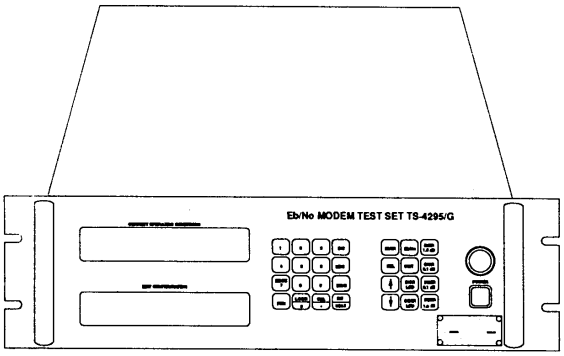
ARMY
NAVY
AIR FORCE

TM 11-6625-3205-13
EE190-BCM MO-010/TS-4295
TO 33D7-3-313-1

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL

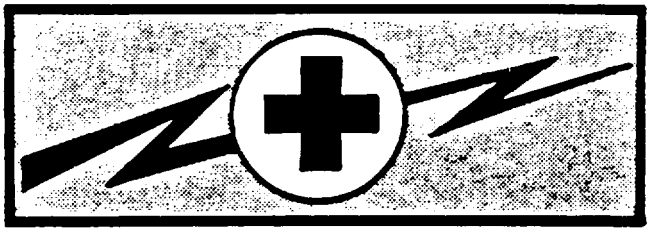


TEST SET, MODEM
TS-42951G
(NSN 6625-01-276-5446)

DEPARTMENTS OF THE ARMY, NAVY, AND THE AIR FORCE

15 JUNE 1990

WARNING



WARNING

HIGH VOLTAGE

IS USED IN THE OPERATION OF THIS EQUIPMENT

DEATH ON CONTACT

MAY RESULT IF PERSONNEL FAIL TO OBSERVE SAFETY PRECAUTIONS

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When the technicians are aided by operators, they must be warned about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 115 volt ac input connections when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING : Do not be misled by the term "low voltage". Potentials as low as 50 volts may cause death under adverse conditions.

For Artificial Respiration, refer to FM 21-11.

5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3 IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

4 SEND FOR HELP AS SOON AS POSSIBLE

5 AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING

Ensure all power is disconnected from the TS-4295/G before performing maintenance.

Technical Manual
No. 11-6625-3205-13
Technical Manual
No. EE190-BC-MMO-010/TS4295
Technical Order
No. 33D7-3-313-1

DEPARTMENTS OF THE ARMY,
NAVY AND THE AIR FORCE

Washington, DC, 15 June 1990

OPERATOR'S, UNIT, AND DIRECT SUPPORT MAINTENANCE MANUAL TEST SET, MODEM TS-4295/G (NSN 6625-01-276-5446)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ME-PS, Fort Monmouth, New Jersey 07703-5000.

For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6,5, Section VI, T.O. 00-5-1. Forward direct to prime ALC/MST.

For Navy, mail comments to the Commander, Space and Naval Warfare Systems command, ATTN: SPAWAR 8122, Washington, D.C. 20363-5100.

A reply will be furnished to you.

Page

LIST OF ILLUSTRATIONS

LIST OF TABLES

HOW TO USE THIS MANUAL

You must familiarize yourself with the entire maintenance procedures before beginning the maintenance tasks.

This manual is divided into three chapters and three appendices:

Chapter 1 contains an introduction to the manual and the equipment.

Chapter 2 contains the instructions for operating the equipment.

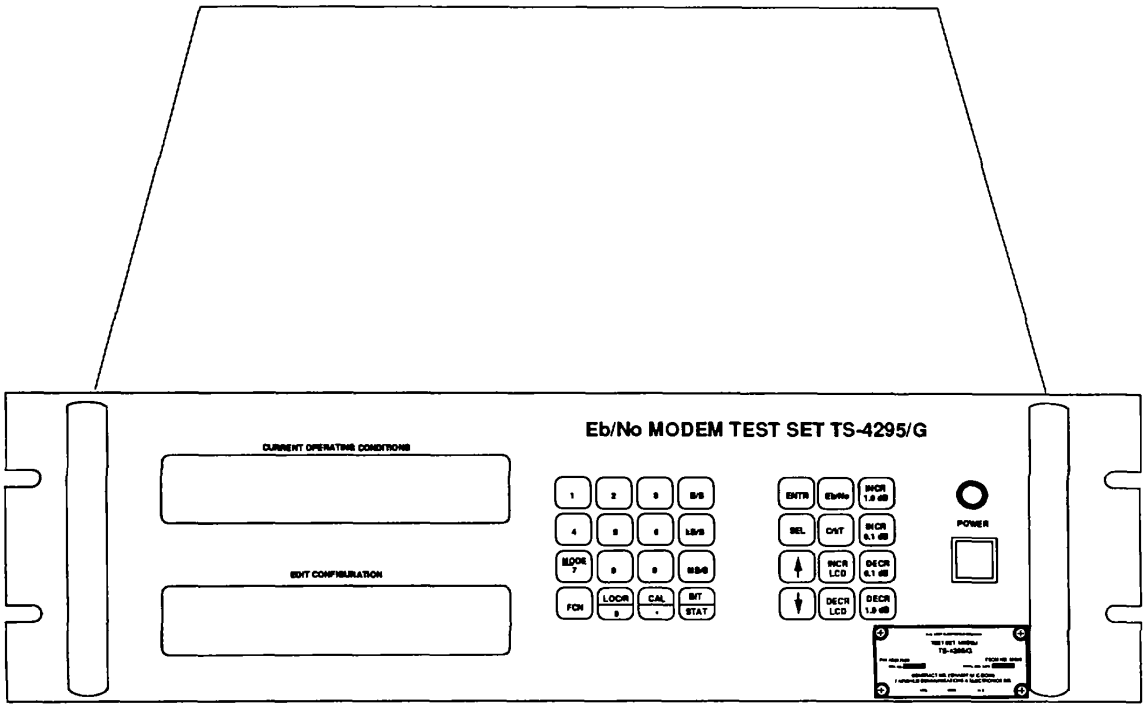
Chapter 3 contains the installation and maintenance instructions for the equipment.

Appendix A contains a list of relevant publications

Appendix B contains a Maintenance Allocation Chart.

Appendix C contains a Isit of expendable/durable supplies and material.

Pages are numbered within each chapter. Each chapter is divided into sections.



CE2ER001

Figure 1-1. TS-4295/G Modem Test Set

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1 SCOPE.

a. This manual is written to the operators, unit and direct support maintenance level. It describes the TS-4295/G Eb/No Modem Test Set (MTS), hereinafter referred to as TS-4295/G. Chapter 1, Introduction, contains general information, equipment description, and technical principles of operation. Chapter 2, Operating Instructions, describes operators controls and indicators, preventive maintenance checks and services (PMCS), operation under usual conditions, and operation under unusual conditions. Chapter 3, Maintenance Instructions, provides troubleshooting procedures. Appendix A, References, lists relevant publications available to the operator. Appendix B, Maintenance Allocation Chart (MAC), identifies each repairable assembly and subassembly of the TS-4295/G. Appendix C is a list of expendable materials.

b. The TS-4295/G (figure 1-1) is designed to replace the TS-3580/G MTS in the U.S. Army Defense Satellite Communications System (DSCS). It is used for testing and evaluating the performance of digital modems used in satellite communication systems.

1-2 MAINTENANCE FORMS, RECORDS, AND REPORTS.

a *Reports of Maintenance and Unsatisfactory Equipment*. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by the DA Pam 738-750, as contained in Army Maintenance Management Update. Air Force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OPNAVINST 4790.2, Vol 3, and unsatisfactory material/conditions (UR submissions) IAW OPNAVINST 4790.2, Vol 2, chapter 17.

b. *Reporting of Item and Packaging Discrepancies*. Fill out and forward SF 364 (Report of Discrepancy (ROD) as prescribed in AR 735-11-2/DLAR 4140.55/SECNAVINST 4355.18/AFR 400-54/MCO 4430.3J.

c. *Transportation Discrepancy Report (TDR) (SF361)*. Fill out and forward Transportation Discrepancy Report (TDR) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-3 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

a. *Army*. If your Modem Test Set needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSELPA-MA-D, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

b. *Air Force.* Air Force personnel are encouraged to submit EIR's in accordance with AFR 900-4.

c. *Navy*. Navy personnel are encouraged to submit EIR's through their local Beneficial Suggestion Program.

1-4 DESTRUCTION OF ARMY ELECTRONICS MATERIEL.

Destruction of Army materiel to prevent enemy use Is described In TM 750-244-2.

1-5 OFFICIAL NOMENCLATURE.

The following is a list of official nomenclature assigned to the equipment major components:

a. Test Set, Modem TS-4295/G

b. Modem Test Set Chassis Assembly A3097898

c. Electronics Subassembly A3097897

d. Power Supply Assembly A3097931

e. Modem Test Set Panel Assembly A3097923

f. Processor Module A3097940

g. IF/Combiner Module A3097941

h. Quad Detector Module A3097942

i Modulator Module A3097944

j. Distribution CCA A3097945

k. Input Attenuator Assembly A3097927

1-5.1 CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS.

Refer to the latest issue of DA PAM 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

Section II. EQUIPMENT DESCRIPTION AND DATA

1-6 EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. Characteristics

19 inch rack-mounted

Modular construction

Narrowband measurement approach

Quadrature detection

Microprocessor control

Continuous real time signal monitoring and level control

Operator control via keyboard and display

Remote control via RS-422/449 interface

b. Capabilities and Features

Output signal only, noise only or signal plus noise at selected attenuation

Selected Eb/No or C/kT

Signal: Internal or External

Internal modulator: 75 B/S to 20 MB/S with (EXT clock and data); Carrier,

BPSK, OQPSK modes; randomizer and differential coder

BITE to isolate to replaceable module level

Replaceable modules interchangeable without alignment or calibration

Replaces TS-3580/G Modem Test Set

1-7 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

The TS-4295/G is designed for either bench operation or slide mounting in a standard 19 inch rack cabinet. It consists of two basic units: the Chassis Assembly and the Electronics Subassembly (Al) (figure 1-2). The Chassis Assembly includes an enclosure (Housing Assembly) to which the following components are attached: Panel Assembly (A2), Power Supply Assembly (A3), Display Assembly LCD, exit screen, fan, cables, and rear panel connectors. The Electronics Subassembly contains four functional electronic modules: Processor Module (A1A1), IF/Combiner Module (A1A2), Quad Detector Module (A1A3), and Modulator Module (A1A4), a Distribution CCA (A1A5), an Input Attenuator Assembly (A1A6), and various cable assemblies. These components are secured to a common base, the mounting plate assembly, which is mounted to the Chassis Assembly.

