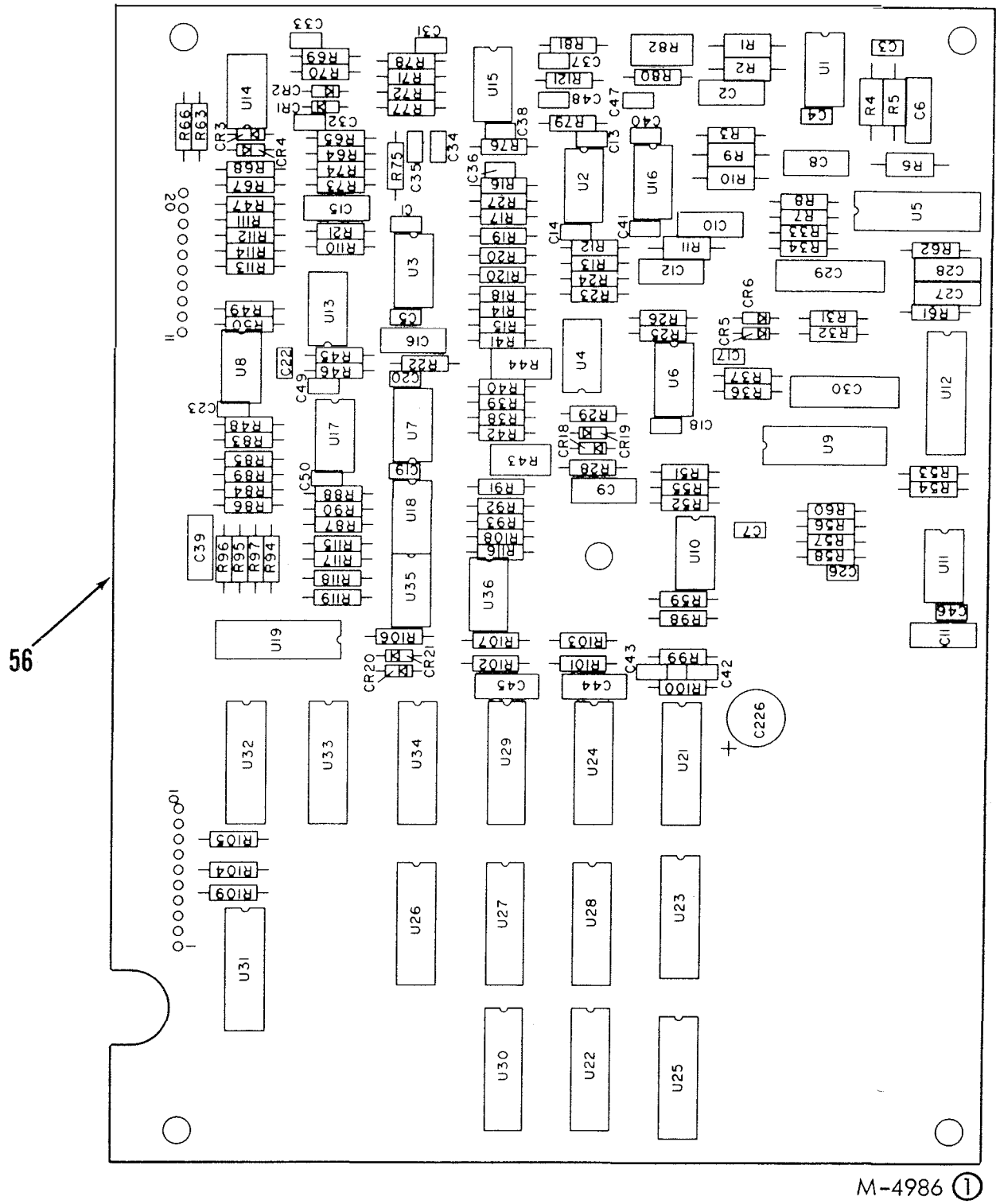

Figure 7-8. Circuit Card Assembly (1A1A2A1) (Sheet 1 of 3)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2A1

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
C1	1	C23	1	C46	1	R6	14	R27	22
C2	2	C26	1	C47	6	R7	15	R28	23
C3	1	C27	3	C48	6	R8	15	R29	23
C4	1	C28	3	C49	1	R9	16	R31	24
C5	1	C29	5	C50	1	R10	16	R32	24
C6	2	C30	5	C226	9	R11	17	R33	24
C7	1	C31	6	CR1	10	R12	18	R34	24
C8	2	C32	1	CR2	10	R13	19	R36	12
C9	3	C33	1	CR3	10	R14	12	R37	12
C10	2	C34	6	CR4	10	R15	12	R38	12
C11	3	C35	6	CR5	10	R16	12	R39	12
C12	2	C36	6	CR6	10	R17	20	R40	12
C13	1	C37	1	CR18	10	R18	12	R41	12
C14	1	C38	1	CR19	10	R19	12	R42	25
C15	4	C39	3	CR20	10	R20	12	R43	26
C16	4	C40	1	CR21	10	R21	12	R44	26
C17	1	C41	1	R1	11	R22	12	R45	27
C18	1	C42	7	R2	11	R23	12	R46	23
C19	1	C43	7	R3	12	R24	12	R47	28
C20	1	C44	8	R4	13	R25	21	R48	28
C22	1	C45	8	R5	13	R26	21	R49	29

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Figure 7-8. Circuit Card Assembly (1A1A2A1) (Sheet 2 of 3)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2A1

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
R50	25	R72	23	R94	24	R115	42	U15	44
R51	30	R73	23	R95	24	R116	30	U16	44
R52	12	R74	23	R96	24	R117	22	U17	44
R53	12	R75	34	R97	24	R118	43	U18	47
R54	30	R76	23	R98	39	R119	22	U19	45
R55	31	R77	34	R99	39	R120	12	U21	48
R56	31	R78	23	R100	39	R121	21	U22	50
R57	12	R79	35	R101	12	U1	44	U23	48
R58	12	R80	36	R102	12	U2	44	U24	48
R59	32	R81	23	R103	39	U3	44	U25	51
R60	32	R82	26	R104	39	U4	44	U26	52
R61	33	R83	12	R105	39	U5	45	U27	52
R62	33	R84	12	R106	40	U6	46	U28	53
R63	21	R85	12	R107	40	U7	44	U29	54
R64	21	R86	12	R108	21	U8	47	U30	55
R65	21	R87	23	R109	39	U9	48	U31	48
R66	21	R88	23	R110	32	U10	47	U32	48
R67	21	R89	37	R111	32	U11	47	U33	55
R68	21	R90	37	R112	41	U12	49	U34	55
R69	32	R91	24	R113	12	U13	44	U35	47
R70	32	R92	30	R114	12	U14	44	U36	47
R71	23	R93	38						

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Figure 7-8. Circuit Card Assembly (1A1A2A1) (Sheet 3 of 3)

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
8 -	8030004076-1	CIRCUIT CARD ASSEMBLY 1A1A2A1 (SEE FIG. 7 INDEX 1 FOR NHA)	REF	
-1	CK05BX104M	. CAPACITOR	23	
-2	608563J250	. CAPACITOR (MFD BY 55112)(8814100009-33)	5	
-3	608104J100	. CAPACITOR (MFD BY 55112)(8814100009-3)	5	
-4	608222J630	. CAPACITOR (MFD BY 55112)(8814100009-94)	2	
-5	60F474J100	. CAPACITOR (MFD BY 55112)(8814100009-13)	2	
-6	CK05BX102M	. CAPACITOR	6	
-7	CK05BX471M	. CAPACITOR	2	
-8	608103J400	. CAPACITOR (MFD BY 55112)(8814100009-64)	2	
-9	6720107H015CD5C	. CAPACITOR (MFD BY 55289)(8813200005-1)	1	
-10	1N4454	. DIODE,SIGNAL (MFD BY 07263)(8879000092-1)	10	
-11	RN55C3742F	. RESISTOR	2	
-12	RL07S103G	. RESISTOR	30	
-13	RN55C4022F	. RESISTOR	2	
-14	RN55C6342F	. RESISTOR	1	
-15	RL07S154G	. RESISTOR	2	
-16	RN55C5762F	. RESISTOR	2	
-17	RN55C3482F	. RESISTOR	1	
-18	RL07S753G	. RESISTOR	1	
-19	RL07S134G	. RESISTOR	1	
-20	RL07S153G	. RESISTOR	1	
-21	RL07S202G	. RESISTOR	10	
-22	RL07S303G	. RESISTOR	3	
-23	RL07S203G	. RESISTOR	12	
-24	RCR07G101JS	. RESISTOR	9	
-25	RL07S512G	. RESISTOR	2	
-26	MT2P103	. RESISTOR,VARIABLE (MFD BY 01121)(887200008-10)	3	
-27	RL07S513G	. RESISTOR	1	
-28	RL07S152G	. RESISTOR	2	
-29	RCR07G155JS	. RESISTOR	1	
-30	RCR07G105JS	. RESISTOR	4	
-31	RL07S333G	. RESISTOR	2	
-32	RL07S102G	. RESISTOR	6	
-33	RL07S183G	. RESISTOR	2	
-34	RL07S243G	. RESISTOR	2	
-35	RL07S163G	. RESISTOR	1	
-36	RL07S473G	. RESISTOR	1	
-37	RL07S224G	. RESISTOR	2	
-38	RCR07G223JS	. RESISTOR	1	
-39	RCR07G393JS	. RESISTOR	7	
-40	RCR07G821JS	. RESISTOR	2	
-41	RL07S272G	. RESISTOR	1	
-42	RCR07G106JS	. RESISTOR	1	
-43	RL07S362G	. RESISTOR	1	
-44	MC4558CPI	. MCKT,DUAL OP AMP (MFD BY 04713)(8855400436-1)	10	
-45	HI1-0201-5	. MCKT,QUAD SWITCH (MFD BY 34341)(8855400451-2)	2	
-46	TL072CP	. MCKT,DUAL OP AMP (MFD BY 01295)(8855400441-1)	1	
-47	LM311N	. MCKT,COMPARATOR (MFD BY 07014)(8855400434-1)	6	
-48	MC14011BCP	. MCKT,QUAD 2 INPUT NAND (MFD BY 04713)(8855400422-1)	6	
-49	CD4098BE	. MCKT,DUAL ONE SHOT (MFD BY 02735)(8855400433-1)	1	
-50	CD4013BE	. MCKT,DUAL D/F (MFD BY 02735)(8855400424-1)	1	
-51	CD4029BE	. MCKT,B/D U/D,CNTR (MFD BY 02735)(8855400426-1)	1	
-52	CD4018BE	. MCKT,DIVIDE BY N (MFD BY 02735)(8855400425-1)	2	
-53	CD4049UBE	. MCKT,HEX INVERTER (MFD BY 02735)(8855400428-1)	1	
-54	CD4012BE	. MCKT,DUAL 4 INPUT NAND (MFD BY 02735)(8855400422-2)	1	
-55	CD4024BE	. MCKT,7 STAGE COUNTER (MFD BY 02735)(8855400425-2)	3	
-56	8080004126-1	. PRINTED CIRCUIT BOARD	1	

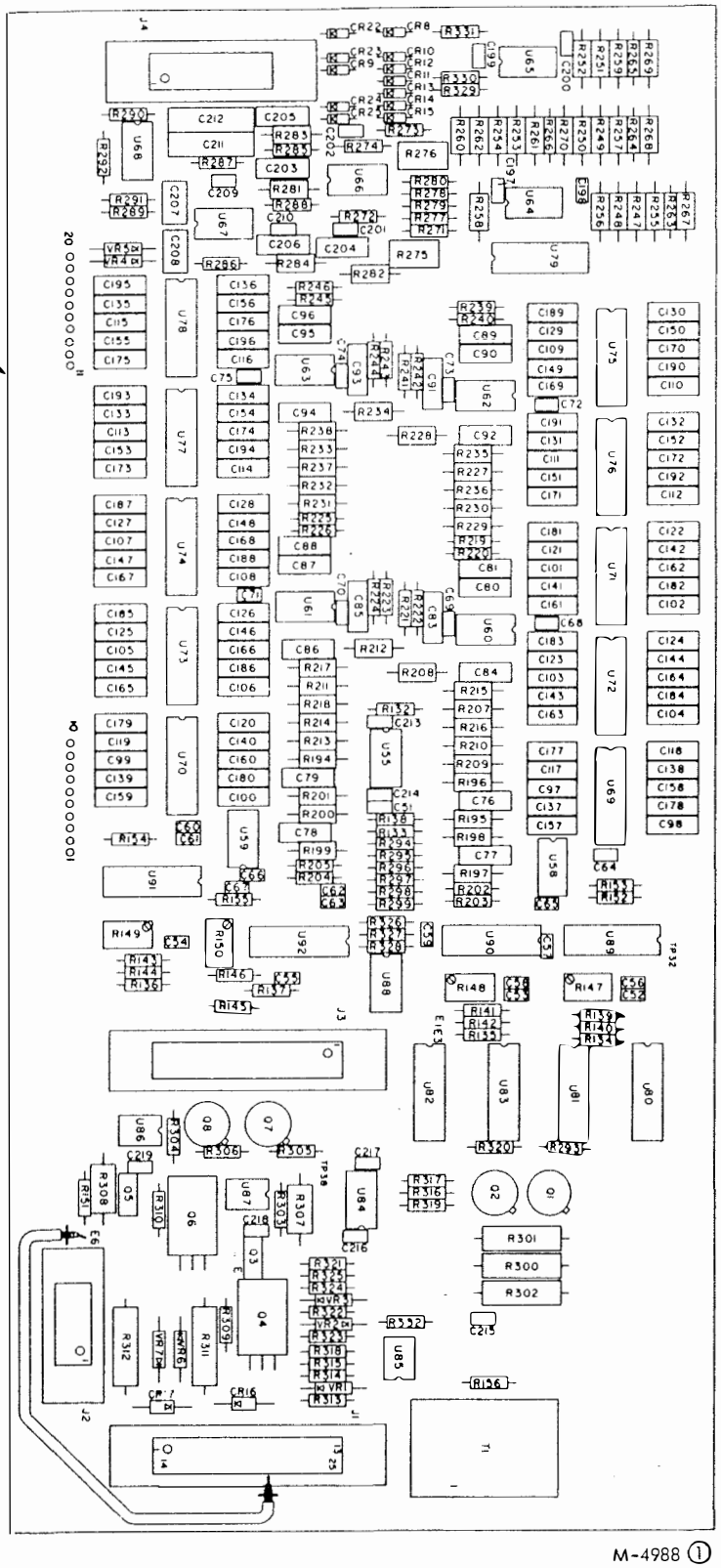

Figure 7-9. Circuit Card Assembly (1A1A2A2) (Sheet 1 of 5)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2A2

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
C51	1	C72	3	C95	4	C116	5	C137	7
C52	2	C73	3	C96	4	C117	6	C138	7
C53	2	C74	3	C97	5	C118	6	C139	7
C54	2	C75	3	C98	5	C119	6	C140	7
C55	2	C76	4	C99	5	C120	6	C141	7
C56	3	C77	4	C100	5	C121	6	C142	7
C57	3	C78	4	C101	5	C122	6	C143	7
C58	3	C79	4	C102	5	C123	6	C144	7
C59	3	C80	4	C103	5	C124	6	C145	7
C60	3	C81	4	C104	5	C125	6	C146	7
C61	3	C83	4	C105	5	C126	6	C147	7
C62	3	C84	4	C106	5	C127	6	C148	7
C63	3	C85	4	C107	5	C128	6	C149	7
C64	3	C86	4	C108	5	C129	6	C150	7
C65	3	C87	4	C109	5	C130	6	C151	7
C66	3	C88	4	C110	5	C131	6	C152	7
C67	3	C90	4	C111	5	C132	6	C153	7
C68	3	C91	4	C112	5	C133	6	C154	7
C69	3	C92	4	C113	5	C134	6	C155	7
C70	3	C93	4	C114	5	C135	6	C156	7
C71	3	C94	4	C115	5	C136	6	C157	8

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Figure 7-9. Circuit Card Assembly (1A1A2A2) (Sheet 2 of 5)

LEGEND

NOTE:

PREFIX ALL REFERENCE
DESIGNATIONS WITH 1A1A2A2

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
C158	8	C179	9	C200	3	CR10	14	Q6	23
C159	8	C180	9	C201	1	CR11	14	Q7	20
C160	8	C181	9	C202	1	CR12	14	Q8	21
C161	8	C182	9	C203	10	CR13	14	R132	24
C162	8	C183	9	C204	10	CR14	14	R133	24
C163	8	C184	9	C205	5	CR15	14	R134	25
C164	8	C185	9	C206	5	CR16	15	R135	25
C165	8	C186	9	C207	11	CR17	15	R136	25
C166	8	C187	9	C208	11	CR22	14	R137	25
C167	8	C188	9	C209	12	CR23	14	R138	26
C168	8	C189	9	C210	12	CR24	14	R139	27
C169	8	C190	9	C211	13	CR25	14	R140	27
C170	8	C191	9	C212	13	J1	16	R141	27
C171	8	C192	9	C213	3	J2	17	R142	27
C172	8	C193	9	C214	3	J3	18	R143	27
C173	8	C194	9	C215	3	J4	19	R144	27
C174	8	C195	9	C216	3	Q1	20	R145	27
C175	8	C196	9	C217	3	Q2	21	R146	27
C176	8	C197	3	C218	2	Q3	22	R147	28
C177	9	C198	3	C219	2	Q4	23	R148	28
C178	9	C199	3	CR8	14	Q5	22	R149	28

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Figure 7-9. Circuit Card Assembly (1A1A2A2) (Sheet 3 of 5)

LEGEND

NOTE:

PREFIX ALL REFERENCE
DESIGNATIONS WITH 1A1A2A2

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
R150	28	R209	34	R230	37	R251	40	R272	42
R151	29	R210	34	R231	37	R252	40	R273	26
R152	30	R211	34	R232	37	R253	40	R274	42
R153	30	R212	34	R233	37	R254	40	R275	43
R154	30	R213	34	R234	37	R255	35	R276	43
R155	30	R214	34	R235	38	R256	35	R277	44
R156	31	R215	35	R236	38	R257	35	R278	44
R194	32	R216	35	R237	38	R258	35	R279	24
R195	32	R217	35	R238	38	R259	35	R280	24
R196	32	R218	35	R239	39	R260	35	R281	45
R197	32	R219	36	R240	39	R261	35	R282	45
R198	32	R220	36	R241	39	R262	35	R283	46
R199	32	R221	36	R242	39	R263	41	R284	46
R200	32	R222	36	R243	39	R264	41	R285	47
R201	32	R223	36	R244	39	R265	41	R286	47
R202	33	R224	36	R245	39	R266	41	R287	48
R203	33	R225	36	R246	39	R267	40	R288	48
R204	33	R226	36	R247	40	R268	40	R289	49
R205	33	R227	37	R248	40	R269	40	R290	49
R207	34	R228	37	R249	40	R270	40	R291	50
R208	34	R229	37	R250	40	R271	26	R292	50

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Figure 7-9. Circuit Card Assembly (1A1A2A2) (Sheet 4 of 5)

LEGEND

NOTE:

PREFIX ALL REFERENCE DESIGNATIONS WITH 1A1A2A2

REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.	REF DES	ITEM NO.
R293	51	R310	29	R327	64	U67	67	U84	67
R294	29	R311	58	R328	44	U68	67	U85	71
R295	52	R312	58	R329	51	U69	68	U86	71
R296	26	R313	59	R330	51	U70	68	U87	71
R297	26	R314	51	R331	51	U71	68	U88	67
R298	52	R315	60	R332	65	U72	68	U89	72
R299	53	R316	29	T1	66	U73	68	U90	72
R300	54	R317	29	U55	67	U74	68	U91	72
R301	54	R318	61	U58	67	U75	68	U92	72
R302	55	R319	51	U59	67	U76	68	VR1	73
R303	56	R320	51	U60	67	U77	68	VR2	74
R304	56	R321	51	U61	67	U78	68	VR3	74
R305	49	R322	62	U62	67	U79	69	VR4	74
R306	49	R323	63	U63	67	U80	70	VR5	74
R307	57	R324	49	U64	67	U81	70	VR6	75
R308	57	R325	61	U65	67	U82	70	VR7	75
R309	29	R326	44	U66	67	U83	70		

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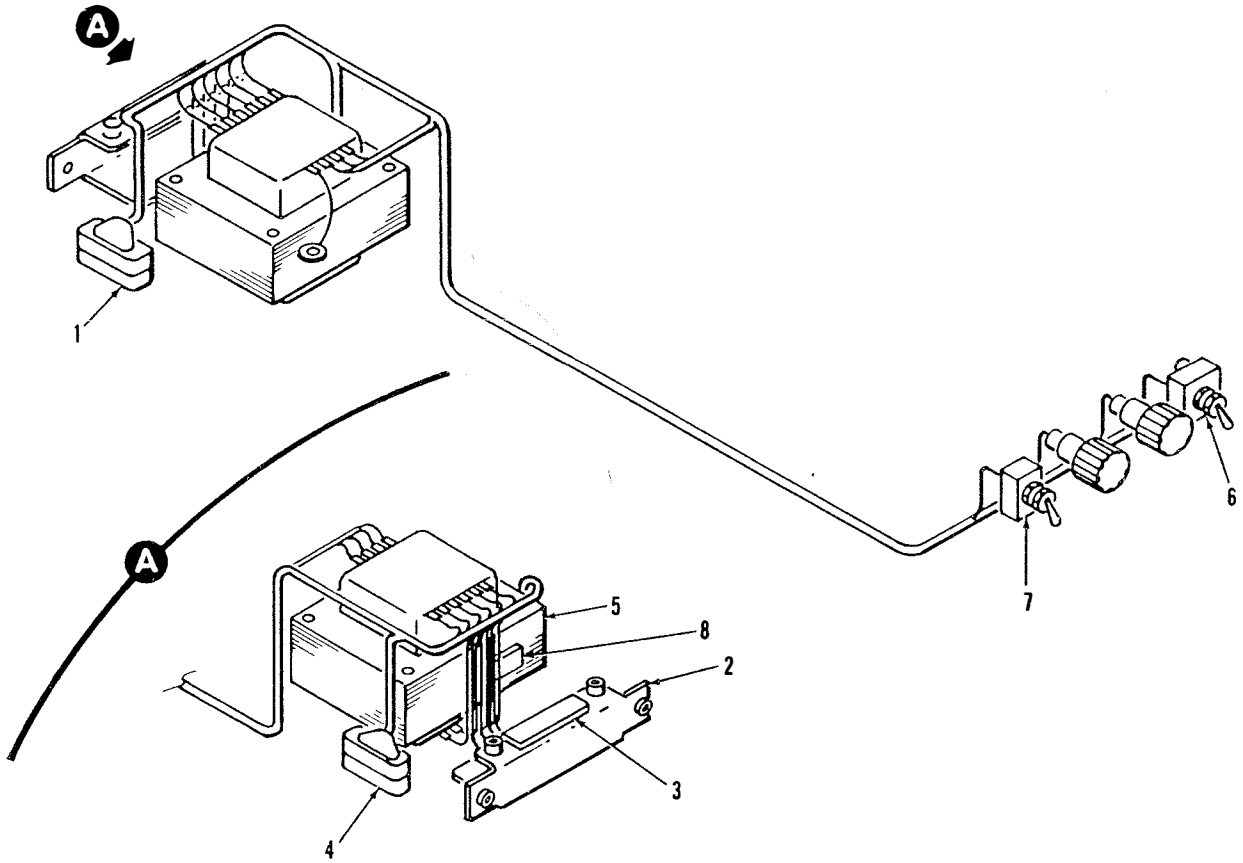
Figure 7-9. Circuit Card Assembly (1A1A2A2) (Sheet 5 of 5)

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
9 -	8030004077-1	CIRCUIT CARD ASSEMBLY 1A1A2A2 (SEE FIG. 7 INDEX 5 FOR NHA)	REF	
-1	CK058X102M	. CAPACITOR	3	
-2	CK05BX101M	. CAPACITOR	6	
-3	CK05BX104M	. CAPACITOR	29	
-4	608223J250	. CAPACITOR (MFD BY 55112)(8814100009-25)	20	
-5	608153J400	. CAPACITOR (MFD BY 55112)(8814100009-67)	22	
-6	601333J250	. CAPACITOR (MFD BY 55112)(8814100009-27)	20	
-7	608473J250	. CAPACITOR (MFD BY 55112)(8814100009-31)	20	
-8	608332J360	. CAPACITOR (MFD BY 55112)(8814100009-96)	20	
-9	608563J250	. CAPACITOR (MFD BY 55112)(8814100009-33)	20	
-10	608103J400	. CAPACITOR (MFD BY 55112)(8814100009-64)	2	
-11	CM04FC301J03	. CAPACITOR	2	
-12	CK058X103M	. CAPACITOR	2	
-13	60F474J100	. CAPACITOR (MFD BY 55112)(8814100009-13)	2	
-14	1N4454	. DIODE,SIGNAL (MFD BY 07263)(9879000092-1)	11	
-15	1N4005	. DIODE (MFD BY 04713)(8879000090-1)	2	
-16	DB25PV	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819200033-3)	1	
-17	DE9SV	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819200034-1)	1	
-18	DB25SV	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819200034-3)	1	
-19	DA15SV	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819200034-2	1	
	D20418-2	. SCREW,LOCK (AP)(MFD BY 71468)(508-001-001)	8	
	350-1300-18-0700	. STANDOFF (AP)(MFD BY 00540)(859-003-005) (USE WITH INDEX 16,17,18 AND 19)	8	
-20	2N2222A	. TRANSISTOR (MFD BY 04713)(8880300053-1)	2	
-21	2N2907A	. TRANSISTOR (MFD BY 04713)(8880300054-1)	2	
	10007DAP	. MOUNTING PAD (MFD BY 07047)(571-001-003) (USE WITH INDEX 20 AND 21)	4	
-22	NJE3439	. TRANSISTOR (MFD BY 04713)(8880300052-1)	2	
-23	FT50	. TRANSISTOR (MFD BY 07263)(8890200035-1)	2	
	MS51957-13	. SCREW (AP)	2	
	MS35338-135	. WASHER (AP)	2	
	NAS620C4L	. WASHER (AP)	2	
	KFS2-440	. NUT,CLINCH (AP)(MFD BY 46384)(592-022-003)	2	
-24	RL07S682G	. RESISTOR.	4	
-25	RCR07G511JS	. RESISTOR.	4	
-26	RL07S203G	. RESISTOR.	5	
-27	RL07S223G	. RESISTOR.	8	
-28	MT2P502	. RESISTOR,VARIABLE (MFD BY 01121)(8872000008-9)	4	
-29	RL07S103G	. RESISTOR.	6	
-30	RL07S471G	. RESISTOR.	4	
-31	RL07S621G	. RESISTOR.	1	
-32	RN55C3742F	. RESISTOR.	8	
-33	RL07S183G	. RESISTOR.	4	
-34	RN55C4022F	. RESISTOR.	8	
-35	RN55C6342F	. RESISTOR.	12	
-36	RL07S154G	. RESISTOR.	8	
-37	RN55C5762F	. RESISTOR.	8	
-38	RN55C3482F	. RESISTOR.	4	
-39	RL07S134G	. RESISTOR.	8	
-40	RN55C1962F	. RESISTOR.	12	
-41	RL07S432G	. RESISTOR.	4	
-42	RL07S363G	. RESISTOR.	2	
-43	MT2P103	. RESISTOR,VARIABLE (MFD BY 01121)(8872000008-10)	2	
-44	RL07S153G	. RESISTOR.	4	
-45	RN55C1022F	. RESISTOR.	2	
-46	RN55C9532F	. RESISTOR.	2	
-47	RL07S822G	. RESISTOR.	2	
-48	RL07S114G	. RESISTOR.	2	
-49	RL07S102G	. RESISTOR.	5	
-50	RL07S392G	. RESISTOR.	2	
-51	RCR07G393JS	. RESISTOR.	8	
-52	RL07S243G	. RESISTOR.	2	
-53	RL07S512G	. RESISTOR.	1	
-54	RCR32G751JS	. RESISTOR.	2	
-55	RCR32G510JS	. RESISTOR.	1	
-56	RCR07G221JS	. RESISTOR.	2	
-57	RCR20G753JS	. RESISTOR.	2	

FIGURE AND INDEX NUMBER	PART NUMBER	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY.	USABLE ON CODE
9 -58	RCR32G101JS	. RESISTOR.	2	
-59	RCR07G680JS	. RESISTOR.	1	
-60	RCR07G391JS	. RESISTOR.	1	
-61	RCR07G105JS	. RESISTOR.	2	
-62	RCR07G513JS	. RESISTOR.	1	
-63	RCR07G301JS	. RESISTOR.	1	
-64	RL07S393G	. RESISTOR.	1	
-65	RCR07G104JS	. RESISTOR.	1	
-66	4-0100	. TRANSFORMER (MFD BY 00144)(8892400052-1).	1	
-67	MC4558CPI	. MCKT,DUAL OP AMP (MFD BY 04713)(8855400436-1)	14	
-68	CD4052BE	. MCKT,DUAL,QUAD MUX (MFD BY 02735)(8855400429-1)	10	
-69	HI1-0201-5	. MCKT,QUAD SWITCH (MFD BY 34371)(8855400451-2)	1	
-70	MC14011BCP	. MCKT,QUAD 2 INPUT NAND (MFD BY 04713)(8855400422-1)	4	
-71	TIL111	. MCKT,OPTO COUPLER (MFD BY 01295)(8855400442-1).	3	
-72	AD40076	. MCKT,MULTIPLIER (MFD BY 24355)(8855400452-1).	4	
-73	1N52268	. DIODE,ZENER (MFD BY 04713)(8879400019-1).	1	
-74	1N5241B	. DIODE,ZENER (MFD BY 04713)(8879400018-1).	4	
-75	1N5281	. DIODE,ZENER (MFD BY 04713)(8879400020-2).	2	
-76	8080004127-1	. PRINTED WIRING BOARD.	1	
10 -		CONVERTER CABLE ASSEMBLIES 1A1W1,1A1W2,1A1W3,1A2W4		
	8030003714-1	. HARNESS ASSEMBLY,POWER 1A1W1 (SEE FIG. 3 INDEX 1 FOR NHA)	REF	
-1	TOE9P	. . CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 55104) (8819800019-1)	1	
-2	8040003691-1	. . BRACKET,SWITCH MTG	1	
-3	46206LFR	. . SWITCH,SLIDE (MFD BY 82389)(8885800007-1).	1	
	MS51957-13	. . SCREW (AP)	2	
	MS35338-135	. . WASHER (AP).	2	
	NAS620C4L	. . WASHER (AP).	2	
-4	DE9S	. . CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819800020-1)	1	
	D20419	. . SCREW,LOCK (AP)(MFD BY 71468)(508-002-002) (USE WITH INDEX 1 AND 4)	4	
-5	CSC15826	. . TRANSFORMER (MFD BY 28984)(8892400051-1)	1	
-6	8A2011	. . SWITCH,TOGGLE,MICRO (MFD BY 91929)(8887300004-2)	1	
-7	8A1011	. . SWITCH,TOGGLE,MICRO (MFD BY 91929)(8887300004-1)	1	
-8	71D7000	. . VARISTOR (MFD BY 50157()8803000002-1).	1	
	8030003786-1	. CABLE ASSEMBLY SYNTH AND DEMOD 1A1W2 (SEE FIG..3. INDEX 19 FOR NHA)	REF	
-9	D825P	. . CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819800019-3)	1	
	D20419-18	. . SCREW,LOCK (AP)(MFD BY 71468)(508-002-001)	2	
-10	DB25S	. . CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819500020-3)	1	
	D20419	. . SCREW,LOCK (AP)(MFD BY 71468)(508-002-002)	2	
	8030004085-1	. CABLE ASSEMBLY,FRONT PANEL 1A1W3 (SEE FIG..3. INDEX 15 FOR NHA)	REF	
-11	7GB1N056P201W	. . RESISTOR,VARIABLE (MFD BY 01121)(8872000C06-2)	1	
-12	73-1007	. . SWITCH,ROTARY (MFD BY 29604)(8886700054-8)	1	
-13	DA15P	. . CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819800019-2)	1	
	D20419	. . SCREW,LOCK (AP)(MFD BY 71468)(508-002-002)	2	
-14	73-1003	. . SWITCH,ROTARY (MFD BY 29604)(8886700054-6)	1	
-15	8A2021	. . SWITCH,TOGGLE,MICRO (MFD BY 91929)(8887300004-2)	2	
-16	8A1011	. . SWITCH,TOGGLE,MICRO (MFD BY 91929)(8887300004-1)	3	
-17	101-3830-09-201	. . INDICATOR,HOUSING (MFD BY 72619)(8841700007-1)	1	
-18	DA15S	. . CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468) (8819800020-2)	1	
	D20419	. . SCREW,LOCK (AP)(MFD BY 71468)(508-002-002)	2	
	8030004103-1	CABLE ASSEMBLY,INPUT-OUTPUT 1A2W4 (SEE FIG. 2 INDEX 9 FOR NHA)	REF	
-19	8040C03690-1	. CLAMP,HARNESS	2	
-20	DB25S	. CONNECTOR,ELECTRICAL,RECEPTACLE (MFD BY 71468). (8819800020-3)	1	
	D20419	. SCREW (AP)(MFD 71468)(508-002-002).	2	
-21	7174-071	. CABLE,ELECTRICAL,RIBBON (MFD BY 55552)(8900720011-1).	AR	
-22	8040003704-1	. CLAMP,HARNESS	1	
-23	8040C03704-2	. CLAMP,HARNESS	1	
-24	8AC11	. SWITCH,INTERLOCK (MFD BY 91929)(8886100005-1)	1	



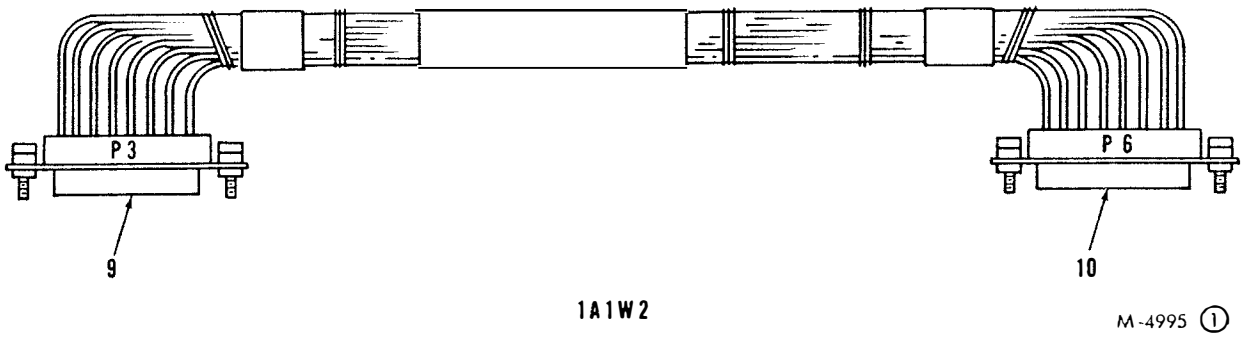


Figure 7-10. Converter Cable Assemblies (Sheet 1 of 2)

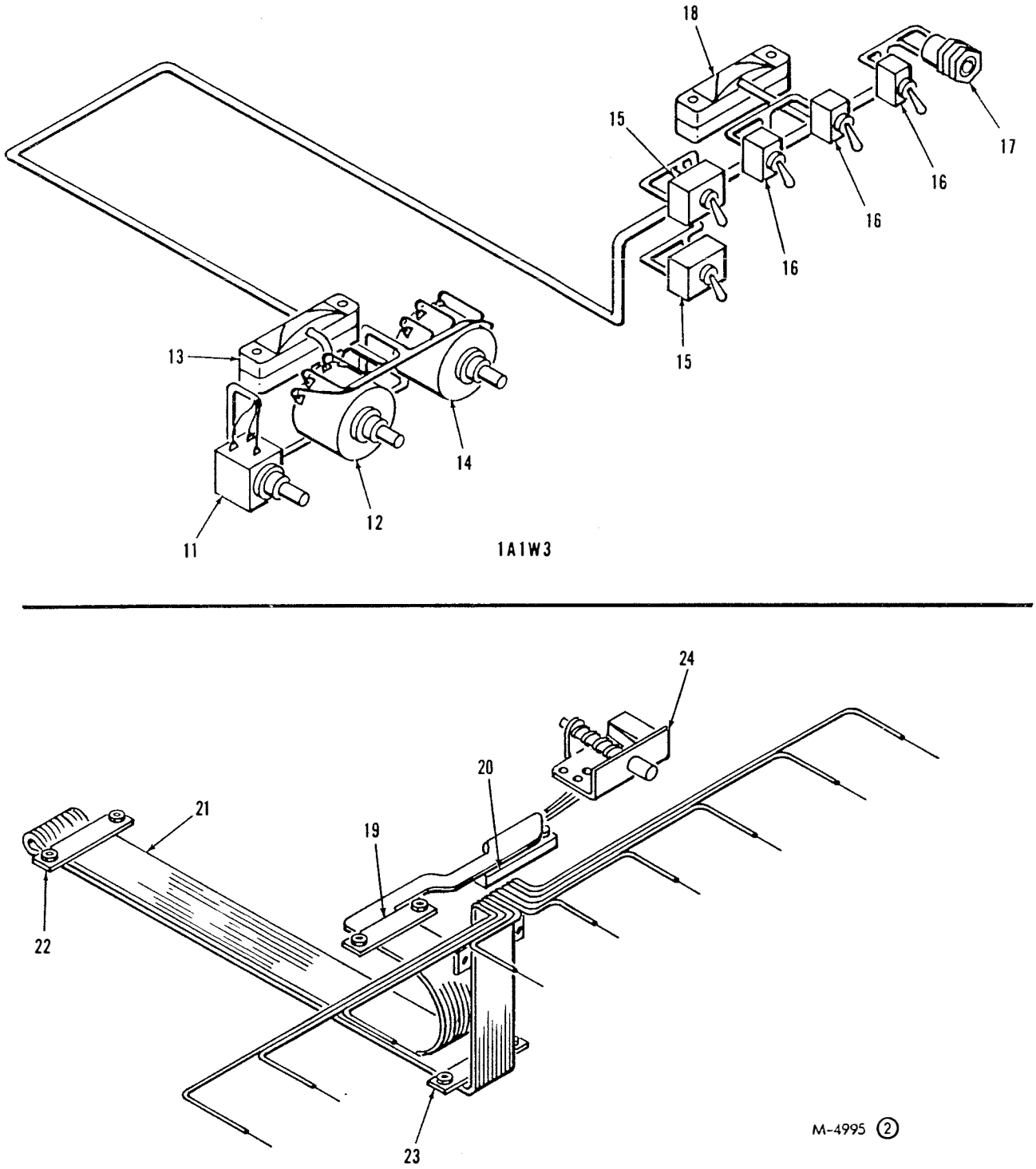


Figure 7-10. Converter Cable Assemblies (Sheet 2 of 2)

PART 3
NUMERICAL INDEX

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE
AD40076	9 -72		
AN960C816L	3 -		
8100729	3 -13		
CA2848-7S	4 -		
	7 -3		
CD4001BE	6 -65		
CD4012BE	8 -54		
CD4013BE	8 -50		
CD4018BE	8 -52		
CD4024BE	5 -17		
CD4027BE	5 -18		
CD4029BE	8 -51		
CD4049UBE	8 -53		
CD4052BE	9 -68		
CD4078BE	6 -62		
CD4094BE	6 -63		
CD4098BE	8 -49		
CK05BX101M	5 -6		
CK05BX102M	6 -6		
CK05BX103M	6 -15		
CK05BX104M	8 -1		
CK058X471K	6 -9		
CK05BX471M	5 -2		
CM04ED330J03	6 -10		
CM04ED390J03	5 -4		
CM04FC301J03	9 -11		
CR85U17.6904MHZ	5 -22		
CSC15826	10 -5		
DA15P	10 -13		
DA15PV	6 -19		
DA15S	10 -18		
DA15SV	9 -19		
DB25P	10 -9		
DB25PV	6 -20		
	9 -16		
DB25S	10 -10		
	10 -20		
DB25SV	9 -18		
DE9PV	6 -21		
DE9S	10 -4		
DE9SV	9 -17		
DS500	3 -11		
D20418-2	6 -		
	9 -		
D20419	10 -		
	10 -		
	10 -		
	10 -		
	10 -		
D20419-18	10 -		
D7500-884	3 -24		
E2A103	6 -44		
E2A104	6 -50		
E2A107	6 -30		
E2A502	6 -27		
E2A504	6 -49		
FLSP1.5-1.00-10B/A26T	4 -9		
FSK138-14	7 -6		
FSN-21A-10	4 -8		
	4 -8		

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE
FT50	6 -25		
	9 -23		
F02B250V1-2A	3 -3		
HI1-0201-5	8 -45		
	9 -69		
KFS2-440	9 -		
LM311N	8 -47		
MBMSS10	3 -		
MC14011BCP	6 -66		
	8 -48		
	9 -70		
MC4558CPI	6 -64		
	8 -44		
	9 -67		
MJE3439	6 -23		
MR818	6 -17		
MS-5195744	1 -		
MS-51958-62	1 -		
MS16633-1012	4 -		
MS24693-26	2 -		
MS24694C8	2 -		
MS3057-4A	1 -13		
MS3057-6A	1 -11		
MS3106A10SL-3S	1 -9		
MS3106A14S-2S	1 -6		
MS3106A14S-5P	1 -7		
MS3106A14S-7P	1 -8		
MS3106A14S-7S	1 -5		
MS3106A14S-9P	1 -10		
MS3367-5-9	3 -		
MS3420-4	1 -14		
MS3420-6	1 -12		
MS35333-69	4 -		
MS35338-134	6 -		
MS35338-135	3 -		
MS35338-136	2 -		
MS35338-137	3 -		
MS35425-17	2 -8		
MS51957-13	3 -		
MS51957-15	6 -		
MS51957-17	6 -		
MS51957-27	3 -		
MS51957-28	2 -		
MS51957-3	4 -		
MS51957-34	3 -		
MS51957-38	3 -		
MS51957-43	2 -		
MS51957-45	3 -		
MS51959-31	3 -		
MS51959-35	3 -		
MS75084-4	5 -8		
MS9021-225	3 -12		
MS91528-1F28	3 -16		
MT2P103	8 -26		
	9 -43		
MT2P502	9 -28		
M39012/16-0013	1 -17		
NAS1352-02-6	6 -		
NAS1786C06-10	3 -2		
NAS620CL4	6 -		

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE
NAS620C10L	1 -		
NAS620C2	4 -		
NAS620C4L	3 -		
NAS620C6L	2 -		
NAS620C8L	1 -		
NAS671C6	3 -		
NA5620C2L	6 -		
NA5620C4L	6 -		
NJE3439	9 -22		
NY02-055G	6 -		
NY04-040NGF	6 -		
RCR07G101JS	8 -24		
RCR07G102JS	5 -11		
RCR07G104JS	9 -65		
RCR07G105JS	6 -59		
RCR07G106JS	8 -42		
RCR07G155JS	8 -29		
RCR07G221JS	9 -56		
RCR07G222JS	5 -13		
RCR07G223JS	8 -38		
RCR07G225JS	6 -52		
RCR07G301JS	9 -63		
RCR07G332JS	6 -57		
RCR07G391JS	9 -60		
RCR07G393JS	5 -12		
RCR07G4R7JS	5 -10		
RCR07G472JS	5 -9		
RCR07G511JS	9 -25		
RCR07G513JS	9 -62		
RCR07G514JS	6 -51		
RCR07G515JS	6 -58		
RCR07G680JS	9 -59		
RCR07G821JS	8 -40		
RCR20G151JS	6 -55		
RCR20G753JS	9 -57		
RCR32G101JS	9 -58		
RCR32G2R7JS	6 -54		
RCR32G510JS	9 -55		
RCR32G561JS	6 -53		
RCR32G751JS	9 -54		
RG-58C/U	1 -18		
RG178BU	5 -23		
RL07S102G	8 -32		
RL07S103G	6 -35		
RL07S114G	9 -48		
RL07S123G	6 -34		
RL07S133G	6 -48		
RL07S134G	8 -19		
RL07S152G	8 -28		
RL07S153G	6 -36		
RL07S154G	8 -15		
RL07S163G	8 -35		
RL07S183G	6 -33		
RL07S202G	8 -21		
RL07S203G	6 -28		
RL07S223G	9 -27		
RL07S224G	8 -37		
RL07S243G	6 -45		
RL07S272G	6 -42		
RL07S303G	6 -26		
RL07S333G	8 -31		
RL07S362G	8 -43		
RL07S363G	9 -42		
RL07S392G	9 -50		
RL07S393G	6 -29		
RL07S432G	9 -41		
RL07S471G	9 -30		
RL07S473G	6 -39		
RL07S512G	6 -38		
RL07S513G	6 -32		
RL07S562G	6 -40		
RL07S563G	6 -41		
RL07S621G	9 -31		
RL07S682G	6 -46		
RL07S752G	6 -37		

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE
RL07S753G	8 -18		
RL07S821G	6 -47		
RL07S822G	9 -47		
RL20S104G	6 -43		
RN55C1022F	9 -45		
RN55C1962F	9 -40		
RN55C3482F	8 -17		
RN55C3742F	8 -11		
RN55C4022F	8 -13		
RN55C5762F	8 -16		
RN55C6342F	8 -14		
RN55C9532F	9 -46		
SK66-52-14	6 -		
	6 -		
SNS475A010MI	6 -12		
SN74LS00N00	5 -16		
SN74LS10N00	5 -19		
SN74LS109AN00	5 -20		
SN74LS160AN00	5 -15		
SN74S124N00	5 -14		
TDE9P	10 -1		
TIL111	9 -71		
TL072CP	8 -46		
UA780U1C	6 -67		
UA790U1C	6 -68		
066-001-001	(SEE P/N B100729)		
1N4005	6 -16		
	9 -15		
1N4454	5 -7		
	6 -18		
	8 -10		
	9 -14		
1N52268	6 -71		
	9 -73		
1N5241B	6 -72		
	9 -74		
1N5258B	6 -70		
1N5281	9 -75		
10007DAP	9 -		
101-0932	3 -7		
101-3830-09-201	10 -17		
10124DAP	6 -		
102001	3 -6		
	3 -17		
10321A0832-2	3 -8		
1642-256SS20	4 -5		
17347A0832-16	4 -7		
	7 -2		
2BP1	3 -5		
2DD03	6 -13		
2N2222A	6 -24		
	9 -20		
2N2907A	9 -21		
218A0440-17	7 -7		
22K1-82	2 -		
3M12143-24-12013	6 -22		
342004L	3 -9		
350-1300-10-0700	6 -		
350-1300-18-0700	9 -		
370068	2 -4		
388-006-001	(SEE P/N 10321A0832-2)		
39D248G030JP4	6 -1		
39D538G015JP4	6 -2		
4-0100	6 -60		
	9 -66		
4N38	6 -69		
443-010-001	(SEE P/N SK66-52-14)		
46206LFR	10 -3		
494-003-001	(SEE P/N 101-0932)		
508-001-001	(SEE P/N D20418-2)		
508-002-001	(SEE P/N D20419-18)		
508-002-002	(SEE P/N D20419)		
538-011C825	5 -5		
571-001-003	(SEE P/N 10007DAP)		
571-001-015	(SEE P/N 10124DAP)		

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE
592-022-003	(SEE P/N KFS2-440)		
592-031-001	(SEE P/N 22K1-82)		
60B103J400	6 -8		
	8 -8		
	9 -10		
60B104J100	8 -3		
60B104M100	5 -1		
	6 -3		
60B123J400	6 -11		
60B153J400	9 -5		
60B222J630	6 -5		
	8 -4		
60B223J250	9 -4		
60B332J360	9 -8		
60B473J250	9 -7		
60B563J250	8 -2		
	9 -9		
60D224M100	6 -14		
60F474J100	8 -5		
	9 -13		
60I333J250	9 -6		
644-007-001	(SEE P/N MBMSS10)		
672D107H015CD5C	6 -7		
	8 -9		
672D107H015DC5C	5 -3		
672D826H020DC5C	6 -4		
70B1N056P201W	10 -11		
71D7000	10 -8		
7174-071	10 -21		
73-1003	10 -14		
73-1007	10 -12		
785-004-004	(SEE P/N CA2848-7S)		
785-013-002	(SEE P/N D7500-884)		
8AC11	10 -24		
8A1011	10 -7		
	10 -16		
8A2011	10 -6		
8A2021	10 -15		
80000030171-1	1 -		
80100000626-1	1 -1		
	2 -		
80200003841-1	2 -1		
8030003706-1	2 -2		
8030003708-1	2 -5		
8030003714-1	3 -1		
	10 -		
8030003786-1	3 -19		
	10 -		
8030003796-1	6 -61		
8030003817-1	3 -10		
8030004072-1	3 -4		
	4 -		
8030004073-1	4 -1		
	5 -		
8030004074-1	4 -3		
	6 -		
8030004075-1	3 -18		
	7 -		
8030004076-1	7 -1		
	8 -		
8030004077-1	7 -5		
	9 -		
8030004084-1	2 -10		
	3 -		
8030004085-1	3 -15		
	10 -		
8030004103-1	2 -9		
	10 -		
8040003602-1	2 -3		
8040003606-1	1 -3		
8040003621-1	2 -6		
8040003650-1	1 -2		
8040003690-1	10 -19		
8040003691-1	10 -2		
8040003704-1	10 -22		

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE
8040003704-2	10 -23		
8040003804-1	1 -4		
8040004002-2	3 -21		
8040004002-56	3 -23		
8060004254-1	4 -		
	7 -		
8060004255-1	6 -74		
8060004256-1	4 -6		
	7 -4		
8060004257-1	4 -10		
	7 -		
8060004258-1	6 -		
8060004259-1	6 -73		
8060004261-1	4 -2		
	7 -		
8080003906-1	3 -22		
8080003925-1	3 -20		
8080004124-1	5 -24		
8080004125-1	6 -76		
8080004126-1	8 -56		
8080004127-1	9 -76		
8080004133-1	4 -4		
81100030833-1	1 -15		
8180000780-1	1 -		
8190001349-1	1 -16		
8190001349-2	1 -19		
843-006-002	(SEE P/N 9284-A-140-17)		
843-006-003	(SEE P/N 9285-A-140-17)		
843-006-004	(SEE P/N 9286-A-140-17)		
859-002-076	(SEE P/N 218A0440-17)		
859-002-226	(SEE P/N 1642-256SS20)		
859-003-005	(SEE P/N 350-1300-18-0700)		
859-003-014	(SEE P/N 350-1300-10-0700)		
859-004-148	(SEE P/N 9739AC832-16)		
859-012-002	(SEE P/N 17347AC832-16)		
8803000002-1	(SEE P/N 71D7000)		
8812400018-2	(SEE P/N FSN-21A-10)		
8813200005-1	(SEE P/N 672D107H015DC5C)		
8813200005-2	(SEE P/N 672D826H020DC5C)		
8813200006-3	(SEE P/N 39D538GG15JP4)		
8813200006-4	(SEE P/N 39D248G030JP4)		
8813400018-1	(SEE P/N 2DD03)		
8814100009-13	(SEE P/N 60F474J100)		
8814100009-25	(SEE P/N 608223J250)		
8814100009-27	(SEE P/N 601333J250)		
8814100009-3	(SEE P/N 608104J100)		
8814100009-303	(SEE P/N 608104M100)		
8814100009-308	(SEE P/N 60D224M100)		
8814100009-31	(SEE P/N 60B473J250)		
8814100009-33	(SEE P/N 608563J250)		
8814100009-64	(SEE P/N 608103J400)		
8814100009-65	(SEE P/N 608123J400)		
8814100009-67	(SEE P/N 608153J400)		
8814100009-94	(SEE P/N 608222J630)		
8814100009-96	(SEE P/N 608332J360)		
8815100013-251	(SEE P/N SNS475AD10M1)		
8815300009-6	(SEE P/N 528-011C825)		
8819200033-1	(SEE P/N DE9PV)		
8819200033-2	(SEE P/N DA15PV)		
8819200033-3	(SEE P/N D825PV)		
8819200034-1	(SEE P/N DE9SV)		
8819200034-2	(SEE P/N DA15SV)		
8819200034-3	(SEE P/N D825SV)		
8819800019-1	(SEE P/N TDE9P)		
8819800019-2	(SEE P/N DA15P)		
8819800019-3	(SEE P/N D825P)		
8819800020-1	(SEE P/N DE9S)		
8819800020-2	(SEE P/N DA15S)		
8819800020-3	(SEE P/N D825S)		
8829400009-1	(SEE P/N 28P1)		
8833300022-1	2 -7		
8834400001-1	(SEE P/N 342004L)		
8841700007-1	(SEE P/N 101-3820-09-201)		
8850800006-1	(SEE P/N 102001)		
8855400422-1	(SEE P/N MC14011BCP)		

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE
8855400422-2	(SEE P/N CD40128E)		
8855400423-1	(SEE P/N CD40018E)		
8855400424-1	(SEE P/N CD4013BE)		
8855400424-2	(SEE P/N CD4027BE)		
8855400425-1	(SEE P/N CD4018BE)		
8855400425-2	(SEE P/N CD4024BE)		
8855400426-1	(SEE P/N CD4029BE)		
8855400428-1	(SEE P/N CD4049UBE)		
8855400429-1	(SEE P/N CD4052BE)		
8855400431-1	(SEE P/N CD4078BE)		
8855400432-1	(SEE P/N CD4094BE)		
8855400433-1	(SEE P/N CD4098BE)		
8855400434-1	(SEE P/N LM311N)		
8855400436-1	(SEE P/N MC4558CPI)		
8855400437-1	(SEE P/N SN74LS00N00)		
8855400437-2	(SEE P/N SN74LS10N00)		
8855400438-1	(SEE P/N SN74LS109AN00)		
8855400439-1	(SEE P/N SN74S124N00)		
8855400440-1	(SEE P/N SN74LS169AN00)		
8855400441-1	(SEE P/N TL072CP)		
8855400442-1	(SEE P/N TIL111)		
8855400443-1	(SEE P/N UA780U1C)		
8855400444-1	(SEE P/N UA790U1C)		
8855400445-1	(SEE P/N 4N38)		
8855400446-1	(SEE P/N 96L02PC)		
8855400451-2	(SEE P/N HI1-0201-5)		
8855400452-1	(SEE P/N AD40076)		
8872000006-2	(SEE P/N 70B1N056P201W)		
8872000007-10	(SEE P/N E2A103)		
8872000007-13	(SEE P/N E2A104)		
8872000007-15	(SEE P/N E2A504)		
8872000007-7	(SEE P/N E2A107)		
8872000007-9	(SEE P/N E2A502)		
8872000008-10	(SEE P/N MT2P103)		
8872000008-9	(SEE P/N MT2P502)		
8879000090-1	(SEE P/N 1N4005)		
8879000092-1	(SEE P/N 1N4454)		
8879400018-1	(SEE P/N 1N5241B)		
8879400019-1	(SEE P/N 1N5226B)		
8879400020-1	(SEE P/N 1N5258B)		
8879400020-2	(SEE P/N 1N5281)		
8879700012-1	(SEE P/N MR818)		
8880200035-1	(SEE P/N FT50)		
8880300052-1	(SEE P/N MJE3439)		
8880300053-1	(SEE P/N 2N2222A)		
8880300054-1	(SEE P/N 2A2907A)		
8881000002-1	(SEE P/N 102001)		
8882300005-1	(SEE P/N 370068)		
8882500006-2	(SEE P/N 3M12143-24-12013)		
8885800007-1	3 -		
	(SEE P/N 46206LFR)		
8886100005-1	(SEE P/N 8AC11)		
8886700054-6	(SEE P/N 73-1003)		
8886700054-8	(SEE P/N 73-1007)		
8887300004-1	(SEE P/N 8A1011)		
8887300004-2	(SEE P/N 8A2011)		
8887300004-3	(SEE P/N 8A2021)		
8892400050-1	(SEE P/N 8030003796-1)		
8892400051-1	3 -		
	(SEE P/N CSC15826)		
8892400052-1	(SEE P/N 4-0100)		
8898400005-1	(SEE P/N DS500)		
8900720011-1	(SEE P/N 7174-071)		
9284-A-140-17	3 -14A		
9285-A-140-17	3 -14B		
9286-A-140-17	3 -14C		
96L02PC	5 -21		
9739A0632-16	3 -14		
975-004-012	(SEE P/N NY04-040NGF)		
975-004-021	(SEE P/N NY02-055G)		