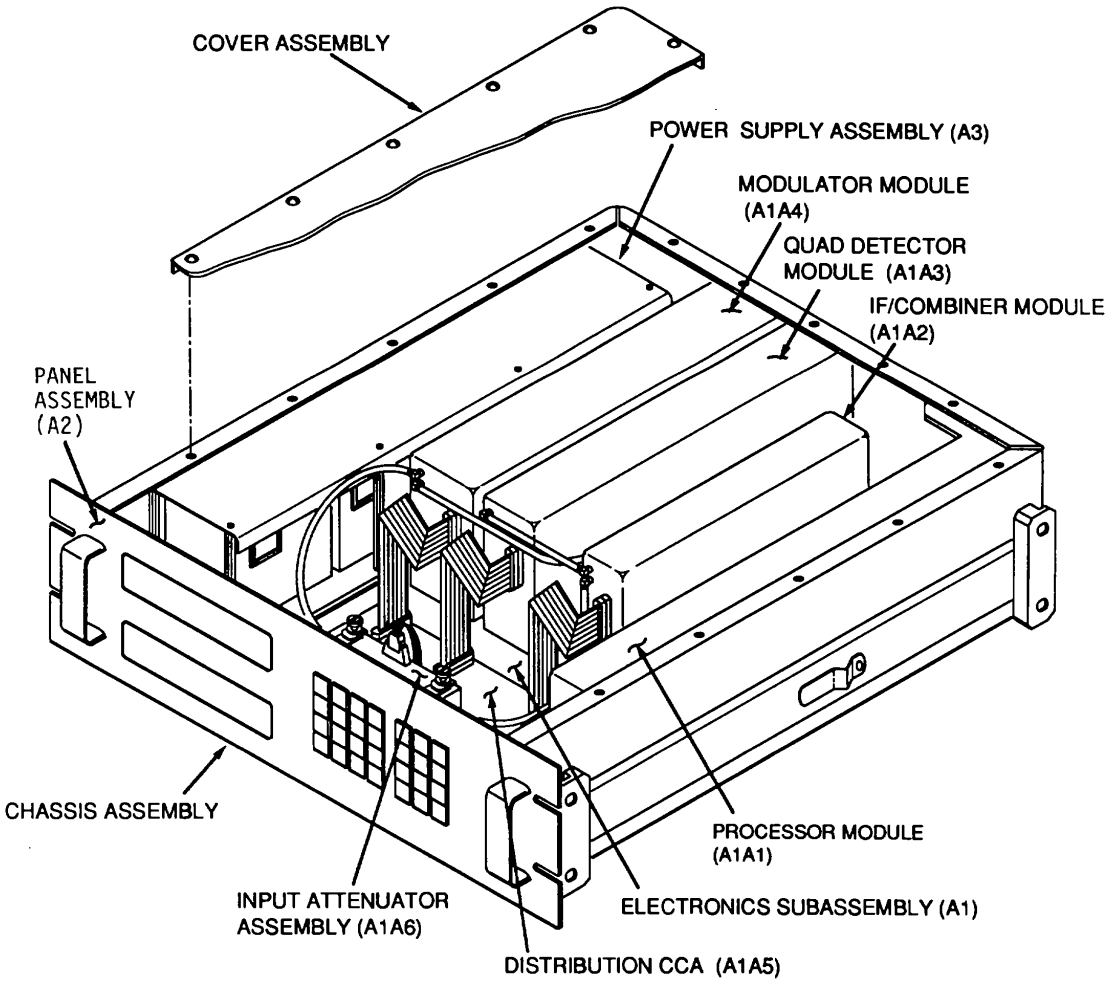


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Figure 1-2. TS-4295/G Modem Test Set - Major Components

1-8 EQUIPMENT DATA.

Physical and performance specifications of the TS-4295/G are listed below:

a. Power

120 VAC, single phase

47-440 Hz

47 Watts

b. Mechanical

Length: 20 inches

Width: 19 inches

Height: 5-1/4 inches

Weight: 41 pounds

c. Performance

Input signal/range:	BPSK, QPSK, OQPSK and CW modulated carrier
	±16 dBm; 50 ohms, VSWR <1.2:1
	70 ± 20 MHz
Modulator Inputs	
Signal/range:	MIL-STD 188 - 114 - Clock and Data 75 bps to 20 Mbps
Output signal/range:	Signal, noise, signal + noise
	50 ohms, VSWR < 1.2:1 C/kT 18.75 to 93 dB, 1.0 dB steps
	Eb/No 0 to 20 dB, 0.1 dB steps
	No -88 to -145 dBM/Hz, 1 dB steps
Eb/No/C/kT Accuracy:	±0.1 dB
Noise Characteristics:	Flatness:
	±0.2 dB, 40-100 MHz
	Crest Factor: 15 dB Minimum
Self Calibration Time:	20 seconds maximum, after power on

Data Rate:	75 bps - 20 Mbps for BPSK, QPSK, OQPSK, and CW modulation
MTBF:	2000 hours

d. Environmental (Operating)

Temperature:	32°F to 120°F
Humidity:	5 percent minimum at 120°F
	94 percent; 32°F to 85°F
Elevation:	10,000 feet

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-9 FUNCTIONAL DESCRIPTION.

a. General. The TS-4295/G provides a calibrated carrier to noise density (C/kT) by combining the output of an internal noise source with the output of either an internal Binary Phase Shift Keying/Offset Quadrature Phase Shift Keying (BPSK/OQPSK) modulator or an external modulated signal. The C/kT is determined by adjusting the carrier level based on the desired ratio of energy per bit to noise power density (Eb/No) and data rate. The resultant carrier plus noise output is available for modem testing. Figure 1-3 shows an internal modulator application, figure 1-4 shows an external modulator application, and figure 1-5 provides an overall functional block diagram of the TS-4295/G.

b. Processor Module. The Processor Module interfaces with all other modules to control and maintain the desired carrier to noise density. The design architecture contains dual processors, the Control Processor and the Signal Processor. The Control Processor provides operator control of the MTS through the front panel keyboard and displays and through the remote control interface. It also provides the calibration and tracking functions for all test set-up conditions which includes the calculations of all internal settings. Finally, it controls initialization, built-in-test (BIT), and the math utilities. The Signal Processor performs the quadrature signal power measurements and numeric integration.

c. IF/Combiner Module. The IF/Combiner Module circuitry combines the output of an internally located noise source with an output of either an internal BPSK or OQPSK modulated carrier or an external continuous wave (CW) or constant envelope (CE) modulated carrier selected by the Modulator Module. The combined output is a calibrated C/kT suitable for testing modem equipment. During calibration the IF/Combiner circuitry can select either the carrier, noise or carrier pulse noise signal to be output to the Quad Detector Module for processing. By changing the LO (local oscillator) output frequency from the Quad Detector Module over the range 85 MHz to 125 MHz, the RMS power of the carrier signals from 50 MHz to 90 MHz can be measured. The Processor Module then attenuates the carrier signal in order to achieve the desired carrier to noise density.

d. Quad Detector Module. The Quad Detector Module contains two circuit card assemblies (CCAs): the Quad Detector CCA and the Synthesizer CCA.

(1) Synthesizer CCA. The Synthesizer CCA uses a 5 MHz reference signal from the Quad Detector CCA to generate a first LO signal in the 85 to 125 MHz frequency range. The frequency Is selected In multiples of 25 KHz by command from the Processor Module. The first LO signal Is outputted to the Quad Detector CCA.

(2) Quad Detector CCA. The Quad Detector CCA generates a 70 MHz reference signal by phaselocking either to an external 5 MHz precision reference or to the output of an Internal TCXO. This 70 MHz reference Is outputted to the Modulator Module, and Is also divided to create quadrature 35 MHz second LO signals. The Quad Detector CCA uses the first LO signal from the Synthesizer CCA to downconvert RF signal energy In the 50 to 90 MHz frequency range to 35 MHz, and then uses the second LO signals to perform the actual quadrature detection. The detected RF signals are outputted to the Processor Module for measurement.

e. Modulator Module. The Modulator Module receives external digital data signals which range from 75 bits/second to 20 Mbits/second. Using the data, the modulator circuitry modulates a 70 MHz carrier from the Quad Detector Module In either a BPSK/OQPSK format. The modulator circuitry can then be commanded by the Processor Module to output either the modulated data or the 70 MHz carrier only, and can perform randomizing and differential encoding of the data.

f. Distribution CCA. The Distribution CCA provides parallel interconnection of the Processor Module Control Bus, (±5V, ±15V, +8V) power and ground to the Modulator, Quad Detector and IF/Combiner modules. It also contains the power supply BIT circuitry.

g. Signal Attenuator. The carrier input to the IF/Combiner Module from the Modulator Module is attenuated by the Signal Attenuator under the control of the Processor Module to maintain a signal level in the -75 dBm to 0 dBm range.

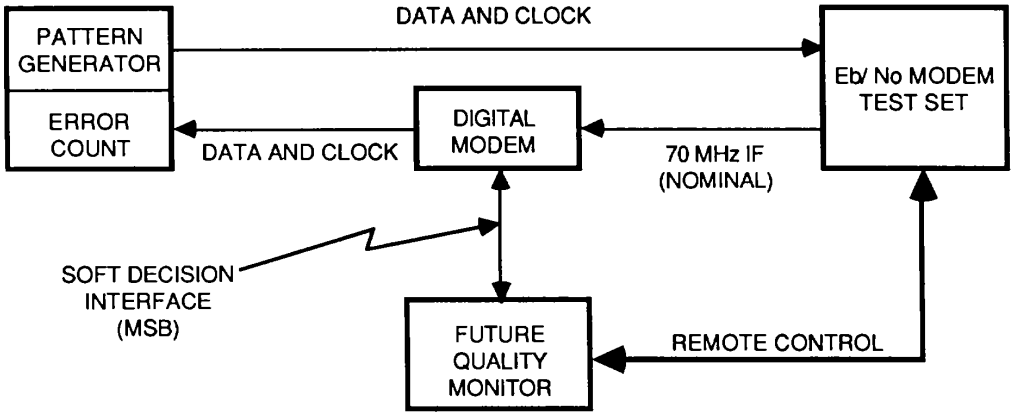

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Figure 1-3. Internal Modulator Application

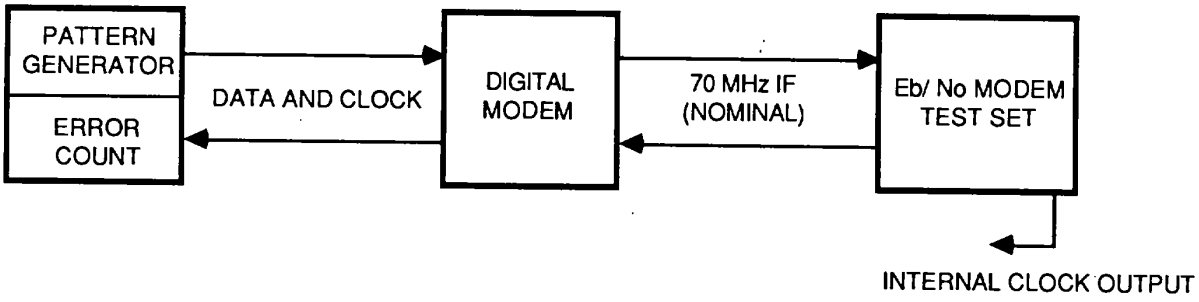

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Figure 1-4. External Modulator Application