PART NUMBER	FIGURE AND INDEX NUMBER	QUANTITY PER ASSY.	SOURCE CODE

PART 4
REFERENCE DESIGNATION INDEX

REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER	REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER
1	2 -1	8020000841-1	1A1A1A1CR83	5 -7	1N4454
1A1	2 -10	8030004084-1	1A1A1A1CR88	5 -7	1N4454
1A1A1	3 -4	8030004072-1	1A1A1A1CR90	5 -7	1N4454
1A1A1A1	4 -1	8030004073-1	1A1A1A1CR92	5 -7	1N4454
1A1A1A1CR1	5 -7	1N4454	1A1A1A1CR97	5 -7	1N4454
1A1A1A1CR103	5 -7	1N4454	1A1A1A1CR98	5 -7	1N4454
1A1A1A1CR106	5 -7	1N4454	1A1A1A1CR99	5 -7	1N4454
1A1A1A1CR107	5 -7	1N4454	1A1A1A1C1	5 -1	608104M100
1A1A1A1CR109	5 -7	1N4454	1A1A1A1C10	5 -2	CK05BX471M
1A1A1A1CR11	5 -7	1N4454	1A1A1A1C11	5 -1	608104M100
1A1A1A1CR113	5 -7	1N4454	1A1A1A1C2	5 -2	CK05BX471M
1A1A1A1CR12	5 -7	1N4454	1A1A1A1C3	5 -2	CK05BX471M
1A1A1A1CR120	5 -7	1N4454	1A1A1A1C4	5 -3	672D107H015D2S2
1A1A1A1CR122	5 -7	1N4454	1A1A1A1C5	5 -4	CM04ED390J03
1A1A1A1CR123	5 -7	1N4454	1A1A1A1C6	5 -5	538-011CB25
1A1A1A1CR125	5 -7	1N4454	1A1A1A1C69	5 -4	CM04ED390J03
1A1A1A1CR129	5 -7	1N4454	1A1A1A1C7	5 -2	CK05BX471M
1A1A1A1CR130	5 -7	1N4454	1A1A1A1C70	5 -6	CK05BX101M
1A1A1A1CR131	5 -7	1N4454	1A1A1A1C8	5 -1	608104M100
1A1A1A1CR133	5 -7	1N4454	1A1A1A1C9	5 -1	608104M100
1A1A1A1CR134	5 -7	1N4454	1A1A1A1L1	5 -8	MS75084-4
1A1A1A1CR136	5 -7	1N4454	1A1A1A1R1	5 -9	RCR07G472JS
1A1A1A1CR138	5 -7	1N4454	1A1A1A1R10	5 -9	RCR07G472JS
1A1A1A1CR139	5 -7	1N4454	1A1A1A1R11	5 -9	RCR07G472JS
1A1A1A1CR142	5 -7	1N4454	1A1A1A1R12	5 -9	RCR07G472JS
1A1A1A1CR143	5 -7	1N4454	1A1A1A1R13	5 -9	RCR07G472JS
1A1A1A1CR146	5 -7	1N4454	1A1A1A1R16	5 -9	RCR07G472JS
1A1A1A1CR149	5 -7	1N4454	1A1A1A1R17	5 -9	RCR07G472JS
1A1A1A1CR152	5 -7	1N4454	1A1A1A1R18	5 -9	RCR07G472JS
1A1A1A1CR153	5 -7	1N4454	1A1A1A1R19	5 -9	RCR07G472JS
1A1A1A1CR156	5 -7	1N4454	1A1A1A1R2	5 -9	RCR07G472JS
1A1A1A1CR157	5 -7	1N4454	1A1A1A1R23	5 -9	RCR07G472JS
1A1A1A1CR160	5 -7	1N4454	1A1A1A1R24	5 -9	RCR07G472JS
1A1A1A1CR164	5 -7	1N4454	1A1A1A1R25	5 -9	RCR07G472JS
1A1A1A1CR168	5 -7	1N4454	1A1A1A1R26	5 -9	RCR07G472JS
1A1A1A1CR170	5 -7	1N4454	1A1A1A1R27	5 -9	RCR07G472JS
1A1A1A1CR172	5 -7	1N4454	1A1A1A1R28	5 -9	RCR07G472JS
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1A1A1A1CR35	5 -7	1N4454	1A1A1A1R38	5 -9	RCR07G472JS
1A1A1A1CR44	5 -7	1N4454	1A1A1A1R40	5 -9	RCR07G472JS
1A1A1A1CR45	5 -7	1N4454	1A1A1A1R41	5 -9	RCR07G472JS
1A1A1A1CR51	5 -7	1N4454	1A1A1A1R42	5 -9	RCR07G472JS
1A1A1A1CR57	5 -7	1N4454	1A1A1A1R43	5 -9	RCR07G472JS
1A1A1A1CR58	5 -7	1N4454	1A1A1A1R44	5 -9	RCR07G472JS
1A1A1A1CR59	5 -7	1N4454	1A1A1A1R45	5 -9	RCR07G472JS
1A1A1A1CR61	5 -7	1N4454	1A1A1A1R46	5 -10	RCR07G4R7JS
1A1A1A1CR65	5 -7	1N4454	1A1A1A1R47	5 -11	RCR07G102JS
1A1A1A1CR66	5 -7	1N4454	1A1A1A1R48	5 -11	RCR07G102JS
1A1A1A1CR67	5 -7	1N4454	1A1A1A1R49	5 -11	RCR07G102JS
1A1A1A1CR71	5 -7	1N4454	1A1A1A1R5	5 -9	RCR07G472JS
1A1A1A1CR75	5 -7	1N4454	1A1A1A1R50	5 -9	RCR07G472JS
1A1A1A1CR76	5 -7	1N4454	1A1A1A1R51	5 -9	RCR07G472JS
1A1A1A1CR8	5 -7	1N4454	1A1A1A1R52	5 -9	RCR07G472JS

REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER	REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER
1A1A1A1R53	5 -9	RCR07G472JS	1A1A1A2C28	6 -6	CK05BX102M
1A1A1A1R54	5 -9	RCR07G472JS	1A1A1A2C29	6 -6	CK05BX102M
1A1A1A1R55	5 -12	RCR07G393JS	1A1A1A2C30	6 -6	CK05BX102M
1A1A1A1R56	5 -12	RCR07G393JS	1A1A1A2C31	6 -6	CK05BX102M
1A1A1A1R57	5 -12	RCR07G393JS	1A1A1A2C32	6 -6	CK05BX102M
1A1A1A1R58	5 -13	RCR07G222JS	1A1A1A2C33	6 -7	672D107H015CD5C
1A1A1A1R59	5 -13	RCR07G222JS	1A1A1A2C34	6 -8	60B103J400
1A1A1A1R60	5 -13	RCR07G222JS	1A1A1A2C35	6 -8	60B103J400
1A1A1A1R61	5 -11	RCR07G102JS	1A1A1A2C36	6 -8	60B103J400
1A1A1A1R62	5 -11	RCR07G102JS	1A1A1A2C37	6 -8	60B103J400
1A1A1A1R63	5 -13	RCR07G222JS	1A1A1A2C38	6 -8	60B103J400
1A1A1A1R8	5 -9	RCR07G472JS	1A1A1A2C39	6 -9	CK05BX471K
1A1A1A1R9	5 -9	RCR07G472JS	1A1A1A2C40	6 -9	CK05BX471K
1A1A1A1U1	5 -14	SN74S124N00	1A1A1A2C41	6 -9	CK05BX471K
1A1A1A1U10	5 -15	SN74LS160AN00	1A1A1A2C42	6 -9	CK05BX471K
1A1A1A1U11	5 -15	SN74LS160AN00	1A1A1A2C43	6 -9	CK05BX471K
1A1A1A1U12	5 -15	SN74LS160AN00	1A1A1A2C44	6 -10	CM04ED330J03
1A1A1A1U13	5 -16	SN74LS00N00	1A1A1A2C45	6 -10	CM04ED330J03
1A1A1A1U14	5 -17	CD4024BE	1A1A1A2C46	6 -10	CM04ED330J03
1A1A1A1U15	5 -18	CD4027BE	1A1A1A2C47	6 -10	CM04ED330J03
1A1A1A1U16	5 -19	SN74LS10N00	1A1A1A2C48	6 -10	CM04ED330J03
1A1A1A1U17	5 -20	SN74LS109AN00	1A1A1A2C49	6 -11	60B123J400
1A1A1A1U18	5 -20	SN74LS109AN00	1A1A1A2C50	6 -11	60B123J400
1A1A1A1U19	5 -20	SN74LS109AN00	1A1A1A2C51	6 -11	60B123J400
1A1A1A1U2	5 -15	SN74LS160AN00	1A1A1A2C52	6 -11	60B123J400
1A1A1A1U20	5 -21	96L02PC	1A1A1A2C53	6 -11	60B123J400
1A1A1A1U21	5 -21	96L02PC	1A1A1A2C54	6 -3	60B104M100
1A1A1A1U22	5 -20	SN74LS109AN00	1A1A1A2C55	6 -3	60B104M100
1A1A1A1U23	5 -20	SN74LS109AN00	1A1A1A2C56	6 -4	672D826H020DC5C
1A1A1A1U3	5 -15	SN74LS160AN00	1A1A1A2C57	6 -12	SNS475A010MI
1A1A1A1U4	5 -15	SN74LS160AN00	1A1A1A2C58	6 -13	2DD03
1A1A1A1U5	5 -15	SN74LS160AN00	1A1A1A2C59	6 -13	2DD03
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1A1A1A1U8	5 -15	SN74LS160AN00	1A1A1A2C62	6 -13	2DD03
1A1A1A1U9	5 -15	SN74LS160AN00	1A1A1A2C63	6 -13	2DD03
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1A1A1A2	4 -3	8030004074-1	1A1A1A2C65	6 -4	672D826H020DC5C
1A1A1A2CR177	6 -16	1N4005	1A1A1A2C66	6 -14	60D224M100
1A1A1A2CR178	6 -16	1N4005	1A1A1A2C67	6 -3	60B104M100
1A1A1A2CR179	6 -16	1N4005	1A1A1A2C68	6 -3	60B104M100
1A1A1A2CR180	6 -16	1N4005	1A1A1A2C69	6 -15	CK05BX103M
1A1A1A2CR181	6 -16	1N4005	1A1A1A2J5	6 -19	DA15PV
1A1A1A2CR182	6 -16	1N4005	1A1A1A2J6	6 -20	DB25PV
1A1A1A2CR183	6 -16	1N4005	1A1A1A2J7	6 -21	DE9PV
1A1A1A2CR184	6 -17	MR818	1A1A1A2P8	6 -22	3M12143-24-12013
1A1A1A2CR185	6 -17	MR818	1A1A1A2Q1	6 -23	MJE3439
1A1A1A2CR186	6 -17	MR818	1A1A1A2Q2	6 -23	MJE3439
1A1A1A2CR189	6 -18	1N4454	1A1A1A2Q3	6 -23	MJE3439
1A1A1A2CR190	6 -18	1N4454	1A1A1A2Q4	6 -23	MJE3439
1A1A1A2CR191	6 -18	1N4454	1A1A1A2Q5	6 -24	2N2222A
1A1A1A2CR192	6 -18	1N4454	1A1A1A2Q6	6 -24	2N2222A
1A1A1A2CR193	6 -18	1N4454	1A1A1A2Q7	6 -25	FT50
1A1A1A2CR194	6 -18	1N4454	1A1A1A2R100	6 -34	RL07S123G
1A1A1A2CR195	6 -18	1N4454	1A1A1A2R101	6 -34	RL07S123G
1A1A1A2CR196	6 -18	1N4454	1A1A1A2R102	6 -34	RL07S123G
1A1A1A2CR197	6 -18	1N4454	1A1A1A2R103	6 -34	RL07S123G
1A1A1A2CR198	6 -18	1N4454	1A1A1A2R104	6 -34	RL07S123G
1A1A1A2CR199	6 -18	1N4454	1A1A1A2R105	6 -35	RL07S103G
1A1A1A2C12	6 -1	39D248G030JP4	1A1A1A2R106	6 -35	RL07S103G
1A1A1A2C13	6 -1	39D248G030JP4	1A1A1A2R107	6 -35	RL07S103G
1A1A1A2C14	6 -2	39D538G015JP4	1A1A1A2R108	6 -35	RL07S103G
1A1A1A2C15	6 -3	60B104M100	1A1A1A2R109	6 -35	RL07S103G
1A1A1A2C16	6 -3	60B104M100	1A1A1A2R110	6 -35	RL07S103G
1A1A1A2C17	6 -3	60B104M100	1A1A1A2R111	6 -35	RL07S103G
1A1A1A2C18	6 -4	672D826H020DC5C	1A1A1A2R112	6 -35	RL07S103G
1A1A1A2C19	6 -4	672D826H020DC5C	1A1A1A2R113	6 -35	RL07S103G
1A1A1A2C20	6 -4	672D826H020DC5C	1A1A1A2R114	6 -35	RL07S103G
1A1A1A2C21	6 -3	60B104M100	1A1A1A2R115	6 -36	RL07S153G
1A1A1A2C22	6 -3	60B104M100	1A1A1A2R116	6 -36	RL07S153G
1A1A1A2C23	6 -5	60B222J630	1A1A1A2R117	6 -36	RL07S153G
1A1A1A2C24	6 -5	60B222J630	1A1A1A2R118	6 -36	RL07S153G
1A1A1A2C25	6 -5	60B222J630	1A1A1A2R119	6 -36	RL07S153G
1A1A1A2C26	6 -5	60B222J630	1A1A1A2R120	6 -36	RL07S153G
1A1A1A2C27	6 -5	60B222J630	1A1A1A2R121	6 -36	RL07S153G

REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER	REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER
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1A1A1A2R123	6 -37	RL07S752G	1A1A1A2R75	6 -32	RL07S513G
1A1A1A2R124	6 -37	RL07S752G	1A1A1A2R76	6 -32	RL07S513G
1A1A1A2R125	6 -37	RL07S752G	1A1A1A2R77	6 -32	RL07S513G
1A1A1A2R126	6 -37	RL07S752G	1A1A1A2R78	6 -32	RL07S513G
1A1A1A2R127	6 -35	RL07S103G	1A1A1A2R79	6 -32	RL07S513G
1A1A1A2R128	6 -35	RL07S103G	1A1A1A2R80	6 -32	RL07S513G
1A1A1A2R129	6 -38	RL07S512G	1A1A1A2R81	6 -32	RL07S513G
1A1A1A2R130	6 -38	RL07S512G	1A1A1A2R82	6 -32	RL07S513G
1A1A1A2R131	6 -38	RL07S512G	1A1A1A2R83	6 -32	RL07S513G
1A1A1A2R132	6 -38	RL07S512G	1A1A1A2R84	6 -32	RL07S513G
1A1A1A2R133	6 -38	RL07S512G	1A1A1A2R85	6 -33	RL07S183G
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1A1A1A2R135	6 -39	RL07S473G	1A1A1A2R87	6 -33	RL07S183G
1A1A1A2R136	6 -39	RL07S473G	1A1A1A2R88	6 -33	RL07S183G
1A1A1A2R137	6 -39	RL07S473G	1A1A1A2R89	6 -33	RL07S183G
1A1A1A2R138	6 -39	RL07S473G	1A1A1A2R90	6 -33	RL07S183G
1A1A1A2R139	6 -40	RL07S562G	1A1A1A2R91	6 -33	RL07S183G
1A1A1A2R140	6 -40	RL07S562G	1A1A1A2R92	6 -33	RL07S183G
1A1A1A2R141	6 -40	RL07S562G	1A1A1A2R93	6 -33	RL07S183G
1A1A1A2R142	6 -40	RL07S562G	1A1A1A2R94	6 -33	RL07S183G
1A1A1A2R143	6 -41	RL07S563G	1A1A1A2R95	6 -34	RL07S123G
1A1A1A2R144	6 -41	RL07S563G	1A1A1A2R96	6 -34	RL07S123G
1A1A1A2R145	6 -41	RL07S563G	1A1A1A2R97	6 -34	RL07S123G
1A1A1A2R146	6 -41	RL07S563G	1A1A1A2R98	6 -34	RL07S123G
1A1A1A2R147	6 -42	RL07S272G	1A1A1A2R99	6 -34	RL07S123G
1A1A1A2R156	6 -43	RL20S104G	1A1A1A2T1	6 -60	4-0100
1A1A1A2R157	6 -43	RL20S104G	1A1A1A2T2	6 -61	80300037*6-1
1A1A1A2R158	6 -43	RL20S104G	1A1A1A2U24	6 -62	CD4078BE
1A1A1A2R159	6 -43	RL20S104G	1A1A1A2J25	6 -62	CD4078BE
1A1A1A2R160	6 -44	E2A103	1A1A1A2J26	6 -63	CD4094BE
1A1A1A2R161	6 -38	RL07S512G	1A1A1A2J27	6 -63	CD4094BE
1A1A1A2R162	6 -38	RL07S512G	1A1A1A2U28	6 -63	CD4094BE
1A1A1A2R163	6 -42	RL07S272G	1A1A1A2J29	6 -63	CD4094BE
1A1A1A2R164	6 -42	RL07S272G	1A1A1A2J30	6 -63	CD4094BE
1A1A1A2R165	6 -45	RL07S243G	1A1A1A2J31	6 -64	MC4558CPI
1A1A1A2R166	6 -45	RL07S243G	1A1A1A2J32	6 -64	MC4558CPI
1A1A1A2R167	6 -46	RL07S682G	1A1A1A2U33	6 -64	MC4558CPI
1A1A1A2R168	6 -46	RL07S682G	1A1A1A2J34	6 -64	MC4558CPI
1A1A1A2R169	6 -47	RL07S821G	1A1A1A2J35	6 -64	MC4558CPI
1A1A1A2R170	6 -47	RL07S821G	1A1A1A2J36	6 -62	CD4078BE
1A1A1A2R171	6 -48	RL07S133G	1A1A1A2J37	6 -65	CD4001BE
1A1A1A2R172	6 -48	RL07S133G	1A1A1A2J38	6 -65	CD4001BE
1A1A1A2R173	6 -48	RL07S133G	1A1A1A2J39	6 -66	MC14011BCP
1A1A1A2R174	6 -48	RL07S133G	1A1A1A2J40	6 -67	UA780U1C
1A1A1A2R175	6 -49	E2A504	1A1A1A2J41	6 -68	UA790U1C
1A1A1A2R176	6 -50	E2A104	1A1A1A2U42	6 -67	UA780U1C
1A1A1A2R177	6 -49	E2A504	1A1A1A2J45	6 -69	4N38
1A1A1A2R178	6 -51	RCR07G514JS	1A1A1A2VR1	6 -70	1N5258B
1A1A1A2R179	6 -52	RCR07G225JS	1A1A1A2VR2	6 -70	1N5258B
1A1A1A2R180	6 -27	E2A502	1A1A1A2VR3	6 -71	1N5226B
1A1A1A2R181	6 -27	E2A502	1A1A1A2VR4	6 -72	1N5241B
1A1A1A2R182	6 -53	RCR32G561JS	1A1A1A2VR5	6 -72	1N5241B
1A1A1A2R183	6 -40	RL07S562G	1A1A12A2R155	9 -31	RL07S621G
1A1A1A2R184	6 -41	RL07S563G	1A1A2	3 -18	8030004075-1
1A1A1A2R185	6 -44	E2A103	1A1A2A R305	9 -49	RL07S102G
1A1A1A2R186	6 -54	RCR32G2R7JS	1A1A2A1	7 -1	8030004076-1
1A1A1A2R187	6 -54	RCR32G2R7JS	1A1A2A1AR12	8 -18	RL07S753G
1A1A1A2R188	6 -35	RL07S103G	1A1A2A1CR1	8 -10	1N4454
1A1A1A2R189	6 -55	RCR20G151JS	1A1A2A1CR18	8 -10	1N4454
1A1A1A2R190	6 -56	RCR07G4R7JS	1A1A2A1CR19	8 -10	1N4454
1A1A1A2R191	6 -57	RCR07G332JS	1A1A2A1CR2	8 -10	1N4454
1A1A1A2R192	6 -57	RCR07G332JS	1A1A2A1CR20	8 -10	1N4454
1A1A1A2R193	6 -58	RCR07G515JS	1A1A2A1CR21	8 -10	1N4454
1A1A1A2R194	6 -59	RCR07G105JS	1A1A2A1CR3	8 -10	1N4454
1A1A1A2R64	6 -26	RL07S303G	1A1A2A1CR4	8 -10	1N4454
1A1A1A2R65	6 -27	E2A502	1A1A2A1CR5	8 -10	1N4454
1A1A1A2R66	6 -28	RL07S203G	1A1A2A1CR6	8 -10	1N4454
1A1A1A2R67	6 -27	E2A502	1A1A2A1C1	8 -1	CK05BX104M
1A1A1A2R68	6 -29	RL07S393G	1A1A2A1C10	8 -2	60B563J250
1A1A1A2R69	6 -30	E2A107	1A1A2A1C11	8 -3	60B104J100
1A1A1A2R70	6 -28	RL07S203G	1A1A2A1C12	8 -2	60B563J250
1A1A1A2R71	6 -31	RCR07G393JS	1A1A2A1C13	8 -1	CK05BX104M
1A1A1A2R72	6 -31	RCR07G393JS	1A1A2A1C14	8 -1	CK05BX104M
1A1A1A2R73	6 -31	RCR07G393JS	1A1A2A1C15	8 -4	60B222J630

REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER	REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER
1A1A2A1C16	8 -4	608222J630	1A1A2A1R2	8 -11	RN55C3742F
1A1A2A1C17	8 -1	CK058X104M	1A1A2A1R20	8 -12	RL07S103G
1A1A2A1C18	8 -1	CK058X104M	1A1A2A1R21	8 -12	RL07S103G
1A1A2A1C19	8 -1	CK058X104M	1A1A2A1R22	8 -12	RL07S103G
1A1A2A1C2	8 -2	608563J250	1A1A2A1R23	8 -12	RL07S103G
1A1A2A1C20	8 -1	CK058X104M	1A1A2A1R24	8 -12	RL07S103G
1A1A2A1C22	8 -1	CK058X104M	1A1A2A1R25	8 -21	RL07S202G
1A1A2A1C226	8 -9	672D107H015CD5C	1A1A2A1R26	8 -21	RL07S202G
1A1A2A1C23	8 -1	CK058X104M	1A1A2A1R27	8 -22	RL07S303G
1A1A2A1C26	8 -1	CK058X104M	1A1A2A1R28	8 -23	RL07S203G
1A1A2A1C27	8 -3	608104J100	1A1A2A1R29	8 -23	RL07S203G
1A1A2A1C28	8 -3	608104J100	1A1A2A1R3	8 -12	RL07S103G
1A1A2A1C29	8 -5	60F474J100	1A1A2A1R31	8 -24	RCR07G101JS
1A1A2A1C3	8 -1	CK058X104M	1A1A2A1R32	8 -24	RCR07G101JS
1A1A2A1C30	8 -5	60F474J100	1A1A2A1R33	8 -24	RCR07G101JS
1A1A2A1C31	8 -6	CK058X102M	1A1A2A1R34	8 -24	RCR07G101JS
1A1A2A1C32	8 -1	CK058X104M	1A1A2A1R36	8 -12	RL07S103G
1A1A2A1C33	8 -1	CK058X104M	1A1A2A1R37	8 -12	RL07S103G
1A1A2A1C34	8 -6	CK058X102M	1A1A2A1R38	8 -12	RL07S103G
1A1A2A1C35	8 -6	CK058X102M	1A1A2A1R39	8 -12	RL07S103G
1A1A2A1C36	8 -6	CK058X102M	1A1A2A1R4	8 -13	RN55C4022F
1A1A2A1C37	8 -1	CK058X104M	1A1A2A1R40	8 -12	RL07S103G
1A1A2A1C38	8 -1	CK058X104M	1A1A2A1R41	8 -12	RL07S103G
1A1A2A1C39	8 -3	608104J100	1A1A2A1R42	8 -25	RL07S512G
1A1A2A1C4	8 -1	CK059X104M	1A1A2A1R43	8 -26	MT2P103
1A1A2A1C40	8 -1	CK058X104M	1A1A2A1R44	8 -26	MT2P103
1A1A2A1C41	8 -1	CK058X104M	1A1A2A1R45	8 -27	RL07S513G
1A1A2A1C42	8 -7	CK059X471M	1A1A2A1R46	8 -23	RL07S203G
1A1A2A1C43	8 -7	CK058X471M	1A1A2A1R47	8 -28	RL07S152G
1A1A2A1C44	8 -8	608103J400	1A1A2A1R48	8 -28	RL07S152G
1A1A2A1C45	8 -8	608103J400	1A1A2A1R49	8 -29	RCR07G155JS
1A1A2A1C46	8 -1	CK058X104M	1A1A2A1R5	8 -13	RN55C4022F
1A1A2A1C47	8 -6	CK058X102M	1A1A2A1R50	8 -25	RL07S512G
1A1A2A1C48	8 -6	CK058X102M	1A1A2A1R51	8 -30	RCR07G105JS
1A1A2A1C49	8 -1	CK058X104M	1A1A2A1R52	8 -12	RL07S103G
1A1A2A1C5	8 -1	CK058X104M	1A1A2A1R53	8 -12	RL07S103G
1A1A2A1C50	8 -1	CK058X104M	1A1A2A1R54	8 -30	RCR07G105JS
1A1A2A1C6	8 -2	608563J250	1A1A2A1R55	8 -31	RL07S333G
1A1A2A1C7	8 -1	CK058X104M	1A1A2A1R56	8 -31	RL07S333G
1A1A2A1C8	8 -2	608563J250	1A1A2A1R57	8 -12	RL07S103G
1A1A2A1C9	8 -3	608104J100	1A1A2A1R58	8 -12	RL07S103G
1A1A2A1R	8 -33	RL07S183G	1A1A2A1R59	8 -32	RL07S102G
1A1A2A1R	8 -33	RL07S183G	1A1A2A1R6	8 -14	RN55C6342F
1A1A2A1R1	8 -11	RN55C3742F	1A1A2A1R60	8 -32	RL07S102G
1A1A2A1R10	8 -16	RN55C5762F	1A1A2A1R63	8 -21	RL07S202G
1A1A2A1R100	8 -39	RCR07G393JS	1A1A2A1R64	8 -21	RL07S202G
1A1A2A1R101	8 -12	RL07S103G	1A1A2A1R65	8 -21	RL07S202G
1A1A2A1R102	8 -12	RL07S103G	1A1A2A1R66	8 -21	RL07S202G
1A1A2A1R103	8 -39	RCR07G393JS	1A1A2A1R67	8 -21	RL07S202G
1A1A2A1R104	8 -39	RCR07G393JS	1A1A2A1R68	8 -21	RL07S202G
1A1A2A1R105	8 -39	RCR07G393JS	1A1A2A1R69	8 -32	RL07S102G
1A1A2A1R106	8 -40	RCR07G821JS	1A1A2A1R7	8 -15	RL07S154G
1A1A2A1R107	8 -40	RCR07G821JS	1A1A2A1R70	8 -32	RL07S102G
1A1A2A1R108	8 -21	RL07S202G	1A1A2A1R71	8 -23	RL07S203G
1A1A2A1R109	8 -39	RCR07G393JS	1A1A2A1R72	8 -23	RL07S203G
1A1A2A1R11	8 -17	RN55C3482F	1A1A2A1R73	8 -23	RL07S203G
1A1A2A1R110	8 -32	RL07S102G	1A1A2A1R74	8 -23	RL07S203G
1A1A2A1R111	8 -32	RL07S102G	1A1A2A1R75	8 -34	RL07S243G
1A1A2A1R112	8 -41	RL07S272G	1A1A2A1R76	8 -23	RL07S203G
1A1A2A1R113	8 -12	RL07S103G	1A1A2A1R77	8 -34	RL07S243G
1A1A2A1R114	8 -12	RL07S103G	1A1A2A1R78	8 -23	RL07S203G
1A1A2A1R115	8 -42	RCR07G106JS	1A1A2A1R79	8 -35	RL07S163G
1A1A2A1R116	8 -30	RCR07G105JS	1A1A2A1R8	8 -15	RL07S154G
1A1A2A1R117	8 -22	RL07S303G	1A1A2A1R80	8 -23	RL07S203G
1A1A2A1R118	8 -43	RL07S362G	1A1A2A1R80	8 -36	RL07S473G
1A1A2A1R119	8 -22	RL07S303G	1A1A2A1R82	8 -26	MT2P103
1A1A2A1R120	8 -12	RL07S103G	1A1A2A1R83	8 -12	RL07S103G
1A1A2A1R121	8 -21	RL07S202G	1A1A2A1R84	8 -12	RL07S103G
1A1A2A1R13	8 -19	RL07S134G	1A1A2A1R85	8 -12	RL07S103G
1A1A2A1R14	8 -12	RL07S103G	1A1A2A1R86	8 -12	RL07S103G
1A1A2A1R15	8 -12	RL07S103G	1A1A2A1R87	8 -23	RL07S203G
1A1A2A1R16	8 -12	RL07S103G	1A1A2A1R88	8 -23	RL07S203G
1A1A2A1R17	8 -20	RL07S153G	1A1A2A1R89	8 -37	RL07S224G
1A1A2A1R18	8 -12	RL07S103G	1A1A2A1R9	8 -16	RN55C5762F
1A1A2A1R19	8 -12	RL07S103G	1A1A2A1R90	8 -37	RL07S224G