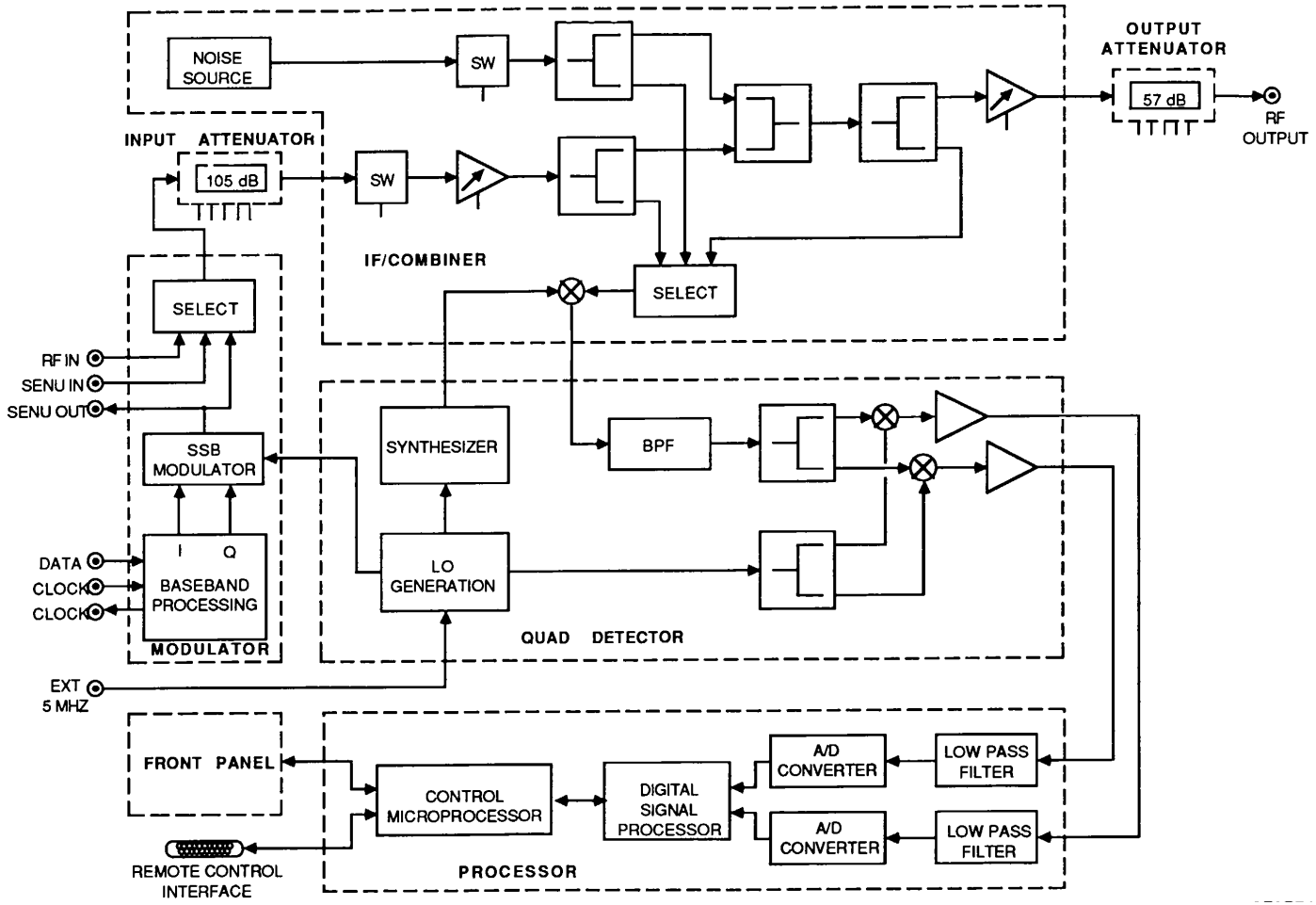

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Figure 1-5. TS-4295/G Functional Block Diagram

h. Power Supply Assembly. The Power Supply Assembly is comprised of five AC to DC linear power supplies mounted to a single plate with a safety cover. The input requirement for the Power Supply Assembly is as follows:

Voltage	*Limits*
120 VAC, 60 Hz, Single Phase	108 VAC to 132 VAC
47 Watts	45 Hz to 420 Hz

The output requirements for the Power Supply Assembly are as follows:

Voltage	*Maximum Current*
+5.0 Volts	3.0 Amperes
-5.2 Volts	0.75 Amperes
+8.0 Volts	1.0 Amperes
+15.0 Volts	1.5 Amperes
-15.0 Volts	0.20 Amperes

The minimum accuracy of each supply voltage is ±1.0 percent. The minimum regulation at the above loads is ±0.2 percent, and the maximum ripple is 10 millivolts peak to peak.

i. Controls. The TS-4295/G is controlled either locally, by the operator at the front panel keypad and display or remotely, through a rear panel RS-422/449 interface connector.

(1) Local Control. The operator controls the TS-4295/G by means of a front panel POWER switch, a 28-key keypad and two 4-line by 40-character Liquid Crystal Displays (LCD's). Keypad and display functions are described and illustrated in Chapter 2, Section I.

(a) Keypad. The keypad (figure 2-1) is comprised of 24 single function keys and four dual function keys. The secondary action of the dual function keys is caused by first pressing the function (FCN) key and then pressing the selected dual function key. There are also three "hidden functions" invoked by pressing the FCN key and a specific numeric key (refer to paragraph 2-1 a.(4)).

(b) LCD's. The upper LCD, CURRENT OPERATING CONDITIONS, displays the operating configuration and status of the TS-4295/G. The lower LCD, EDIT CONFIGURATION, displays the selectable parameters which will comprise the next operating configuration (figure 2-2). The lower LCD also displays the ALARM and BIT status of the equipment if selected by the operator. Typical displays are shown in figure 2-3. Also, when a new variable parameter is entered, all other parameters dependent on it are calculated, reset, checked, and displayed. Default values are provided for all variable parameters.

(c) Operation. The operator uses the keypad and menu presented in the lower display to select the set of operational parameters which will be used in a specific test case. After making a selection, pressing the FCN key and then the CAL key causes the TS-4295/G to reconfigure and perform a self calibration operation. The selected parameters are also transferred to the upper display. Operation of the test set is unaffected until the calibration sequence is started. A new Edit configuration may be established at the same time that a test is in progress, without affecting unit operation until the calibration operation is executed.

The operator uses the keypad to change the information in the lower display either by direct numeric entry or by use of the cursor up/down and SEL keys. A blinking cursor indicates the currently selected parameter. A new value for a given parameter is accepted when the cursor is moved to the next (or previous) parameter in the menu. If an out of range entry is made, the invalid entry will blink and the cursor will not move to the next (or previous) parameter until the entry is corrected. This ensures that invalid entries are not incorporated in the new configuration.

(2) Remote Control. The Electronics Subassembly provides a half-duplex, binary, serial asynchronous communications interface that allows remote control of the TS-4295/G. This interface provides all capabilities for control and display that are available at the front panel.

(a) Timing. Each byte is transmitted/received serially at a nominal bit rate of 9600 bits per second (bps). Other bit rates, defined by

$$\text{Rate} = 75 \times 2^{n}, \quad \text{where } n = 1 \text{ through } 7$$

are selectable.

(b) Byte Definition. Bytes are comprised of 1 start bit, 8 data bits, 1 stop bit and an odd parity bit. Definition of transmit and receive codes are in accordance with tables 1-1, 1-2 and 1-3.

c) Protocol. The TS-4295/G provides a Remote Control Protocol in accordance with the following:

1. The TS-4295/G responds to remote commands only following a valid unit identifier sequence.

2. Following receipt of a valid unit identifier sequence, the TS-4295/G continues to respond to all remote commands until a different unit address is received.

3. Multiple byte commands are implemented, reflecting legitimate front panel keystroke sequences.

4. The TS-4295/G responds to every command byte with an echo byte (when addressed).

   - The echo indicates byte receipt status: Parity Error (PE) Framing Error (FE), Overrun Error (OE)
   - The echo indicates valid/invalid (after "ENTER")
   - The echo indicates calibrated/uncalibrated
   - A special (see table 1-3) echo is used for BIT commands

5. All command sequences except the unit address are terminated with the "ENTER" byte. Commands are processed when the "ENTER" byte is received.

6. Commands received prior to response to a previous command are Ignored.

7. The TS-4295/G implements the Remote Control Protocol State Diagram presented In figure 1-6.

8. The Remote Control Protocol Implements the Remote Commands given In table 1-1.

9. The Remote Control Protocol Implements the "Toggle Switch Control Word" given in table 1-2.

10. The echo byte implements the bit assignment given in table 1-3.

(d) Timeout Considerations. The TS-4295/G returns a status byte in response to a transmitted byte in no more than 1.0 second [except in the case of the calibrate (CAL) or Built-In-Test (BIT) commands]. When the CAL command is received, the TS-4295/G responds in no more than 21 seconds. When the BIT command is received, the TS-4295/G responds in no more than 45 seconds.

Table 1-1. Remote Command List

CODE								HEX	MAPPING
b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0		
0	0	0	0	0	0	0	1	-(01)	Norm. Cal.
0	0	0	0	0	0	1	0	-(02)	C/kT
0	0	0	0	0	0	1	1	-(03)	NOISE
0	0	0	0	0	1	0	0	-(04)	POWER OUT
0	0	0	0	0	1	0	1	-(05)	ENTER
0	0	0	0	0	1	1	0	-(06)	MB/S
0	0	0	0	0	1	1	1	-(07)	KB/S
0	0	0	0	1	0	0	0	-(08)	B/S
0	0	0	0	1	0	0	1	-(09)	Center Freq
0	0	0	0	1	0	1	0	-(0A)	Eb/No
0	0	0	0	1	0	1	1	-(0B)	Data Rate
0	0	0	0	1	1	0	0	-(0C)	Remote
0	0	0	0	1	1	0	1	-(0D)	Local
0	0	0	0	1	1	1	0	-(0E)	BIT
0	0	0	1	0	0	0	0	-(10)	0
0	0	0	1	0	0	0	1	-(11)	1
0	0	0	1	0	0	1	0	-(12)	2
0	0	0	1	0	0	1	1	-(13)	3
0	0	0	1	0	1	0	0	-(14)	4
0	0	0	1	0	1	0	1	-(15)	5
0	0	0	1	0	1	1	0	-(16)	6
0	0	0	1	0	1	1	1	-(17)	7
0	0	0	1	1	0	0	0	-(18)	8
0	0	0	1	1	0	0	1	-(19)	9
0	0	0	1	1	0	1	0	-(1A)	“.”
0	0	0	1	1	0	1	1	-(1B)	INCREMTL CAL
0	0	0	1	1	1	0	0	-(1C)	INCR 0.1 dB
0	0	0	1	1	1	0	1	-(1D)	INCR 1.0 dB
0	0	0	1	1	1	1	0	-(1E)	DECR 0.1 dB
0	0	0	1	1	1	1	1	-(1F)	DECR 1.0 dB
0	0	1	0	0	0	0	0	-(20)	SIGNAL TOGGLE
0	0	1	0	0	0	0	1	-(21)	NOISE TOGGLE
0	1	X	X	X	X	X	X	.....	Addr Unit X
1	X	X	X	X	X	X	-	.....	Toggle Sw CW