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1A1A2A1R91	8 -24	RCR07G101JS	1A1A2A2C118	9 -6	60I333J250
1A1A2A1R92	8 -30	RCR07G105JS	1A1A2A2C119	9 -5	60B153J400
1A1A2A1R93	8 -38	RCR07G223JS	1A1A2A2C119	9 -6	60I333J250
1A1A2A1R94	8 -24	RCR07G101JS	1A1A2A2C120	9 -6	60I333J250
1A1A2A1R95	8 -24	RCR07G101JS	1A1A2A2C121	9 -6	60I333J250
1A1A2A1R96	8 -24	RCR07G101JS	1A1A2A2C122	9 -6	60I333J250
1A1A2A1R97	8 -24	RCR07G101JS	1A1A2A2C123	9 -6	60I333J250
1A1A2A1R98	8 -39	RCR07G393JS	1A1A2A2C124	9 -6	60I333J250
1A1A2A1R99	8 -39	RCR07G393JS	1A1A2A2C125	9 -6	60I333J250
1A1A2A1U1	8 -44	MC4558CPI	1A1A2A2C126	9 -6	60I333J250
1A1A2A1U10	8 -47	LM311N	1A1A2A2C127	9 -6	60I333J250
1A1A2A1U11	8 -47	LM311N	1A1A2A2C128	9 -6	60I333J250
1A1A2A1U12	8 -49	CD4098BE	1A1A2A2C129	9 -6	60I333J250
1A1A2A1U13	8 -44	MC4558CPI	1A1A2A2C130	9 -6	60I333J250
1A1A2A1U14	8 -44	MC4558CPI	1A1A2A2C131	9 -6	60I333J250
1A1A2A1U15	8 -44	MC4558CPI	1A1A2A2C132	9 -6	60I333J250
1A1A2A1U16	8 -44	MC4558CPI	1A1A2A2C133	9 -6	60I333J250
1A1A2A1U17	8 -44	MC4558CPI	1A1A2A2C134	9 -6	60I333J250
1A1A2A1U18	8 -47	LM311N	1A1A2A2C135	9 -6	60I333J250
1A1A2A1U19	8 -45	HI1-0201-5	1A1A2A2C136	9 -6	60I333J250
1A1A2A1U2	8 -44	MC4558CPI	1A1A2A2C137	9 -7	60B473J250
1A1A2A1U21	8 -48	MC140118CP	1A1A2A2C138	9 -7	60B473J250
1A1A2A1U22	8 -50	CD4013BE	1A1A2A2C139	9 -7	60B473J250
1A1A2A1U23	8 -48	MC140118CP	1A1A2A2C140	9 -7	60B473J250
1A1A2A1U24	8 -48	MC140118CP	1A1A2A2C141	9 -7	60B473J250
1A1A2A1U25	8 -51	CD4029BE	1A1A2A2C142	9 -7	60B473J250
1A1A2A1U26	8 -52	CD4018BE	1A1A2A2C143	9 -7	60B473J250
1A1A2A1U27	8 -52	CD4018BE	1A1A2A2C144	9 -7	60B473J250
1A1A2A1U28	8 -53	CD4049UBE	1A1A2A2C145	9 -7	60B473J250
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1A1A2A1U3	8 -44	MC4558CPI	1A1A2A2C147	9 -7	60B473J250
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1A1A2A1U32	8 -48	MC140118CP	1A1A2A2C150	9 -7	60B473J250
1A1A2A1U33	8 -55	CD4024BE	1A1A2A2C151	9 -7	60B473J250
1A1A2A1U34	8 -55	CD4024BE	1A1A2A2C152	9 -7	60B473J250
1A1A2A1U35	8 -47	LM311N	1A1A2A2C153	9 -7	60B473J250
1A1A2A1U36	8 -47	LM311N	1A1A2A2C154	9 -7	60B473J250
1A1A2A1U4	8 -44	MC4558CPI	1A1A2A2C155	9 -7	60B473J250
1A1A2A1U5	8 -45	HI1-0201-5	1A1A2A2C156	9 -7	60B473J250
1A1A2A1U6	8 -46	TL072CP	1A1A2A2C157	9 -8	60B332J360
1A1A2A1U7	8 -44	MC4558CPI	1A1A2A2C158	9 -8	60B332J360
1A1A2A1U8	8 -47	LM311N	1A1A2A2C159	9 -8	60B332J360
1A1A2A1U9	8 -48	MC140118CP	1A1A2A2C160	9 -8	60B332J360
1A1A2A2	7 -5	8030004077-1	1A1A2A2C161	9 -8	60B332J360
1A1A2A2CR10	9 -14	1N4454	1A1A2A2C162	9 -8	60B332J360
1A1A2A2CR11	9 -14	1N4454	1A1A2A2C163	9 -8	60B332J360
1A1A2A2CR12	9 -14	1N4454	1A1A2A2C164	9 -8	60B332J360
1A1A2A2CR13	9 -14	1N4454	1A1A2A2C165	9 -8	60B332J360
1A1A2A2CR14	9 -14	1N4454	1A1A2A2C166	9 -8	60B332J360
1A1A2A2CR15	9 -14	1N4454	1A1A2A2C167	9 -8	60B332J360
1A1A2A2CR16	9 -15	1N4005	1A1A2A2C168	9 -8	60B332J360
1A1A2A2CR17	9 -15	1N4005	1A1A2A2C169	9 -8	60B332J360
1A1A2A2CR22	9 -14	1N4454	1A1A2A2C170	9 -8	60B332J360
1A1A2A2CR23	9 -14	1N4454	1A1A2A2C171	9 -8	60B332J360
1A1A2A2CR24	9 -14	1N4454	1A1A2A2C172	9 -8	60B332J360
1A1A2A2CR25	9 -14	1N4454	1A1A2A2C173	9 -8	60B332J360
1A1A2A2CR8	9 -14	1N4454	1A1A2A2C174	9 -8	60B332J360
1A1A2A2C100	9 -5	60B153J400	1A1A2A2C175	9 -8	60B332J360
1A1A2A2C101	9 -5	60B153J400	1A1A2A2C176	9 -8	60B332J360
1A1A2A2C102	9 -5	60B153J400	1A1A2A2C177	9 -9	60B563J250
1A1A2A2C103	9 -5	60B153J400	1A1A2A2C178	9 -9	60B563J250
1A1A2A2C104	9 -5	60B153J400	1A1A2A2C179	9 -9	60B563J250
1A1A2A2C105	9 -5	60B153J400	1A1A2A2C180	9 -9	60B563J250
1A1A2A2C106	9 -5	60B153J400	1A1A2A2C181	9 -9	60B563J250
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1A1A2A2C108	9 -5	60B153J400	1A1A2A2C183	9 -9	60B563J250
1A1A2A2C110	9 -5	60B153J400	1A1A2A2C184	9 -9	60B563J250
1A1A2A2C111	9 -5	60B153J400	1A1A2A2C185	9 -9	60B563J250
1A1A2A2C112	9 -5	60B153J400	1A1A2A2C186	9 -9	60B563J250
1A1A2A2C113	9 -5	60B153J400	1A1A2A2C187	9 -9	60B563J250
1A1A2A2C114	9 -5	60B153J400	1A1A2A2C188	9 -9	60B563J250
1A1A2A2C115	9 -5	60B153J400	1A1A2A2C189	9 -9	60B563J250
1A1A2A2C116	9 -5	60B153J400	1A1A2A2C190	9 -9	60B563J250
1A1A2A2C117	9 -6	60I333J250	1A1A2A2C191	9 -9	60B563J250

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1A1A2A2C192	9 -9	608563J250	1A1A2A2C99	9 -5	60B153J400
1A1A2A2C193	9 -9	608563J250	1A1A2A2J1	9 -16	DB25PV
1A1A2A2C194	9 -9	608563J250	1A1A2A2J2	9 -17	DE9SV
1A1A2A2C195	9 -9	608563J250	1A1A2A2J3	9 -18	DB25SV
1A1A2A2C196	9 -9	608563J250	1A1A2A2J4	9 -19	DA15SV
1A1A2A2C197	9 -3	CK05BX104M	1A1A2A2Q1	9 -20	2N2222A
1A1A2A2C198	9 -3	CK05BX104M	1A1A2A2Q2	9 -21	2N2907A
1A1A2A2C199	9 -3	CK05BX104M	1A1A2A2Q3	9 -22	NJE3439
1A1A2A2C200	9 -3	CK05BX104M	1A1A2A2Q4	9 -23	FT50
1A1A2A2C201	9 -1	CK05BX102M	1A1A2A2Q5	9 -22	NJE3439
1A1A2A2C202	9 -1	CK05BX102M	1A1A2A2Q6	9 -23	FT50
1A1A2A2C203	9 -10	608103J400	1A1A2A2Q7	9 -20	2N2222A
1A1A2A2C204	9 -10	608103J400	1A1A2A2Q8	9 -21	2N2907A
1A1A2A2C205	9 -5	60B153J400	1A1A2A2R132	9 -24	RL07S682G
1A1A2A2C206	9 -5	60B153J400	1A1A2A2R133	9 -24	RL07S682G
1A1A2A2C207	9 -11	CM04FC301J03	1A1A2A2R134	9 -25	RCR07G511JS
1A1A2A2C208	9 -11	CM04FC301J03	1A1A2A2R135	9 -25	RCR07G511JS
1A1A2A2C209	9 -12	CK05BX103M	1A1A2A2R136	9 -25	RCR07G511JS
1A1A2A2C210	9 -12	CK05BX103M	1A1A2A2R137	9 -25	RCR07G511JS
1A1A2A2C211	9 -13	60F474J100	1A1A2A2R138	9 -26	RL07S203G
1A1A2A2C212	9 -13	60F474J100	1A1A2A2R139	9 -27	RL07S223G
1A1A2A2C213	9 -3	CK05BX104M	1A1A2A2R140	9 -27	RL07S223G
1A1A2A2C214	9 -3	CK05BX104M	1A1A2A2R141	9 -27	RL07S223G
1A1A2A2C215	9 -3	CK05BX104M	1A1A2A2R142	9 -27	RL07S223G
1A1A2A2C216	9 -3	CK05BX104M	1A1A2A2R143	9 -27	RL07S223G
1A1A2A2C217	9 -3	CK05BX104M	1A1A2A2R144	9 -27	RL07S223G
1A1A2A2C218	9 -2	CK05BX101M	1A1A2A2R145	9 -27	RL07S223G
1A1A2A2C219	9 -2	CK05BX101M	1A1A2A2R146	9 -27	RL07S223G
1A1A2A2C51	9 -1	CK05BX102M	1A1A2A2R147	9 -28	MT2P502
1A1A2A2C52	9 -2	CK05BX101M	1A1A2A2R148	9 -28	MT2P502
1A1A2A2C53	9 -2	CK05BX101M	1A1A2A2R149	9 -28	MT2P502
1A1A2A2C54	9 -2	CK05BX101M	1A1A2A2R150	9 -28	MT2P502
1A1A2A2C55	9 -2	CK05BX101M	1A1A2A2R151	9 -29	RL07S103G
1A1A2A2C56	9 -3	CK05BX104M	1A1A2A2R152	9 -30	RL07S471G
1A1A2A2C57	9 -3	CK05BX104M	1A1A2A2R153	9 -30	RL07S471G
1A1A2A2C58	9 -3	CK05BX104M	1A1A2A2R154	9 -30	RL07S471G
1A1A2A2C59	9 -3	CK05BX104M	1A1A2A2R155	9 -30	RL07S471G
1A1A2A2C60	9 -3	CK05BX104M	1A1A2A2R194	9 -32	RN55C3742F
1A1A2A2C61	9 -3	CK05BX104M	1A1A2A2R195	9 -32	RN55C3742F
1A1A2A2C62	9 -3	CK05BX104M	1A1A2A2R196	9 -32	RN55C3742F
1A1A2A2C63	9 -3	CK05BX104M	1A1A2A2R197	9 -32	RN55C3742F
1A1A2A2C64	9 -3	CK05BX104M	1A1A2A2R198	9 -32	RN55C3742F
1A1A2A2C65	9 -3	CK05BX104M	1A1A2A2R199	9 -32	RN55C3742F
1A1A2A2C66	9 -3	CK05BX104M	1A1A2A2R200	9 -32	RN55C3742F
1A1A2A2C67	9 -3	CK05BX104M	1A1A2A2R201	9 -32	RN55C3742F
1A1A2A2C68	9 -3	CK05BX104M	1A1A2A2R202	9 -33	RL07S183G
1A1A2A2C69	9 -3	CK05BX104M	1A1A2A2R203	9 -33	RL07S183G
1A1A2A2C70	9 -3	CK05BX104M	1A1A2A2R204	9 -33	RL07S183G
1A1A2A2C71	9 -3	CK05BX104M	1A1A2A2R205	9 -33	RL07S183G
1A1A2A2C72	9 -3	CK05BX104M	1A1A2A2R207	9 -34	RN55C4022F
1A1A2A2C73	9 -3	CK05BX104M	1A1A2A2R208	9 -34	RN55C4022F
1A1A2A2C74	9 -3	CK05BX104M	1A1A2A2R209	9 -34	RN55C4022F
1A1A2A2C75	9 -3	CK05BX104M	1A1A2A2R210	9 -34	RN55C4022F
1A1A2A2C76	9 -4	608223J250	1A1A2A2R211	9 -34	RN55C4022F
1A1A2A2C77	9 -4	608223J250	1A1A2A2R212	9 -34	RN55C4022F
1A1A2A2C78	9 -4	608223J250	1A1A2A2R213	9 -34	RN55C4022F
1A1A2A2C79	9 -4	608223J250	1A1A2A2R214	9 -34	RN55C4022F
1A1A2A2C80	9 -4	608223J250	1A1A2A2R215	9 -35	RN55C6342F
1A1A2A2C81	9 -4	608223J250	1A1A2A2R216	9 -35	RN55C6342F
1A1A2A2C83	9 -4	608223J250	1A1A2A2R217	9 -35	RN55C6342F
1A1A2A2C84	9 -4	608223J250	1A1A2A2R218	9 -35	RN55C6342F
1A1A2A2C85	9 -4	608223J250	1A1A2A2R219	9 -36	RL07S154G
1A1A2A2C86	9 -4	608223J250	1A1A2A2R220	9 -36	RL07S154G
1A1A2A2C87	9 -4	608223J250	1A1A2A2R221	9 -36	RL07S154G
1A1A2A2C88	9 -4	608223J250	1A1A2A2R222	9 -36	RL07S154G
1A1A2A2C89	9 -4	608223J250	1A1A2A2R223	9 -36	RL07S154G
1A1A2A2C90	9 -4	608223J250	1A1A2A2R224	9 -36	RL07S154G
1A1A2A2C91	9 -4	608223J250	1A1A2A2R225	9 -36	RL07S154G
1A1A2A2C92	9 -4	608223J250	1A1A2A2R226	9 -36	RL07S154G
1A1A2A2C93	9 -4	608223J250	1A1A2A2R227	9 -37	RN55C5762F
1A1A2A2C94	9 -4	608223J250	1A1A2A2R228	9 -37	RN55C5762F
1A1A2A2C95	9 -4	608223J250	1A1A2A2R229	9 -37	RN55C5762F
1A1A2A2C96	9 -4	608223J250	1A1A2A2R230	9 -37	RN55C5762F
1A1A2A2C97	9 -5	60B153J400	1A1A2A2R231	9 -37	RN55C5762F
1A1A2A2C98	9 -5	60B153J400	1A1A2A2R232	9 -37	RN55C5762F

REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER	REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER
1A1A2A2R233	9 -37	RN55C5762F	1A1A2A2R310	9 -29	RLC7S103G
1A1A2A2R234	9 -37	RN55C5762F	1A1A2A2R311	9 -58	RCR32G101JS
1A1A2A2R235	9 -38	RN55C3482F	1A1A2A2R312	9 -58	RCR32G101JS
1A1A2A2R236	9 -38	RN55C3482F	1A1A2A2R313	9 -59	RCR07G680JS
1A1A2A2R237	9 -38	RN55C3482F	1A1A2A2R314	9 -51	RCR07G393JS
1A1A2A2R238	9 -38	RN55C3482F	1A1A2A2R315	9 -60	RCR07G391JS
1A1A2A2R239	9 -39	RL07S134G	1A1A2A2R316	9 -29	RL07S103G
1A1A2A2R240	9 -39	RL07S134G	1A1A2A2R317	9 -29	RL07S103G
1A1A2A2R241	9 -39	RL07S134G	1A1A2A2R318	9 -61	RCR07G1C5JS
1A1A2A2R242	9 -39	RL07S134G	1A1A2A2R319	9 -51	RCR07G393JS
1A1A2A2R243	9 -39	RL07S134G	1A1A2A2R320	9 -51	RCR07G393JS
1A1A2A2R244	9 -39	RL07S134G	1A1A2A2R321	9 -51	RCR07G393JS
1A1A2A2R245	9 -39	RL07S134G	1A1A2A2R322	9 -62	RCR07G513JS
1A1A2A2R246	9 -39	RL07S134G	1A1A2A2R323	9 -63	RCR07G301JS
1A1A2A2R247	9 -40	RN55C1962F	1A1A2A2R324	9 -49	RL07S102G
1A1A2A2R248	9 -40	RN55C1962F	1A1A2A2R325	9 -61	RCR07G105JS
1A1A2A2R249	9 -40	RN55C1962F	1A1A2A2R326	9 -44	RL07S153G
1A1A2A2R250	9 -40	RN55C1962F	1A1A2A2R327	9 -64	RL07S393G
1A1A2A2R251	9 -40	RN55C1962F	1A1A2A2R328	9 -44	RL07S153G
1A1A2A2R252	9 -40	RN55C1962F	1A1A2A2R329	9 -51	RCR07G393JS
1A1A2A2R253	9 -40	RN55C1962F	1A1A2A2R330	9 -51	RCR07G393JS
1A1A2A2R254	9 -40	RN55C1962F	1A1A2A2R331	9 -51	RCR07G393JS
1A1A2A2R255	9 -35	RN55C6342F	1A1A2A2R332	9 -65	RCR07G104JS
1A1A2A2R256	9 -35	RN55C6342F	1A1A2A2T1	9 -66	4-0100
1A1A2A2R257	9 -35	RN55C6342F	1A1A2A2U55	9 -67	MC4558CPI
1A1A2A2R258	9 -35	RN55C6342F	1A1A2A2U58	9 -67	MC4558CPI
1A1A2A2R259	9 -35	RN55C6342F	1A1A2A2U59	9 -67	MC4558CPI
1A1A2A2R260	9 -35	RN55C6342F	1A1A2A2U60	9 -67	MC4558CPI
1A1A2A2R261	9 -35	RN55C6342F	1A1A2A2U61	9 -67	MC4558CPI
1A1A2A2R262	9 -35	RN55C6342F	1A1A2A2U62	9 -67	MC4558CPI
1A1A2A2R263	9 -41	RL07S432G	1A1A2A2U63	9 -67	MC4558CPI
1A1A2A2R264	9 -41	RL07S432G	1A1A2A2U64	9 -67	MC4558CPI
1A1A2A2R265	9 -41	RL07S432G	1A1A2A2U65	9 -67	MC4558CPI
1A1A2A2R266	9 -41	RL07S432G	1A1A2A2U66	9 -67	MC4558CPI
1A1A2A2R267	9 -40	RN55C1962F	1A1A2A2U67	9 -67	MC4558CPI
1A1A2A2R268	9 -40	RN55C1962F	1A1A2A2U68	9 -67	MC4558CPI
1A1A2A2R269	9 -40	RN55C1962F	1A1A2A2U69	9 -68	CD4052BE
1A1A2A2R270	9 -40	RN55C1962F	1A1A2A2U70	9 -68	CD4052BE
1A1A2A2R271	9 -26	RL07S203G	1A1A2A2U71	9 -68	CD4052BE
1A1A2A2R272	9 -42	RL07S363G	1A1A2A2U72	9 -68	CD4052BE
1A1A2A2R273	9 -26	RL07S203G	1A1A2A2U73	9 -68	CD4052BE
1A1A2A2R274	9 -42	RL07S363G	1A1A2A2U74	9 -68	CD4052BE
1A1A2A2R275	9 -43	MT2P103	1A1A2A2U75	9 -68	CD4052BE
1A1A2A2R276	9 -43	MT2P103	1A1A2A2U76	9 -68	CD4052BE
1A1A2A2R277	9 -44	RL07S153G	1A1A2A2U77	9 -68	CD4052BE
1A1A2A2R278	9 -44	RL07S153G	1A1A2A2U78	9 -68	CD4052BE
1A1A2A2R279	9 -24	RL07S682G	1A1A2A2U79	9 -69	HI1-0201-5
1A1A2A2R280	9 -24	RL07S682G	1A1A2A2U80	9 -70	MC14011BCP
1A1A2A2R281	9 -45	RN55C1022F	1A1A2A2U81	9 -70	MC14011BCP
1A1A2A2R283	9 -46	RN55C9532F	1A1A2A2U82	9 -70	MC14011BCP
1A1A2A2R284	9 -46	RN55C9532F	1A1A2A2U83	9 -70	MC14011BCP
1A1A2A2R285	9 -47	RL07S822G	1A1A2A2U84	9 -67	MC4558CPI
1A1A2A2R286	9 -47	RL07S822G	1A1A2A2U85	9 -71	TIL111
1A1A2A2R287	9 -48	RL07S114G	1A1A2A2U86	9 -71	TIL111
1A1A2A2R288	9 -48	RL07S114G	1A1A2A2U87	9 -71	TIL111
1A1A2A2R289	9 -49	RL07S102G	1A1A2A2U88	9 -67	MC4558CPI
1A1A2A2R290	9 -49	RL07S102G	1A1A2A2U89	9 -72	AD40076
1A1A2A2R291	9 -50	RL07S392G	1A1A2A2U90	9 -72	AD40076
1A1A2A2R292	9 -50	RL07S392G	1A1A2A2U91	9 -72	AD40076
1A1A2A2R293	9 -51	RCR07G393JS	1A1A2A2U92	9 -72	AD40076
1A1A2A2R294	9 -29	RL07S103G	1A1A2A2VR1	9 -73	1N5226B
1A1A2A2R295	9 -52	RL07S243G	1A1A2A2VR2	9 -74	1N5241B
1A1A2A2R296	9 -26	RL07S203G	1A1A2A2VR3	9 -74	1N5241B
1A1A2A2R297	9 -26	RL07S203G	1A1A2A2VR3	9 -74	1N5241B
1A1A2A2R298	9 -52	RL07S243G	1A1A2A2VR5	9 -74	1N5241B
1A1A2A2R299	9 -53	RL07S512G	1A1A2A2VR6	9 -75	1N5281
1A1A2A2R300	9 -54	RCR32G751JS	1A1A2A2VR7	9 -75	1N5281
1A1A2A2R301	9 -54	RCR32G751JS	1A1DS1	3 -6	102001
1A1A2A2R302	9 -55	RCR32G510JS	1A1F1	3 -3	F02B250V1-2A
1A1A2A2R303	9 -56	RCR07G221JS	1A1F2	3 -3	F02B250V1-2A
1A1A2A2R304	9 -56	RCR07G221JS	1A1V1	3 -5	28P1
1A1A2A2R306	9 -49	RL07S102G	1A1W1	3 -1	8030003714-1
1A1A2A2R307	9 -57	RCR20G753JS	1A1W1P2	10 -1	TDE9P
1A1A2A2R308	9 -57	RCR20G753JS	1A1W1P7	10 -4	DE9S
1A1A2A2R309	9 -29	RL07S103G	1A1W1RV1	10 -8	71D7000

REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER	REFERENCE DESIGNATION	FIGURE AND INDEX NUMBER	PART NUMBER
1A1W1S10	10 -3	46206LFR			
1A1W1S8	10 -7	8A1011			
1A1W1S9	10 -6	8A2011			
1A1W1T1	10 -5	CSC15826			
1A1W1XDS1	10 -17	101-3830-09-201			
1A1W2	3 -19	8030003786-1			
1A1W2	10 -	8030003786-1			
1A1W2P3	10 -9	DB25P			
1A1W2P6	10 -10	DB25S			
1A1W3	3 -15	8030004085-1			
1A1W3	10 -	8030004085-1			
1A1W3P4	10 -13	DA15P			
1A1W3P5	10 -18	DA15S			
1A1W3R1	10 -11	7081N056P201W			
1A1W3S1	10 -12	73-1007			
1A1W3S2	10 -14	73-1003			
1A1W3S3	10 -15	8A2021			
1A1W3S4	10 -16	8A1011			
1A1W3S5	10 -16	8A1011			
1A1W3S6	10 -16	8A1011			
1A1W3S7	10 -15	8A2021			
1A1XF1	3 -9	342004L			
1A1XF2	3 -9	342004L			
1A2	2 -5	8030003708-1			
1A2FL1	2 -7	8833300022-1			
1A2W4	2 -9	8030004103-1			
1A2W4	10 -	8030004103-1			
1A2W4P1	10 -20	DB25S			
1A2W4S1	10 -24	8AC11			

GLOSSARY I. Abbreviations

A

A	Ampere
ac	Alternating current
ASCII	USA Standard Code for Information Interchange
AWG	American Wire Gage

B

BAUD	The unit of modulation rate. One baud corresponds to a rate of one unit interval per second. The modulation rate is expressed as the reciprocal of the duration in seconds of the unit interval. Example: If the duration of the unit interval is 20 milliseconds, the modulation rate is 50 bauds.

C

COM	Common
CRT	Cathode Ray Tube

D

dBm	Decibels referred to one milliwatt
dc	Direct current

F

Flat fade	A condition in which both the high and low frequency components of the received signal fade simultaneously.
fsk, FSK	Frequency shift keying

G

GND	Ground

H

HF	High frequency (3 to 30 megahertz)
Hz	Hertz (cycles per second)

GLOSSARY I. Abbreviations (Continued)

L

LF	Low frequency (30 to 300 kilohertz)

M

M	Mega (10^6)
MMMC	Maritime Mobile Mode Control
m	Milli (10^{-3})
Mark	Closed-circuit condition or equivalent in a keying circuit.
Mct	Microcircuit
MP	Multipath
MTBF	Meantime between failure

N

Neutral	Keying method in which current flow represents a mark and no current flow represents a space.

P

P-P	Peak to peak
Polar	A condition in which current flows in one direction on a marking pulse and in the opposite direction on a spacing pulse.

S

Space	Open circuit or equivalent condition in a keying circuit.