Table 1-2. Toggle Switch Control Word BIT Assignment

b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0
1	0	0 = N/A	0=Coded	0=Rand Off	0=SENU Out	0	0=Ext Sig
	0	1 = Noise	1=Uncoded	1=Rand On	1=SENU In	0	1=Int BPSK
	1	0 = Signal				1	0=Int OQPSK
	1	1 = Operate (Sig + Noise)				1	1=Int CW

Table 1-3. Echo Codes r

NORMAL ECHO							
b_7	b_6	b_5	b_4	b_3	b_2	b_1	b_0
1=111gl CMD	0	X	1-OE	1-FE	1-PE	X	0-Norm 1=Uncal
(FE - Framing Error, PE - Parity Error, OE . Overrun Error)							
ECHO TO BIT COMMAND							
1	1	S	S	S	P	P	P
Where PPP - Primary BIT Fault, and SSS = Secondary Fault, with the following SSS or PPP binary mapping:							
000 = No Fault							
001 = Processor							
010 = Quad Detector							
011 = IF/Combiner							
100 = Modulator							
101 = Power Supply							
110 = Signal Attenuator							

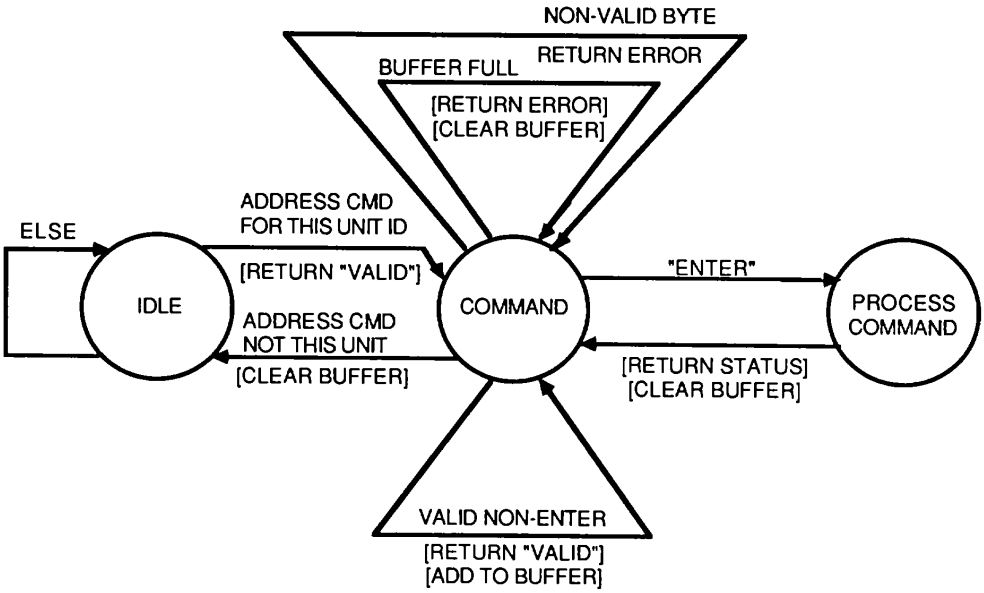

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Figure 1-6. Remote Control Protocol State Diagram

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS, INDICATORS AND CONNECTORS

2-1 OPERATOR'S CONTROLS AND INDICATORS.

a. Front Panel. The Front Panel controls and indicators consist of the two liquid crystal displays (LCD's), CURRENT OPERATING CONDITIONS and EDIT CONFIGURATION, the keypad, and the POWER switch and indicator (figure FO-1). The keypad keys are used for control/inputs and the LCD's provide output indicators.

(1) LCDs. Typical examples of the two displays in the default Signal Plus Noise mode and an example of the lower (EDIT) display in the Status, Remote, and BIT modes are shown in figure 2-1. Table 2-1 describes the function of each output indicator field shown in these displays.

(2) Keypad (figure 2-2). The keypad is comprised of 24 single function keys and four dual function keys. The secondary action of the dual function keys is caused by first pressing the function (FCN) key and then pressing the key selected for the desired action. Dual function keys are so identified by the two contrasting colors and the upper and lower characters printed on the key. The function of each key is described in table 2-2.

(3) Power Switch and Indicator. When the power switch is activated, the green light will come on indicating that power is supplied to the system.

(4) Additional Select Functions. The following select functions are caused by using a combination of keypad keys.

(a) SENU Select. Place the cursor in EDIT CONFIGURATION display at SENU field and toggle select key between SENU IN and SENU OUT states. Default: SENU OUT.

(b) Coder Select. Place the cursor in EDIT CONFIGURATION display at the Coder field and toggle SELECT key between CODED and UNCODED states. Default: CODED.

(c) Randomizer Select. Place the cursor in EDIT CONFIGURATION display at Randomizer field and toggle SELECT key between RAND ON and RAND OFF. Default: RAND ON.

(d) Data Rate Select. Place the cursor in EDIT CONFIGURATION display at Data Rate field and enter desired data rate using the numeric keys and data rate keys as appropriate. Enter data rates using 5 significant digits plus decimal point and multiplier. Range: 75 bps to 20 Mbs. Default: 500 kB/S.

(e) Noise Density Select. Place cursor in EDIT CONFIGURATION display at Noise Density field and enter desired output noise density using numeric keys. Use 2 or 3 digits as appropriate. Range: -88 to -145 dBm/Hz. Default: -88 dBr/Hz.

(f) Center Frequency Select. Place cursor in EDIT CONFIGURATION display at Center Frequency field and enter desired RF carrier center frequency using numeric keys. This function is only operable with an external signal source. Enter using 5 significant digits plus decimal point. Range: 50 to 90 MHz. Default: 70 MHz.

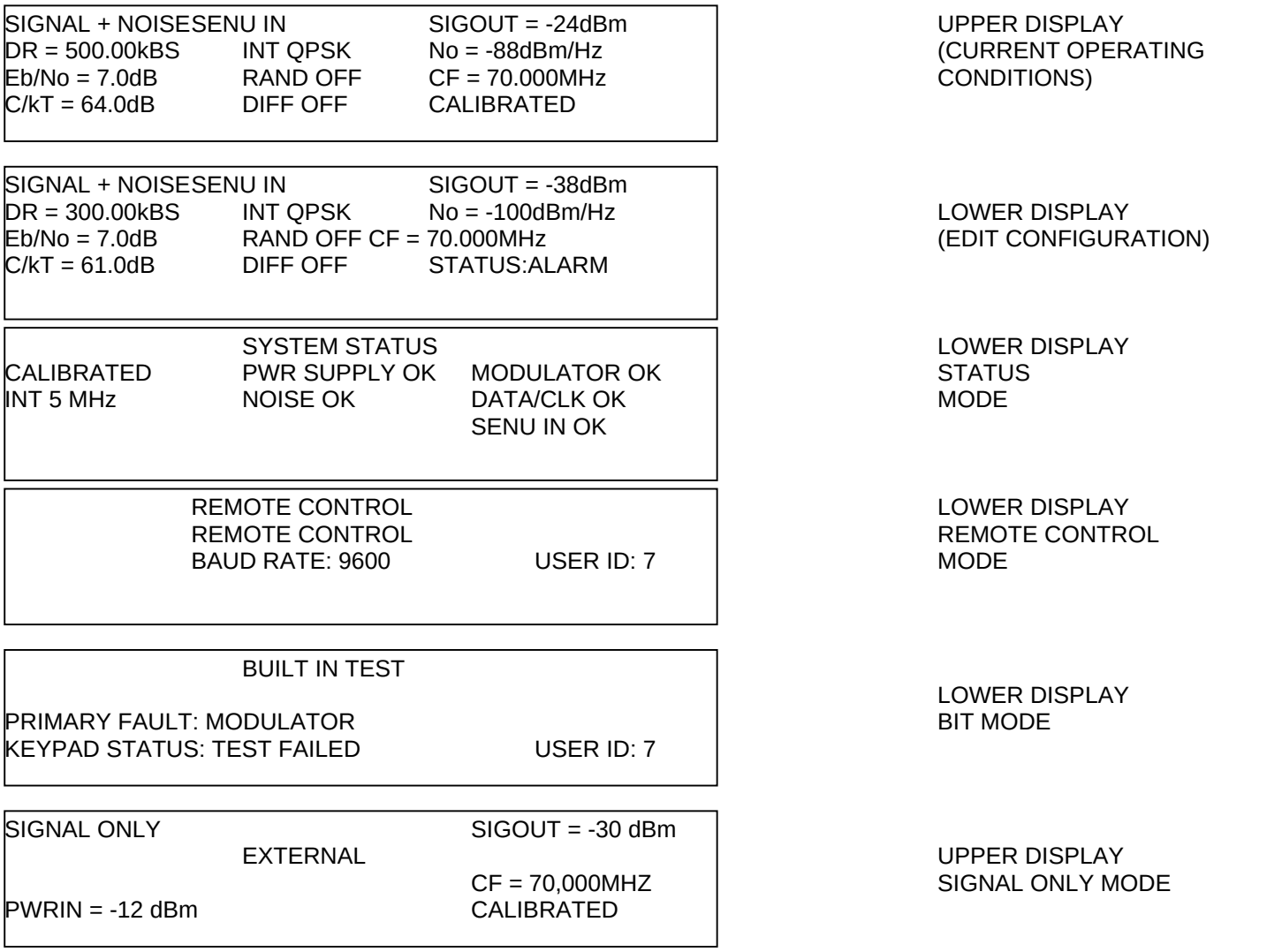

Figure 2-1. Typical Displays

Table 2-1. Display Indicator Functions

Figure 2-1 Display	Example Indicator(s)	Field	Function
OPERATING	SIGNAL+NOISE	Mode	Displays current operating mode. Options: SIGNAL + NOISE, SIGNAL ONLY, NOISE ONLY
	DR = 500.00kBs	Data Rate	Displays current operating data rate: 75 B/S to 20 MB/S. Expressed in BS, kBS, or MBS1 2
	Eb/No = 7.0dB	Eb/No	Displays current operating Eb/No: 0.0 to 20.0 dB.1 2 Default Value: 7.0 dB
	C/kT = 64.0dB	C/kT	Displays current operating C/kT: 18.8 to 93.0 dB.1 2 Default Value: 64.0 dB
	PWRIN = -12dBm	Power Input	Displays current input power in dBm, Only in SIGNAL ONLY mode.
	SENU IN	SENU	Indicates whether signal path is routed to external SENU connectors on rear panel. Indicators: SENU IN, SENU OUT. 2 (Not displayed if Modulation Source is EXTERNAL)
	INT QPSK	Modulation Source/Type	Indicates if RF OUTPUT signal provided from external source (RF In connector) or from internal modulator. Indicators: EXTERNAL, INT CW, INT BPSK, INT QPSK
	RAND OFF	Randomizer On/Off	Indicates if internal Randomizer selected for current operating mode. Indicators: RAND ON, RAND OFF. (Not displayed if RF Output Signal provided from external signal source.)
	DIFF OFF	Coder On/Off	Indicates if internal Differential Coder selected for current operating mode. Indicators: DIFF ON, DIFF OFF. (Not displayed if RF OUTPUT signal provided from external signal source.) 2