T

TP	Test point

U

UHF	Ultrahigh frequency (300 to 3000 megahertz)

V

V	Volts
Vlf	Very low frequency (3 to 30 kilohertz)

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GLOSSARY II. Mnemonic Definitions

Mnemonic	Definition
AUD 1	Audio Line No. 1
AUD 2	Audio Line No. 2
AUD 3	Audio Line No. 3
BFMR	Bandpass Filtered Mark
BFSP	Bandpass Filtered Space
CSDA	Clear/Secure Data
CSDC	Clear/Secure Data Control
DIV A	Diversity A
DIV B	Diversity B
DSBK	Display Blanking
HEAT CT	CRT Heater Center Tap
HEAT HI	CRT Heater High Side
HEAT LO	CRT Heater Low Side
HFMC	High Frequency Mode Control
HF(MP)MC	High Frequency (Multipath) Mode Control
HLLI	High Level Loop Input
HLIR	High Level Loop Input Return
IND	Indicator Lamp Voltage
KEY	Key Line
KEYR	Key Line Return
LFMC	Low Frequency Mode Control
LLLI	Low Level Loop Input
LLIR	Low Level Loop Input Return
+LOOP	High Level Loop Output, Positive
-LOOP	High Level Loop Output, Negative
LOOPR	High Level Loop Output Return
LOW	Low Level Loop Output
LOWR	Low Level Loop Output Return
LPMH	Late Pulse Mark Hold
MBRT	Mode and Baud Rate Return
MKI	Mark 0 Degrees
MKQ	Mark 90 Degrees
MMMC	MMM Mode Control
NRDC	Normal/Reverse Data Control

GLOSSARY II. Mnemonic Definitions (Continued)

Mnemonic	Definition
OPRC	Operate Control
PWR 1	Power One (High Side)
PWR 2	Power Two (Return)
RCA 1	Receive Audio One
RCA 2	Receive Audio Two (Center Tap)
RCA 3	Receive Audio Three
RTUN	Remote Tuning
SHLD	Shield (Power)
SHLDA	Shield (Transmit Audio)
SPI	Space 0 Degrees
SPQ	Space 90 Degrees
STBC	Stand-By Control
TRDC	Transmit Data Control
TXA1	Transmit Audio Line One
TXA2	Transmit Audio Line Two (Center Tap)
TXA3	Transmit Audio Line Three
TXDA	Transmit Data
TXOC	Transmit Off Control
VLFMC	Very Low Frequency Mode Control
17 CT	17 Volt Center Tap
17 HI	17 Volt High Side
17 LO	17 Volt Low Side
37 CT	37 Volt Center Tap
37 HI	37 Volt High Side
37 LO	37 Volt Low Side
45.5 BC	45.5 Baud Rate Control
50 BC	50 Baud Rate Control
75 BC	75 Baud Rate Control
150 BC	150 Baud Rate Control
1296 FB	1296 X (Times) Frequency of Baud Rate
2159 I	2159 Hz Secure Reference Frequency 0 Degrees
2159 Q	2159 Hz Secure Reference Frequency 90 Degrees

APPENDIX A

A-1. DIODE MATRIX SETUP

Procedures for developing the synthesizer matrix configuration (diode and jumper placement) corresponding to any desired MODE or DATA RATE (Secure-Baud) frequency is provided in the following steps. The matrix shown in Figure A-1 is typical. Each horizontal line, except for the ground bus line, corresponds to either a mark, space, or data rate frequency depending upon which matrix circuit is under consideration. Proceed as follows:

1. Multiply desired frequency by 16:
   Example: Frequency 1 (Figure A-1) is 1575 Hz.

   $$1{,}575 \times 16 = 25{,}200$$

2. Divide 17, 690, 400 (Y1 crystal frequency in Hz) by number obtained in step 1:

   $$\frac{17{,}690{,}400}{25200} = 702 \text{ (rounded)}$$

3. Find the nines complement of the quotient obtained in step 2 carried to four digits (add zeroes to left of quotient number as required to obtain four digits):

   9999 - 0702 = 9297 (nines complement)

4. Take the least significant bit of the nines complement (the number 7) and convert it to its binary equivalent:

   Using binary conversion factor
   Find binary equivalent of 7

8	4	2	1
0	1	1	1

   As shown, a binary one is placed under those numerals of the binary conversion factor that, when summed, equal seven. A binary zero is placed under the remaining binary conversion factor numeral(s). The resultant binary equivalent of the numeral seven is found to be 0111.

5. The binary equivalents of all digits in the nines complement number obtained in step 3 are shown in Figure A-1 above each of the presettable counter matrices with the least significant bit placed at the far left and each succeeding bit following to the right. Diode placement for frequency 1 is shown as developed using the preceeding steps. The remaining frequency lines 2, 3, and 4 are developed in the same manner. As shown, diodes are placed for binary zeroes, and diodes are omitted for binary ones.

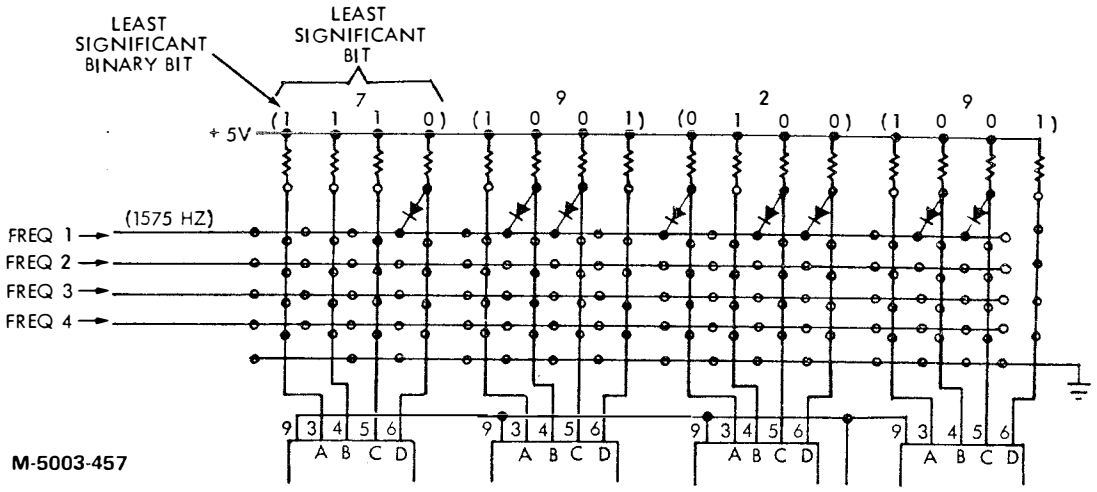


Figure A-1. Typical Diode Matrix

6. If, by coincidence, all the intersections of the four frequency lines with any one of the input lines (A,B,C, or D) to the presettable counters require diode placement, the diodes are omitted and a jumper placed between that input line and the ground bus line per Figure A-2

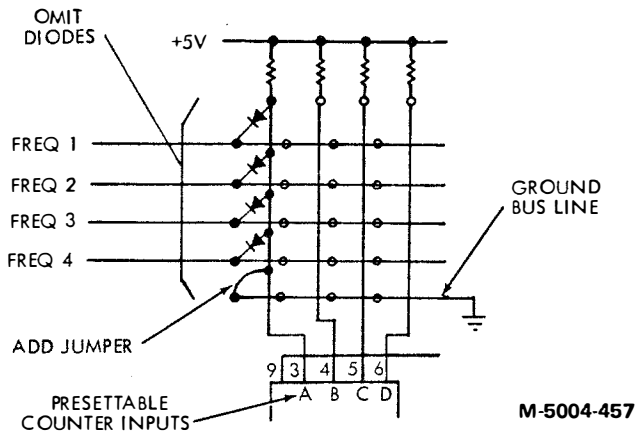
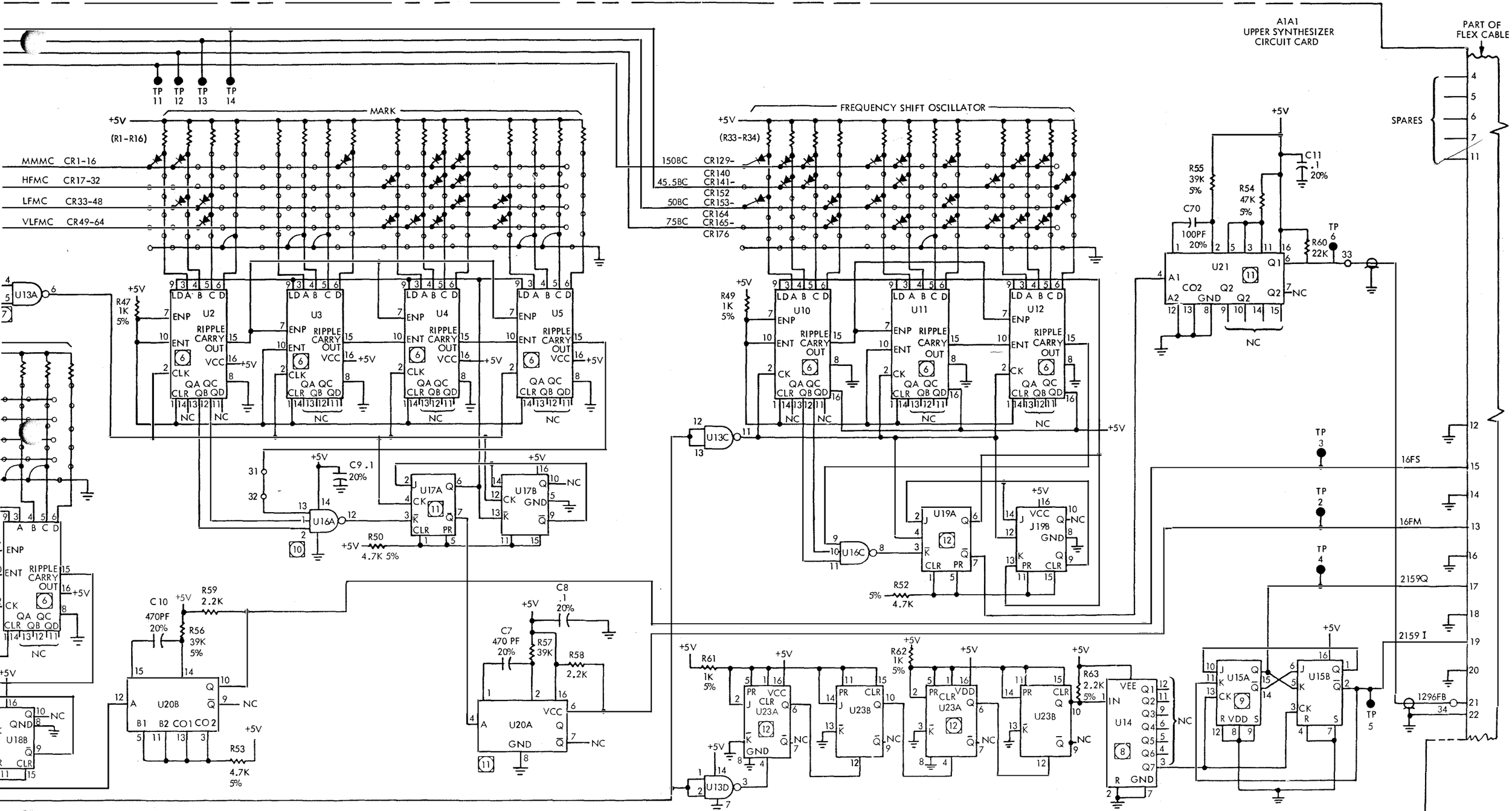


Figure A-2. Jumper Placement



M-4983 (1)

Figure FO-1. Synthesizer 1A1A1, Schematic Diagram (Sheet 1 of 3)

OTHERWISE SPECIFIED.

ES ARE 88 79000092-1 (IN4454 REF)

TA[illegible]'ALUES ARE IN OHMS, 2%, 1/4 W.

.CITANCE VALUES ARE IN MICROFARADS, 100 V.

X REFERENCE DESIGNATIONS WITH A1.

ER IS 8855400439-1 (SN74S124 REF).
ER IS 8855400440-1 (SN74LS160 REF).
ER IS 8855400437-1 (SN74LS00 REF).
ER IS 8855400425-2 (CD40Z4 REF).
ER IS 8855400424-2 (CD4027 REF).
ER IS 8855400437-2 (SN74LS10 REF).
ER IS 8855400446-1 (96L02 REF).
ER IS 8855400438-1 (SN74LS109 REF).

ER IS 8879000090-1 (IN4005 REF).
ER IS 8879700012-1 (MR818 REF).

ER IS 8892400052-1 (4-0100 REF).
ER IS 8892400050-1 (8030003796-1 REF).
ER IS 8855400443-1 (UA78GUIC REF).
ER IS 8855400444-1 (UA79GUIC REF).
ER IS 8855400445-1 (4N38 REF).
ER IS 8855400431-1 (CD4078 REF).
ER IS 8855400432-1 (CD4094 REF).
ER I[illegible]3400436-1 (MC4558 REF).
ER IS 8855400423-1 (CD4001 REF).
ER IS 8855400422-1 (CD4011 REF).
ER IS 8879400018-1 (IN5241B REF).
ER IS 8879400020-1 (IN5258B REF).
ER IS 8879400019-1 (IN5226B REF).

ER IS 8880300052-1 (MJE3439 REF).
ER IS 8880200035-1 (FT50 REF).
ER IS 8880300053-1 (2N2222A REF).

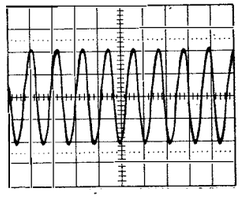
TEST POINT DATA

THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED:

TP1

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: .5 mS/DIV
PROBE ATTEN: 100:1

FREQUENCY: 17,690 400 ±100 Hz

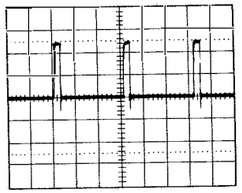


TP2, TP3

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: 20 µS/DIV
PROBE ATTEN: 10:1

FREQUENCY: (Hz ±10 Hz)

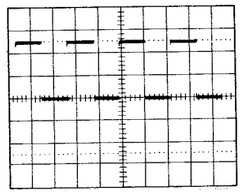
MODE	TP2	TP3
VLF	16,000	16,800
LF	14,640	17,360
HF	25,200	38,800
HF (MP)	25,200	38,800
MMM	25,825	28,580



TP4, TP5

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: .2 mS/DIV
PROBE ATTEN: 10:1

FREQUENCY: 2160 ±10Hz

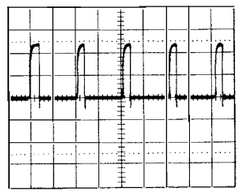


TP6

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: 5 µS/DIV
PROBE ATTEN: 10:1

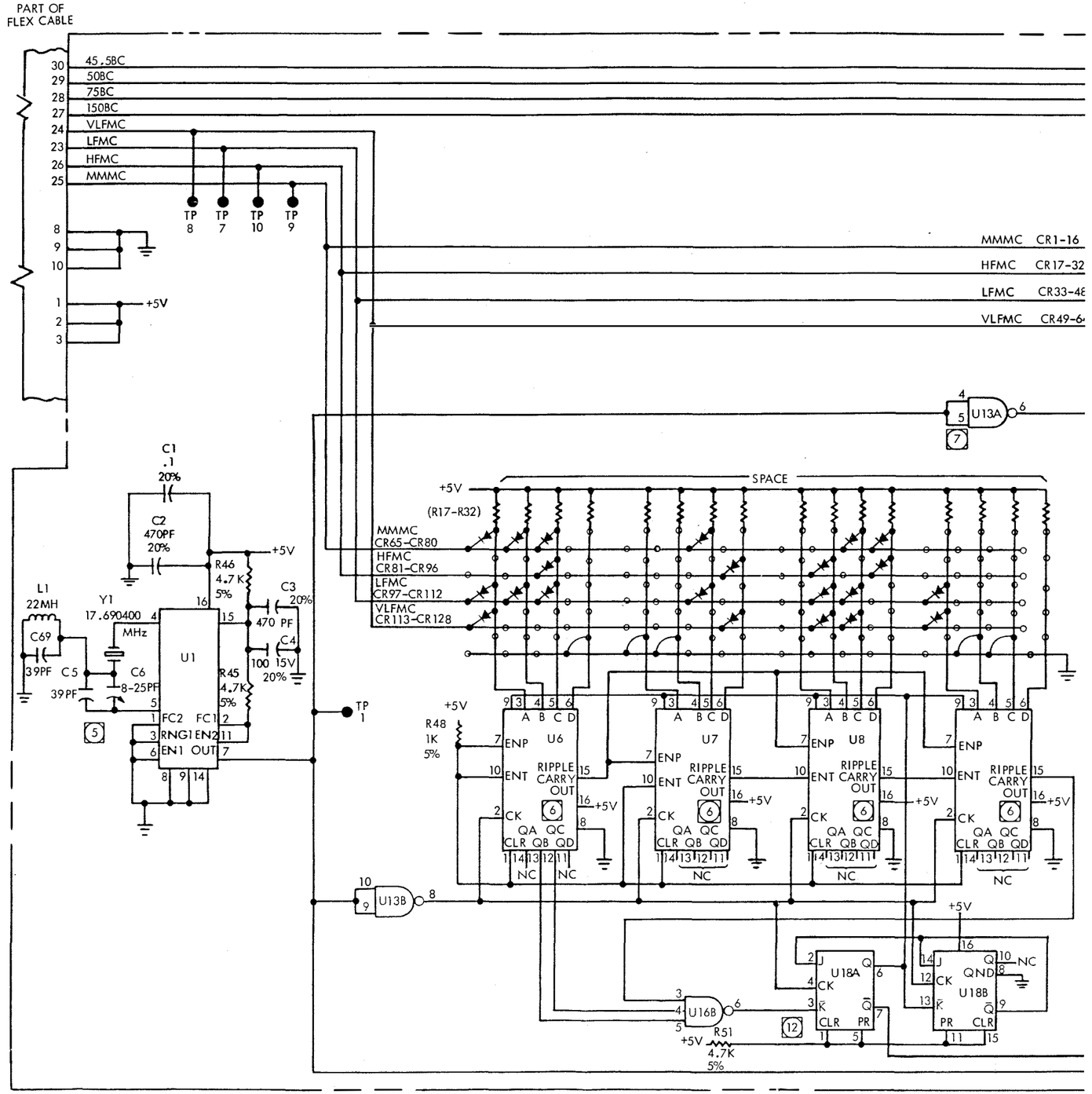
FREQUENCY:

BAUD RATE	FREQUENCY kHz ±100 Hz
75	97.2
50	64.8
45.5	58.968



TEST POINT	MODE	D.C. VOLTS	ALL OTHER MODES
TP7	LF	-.6 ±.5	+5 ±.5 VDC
TP8	VLF	-.6 ±.5	+5 ±.5 VDC
TP9	MMM	-.6 ±.5	+5 ±.5 VDC
TP10	HF	-.6 ±.5	+5 ±.5 VDC
TP11	ALL MODES	+5 ±.5	

TEST POINT	BAUD RATE	D.C. VOLTS	ALL OTHER BAUD RATES
TP12	75	-.7 ±.5	+5 ±.5 VDC
TP13	50	-.7 ±.5	+5 ±.5 VDC
TP14	45.5	-.7 ±.5	+5 ±.5 VDC



FO-1 sheet 1

NOTES: UNLESS OTHERWISE SPECIFIED.

1. DIODES ARE 88 79000092-1 (IN4454 REF)
2. RESISTANCE VALUES ARE IN OHMS, 2%, 1/4 W.
3. CAPACITANCE VALUES ARE IN MICROFARADS, 5%, 100 V.
4. PREFIX REFERENCE DESIGNATIONS WITH A1.

5. PART NUMBER IS 8855400439-1 (SN74S124 REF).
6. PART NUMBER IS 8855400440-1 (SN74LS160 REF).
7. PART NUMBER IS 8855400437-1 (SN74LS00 REF).
8. PART NUMBER IS 8855400425-2 (CD40Z4 REF).
9. PART NUMBER IS 8855400424-2 (CD4027 REF).
10. PART NUMBER IS 8855400437-2 (SN74LS10 REF).
11. PART NUMBER IS 8855400446-1 (96L02 REF).
12. PART NUMBER IS 8855400438-1 (SN74LS109 REF).
13. DELETED
14. PART NUMBER IS 8879000090-1 (IN4005 REF).
15. PART NUMBER IS 8879700012-1 (MR818 REF).
16. DELETED
17. PART NUMBER IS 8892400052-1 (4-0100 REF).
18. PART NUMBER IS 8892400050-1 (8030003796-1 REF).
19. PART NUMBER IS 8855400443-1 (UA78GUIC REF).
20. PART NUMBER IS 8855400444-1 (UA79GUIC REF).
21. PART NUMBER IS 8855400445-1 (4N38 REF).
22. PART NUMBER IS 8855400431-1 (CD4078 REF).
23. PART NUMBER IS 8855400432-1 (CD4094 REF).
24. PART NUMBER IS 8855400436-1 (MC4558 REF).
25. PART NUMBER IS 8855400423-1 (CD4001 REF).
26. PART NUMBER IS 8855400422-1 (CD4011 REF).
27. PART NUMBER IS 8879400018-1 (IN5241B REF).
28. PART NUMBER IS 8879400020-1 (IN5258B REF).
29. PART NUMBER IS 8879400019-1 (IN5226B REF).
30. DELETED
31. PART NUMBER IS 8880300052-1 (MJE3439 REF).
32. PART NUMBER IS 8880200035-1 (FT50 REF).
33. PART NUMBER IS 8880300053-1 (2N2222A REF).

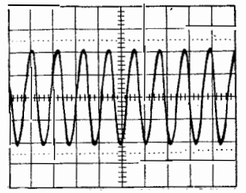
TEST POINT DATA

THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED:

TP1

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: .5 mS/DIV
PROBE ATTEN: 100:1

FREQUENCY: 17,690 400 ±100 Hz

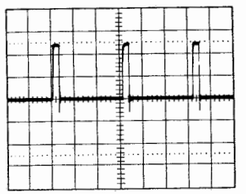


TP2, TP3

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: 20 µS/DIV
PROBE ATTEN: 10:1

FREQUENCY: (Hz ±10 Hz)

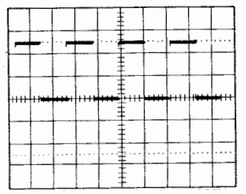
MODE	TP2	TP3
VLF	16,000	16,800
LF	14,640	17,360
HF	25,200	38,800
HF (MP)	25,200	38,800
MMM	25,825	28,580



TP4, TP5

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: .2 mS/DIV
PROBE ATTEN: 10:1

FREQUENCY: 2160 ±10Hz

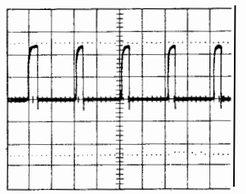


TP6

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: 5 µS/DIV
PROBE ATTEN: 10:1

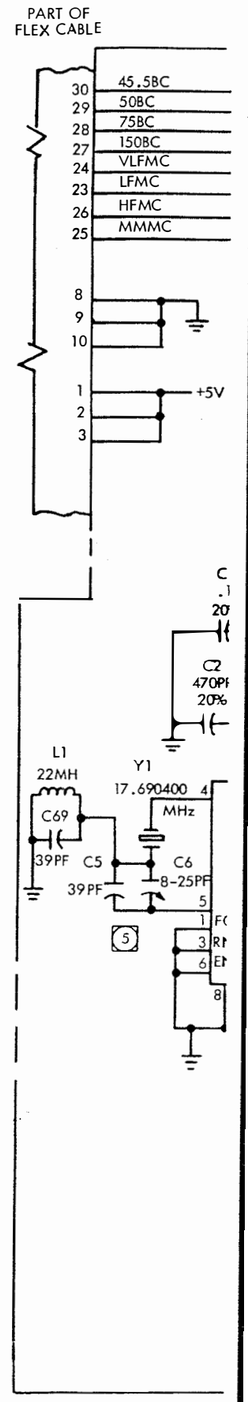
FREQUENCY:

BAUD RATE	FREQUENCY kHz ±100 Hz
75	97.2
50	64.8
45.5	58.968



TEST POINT	MODE	D.C. VOLTS	ALL OTHER MODES
TP7	LF	-.6 ±.5	+5 ±.5 VDC
TP8	VLF	-.6 ±.5	+5 ±.5 VDC
TP9	MMM	-.6 ±.5	+5 ±.5 VDC
TP10	HF	-.6 ±.5	+5 ±.5 VDC
TP11	ALL MODES	+5 ±.5	

TEST POINT	BAUD RATE	D.C. VOLTS	ALL OTHER BAUD RATES
TP12	75	-.7 ±.5	+5 ±.5 VDC
TP13	50	-.7 ±.5	+5 ±.5 VDC
TP14	45.5	-.7 ±.5	+5 ±.5 VDC



FO-1 SHEET 1

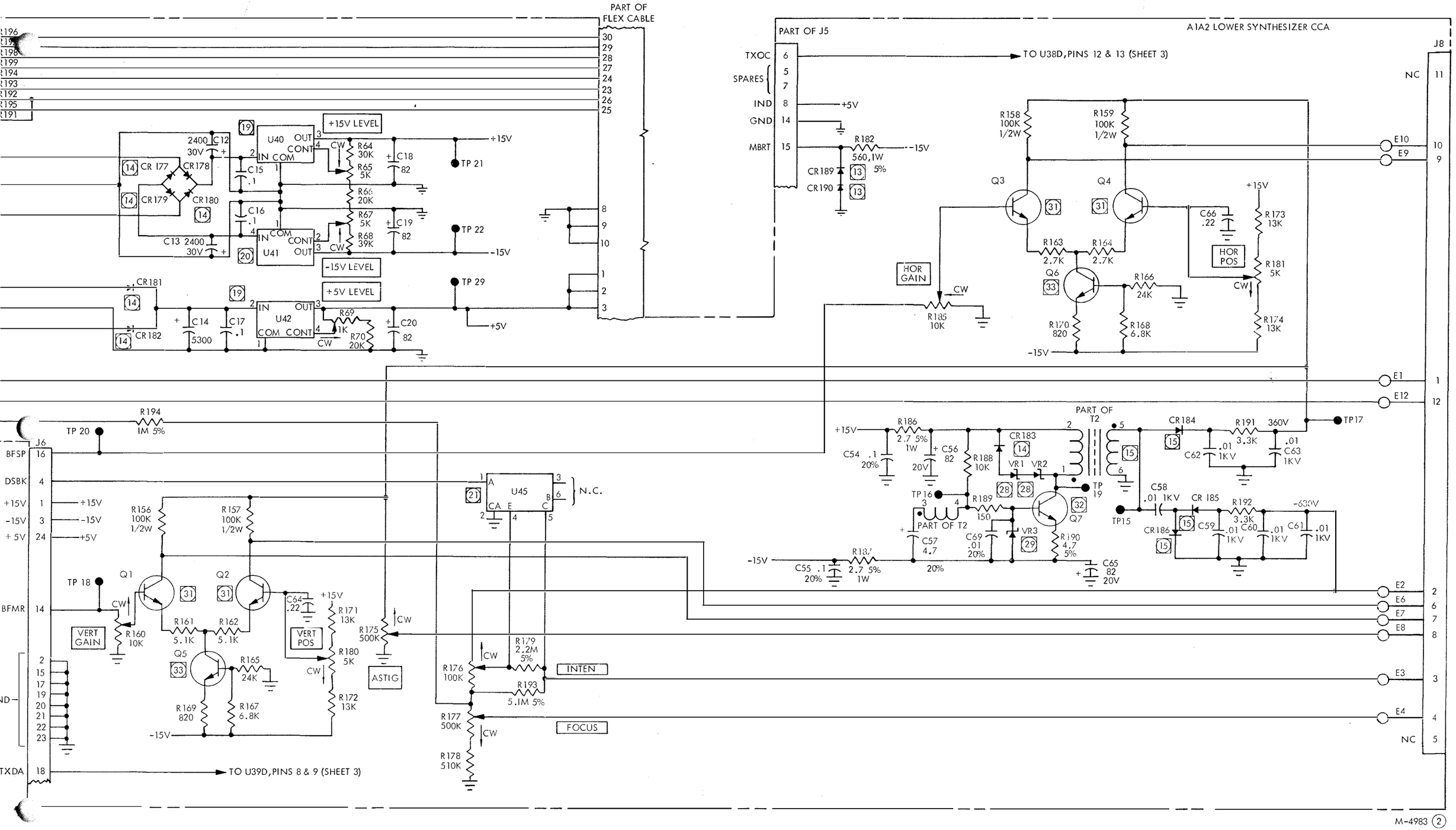


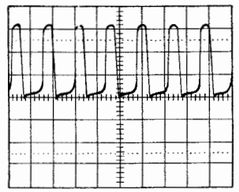
Figure FO-1. Synthesizer 1A1A1, Schematic Diagram (Sheet 2 of 3)

TEST POINT DATA

THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED:

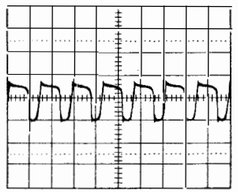
TP15

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: .5 mS/DIV
PROBE ATTEN: 100:1



TP16

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: .1V/DIV
HORIZ: .5 mS/DIV
PROBE ATTEN: 100:1



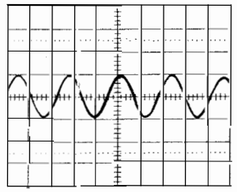
TP17: 360 ±10 VDC

TP18, TP20

CONVERTER FRONT PANEL CONTROL SETTINGS:

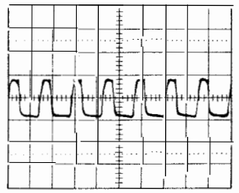
TRANSMIT/OFF/RETRANSMIT — RETRANSMIT (TP18) (TP20 NO SIGNAL); TRANSMIT (TP20) (TP18 NO SIGNAL)
AUTO/OPR/STANDBY — OPR
NORMAL/REVERSE — NORMAL
MODE — HF
LEVEL — 5

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5V/DIV
HORIZ: 2 mS/DIV
PROBE ATTEN: 1:1