Table 2-1. Display Indicator Functions - Continued

Figure 2-1 Display	Example Indicator(s)	Field	Function
OPERATING (Continued)	RATE 3/4	Coding	Indicates whether externally modulated signal is uncoded, or incorporates Forward Error Correction Coding. Indicators: UNCODED, RATE 1/2, RATE 3/43.
	SIGOUT = -24dBm SIGOUT = -30dBm	Power Output	Indicates nominal power output level in dBm at rear panel connector 2,
	No = - 100 dBm/Hz	No Output	Indicates nominal output noise power density in dBm/Hz at rear panel connector. [1]
	CF = 70.000MHz	Center Frequency	Indicates center frequency in MHz of RF carrier selected for current operation.[2]
	CALIBRATED	Calibration State	Indicates state of internal calibration of TS-4295/G. Indicators: CALIBRATED, UNCALIBRATED
EDIT	SIGNAL + NOISE	Mode	Displays mode selected for Edit Configuration. Indicators: SIGNAL + NOISE, SIGNAL ONLY, NOISE ONLY
	DR = 300.00kBs	Data Rate	Displays data rate selected for Edit Configuration; 75 BS to 20 MB/S. Expressed in BS, kBS, or MBS.[1 2]
	Eb/No = 7.0dB	Eb/No	Displays Eb/No selected for Edit Configuration: 0.0 to 20.0 dB. Default Value: 7.0 dB [1 2]
	C/kT = 61.0dB	C/kT	Displays C/kT selected for Edit Configuration: 18.8 to 93.0 dB. Default Value: 64.0 dB [1 2]
	SENU IN	SENU	Indicates if signal path for Edit Configuration is routed to external SENU connectors on rear panel. Indicators: SENU IN, SENU OUT 2 (Not displayed if Modulation Source is External)

Table 2-1. Display Indicator Functions - Continued

Figure 2-1 Display	Example Indicator(s)	Field	Function
EDIT (Continued)	INT QPSK	Modulation Source/Type	Indicates if RF Output Signal for Edit Configuration is provided from external source (RF In connector) or from internal modulator. Indicators: EXTERNAL, INT CW, INT BPSK, INT QPSK 2
	RAND OFF	Randomizer On/Off	Indicates if internal Randomizer selected for Edit configuration. Indicators: RAND ON, RAND OFF. (Not displayed if RF Output signal provided from external signal source.) 2
	RATE 3/4	Coding	Indicates whether externally modulated signal is uncoded, or incorporates Forward Error Correction Coding. Indicators: UNCODED, RATE 1/2, RATE 3/4 3.
	DIFF OFF	Coder On/Off	Indicates if Internal Differential Coder selected for Edit Configuration. Indicators: DIFF ON, DIFF OFF.(Not displayed if RF Output signal provided from external signal source.) 2
	SIGOUT = -38dBm	Power Output	Indicates nominal power output level in dBm at rear panel connector 2
	No = -100dBm/Hz	No Output	Indicates nominal output noise power density in a dBm/Hz at rear panel connector in Edit Configuration. 1
	CF = -70.000 MHz	Center Frequency	Indicates center frequency of RF carrier selected for Edit Configuration. 2
	STATUS: ALARM	Alarm Status	Indicates on-line alarm condition present. Indicator -- STATUS OK or STATUS ALARM -- blinks on and off until STATUS key is pressed and system status display is shown.

Table 2-1. Display Indicator Functions - Continued

Figure 2-1 Display	Example Indicator(s)	Field	Function
EDIT (Status Mode)	SYSTEM STATUS	Status Mode	Indicates EDIT CONFIGURATION display is in System Status mode.
	CALIBRATED	Calibration State	Indicates state of internal calibration. Indicators: CALIBRATED, UNCALIBRATED
	INT 5 MHz	5 MHZ Reference	Indicates if reference timing signal present at 5 MHz
		Source	Reference input rear panel connector and internal clock is phased locked to it. Indicators: EXT 5 MHz (Signal present) INT 5 MHz (No signal present)
	PWR SUPPLY OK	Power Supply Status	Indicates if power supply working properly. Indicators: PWR SUPPLY OK, PWR SUPPLY FLT
	NOISE OK	Noise Source Status	Indicates if noise source is working correctly. Indicators: NOISE OK, NOISE FLT
	MODULATOR OK	Signal Source Status	Indicates state of internal or external RF input signal. Indicators: MODULATOR OK, MODULATOR FLT, RF INPUT OK, RF INPUT FLT
	DATA/CLK OK	Data/Clock Status	Indicates state of external data and clock signals. Indicators: DATA/CLK OK, DATA/CLK FLT
	SENU IN OK	SENU Input Status	Indicates status of RF signal at rear panel. SENU IN connector. Indicators: SENU IN OK, SENU IN FLT
EDIT (BIT Mode)	BUILT IN TEST	BIT Mode	Indicates EDIT display is in BIT mode. (Initiated by pressing FCN and BIT keys as described in paragraph 2-1 *a.(2)* An LCD test runs for 5 seconds and a keypad test runs for 20 seconds. The operator may respond to prompts to press each key during the keypad test.

Table 2-1. Display Indicator Functions - Continued

Figure 2-1 Display	Example Indicator(s)	Field	Function
EDIT (BIT Mode) (Continued)	PRIMARY FAULT: MODULATOR	Primary Fault	Indicates Primary fault (module) detected by BIT or that none was detected. Indicators: PRIMARY FAULT: None PRIMARY FAULT: Modulator PRIMARY FAULT: IF/Combiner PRIMARY FAULT: Quad Detector PRIMARY FAULT: Processor PRIMARY FAULT: Power Supply PRIMARY FAULT: Input Attenuator
	KEYPAD STATUS: TEST FAILED	Keypad Status	Indicates results of keypad test. Indicators: KEYPAD STATUS: TEST PASSED, KEYPAD STATUS: TEST FAILED, KEYPAD STATUS: TEST HALTED
	USER ID: 7	User ID	Provides decimal indication of binary user ID selected using rear panel switch.
(Remote Control Mode)	REMOTE CONTROL	Remote Control Indication (2 fields)	Indicates TS-4295/G is under remote control. (Initiated by pressing FCN and LOC/R keys as described in paragraph 2-1 a.(2) or by appropriate code received at Remote Control interface connector.)
	BAUD RATE: 9600	Baud Rate	Indicates baud rate selected for Remote Control interface. Range: 150 to 9600 baud.
	USER ID: 7	User ID	Decimal indication of binary user ID selected by using rear panel switch.

1 = The specified field is blank in SIGNAL ONLY Mode.

2 = The specified field is blank in NOISE ONLY Mode.
3 = Takes the place of RANDOMIZER ON/OFF field when EXTERNAL MODULATOR is selected.

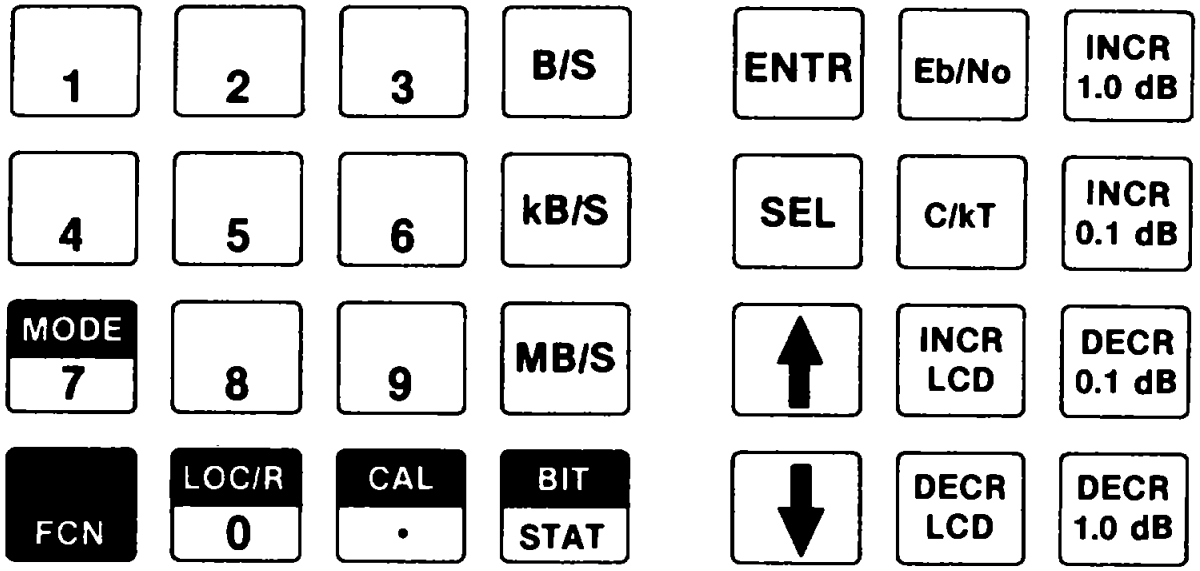

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Figure 2-2. Keyboard Layout

Table 2-2. Keypad Control Functions

Figure 2-2 Display	Control	Function
OPERATING	FCN	Causes secondary action of any of four dual function keys (MODE, LOC/R, CAL, BIT)
EDIT	MODE	Secondary function causes mode displayed in EDIT CONFIGURATION to toggle between any of four primary operational modes: SIGNAL+NOISE, SIGNAL ONLY, NOISE ONLY, AND BIT. Default: SIGNAL+NOISE
OPERATING	LOC/R	Local/Remote is a secondary function; causes assigned control source to toggle between local (keypad) and remote (remote interface) control. Default: Local
OPERATING/EDIT	CAL	Calibrate is a secondary function; initiates calibration of output signal, and makes edited configuration operational and displayed on the upper screen.
EDIT	BIT	Built-In-Test is a secondary function; initiates self test.
EDIT	0-9	Input for entering numeric parameter data as required for operation.
EDIT	STAT	Causes internal status information to be shown in lower display. Further use returns lower display to normal (edit) mode.
EDIT	B/S	10° multiplier causes valid numeric data rate keyed into edit configuration to be entered in terms of bits per second.
EDIT	kB/S	10^3 multiplier causes valid numeric data rate keyed into edit configuration to be entered in terms of kilobits per second.
OPERATING	MB/S	10^6 multiplier causes valid numeric data rate keyed into edit configuration to be entered in terms of megabits per second.
EDIT	ENTR	Causes TS-4295/G to accept variable parameter entered in edit configuration, and to evaluate the parameter's acceptability within operational configuration.
EDIT	SEL	Causes value of variable parameters in edit configuration SENU, CODER, RANDOMIZER, and Modulation Source/Type fields to rotate among the two to four selectable states.
EDIT	E_b/N_o	Places cursor in EDIT CONFIGURATION display at E_b/N_o field. E_b/N_o is entered using numeric keys: one or two digits, decimal point, and one digit to right of decimal point. Value range: 0.0 to 20.0 dB. Default: 7.0 dB

Table 2-2. Keypad Control Functions - Continued

Figure 2-2		
Display	Control	Function
EDIT	C/Kt	Places cursor in EDIT CONFIGURATION display at C/kT field. C/kT entered using numeric keys: one or two digits, decimal point, and one digit to right of decimal. Value range: 18.8 to 93.0 dB. Default: 64.0 dB
EDIT	INCR 0.1 dB	Causes value of selected parameter (E_b/N_0 or C/kT) in EDIT CONFIGURATION display to be incremented by 0.1 dB.
EDIT	INCR 1.0 dB	Causes value of selected parameter (E_b/N_0 or C/kT) in EDIT CONFIGURATION display to be incremented by 1.0 dB.
EDIT	DECR 0.1 dB	Causes value of selected parameter (E_b/N_0 or C/kT) in EDIT CONFIGURATION display to be decremented by 0.1 dB.
EDIT	DECR 1.0 dB	Causes value of selected parameter (E_b/N_0 or C/kT) in EDIT CONFIGURATION display to be decremented by 1.0 dB.
EDIT	↑	Cursor up causes cursor in EDIT CONFIGURATION display to move to succeeding selectable parameter.
EDIT	↓	Cursor down causes cursor in EDIT CONFIGURATION display to move to preceding selectable parameter.
OPERATING/EDIT	INCR LCD	Causes contrast of displays to be increased to adjust optimum viewing angle.
OPERATING/EDIT	DECR LCD	Causes contrast of displays to be decreased to adjust optimum viewing angle.

(5) *Additional Function Key Operations.* The following select functions are performed using the FCN and numeric keys. They are not visible to the operator.

(a) *Signal Toggle*. Press FCN key and numeric 1 key to stop output carrier signal. Repeat this function to restore signal to its original level. Signal toggle has no effect in Noise Only mode.

(b) *Noise Toggle.* Press FCN key and numeric 2 key to stop noise output signal. Repeat this function to restore signal to its original level. Noise toggle has no effect in Signal Only mode.

(c) *Adjust Output Level*. Press FCN key and numeric 3 key to stop noise output signal and send a 70 MHz modulated (CW) signal at nominal -15 dBm level to RF output connector. The CURRENT OPERATING CONDITION display is cleared and the lower EDIT CONFIGURATION display prompts operator to manually fine tune output level using cursor up/down arrow keys as appropriate. Repeat this operation to terminate this function.

(6) *Incremental Calibration*. The INCREMENTAL CAL mode of operation is used for making an adjustment to the TS-4295/G in only the E_b/N_o and C/kT parameters, while leaving all other parameters unaltered. In this mode, the EDIT CONFIGURATION display shows INCREMENTAL CAL instead of SIGNAL+NOISE. This mode is entered when the system is currently in a calibrated state, and the operator presses either of the E_b/N_o or C/kT keys. On this screen, the operator is presented with the E_b/N_o, C/kT and SIGOUT fields, with the values taken from the CURRENT OPERATING CONDITION display. The operator may use the INCR/DECR keys to select a new E_b/N_o, C/kT or he may enter the value directly using the numeric keys. The cursor arrow keys are used to toggle between the E_b/N_o and C/kT fields. When the operator presses FCN and then CAL, the values go instantly into the upper screen, and an incremental CAL is initiated. During the incremental calibration operation, the output signal will not be interrupted. If the E_b/N_o or C/kT key is pressed when in the INCREMENTAL CAL mode, this mode will terminate without doing any calibration. This allows the operator to escape from this mode without altering the state of the system calibration.

b. *Rear Panel*. Rear panel controls and connectors are shown in figure FO-2 and described in table 2-3.

Table 2-3. Rear Panel Controls, Connectors and Captive Screws

Figure FO-2 Index No.	Control/Connector/ Captive Screws	Function
1	RS422 J9	37-pin D-Type connector interfaces remote command signals with TS-4295/G
2	UNIT IDENT switch	6-position DIP switch identifies TS-4295/G on remotely controlled command bus
3	Captive Screws	Retain Processor Module
4	Captive Screws	Retain Quad Detector Module
5	5 MHz REF J7	TNC connector allows 5 MHz external frequency standard input
6	DATA IN J4	TWINAX BNC 31-223 connector allows MIL-STD-188 baseband data input
7	Captive Screws	Retain Modulator Module
8	RF IN J1	TNC connector allows nominal 70 MHz modulator input
9	115 VAC J10/FL2	AC power connector provides power input
10	FUSE F1 2.5 AMP SLO-BLO	Provides overload protection
11	SPARE FUSE	Spare 2.5 amp fuse
12	SENU IN J2	TNC connector provides bandwidth limiting input
13	SENU OUT J3	TNC connector provides bandwidth limiting output
14	CLOCK OUT J6	TWINAX BNC 31-223 connector provides MIL-STD-188 baseband clock output
15	CLOCK IN J5	TWINAX BNC 31-223 connector provides MIL-STD-188 baseband clock input
16	RF OUT J8	TNC connector provides nominal 70 MHz output to modem

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

2-2 PMCS INTRODUCTORY MATERIAL.

a. *General.* There are no PMCS schedules for the equipment covered in this manual. Routine checks of equipment are required to assure operational readiness at all times. Routine checks should be done anytime they are required for good housekeeping practices.

b. *PMCS Procedure*. Inspect and clean the TS-4295/G routinely as follows:

(1) *Inspection*

(a) Cleaning. Inspect the exterior of the unit. The exterior surface should be free of dust, grease, and fungus.

(b) Cables. Check cables for cuts, cracks, fraying, deterioration, or corrosion.

(c) Connectors. Check all equipment connectors for evidence of damage to connector pins.

(d) Check functioning of POWER lamp indicator.

(e) Check that air inlet and exit screens are clean and unobstructed.

(f) Check that fan is clean and operable.

(g) Check chassis for broken mechanical items.

(2) *Cleaning.* Remove dust and loose dirt from exterior flat surfaces with a clean soft cloth. Remove dust and dirt from connectors with a brush. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used for more effective cleaning. To remove oil or grease, use a lint free cloth dampened with isopropyl alcohol.

SECTION III. OPERATION UNDER USUAL CONDITIONS.

2-3 OPERATING PROCEDURES.

To make the TS-4295/G ready for operation, proceed as follows:

a. Set front panel POWER switch to on. Observe that green LED comes on.

b. Let unit warm up for 20 seconds.

c. Configure external system for desired test.

NOTE

Test procedures are dependent upon external equipment and the actual type of modem being tested. Therefore, detailed procedures are not included in this technical manual.

d. Configure TS-4295/G using keypad and EDIT CONFIGURATION display.

(1) Press FCN and then CAL keys. Note UNCALIBRATED indicator is blinking.

(2) When indicator changes to CALIBRATED, begin testing.

2-4 SHUTDOWN.

To shutdown the TS-4295/G, set front panel POWER switch to OFF. Observe that green LED goes out.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-5 OPERATION UNDER UNUSUAL WEATHER.

Environmental limitations -- temperature and humidity -- are listed in Chapter 1, Section II, Paragraph 1-9. Operating the TS-4295/G outside the environmental limitations may cause permanent damage to the equipment or compromise test results.

2-6 EMERGENCY PROCEDURES.

High voltage and current can cause minor system damage. This hazard is the result of accidental or wrong connection of damaging voltage and current levels to the TS-4295/G or the internal modules. Connectors and cables are labeled to minimize the probability of this hazard. In addition, a 2.5 amp fuse in series with the 120 VAC input provides overcurrent protection, and each of the five AC to DC power supplies has overvoltage protection circuitry. In the event of a catastrophic power failure, set the front panel POWER switch to off.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. OPERATOR MAINTENANCE

3-1 OPERATOR MAINTENANCE PROCEDURES.

Operator Maintenance procedures for the TS-4295/G are limited to inspection and cleaning as described in Chapter 2, paragraph 2-2.b These procedures consist of a visual examination to determine the serviceability of the TS-4295/G.

Section II. UNIT MAINTENANCE

3-2 REPAIR PARTS, SPECIAL TOOLS, TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE) AND SUPPORT EQUIPMENT.

Repair parts, special tools, test measurement and diagnostic equipment (TMDE), and support equipment are listed and illustrated in the Repair Parts and Special Tools List, TM 11-6625-3205-23P, covering unit and direct support maintenance of this equipment.

3-3 SERVICE UPON RECEIPT.

a. Unpacking. The TS-4295/G is packaged in wooden or cardboard containers and sealed with tape. No unusual unpacking procedures need be observed. Exercise caution when removing the unit from the container to prevent damage to the equipment. Retain the packaging material for possible future use.

b. Inspection of Unpacked Equipment.

(1) Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage as prescribed in paragraph 1-2c.

(2) Check the equipment against the packing list shipped with the equipment to insure the shipment Is complete. Report all discrepancies in accordance with Instructions in paragraph 1 - 2c. The equipment should be placed In service even if a minor assembly or part that does not affect proper functioning is missing or damaged.

c. Initial Adjustments.

No initial adjustments are required, however, the UNIT IDENT switch (2, figure FO-2), a six position dip switch, must be set to the appropriate position, prior to Installation of the TS-4295/G into the rack. This setting is required when the unit is to be used in a remote configuration.

3-4 UNIT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS).

Unit PMCS are the same as those listed in Chapter 2, Paragraph 2-2.b.

3-5 TROUBLESHOOTING PROCEDURES.

a. *Malfunction Detection.* The TS-4295/G detects and displays summary faults. Summary faults are Input/Output (I/O) signals or voltage level tolerance fluctuations that are outside of equipment specifications. Summary fault indications help the operator initiate Built-in-Test (BIT) fault isolation. Refer to Chapter 2, table 2-1.

(1) No external input or test equipment are required to exercise the BIT fault detection and isolation functions. BIT detects both failures and out-of-tolerance conditions. Detected faults are isolated and identified to the faulty module. The TS-4295/G also monitors the levels of the various DC Voltages. Out of tolerance conditions are indicated by Front Panel POWER indicator and LCD displays.

(2) In addition to testing the Front Panel LCD's and the keypad, BIT tests the following modular Line Replaceable Units (LRUs).

(a)	Processor A1A1	(d)	Modulator A1A4
(b)	IF/Combiner A1A2	(e)	Power Supply
(c)	Quad Detector A1A3	(f)	Input Attenuator

b. *Power-Up Troubleshooting*. Use table 3-1 to troubleshoot faults that may occur during the power-up process. Set front panel POWER switch to ON position.

c. *BIT*. After Power-Up, the TS-4295/G is ready for a self-test of the LCD's, keypad and modules. To run BIT, press the FCN key and then the BIT key. The lower, EDIT CONFIGURATION display shows:

BUILT IN TEST

All pixels on the lower display are turned on for five seconds. After this LCD test pattern display, the operator is prompted on the display to test the keypad as follows:

NOTE

When pressing each key as directed in the BIT test, press all seven keys in the top row before proceeding to the next row. There will be no changes in the display during the pressing of each key unless there is a malfunction.