TP19

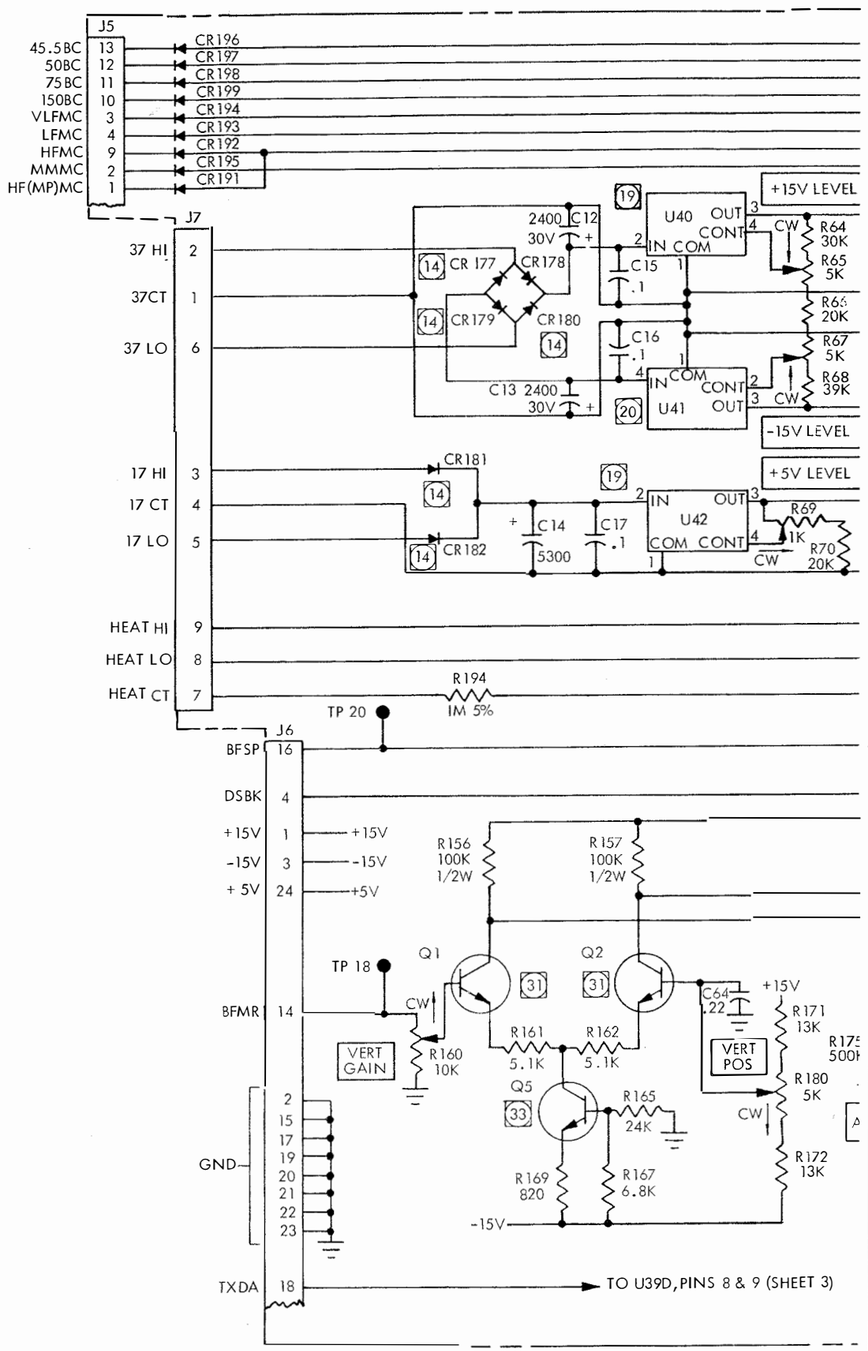
OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5V/DIV
HORIZ: .5 mS/DIV
PROBE ATTEN: 1:1



TP21: +15 ±.5 VDC

TP22: -15 ±.5 VDC

TP29: +5 ±.25 VDC



FO-1 SHEET 2

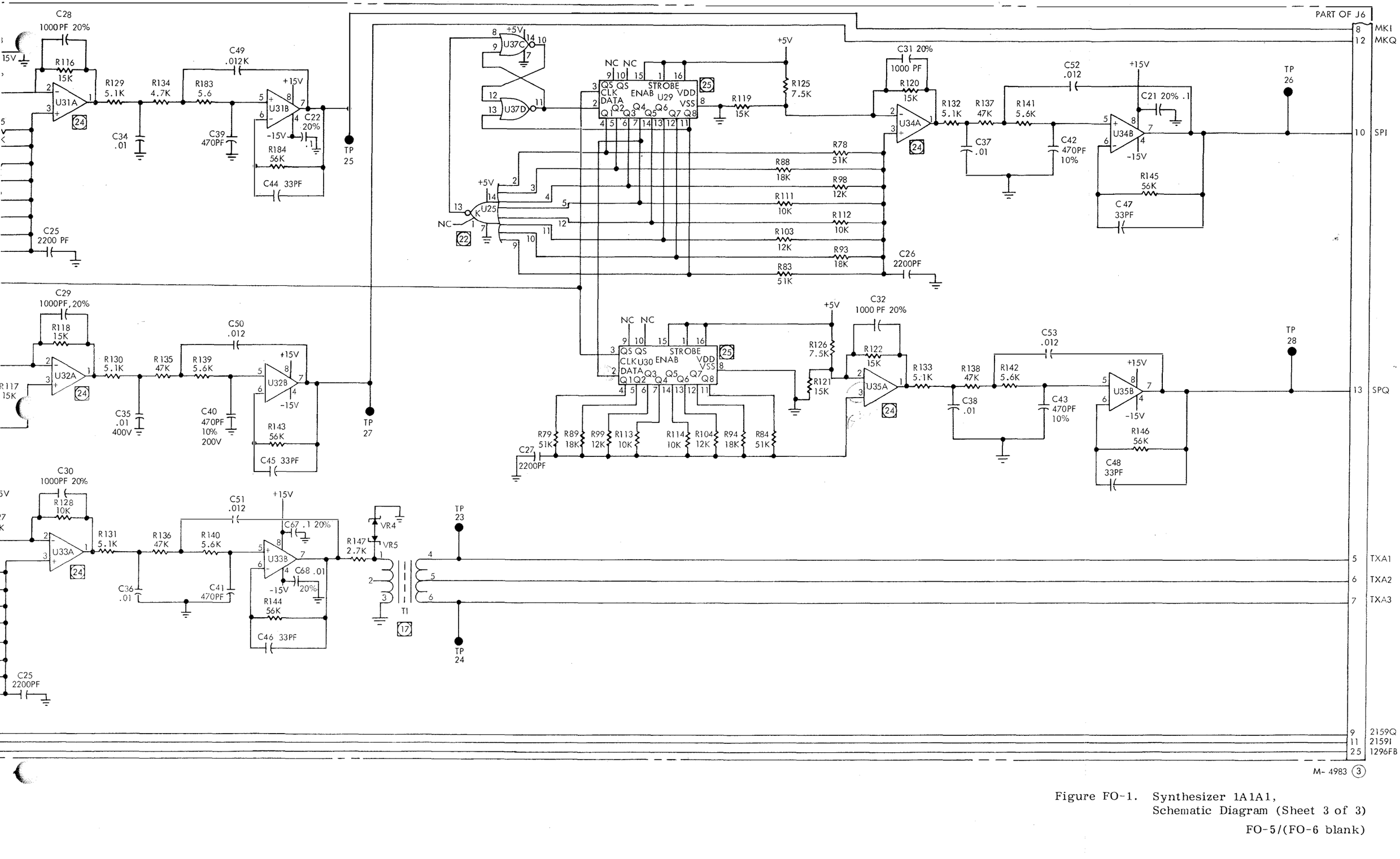


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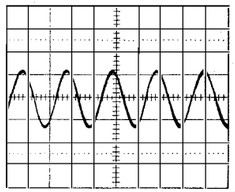
Figure FO-1. Synthesizer 1A1A1, Schematic Diagram (Sheet 3 of 3)

TEST POINT DATA

THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOTAGES APPEAR AT THE TEST POINTS SPECIFIED:

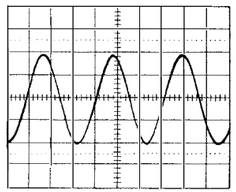
TP23, TP24



SYNC: INT
VERT: .5V/DIV
HORIZ: 2 mS/DIV
PROBE ATTEN: 1:1

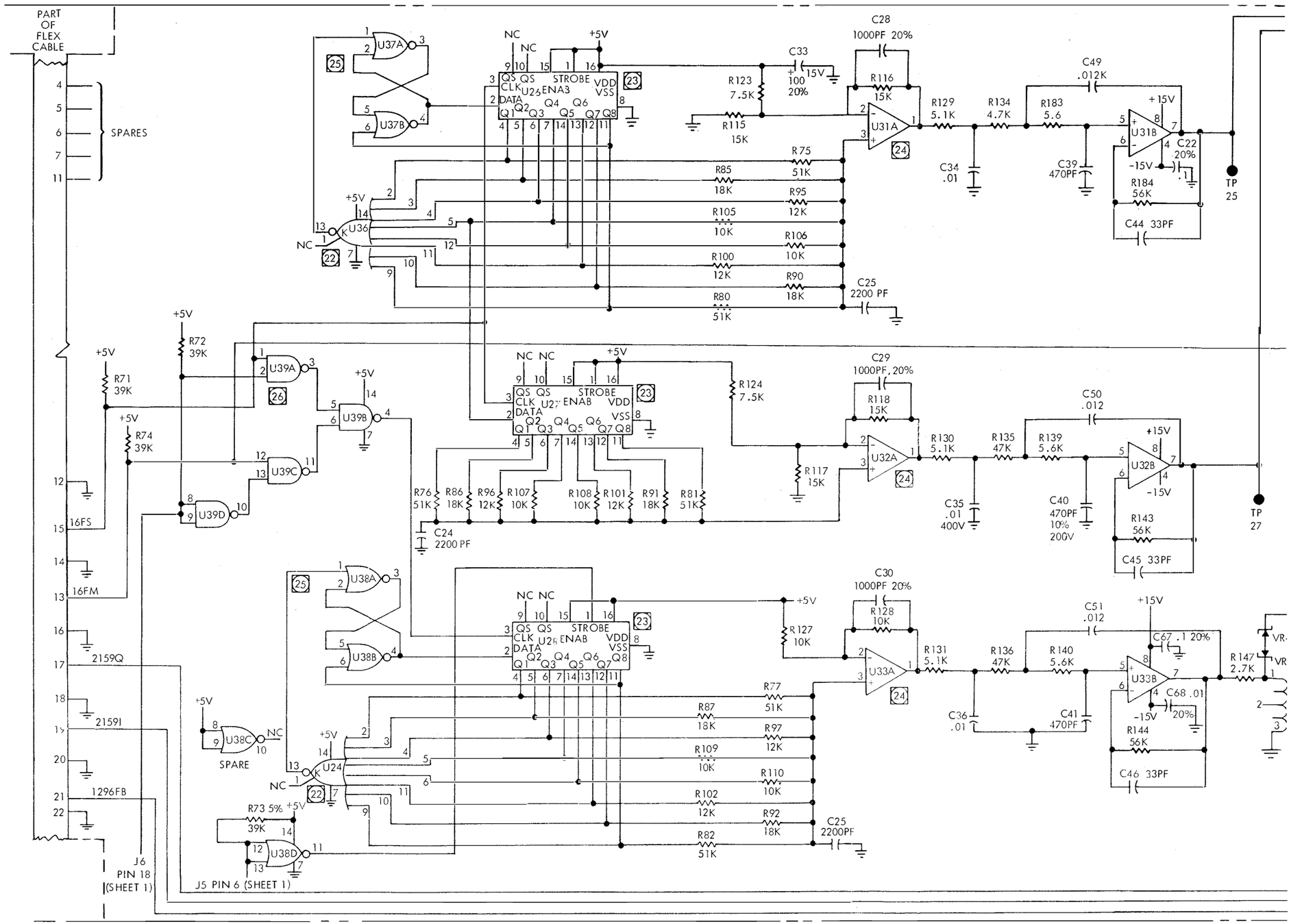
NOTE: FREQUENCY VARIES DEPENDING UPON MODE AND TRANSMIT/ OFF/RETRANSMIT SWITCHES.

TP25 THROUGH TP28

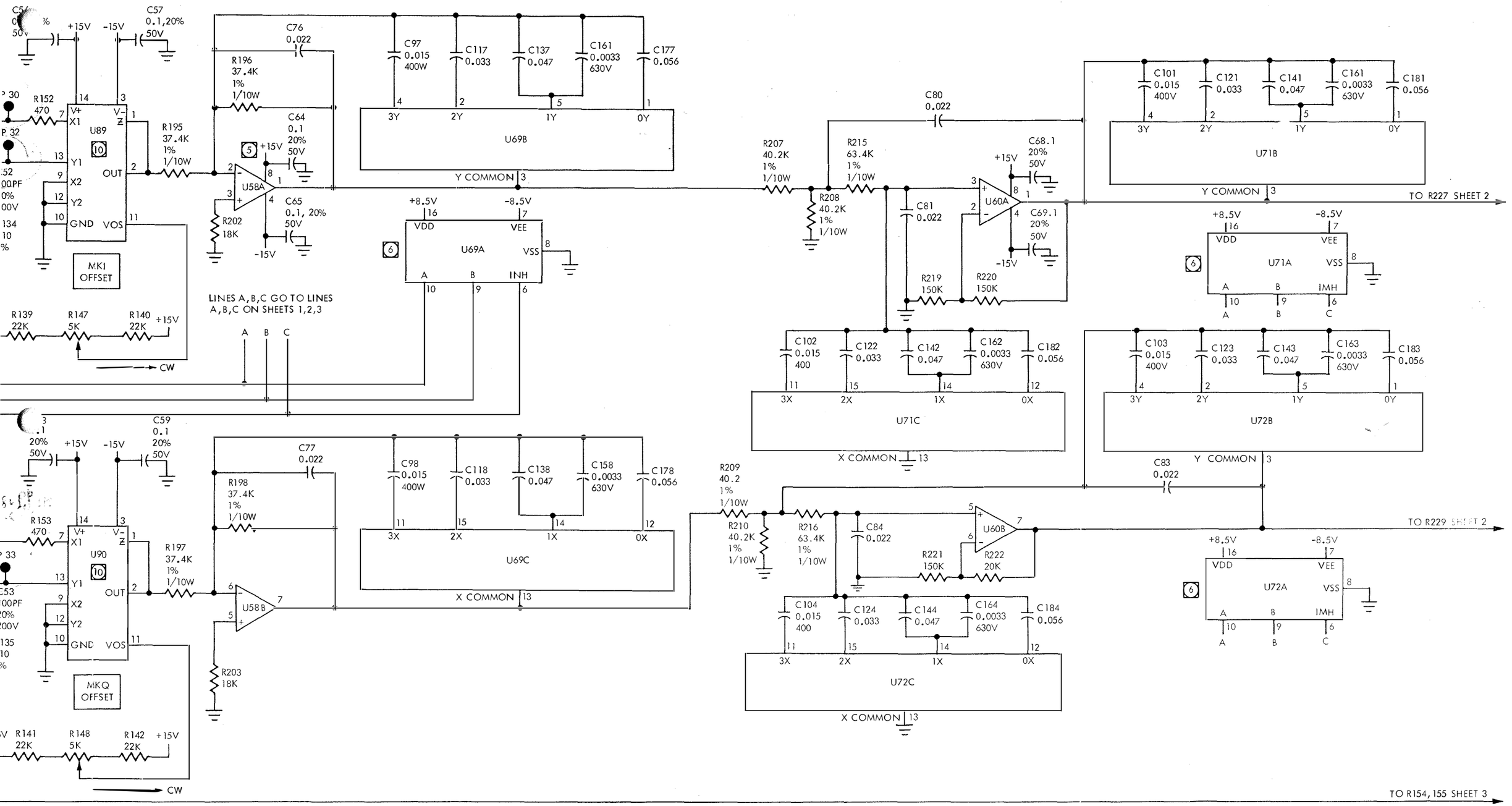


OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5V/DIV
HORIZ: 2 mS/DIV
PROBE ATTEN: 1:1

NOTE: FREQUENCY VARIES DEPENDING UPON MODE SWITCH SETTING.



FOLLOWS SHEET 3



M-4984A(1)

Figure FO-2. Demodulator 1A1A2, Schematic Diagram (Sheet 1 of 7)

CHANGE 2

TEST POINT DATA

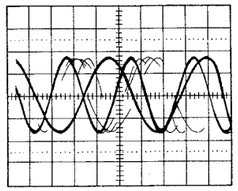
THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED:

CONVERTER FRONT PANEL
CONTROL SETTINGS: (UNLESS OTHERWISE SPECIFIED)

LEVEL	- 5
MODE	- HF
TRANSMIT/OFF/RETRANSMIT	- RETRANSMIT
AUTO/OPR/STANDBY	- AUTO OR OPR
NORMAL/REVERSE	- REVERSE
CLEAR/SECURE	- SECURE

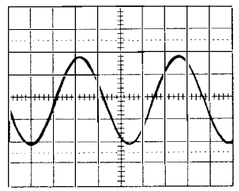
TP30

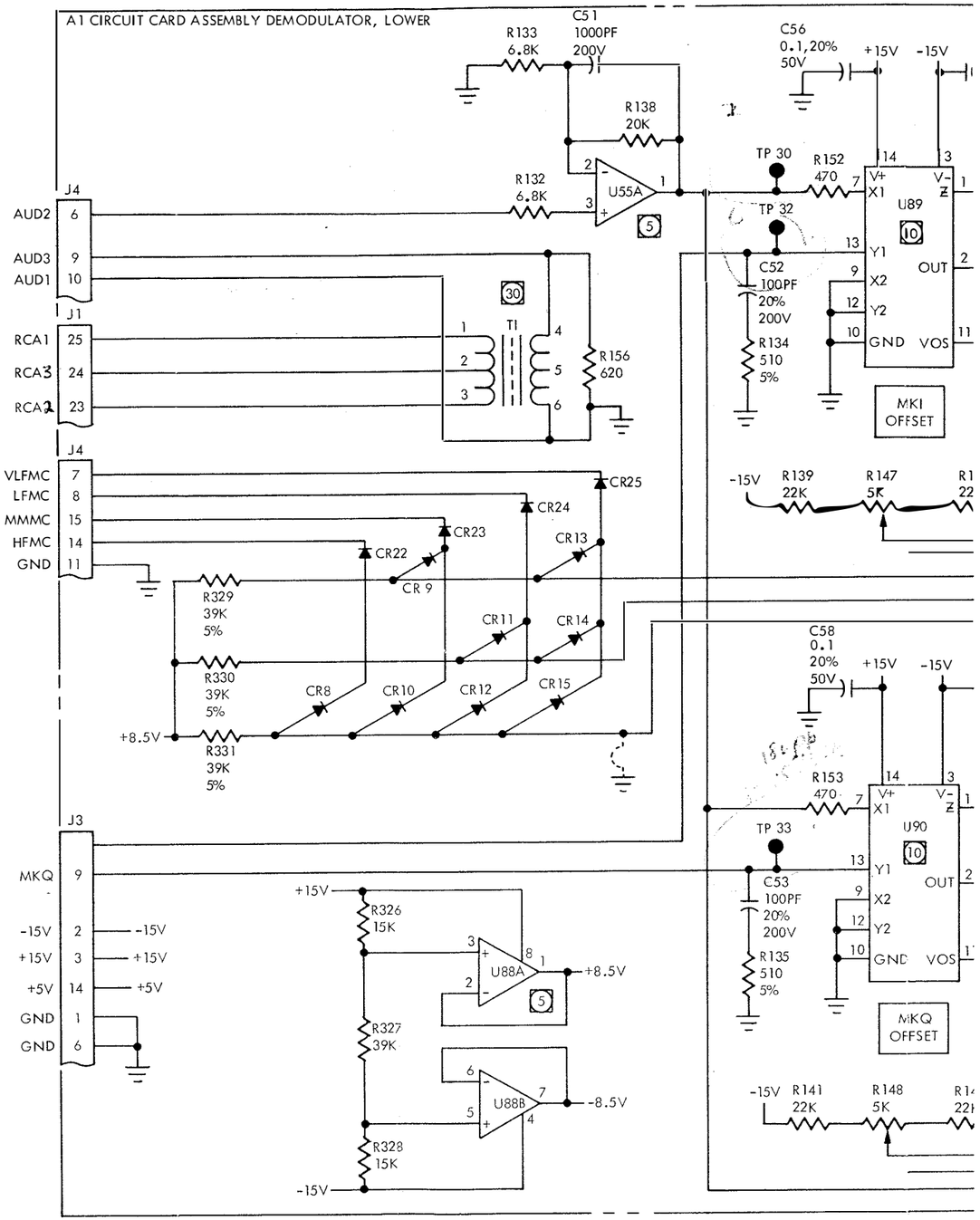
OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: .5V/DIV
HORIZ: .1 mS/DIV
PROBE ATTEN: 1:1



TP32, TP33

OSCILLOSCOPE SETTINGS:
SAME AS TP30 ABOVE





FO-2 SHEET 1

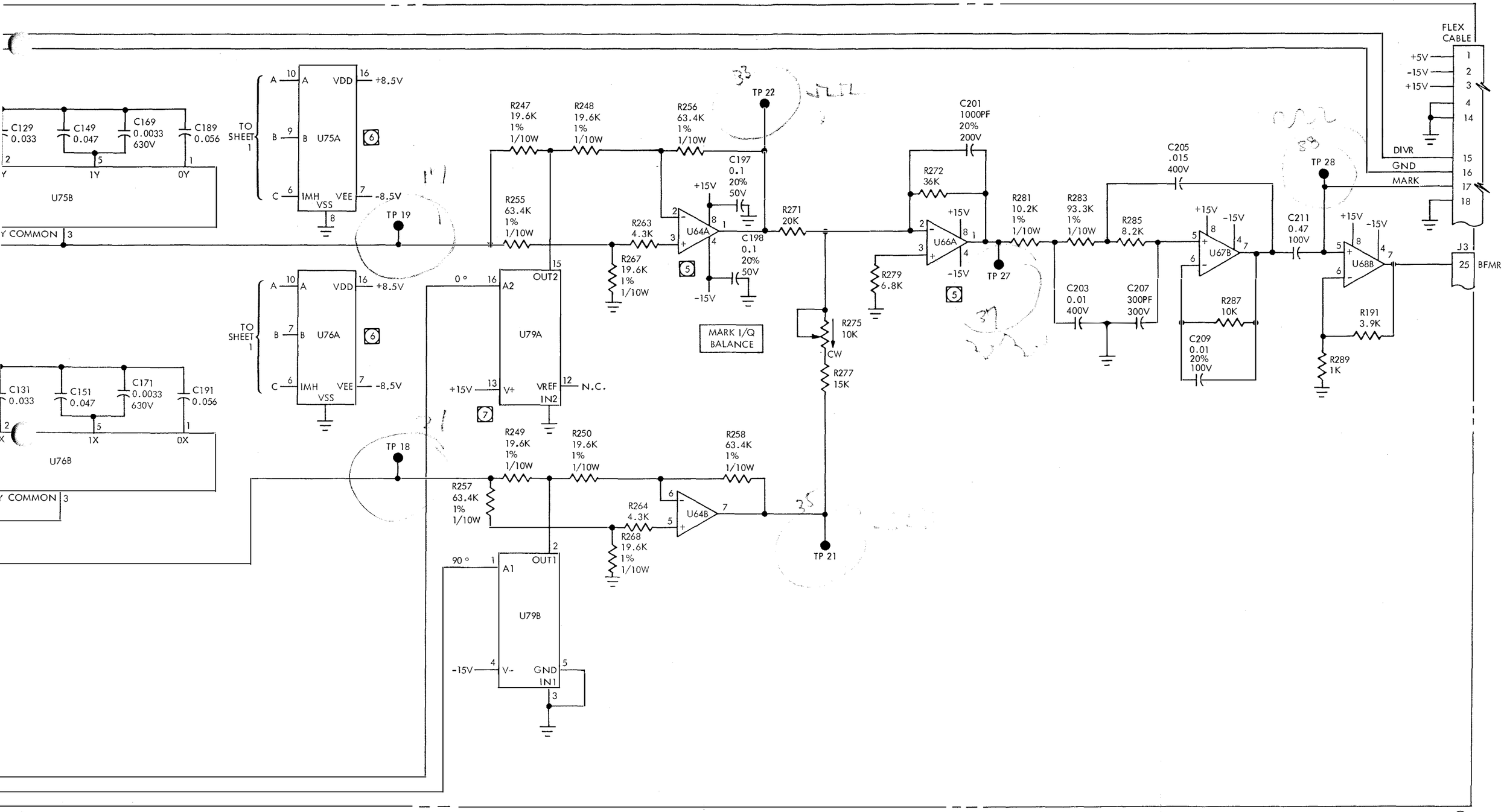


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Figure FO-2. Demodulator 1A1A2, Schematic Diagram (Sheet 2 of 7)

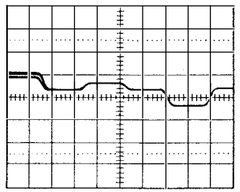
TEST POINT DATA

THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED:

SEE SHEET 1 FOR CONVERTER CONTROL SETTINGS.