PRESS EACH KEY

LEFT TO RIGHT, TOP TO BOTTOM

PRESS LOWER RIGHT KEY TO HALT

If the operator does not respond in 20 seconds, the keypad test times out. The BIT process proceeds to test the modules. The PRIMARY FAULT indicator shows which module has failed or that none have failed. The KEYPAD STATUS indicates or shows whether the keypad test has passed, failed, or been halted. Use table 3-1 to troubleshoot faults that may occur during BIT.

d. The TS-4295/G BIT function identifies only the primary fault by module. However, there may be incidences where BIT incorrectly detects and isolates the failure. Therefore, table 3-1 provides the sequence of repair actions from removing the primary fault as identified by BIT to removing a secondary fault in the event that the primary fault replacement failed to correct the discrepancy. In addition, table 3-1 provides troubleshooting instructions in the event that a fault prevents BIT from being run. Table 3-1 is used as follows:

Table 3-1. BIT Troubleshooting

		SYMPTOM GROUPINGS																	
FAILURE SYMPTOMS	I. BUILT-IN-TEST	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	KEYPAD STATUS: TEST FAILED	X																	
	PRIMARY FAULT: MODULATOR		X																
	PRIMARY FAULT: QUAD DETECTOR			X															
	PRIMARY FAULT: IF/COMBINER				X														
	PRIMARY FAULT: PROCESSOR					X													
	PRIMARY FAULT: POWER SUPPLY						X												
	PRIMARY FAULT: ATTENUATOR							X											
	PRIMARY FAULT: NONE								X	X	X	X	X						
	BIT NON-OPERATIONAL													X	X	X	X	X	X
	II. DISPLAYS																		
	BOTH DISPLAYS OPERATIONAL								X	X	X	X	X					X	
	ONLY ONE DISPLAY OPERATIONAL													X					
	BOTH DISPLAYS NON-OPERATIONAL														X	X	X		X
	BACKLIGHTING ON BOTH DISPLAYS								X	X	X			X	X	X		X	
	BACKLIGHTING ON ONLY ONE DISPLAY											X							
	NO BACKLIGHTING ON EITHER DISPLAY												X				X		X
	III. KEYPAD																		
	KEYPAD OPERATIONAL								X	X	X	X	X						
	KEYPAD NON-OPERATIONAL																	X	
	IV. POWER LED																		
	POWER LED LIGHTS @ POWER ON								X			X	X	X		X		X	
	POWER LED FAILS TO LIGHT @ POWER ON									X	X				X		X		X
	V. FAN																		
	FAN IS ON @ POWER ON									X		X	X	X	X	X	X	X	
	FAN IS OFF @ POWER ON								X		X								X
REPAIR ACTION	FRONT PANEL 3-10 o	1																2	
	MODULATOR MODULE 3-6 c		1																
	QUAD DETECTOR MODULE 3-6 e		2	1	2														
	IF/COMBINER MODULE 3-6 g				1			2											
	PROCESSOR MODULE 3-6 i	2	3	2	3	1	2	3						1		1		1	
	POWER SUPPLY ASSEMBLY 3-6 k					2	1					1	1		1		1		3
	ATTENUATOR 3-10 i							1											
	DISTRIBUTION CCA 3-10 k		4	3	4	3	3	4	2	3	1				2	2	2		
	POWER LED									1									
	POWER LED ASSEMBLY 3-10 e									2									
	POWER SWITCH 3-10 c																		2
	FAN 3-10 q								1		2								
	FUSE 3-6 m																		1
	LCD 3-10 n											2		2					

(1) There are five failure indicators available to the operator. They are as follows:

a. Built-In-Test

b. Displays

c. Keypad

d. Power LED

e. Fan

The columns of the table identify 18 separate groupings of symptoms which are observed by the operator. The operator must select only one grouping of failure symptoms which matches the TS-4295/G operation. If a grouping cannot be matched to the failure symptoms return the unit to depot for repair.

(2) Once the operator has matched a grouping of failure symptoms to the TS-4295/G operation a list of repair actions for each grouping is provided. The repair actions should be performed in sequence until the failure is resolved. In the event that the identified repair actions fail to resolve the failure the TS-4295/G shall be returned to depot for repair.

3-6 UNIT MAINTENANCE PROCEDURES.

WARNING

Ensure all power is disconnected from the TS-4295/G before performing maintenance.

Maintenance procedures for the TS-4295/G consist of removal and replacement of field repairable parts. Refer to figure FO-3 unless otherwise noted.

a. *Removal of TS-4295/G (figure 3-1).* To remove the TS-4295/G from the rack, proceed as follows:

(1) Loosen mounting screws that secure TS-4295/G to rack.

(2) Pull TS-4295/G out from rack until fully extended on slides.

(3) Disconnect RF OUT connector J8 from Modem UUT or patch panel.

(4) Disconnect RF IN connector J1 from Modem UUT or patch panel.

(5) Disconnect bandwidth limiting SENU OUT connector J3 from SENU source or patch panel.

(6) Disconnect bandwidth limiting SENU IN connector J2 from SENU source or patch panel.

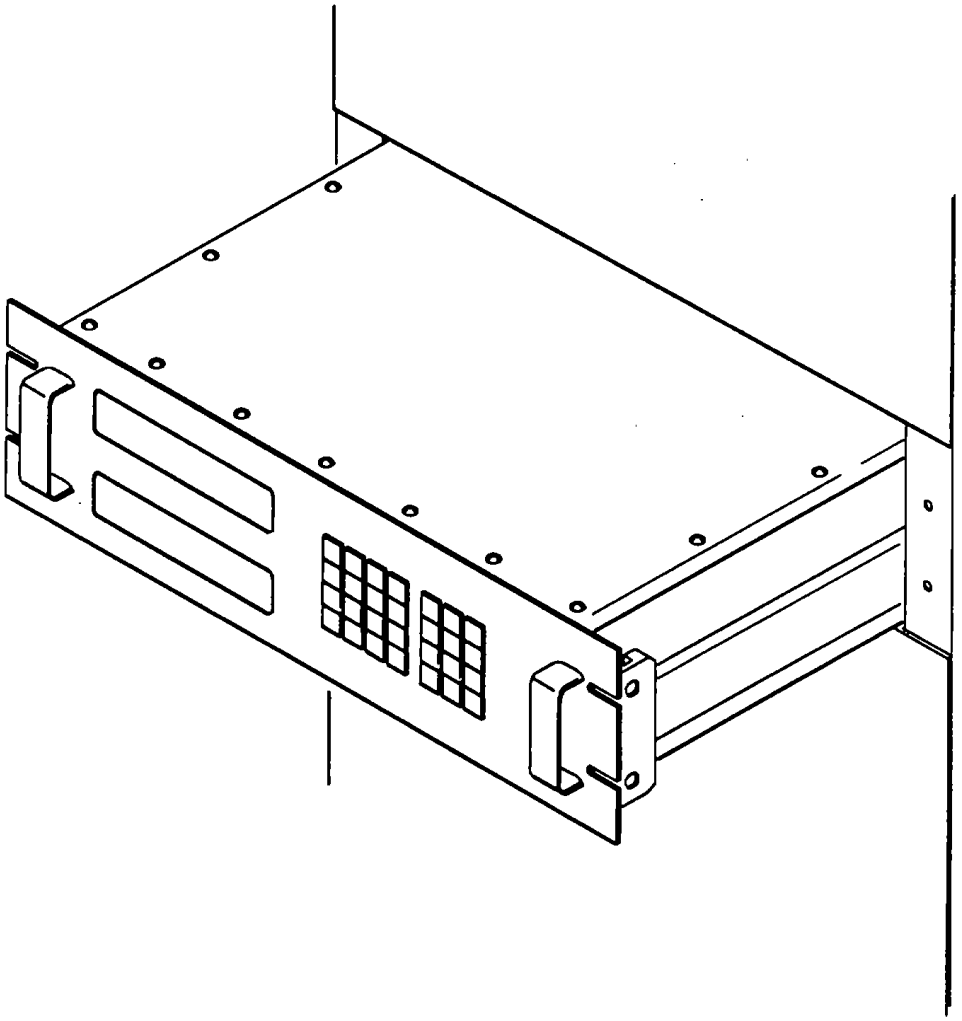
(7) Disconnect baseband CLOCK OUT connector J6 from clock source or patch panel.

(8) Disconnect baseband CLOCK IN connector J5 from clock source or patch panel.

(9) Disconnect baseband DATA IN connector J4 from data source or patch panel.

(10) Disconnect 5 MHz REF connector J7 from external clock or patch panel.

(11) Disconnect remote control interface cable from RS 422 connector J9 (if applicable).



CE2ER009

Figure 3-1. TS-4295/G Installation

(12) Disconnect prime power cord from 115 VAC connector J1 0/FL2.

(13) Release slide locks and slide unit out of rack slides.

(14) Lower the TS-4295/G to a bench.

b. *Installation of TS-4295/G (figure 3-1).* To install the TS-4295/G into the rack proceed as follows:

(1) Align unit with rack slides and slide unit into slides until slide locks engage. If rack slides are four feet or more above ground level, a two man lift is required.

(2) Secure unit to rack with mounting screws.

(3) Connect prime power cord to 115 VAC connector J1 0/FL2.

(4) Connect remote control interface cable to RS422 connector J9 (optional)*.

(5) Connect 5 MHz REF connector J7 to external clock or patch panel (optional)*

(6) Connect baseband DATA IN connector J4 to data source or patch panel.*

(7) Connect baseband CLOCK IN connector J5 to clock source or patch panel.*

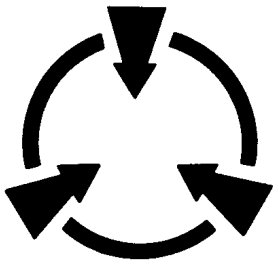
(8) Connect baseband CLOCK OUT connector J6 to clock source or patch panel.*

(9) Connect bandwidth limiting SENU IN connector J2 to SENU source or patch panel.*

(10) Connect bandwidth limiting SENU OUT connector J3 to SENU source or patch panel.*

(11) Connect RF IN connector J1 from Modem transmitter (may be UUT) or patch panel.*

(12) Connect RF OUT connector J8 to Modem Receiver UUT or patch panel.



CAUTION

This equipment contains parts and assemblies sensitive to damage by electrostatic discharge (ESD). Use ESD precautionary procedures when removing or inserting Processor, IF/Combiner, Quad Detector or Modulator modules from/into the Modem Test Set. Use the same precautionary procedures anytime these modules are not plugged into the Modem Test Set.

*As required for external equipment and unit under test.

NOTE

Figure 3-2 and Table 3-2 are supplied to facilitate the dissassembly and assembly of the TS-4295/G.

c. Removal of Modulator Module. (figure FO-4, sheet 1)

(1) Loosen 22 captive studs and remove cover assembly.

(2) Loosen two captive screws at rear panel.

(3) Disconnect cable assembly connectors A1W3P1, from A1A4J7(2) and A1W1P1 from A1A4J8(1).

(4) Disconnect cable assembly connector A1W2P2 from Distribution CCA connector A1A5J3.

(5) Loosen the two captive screws and remove the Modulator Module.

(6) Remove and retain the ribbon cable A1W2 from the faulted module.

d. Installation of Modulator Module. (figure FO-4, sheet 1).

(1) Connect cable assembly connector A1W2P1 to connector A1A4J9(3).

(2) Position the Modulator Module into the chassis and secure with the two captive screws at rear panel

(3) Connect cable assembly connectors A1W1P1 to A1A4J8(1) and A1W3P1 to A1A4J7(2).

(4) Position cover assembly onto the top of the TS-4295/G and secure with the 22 captive studs.

e. Removal of Quad Detector Module. (figure FO-4, sheet 1).

(1) Loosen 22 captive studs and remove cover assembly.