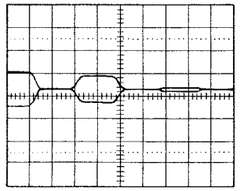
TP18 AND TP19
(TP24 AND TP25, SHEET 4)

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: .5V/DIV
HORIZ: 10 mS/DIV
PROBE ATTEN: 1:1



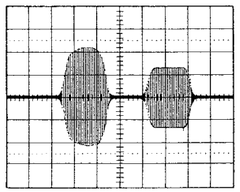
TP21 AND TP22
(TP20 AND TP23, SHEET 4)

OSCILLOSCOPE SETTINGS:
SAME AS FOR TP18 AND TP19



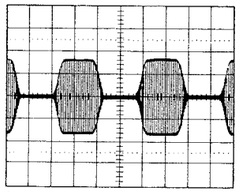
TP27
(TP26 SHEET 4)

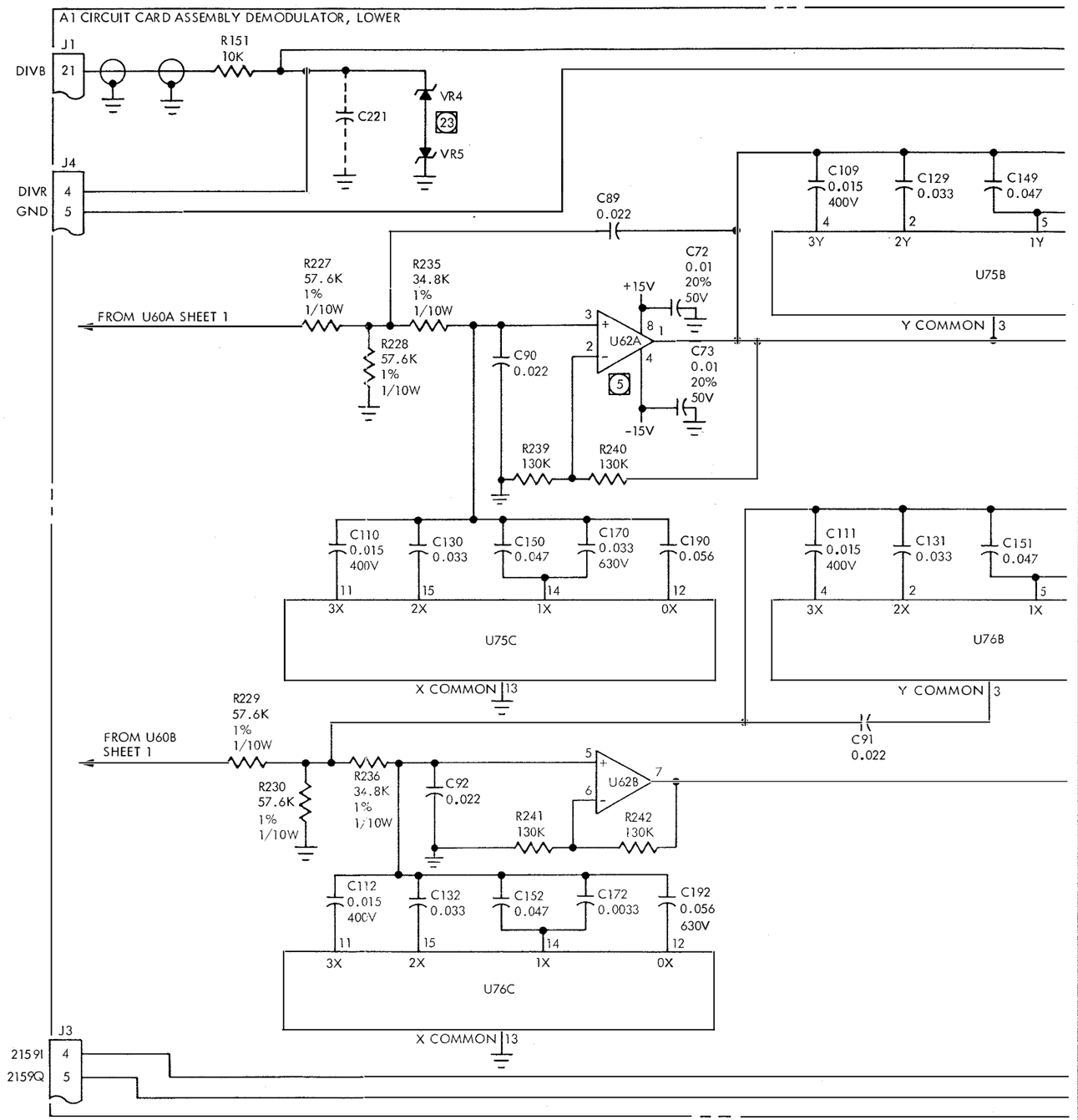
OSCILLOSCOPE SETTINGS:
SAME AS FOR TP18 AND TP19



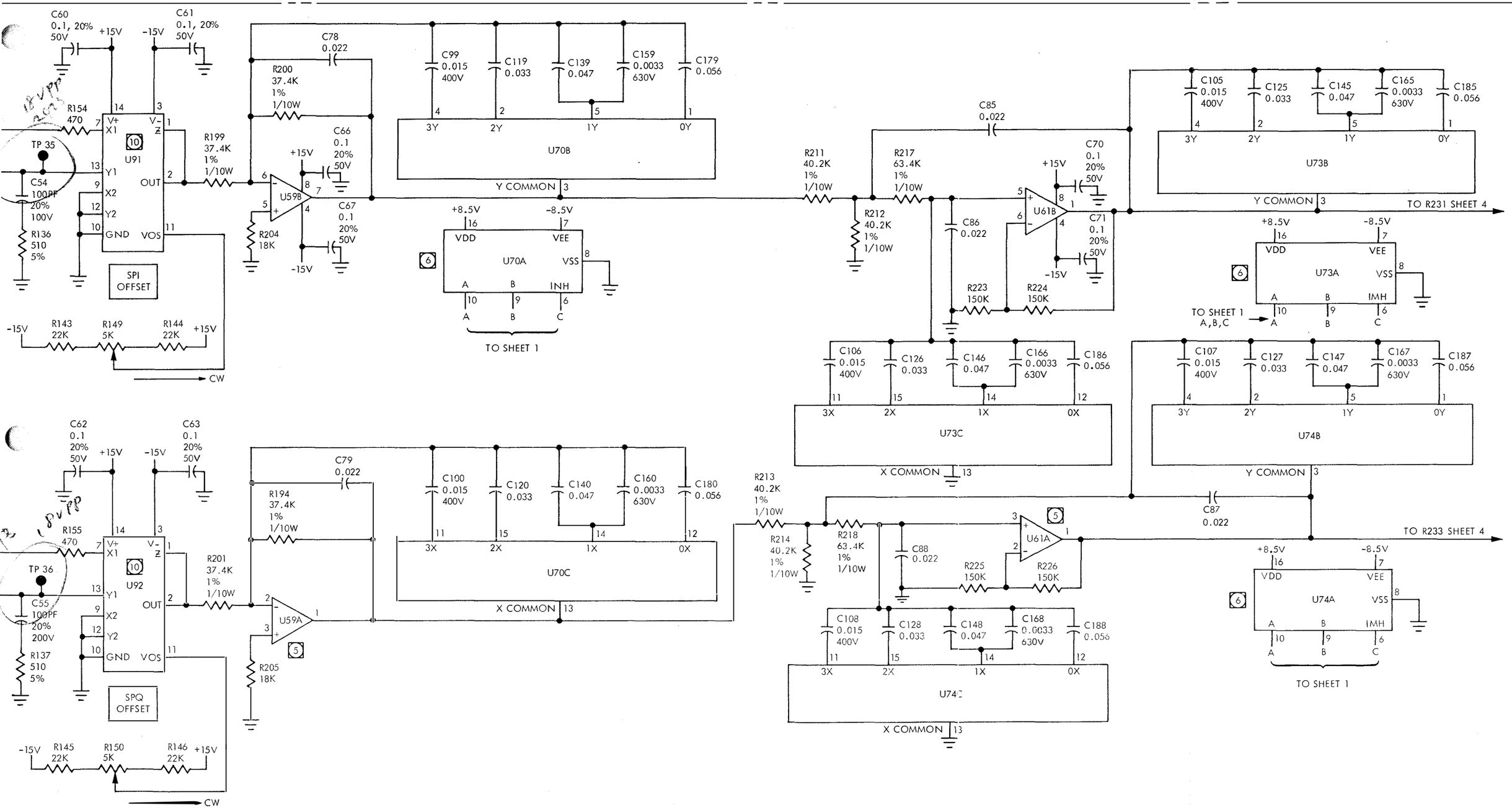
TP28
(TP29, SHEET 4)

OSCILLOSCOPE SETTINGS:
SAME AS FOR TP18 AND TP19





FO-2 SHEET 2



M-4984 (3)

Figure FO-2. Demodulator 1A1A2, Schematic Diagram (Sheet 3 of 7)

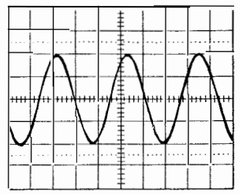
TEST POINT DATA

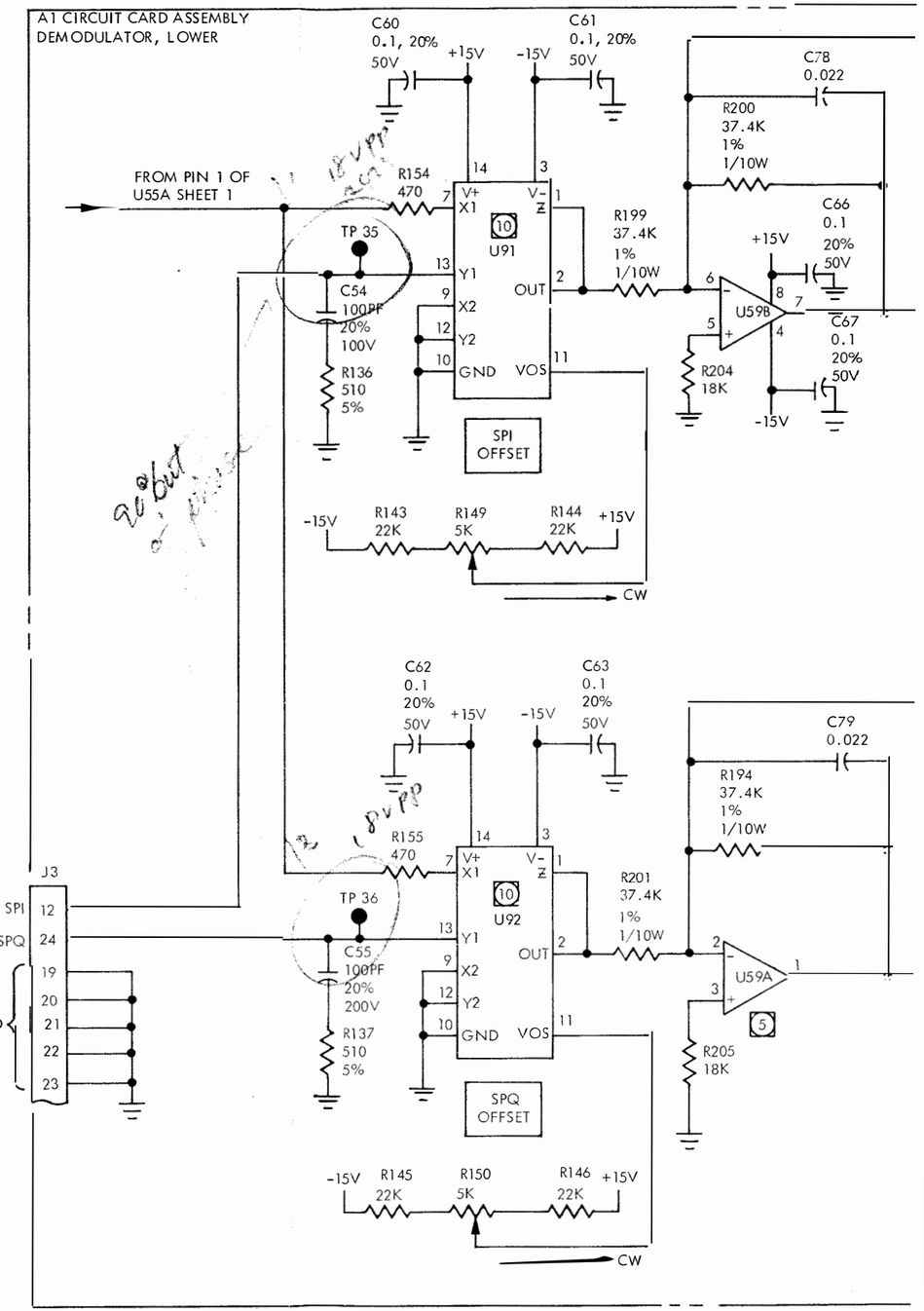
THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED.

SEE SHEET 1 FOR CONVERTER CONTROL SETTINGS.

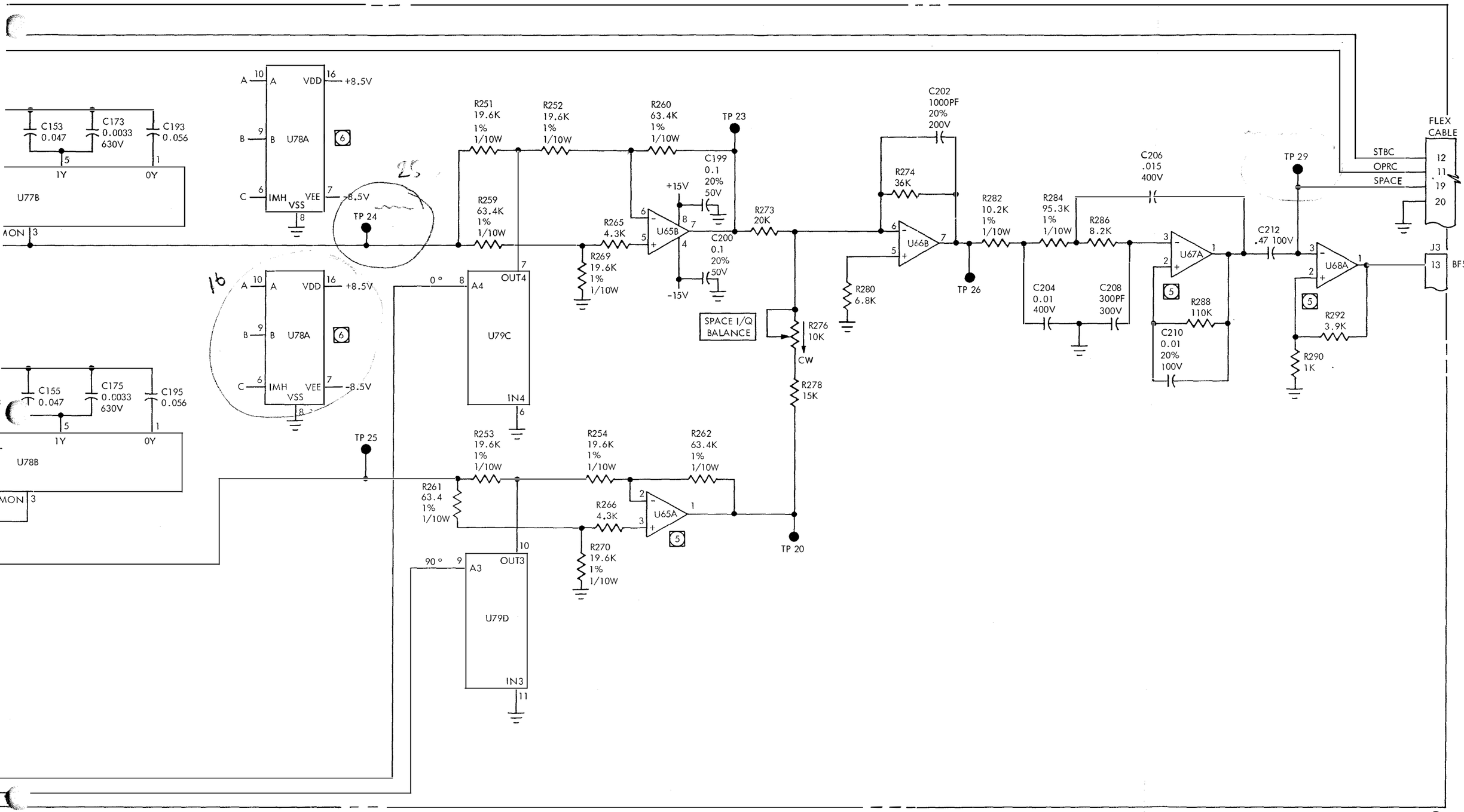
TP35 AND TP36

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5
HORIZ: .1 mS/DIV
PROBE ATTEN: 1:1





FO-2 SHEET 3



M-4984 (4)

Figure FO-2. Demodulator 1A1A2, Schematic Diagram (Sheet 4 of 7)

TEST POINT DATA

SEE SHEET 2

A1 CIRCUIT CARD ASSEMBLY DEMODULATOR, LOWER

J4

STBC 2

OPRC 3

TO U60A SHEET 3

R231 57.6K 1% 1/10W

R232 57.6K 1% 1/10W

R237 34.8K 1% 1/10W

C93 0.022

C74 0.1 20% 50V

C94 0.022

C75 0.1 20% 50V

+15V

-15V

U63B

R243 130K

R244 130K

C113 0.015 400V

C133 0.033

C153 0.047

C173 0.0033 630V

C193 0.056

U77B

Y COMMON 3

C114 0.015 400V

C134 0.033

C154 0.047

C174 0.0033 630V

C194 0.056

U77C

X COMMON 13

C115 0.015 400V

C135 0.033

C155 0.047

C175 0.0033 630V

C195 0.056

U78B

Y COMMON 3

C95 0.022

TO U60B SHEET 3

R233 57.6K 1% 1/10W

R234 57.6K 1% 1/10W

R238 34.8K 1% 1/10W

C96 0.022

U63A

R245 130K

R246 130K

C116 0.015 400V

C136 0.033

C156 0.0033 630V

C176 0.0033 630V

C196 0.056

U78C

X COMMON 13

J3

21591 4

2159Q 5

U78A

+8.5V

-8.5V

TP 24

TP 25

FO-2 SHEET 4

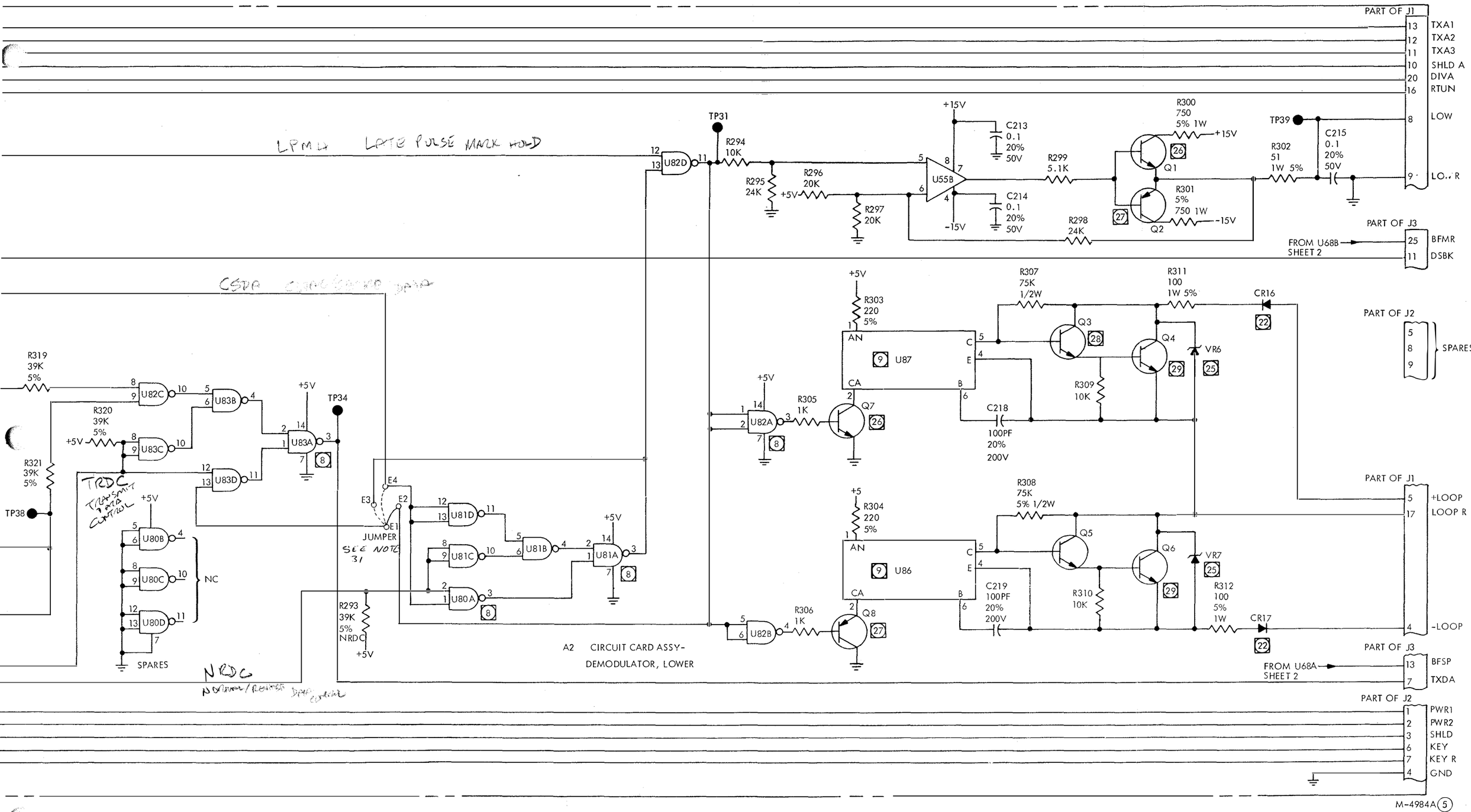


Figure FO-2. Demodulator 1A1A2, Schematic Diagram (Sheet 5 of 7)

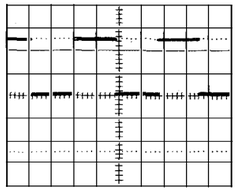
TEST POINT DATA

THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED.

SEE SHEET 1 FOR CONVERTER CONTROL SETTINGS.

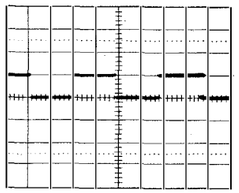
TP31

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 2V/DIV
HORIZ: 10 mS/DIV
PROBE ATTEN: 1:1



TP34

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5V/DIV
HORIZ: 10 mS/DIV
PROBE ATTEN: 1:1

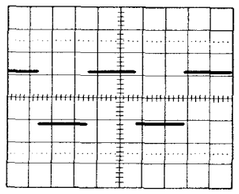


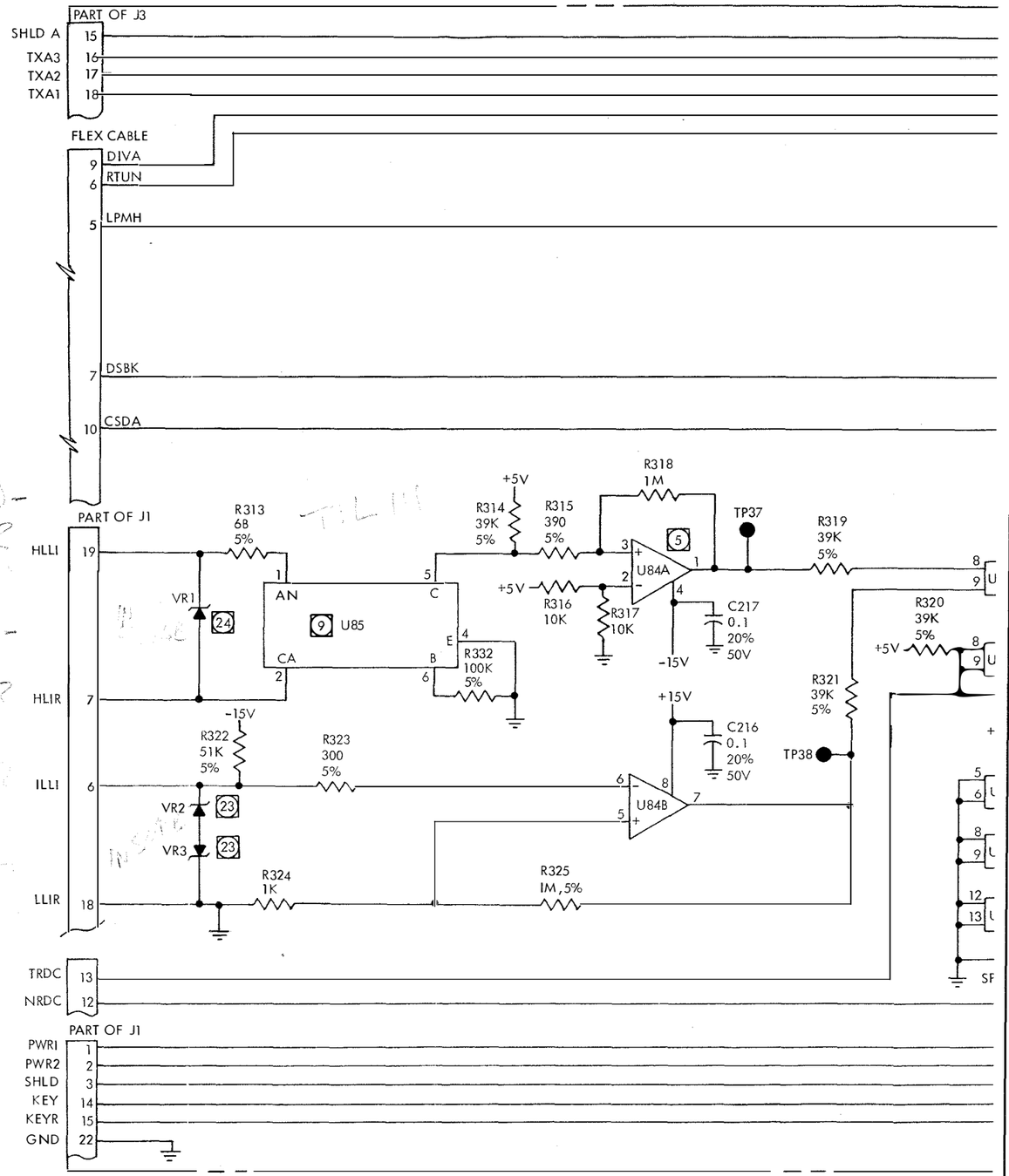
TP37 AND TP38

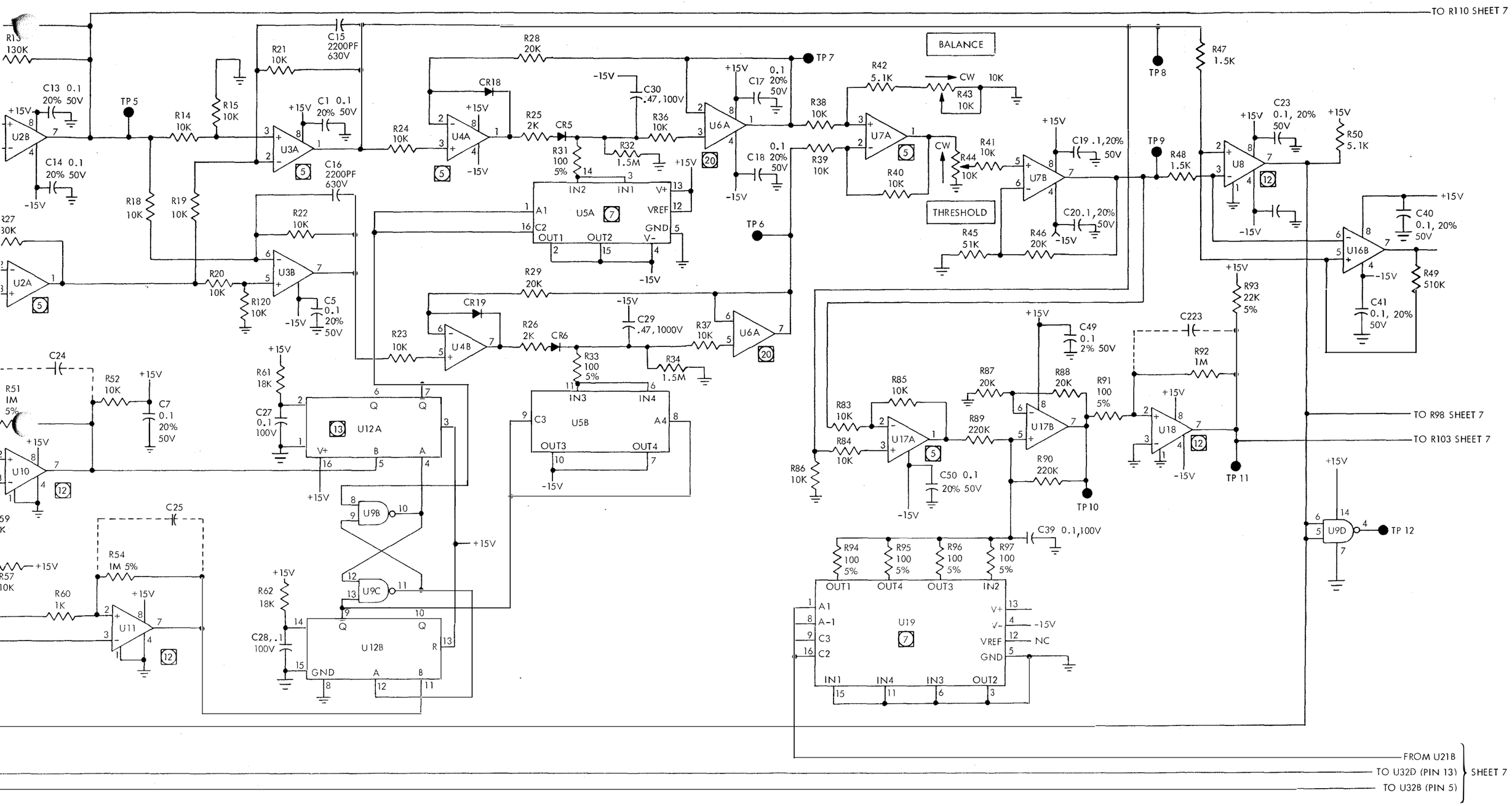
+15 ±.5 VDC (WHEN SYSTEM IS NOT RECEIVING TRANSMITTED DATA)

TP39

OSCILLOSCOPE SETTINGS: SAME AS TP34



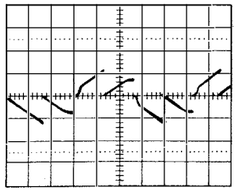




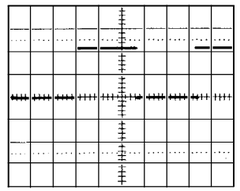
M-4984A (6)

Figure FO-2. Demodulator 1A1A2, Schematic Diagram (Sheet 6 of 7)

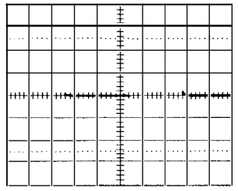
PE SETTINGS:
O
V
/DIV
10:1



PE SETTINGS:
AME AS FOR TP6 AND TP7



PE SETTINGS:
AME AS FOR TP6 AND TP7



A1 CIRCUIT CARD ASSEMBLY DEMODULATOR, UPPER

1 +5V
2 +15V
3 -15V
4
18
15 DIVR
16
17 MARK
8
19 SPACE
20
12 STBC
11 OPRC

C226 100PF 20% 20V

R1 27.4K 1%,1/10W
R2 37.4K 1% 1/10W
C2 0.022
C3 0.1 20% 50V
C4 0.1,20% 50V
R3 10K
U1A
R4 40.2K 1% 1/10W
R5 40.2K 1% 1/10W
R6 63.4K 1% 1/10W
C6 0.022
C8 0.022
R7 150K
R8 150K
U1B
R9 57.6K 1% 1/10W
R10 57.6K 1% 1/10W
C12 0.022
R11 34.8K 1% 1/10W
C10 0.022
R12 75K
R13 130K
C13 0.1 20% 50V
C14 0.1 20% 50V
U2B
TP5
R14 10K
R15 10K
R21 10K
C15 2200PF 630V
C1 0.1 20% 50V
U3A
C16 2200PF 630V
R18 10K
R19 10K
R22 10K
U3B
R20 10K
R120 10K
C5 0.1 20% 50V
TP4
R16 10K
R27 30K
R17 15K
U2A
TP3
R64 2K
R71 20K
C31 1000PF 20% 200V
CR1
C32 0.1 20% 50V
R63 2K
U14A
R65 2K
.70 1K
C33 0.1 20% 50V
CR2
R78 20K
U15A
R72 20K
R77 24K
C34 1000PF 20% 200V
R67 1K
R73 20K
C36 1000PF 20% 200V
R66 2K
CR3
R76 20K
U14B
R69 1K
CR4
C37 0.1 20% 50V
R68 2K
R74 20K
U15B
C35 1000PF 20% 200V
R75 24K
C38 0.1 20% 50V
TP2
M/S BALANCE
R82 10K
CW
R121 2K
TP1
C47 1000PF 20% 200V
R80 47K
R81 20K
U16A
C48 1000PF 20% 200V
R79 16K
C24
R51 1M 5%
R52 10K
C7 0.1 20% 50V
R61 18K
C27 0.1 100V
R55 33K
C9 0.1 100V
U9A
R56 33K
C11 0.1 100V
R58 10K
C26 0.1 20% 50V
R59 1K
R57 10K
U10
C25
R54 1M 5%
R60 1K
U11
R62 18K
C28,.1 100V
GND
V+
Q

-15V
+15V
5
8
12
13

FO-2 SHEET 6

TEST POINT DATA

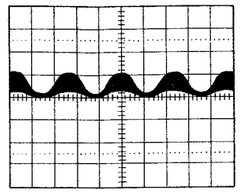
THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED.

SEE SHEET 1 FOR CONVERTER CONTROL SETTINGS:

TP1 AND TP2

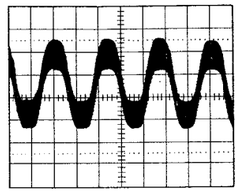
OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: .1V/DIV
HORIZ: 10 mS/DIV
PROBE ATTEN: 10:1

NOTE: FREQUENCY VARIES DE PENDING UPON SETTING OF MODE SWITCH.



TP3

OSCILLOSCOPE SETTINGS:
SAME AS FOR TP1 AND TP2

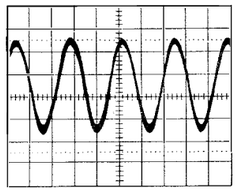


TP4

NOT APPLICABLE FOR SINGLE CONVERTER. WILL APPEAR SAME AS TP5 BELOW WHEN TWO CONVERTERS ARE CONNECTED TOGETHER IN DIVERSITY APPLICATION.

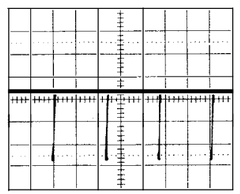
TP5 AND TP8

OSCILLOSCOPE SETTINGS:
SAME AS TP1 AND TP2



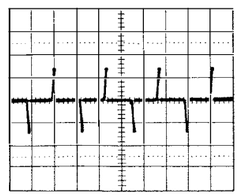
TP6 AND TP7

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: .5V/DIV
HORIZ: 10 mS/DIV
PROBE ATTEN: 10:1



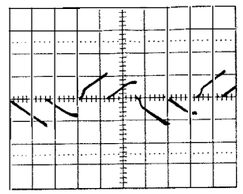
TP9

OSCILLOSCOPE SETTINGS:
SAME AS FOR TP6 AND TP7



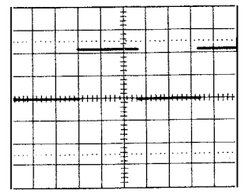
TP10

OSCILLOSCOPE SETTINGS:
SYNC: EXT (TO TP12)
VERT: .5V/DIV
HORIZ: 10 mS/DIV
PROBE ATTEN: 10:1



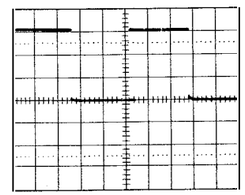
TP11

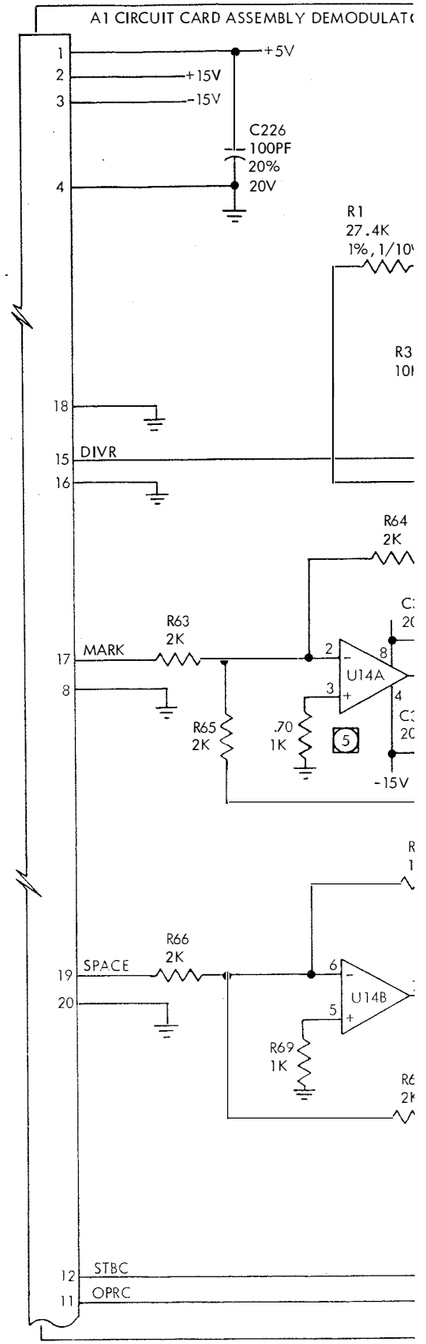
OSCILLOSCOPE SETTINGS:
SAME AS FOR TP6 AND TP7



TP12

OSCILLOSCOPE SETTINGS:
SAME AS FOR TP6 AND TP7





FO-2 SHEET 6

FLEX CABLE

U23A U23B U23D U32C U32B U32D U32A U29A U28A U28B U28C U29B U22B U31C U31D U31B U31A U13A U13B U36 U26 U27 U33 U34 U30

+5V +15V -15V

TP 13 TP 14 TP 15 TP 16 TP 17

R103 39K 5%
R104 39K 5%
R105 39K 5%
R106 820 5%
R107 820 5%
R108 2K
R109 39K 5%
R110 1K
R111 1K
R112 2.7K
R113 10K
R114 10K
R115 1M 5%
R116 1M 5%
R117 30K
R118 3.6K
R119 30K

C224 C225

CR20 CR21

N.C.

DIVA RTUN LPMH DSBK CSDA

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Figure FO-2. Demodulator 1A1A2, Schematic Diagram (Sheet 7 of 7)

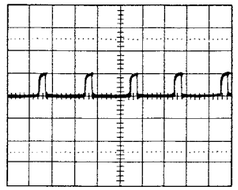
TEST POINT DATA

THE FOLLOWING WAVEFORMS, FREQUENCIES, OR D.C. VOLTAGES APPEAR AT THE TEST POINTS SPECIFIED.

SEE SHEET 1 FOR CONVERTER CONTROL SETTINGS:

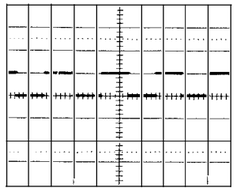
TP13

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: .5V/DIV
HORIZ: 50 µS/DIV
PROBE ATTEN: 10:1



TP14

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5V/DIV
HORIZ: 5 mS/DIV
PROBE ATTEN: 1:1

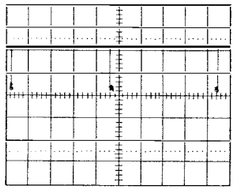


TP15

+5 ±.5 VDC

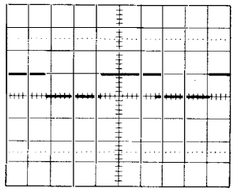
TP16

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5V/DIV
HORIZ: 5 mS/DIV
PROBE ATTEN: 1:1



TP17

OSCILLOSCOPE SETTINGS:
SYNC: INT
VERT: 5V/DIV
HORIZ: 10 mS/DIV
PROBE ATTEN: 1:1



A1 CIRCUIT CARD ASSEMBLY DEMODULATOR, UPPER

FROM U25 SHEET 6

FLEX CABLE

11 OPRC
12 STBC

FROM U9A SHEET 6

R98 39K 5%

U23C U21A U21D

C42 470PF 20% 200V

R99 39K

C43 470PF 20% 200V

R100 39K 5%

U22A SET D CK Q R

U23A U23D

TO U19 SHEET 6

U21B U28F

C44 0.01 400V

R101 10K

U28E U24D

R102 10K

U24C

C45 0.01 400V

U28D

U24B U24A U21C

U25 C1PE V+ B/D Q1 Q2 Q3 Q4 Q5 U/D CK GND N.C. J1 J2 J3 J4

+5V

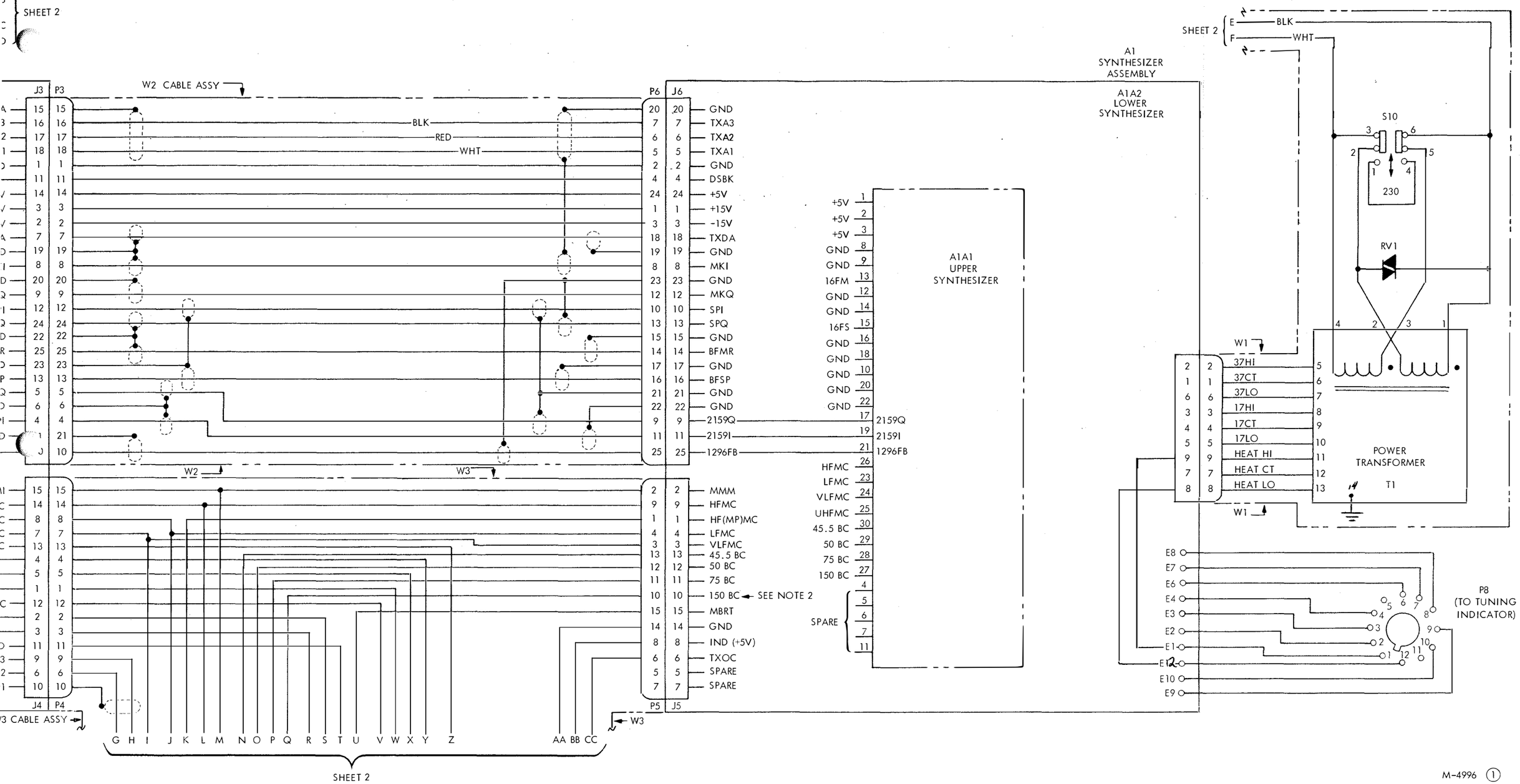
J3 1296FB 10

FLEX CABLE 8 13

J4 CSDC 1

FROM U18 SHEET 6

FO-2 SHEET 7

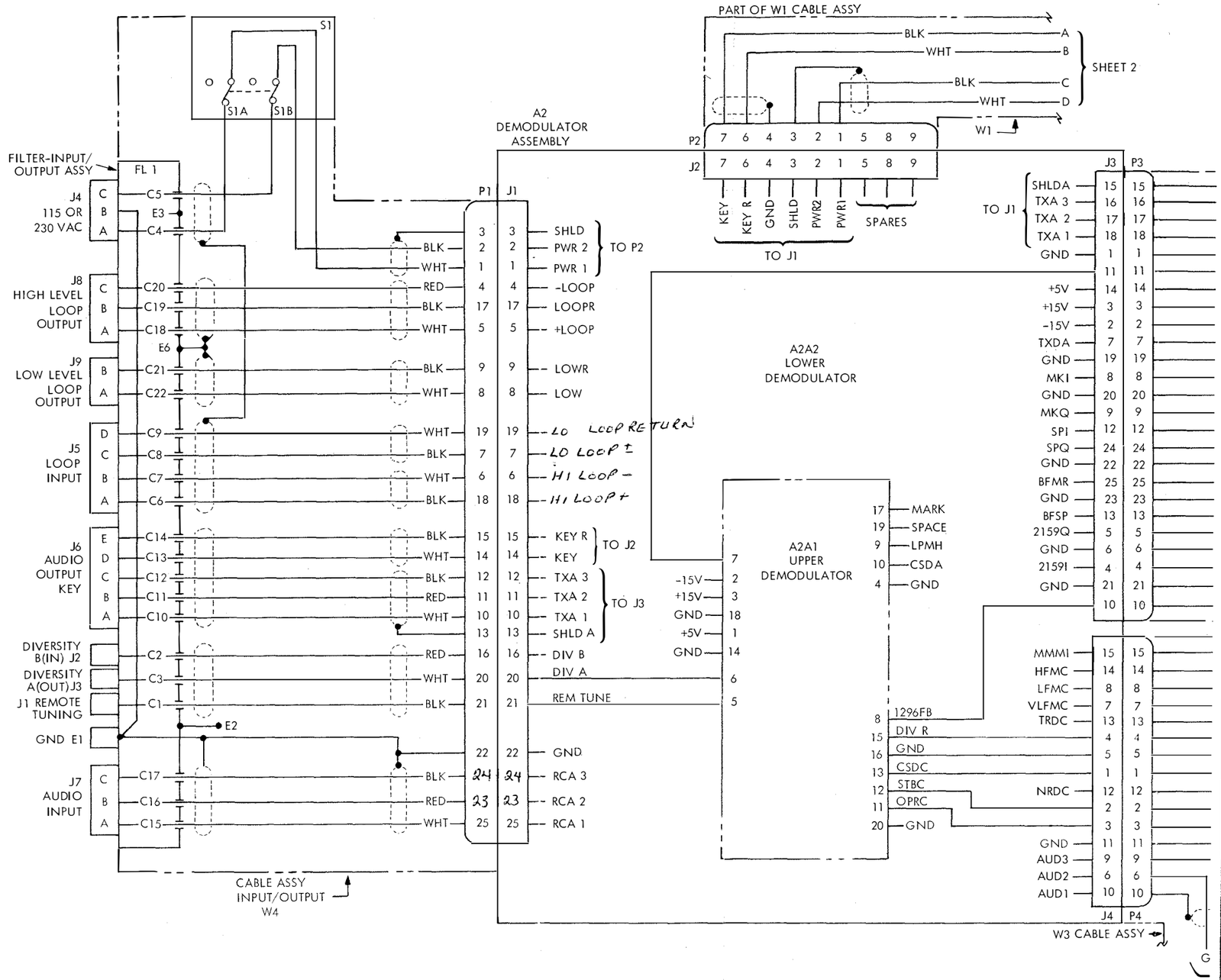


M-4996 (1)

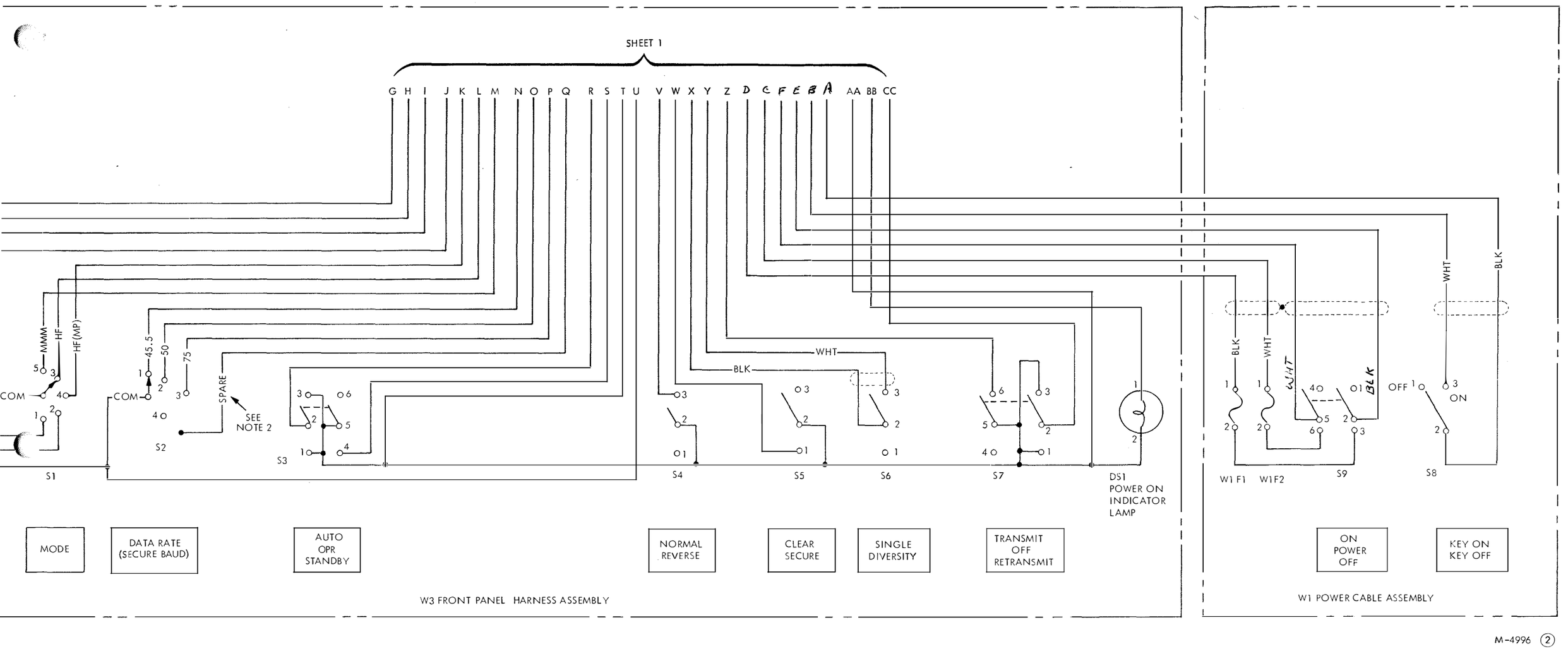
Figure FO-3. CV-3510A/UG Converter Interconnect Diagram (Sheet 1 of 2)

CHANGE 2

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE VALUES ARE IN OHMS
2. WIRE FROM W3 P5-10 NOT CONNECTED TO W3S2
3. S1 SHOWN IN ON CONDITION (CONVERTER ASSEMBLY INSTALLED IN CASE)



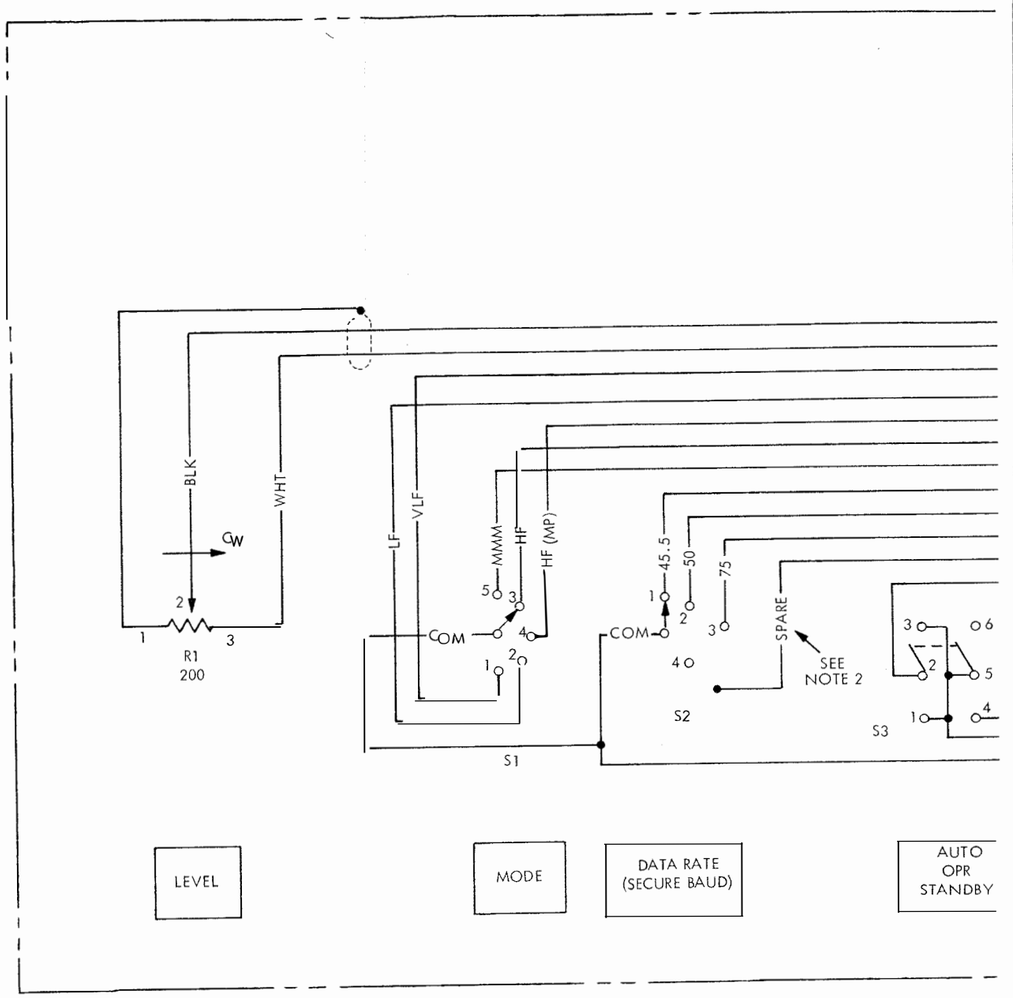
FO-3 SHEET 1



M-4996 (2)

Figure FO-3. CV-3510A/UG Converter Interconnect Diagram (Sheet 2 of 2)

CHANGE 2


BLK
WHT
CW
2
1
3
R1
200
LF
VLF
MMM
HF
HF (MP)
5
3
4
COM
1
2
S1
45.5
50
75
SPARE
SEE
NOTE 2
4 O
S2
S3
LEVEL
MODE
DATA RATE
(SECURE BAUD)
AUTO
OPR
STANDBY

FO3 SHEET 2

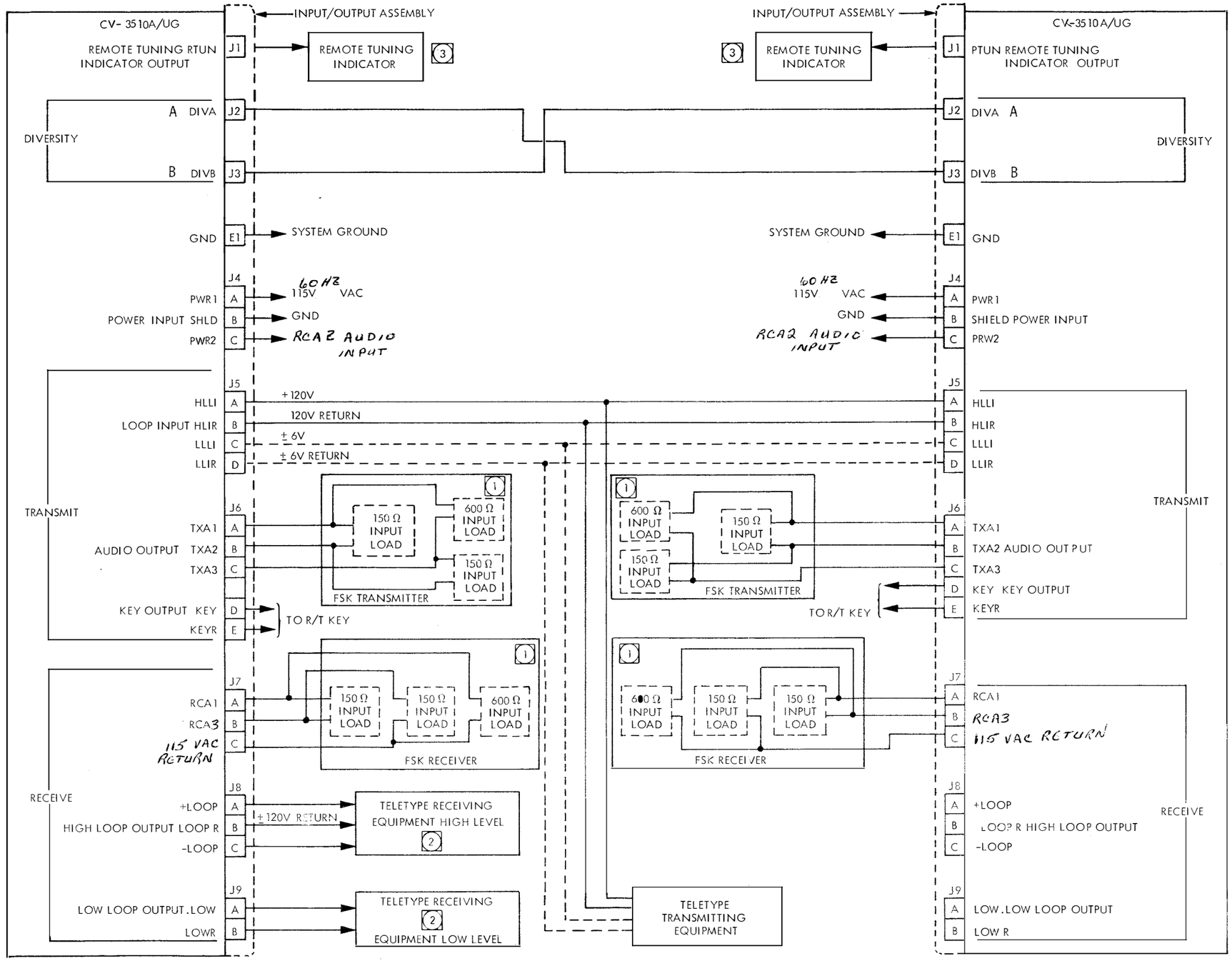


Figure FO-4. AN/URA-17E Converter Group Interconnect Diagram

CHANGE 2