(2) Loosen two captive screws at rear panel.

(3) Disconnect cable assembly connectors A1W3P2 from A1A3J2(14), AW11P2 from A1A3J4(15), A1W12P2 from A1A3J5(16), A1W7P1 from A1A3J6(17), A1W6P1 from A1A3J3(11), and A1W4P1 from A1A3J1(12).

(4) Loosen the two captive screws (18) and remove the Quad Detector Module.

f. Installation of Quad Detector Module (Figure FO-4, sheet 1).

(1) Position the Quad Detector Module into the chassis and secure with the two captive screws at the rear panel.

(2) Secure the two captive screws (18) to the mounting bar.

(3) Connect cable assembly connectors A1W4P1 to A12A3J1(12), A1W6P1 to A1A3J3(11), A1W7P1 to A1A3J6(17), A1W12P2 to A1A3J5(16), A1W11P2 to A1A3J4(15), and A1W3P2 to A1A3J2(14).

(4) Position the cover assembly onto the top of the TS-4295/G and secure with the 22 captive studs.

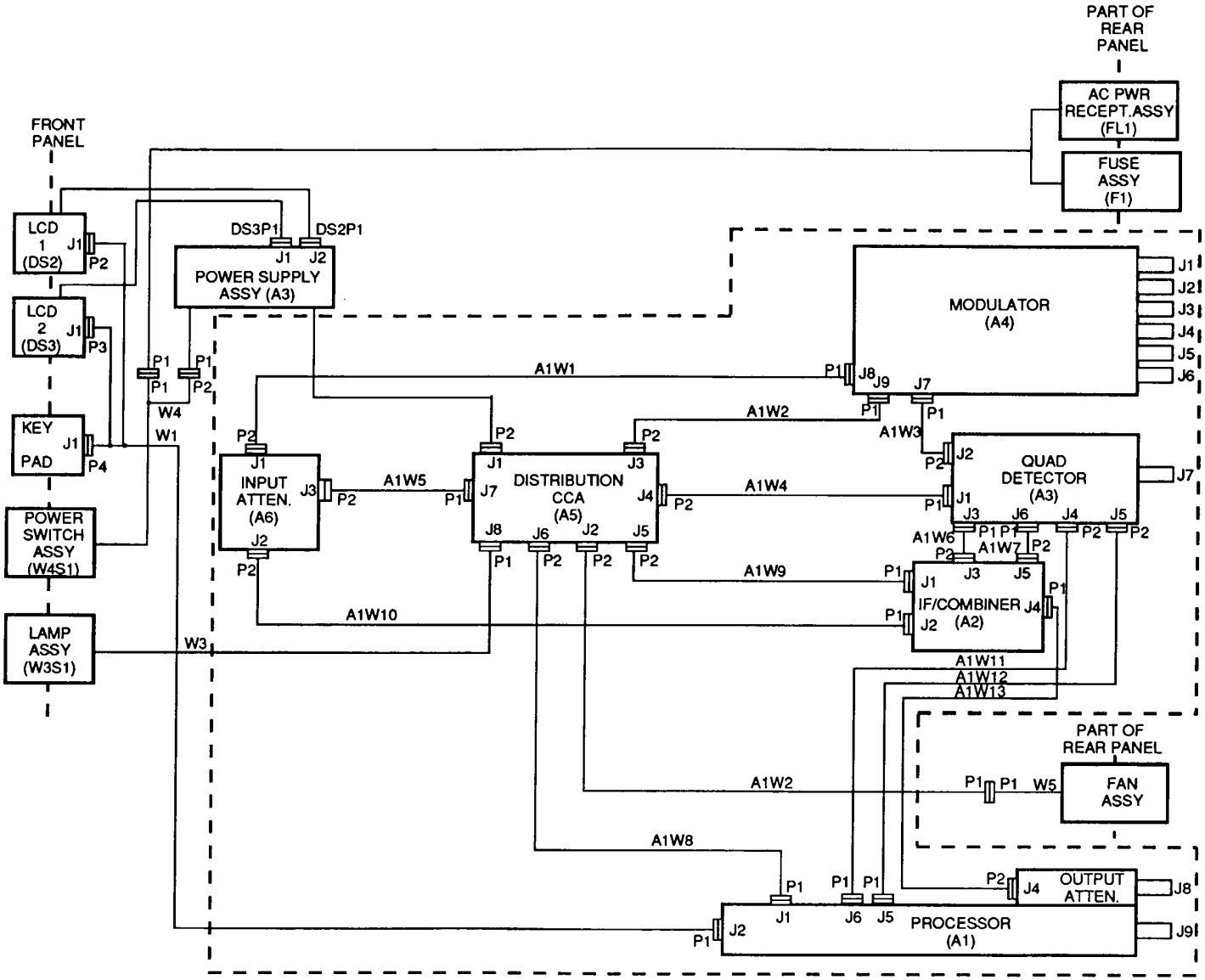


Figure 3-2. TS-4295/G Cable Interconnect Diagram

Table 3-2. Cable Interconnection List

Cable/Connector	Connects To
	ELECTRONICS SUBASSEMBLY
A1W1/P1	Modulator Module A1A4J8
P2	Input Attenuator A1A6J1
A1W2/P1	Modulator Module A1A4J9
P2	Distribution CCA A1A5J3
A1W3/P1	Modulator Module A1A4J7
P2	Quad Detector Module A1A3J2
A1W4/P	Quad Detector Module A1A3J1
P2	Distribution CCA A1A5J4
A1W5/P1	Distribution CCA A1A5J7
P2	Input Attenuator A1A6J3
A1W6/P1	Quad Detector Module A1A3J3
P2	IF/Combiner Module A1A2J3
A1W7/P1	Quad Detector Module A1A3J6
P2	IF/Combiner Module A1A2J5
A1W8/P1	Processor Module A1AlJ1
P2	Distribution CCA A1A5J6
A1W9/P1	IF/Combiner Module A1A2J1
P2	Distribution CCA A1A5J5
A1W10/P1	IF/Combiner Module A1 A2J2
P2	Input Attenuator A1A6J2
A1W11/P1	Processor Module A1A1J6
P2	Quad Detector Module A1A3J4
A1W12/P1	Processor Module A1A1J5
P2	Quad Detector Module A1A3J5
A1W13/P1	IF/Combiner Module A1A2J4
P2	Processor Module Output Attenuator A1A1J4

Table 3-2. Cable Interconnection List - Continued

Cable/Connector	Connects To
	CHASSIS ASSEMBLY
W1/P1	Processor Module A1A1J2
P2	Liquid Crystal Display (DS2) J1
P3	Liquid Crystal Display (DS3) J1
P4	Keypad J1
W2/P1	W5/P1
P2	Distribution CCA A1A5J2
W3/P1	Distribution CCA A1A5J8
W4/P1	AC Power P1
P2	Power Supply A3P1
W5/P1	W2/P1
A3P2 (Power Supply)	Distribution CCA A1A5J1

g. Removal of IF/Combiner Module. (figure FO-4, sheet 2).

(1) Loosen 22 captive studs and remove cover assembly.

(2) Disconnect cable assembly connectors A1W6P2 from A1A2J3(20), A1W10P1 from A1A2J2(19), A1W9P1 from A1A2J1(21), A1W13P1 from A1A2J4(22) and A1W7P2 from A1A2J4(23).

(3) Loosen the four captive screws (24) and remove the IF/Combiner Module.

h. Installation of IF/Combiner Module.

(1) Position the IF/Combiner Module onto the two mounting bars and secure with the four captive screws (24).

(2) Connect cable assembly connectors A1W7P2 to A1A2J5(23), A1W13P1 to A1A2J4(22), A1W9P1 to A1A2J1(21), A1W10P1 to A1A2J2(19), and A1W6P2 to A1A2J3(20).

(3) Position the cover assembly onto the top of the TS-4295/G and secure with the 22 captive studs.

i. Removal of the Processor Module. (figure FO-4, sheet 2).

(1) Loosen 22 captive studs and remove cover.

(2) Disconnect cable assembly connectors A1W12P1 from A1A1J5(29), A1W13P2 from A1A1J4(30), A1W11P1 from A1A1J6(28), and W1P1 from A1A1J2(32).

(3) Disconnect cable assembly connector A1W8P2 from Distribution CCA connector A1A5J6.

(4) Loosen the two captive screws at rear panel.

(5) Loosen the captive screw (33) and remove the Processor Module.

(6) Remove and retain ribbon cable A1 W8 from the faulted module.

j. Installation of Processor Module. (figure FO-4, sheet 2).

(1) Connect ribbon cable connector A1W8PI to connector A1A1J1(31).

(2) Position the Processor Module onto the mounting bar and secure with the captive screws at rear panel.

(3) Secure the captive screw (33) to the mounting bar.

(4) Connect cable assembly connectors W1P1 to A1A1J2(32), AW1P1 to A1A1J6(28), A1W13P2 to A1A1J4(30), and A1W12P1 to A1A1J5(29).

(5) Connect ribbon cable connector A1W8P2 to Distribution CCA connector A1A5J6.

(6) Position the cover assembly onto the top of the TS-4295/G and secure with the 22 captive studs.

k. Removal of Power Supply Assembly.

(1) Loosen 22 captive studs(l) and remove cover assembly(2).

(2) Disconnect Power Supply Assembly cable connector A3P2 (49) from the Distribution CCA connector A1A5J1 (63).

(3) Disconnect Cable Assembly connector W4P2 (44) from Power Supply Assembly cable connector A3P1 (48).

CAUTION

Support Power Supply Assembly firmly when removing retaining screws.

(4) Loosen and remove the six screws (50) from the chassis bottom and remove the Power Supply Assembly (51).

(5) Disconnect ground terminal (23).

(6) Disconnect LCD cable connector DS2P1 (97) from the Power Supply Assembly connector A3A1J2 (52).

(7) Disconnect LCD cable connector DS3P1 (98) from the Power Supply Assembly connector A3A1J1 (53).

(8) Remove Power Supply Assembly from chassis.

l. Installation of Power Supply Assembly.

CAUTION

Care must be exercised when installing the Power Supply Assembly to prevent damage to the wiring running along the side of the chassis.

(1) Position the Power Supply Assembly (51) on top of chassis.

(2) Connect LCD cable connector DS3P1 (98), to the Power Supply Assembly connector A3A1J1 (53).

(3) Connect LCD cable connector DS2P1 (97), to the Power Supply Assembly connector A3AIJ2 (52).

(4) Connect ground terminal (23).

(5) Set the Power Supply Assembly into chassis and attach with six screws(50).

(6) Connect Power Switch Assembly connector W4P2 (44) to Power Supply Assembly cable connector A3P1 (48).

(7) Connect Power Supply cable connector A3P2 (49), to the Distribution CCA connector A1A5J1 (63).

(8) Position the cover assembly (2) onto the top of the TS-4295/G and secure with the 22 captive studs (1).

m. Removal/installation of Miscellaneous Unit Maintenance Items. As the procedures for removing or installing the following items are obvious, no instructions are listed:

(1) Lamp

(2) Fuse

Section III. DIRECT SUPPORT MAINTENANCE

3-7 REPAIR PARTS, SPECIAL TOOLS, TEST MEASUREMENT AND DIAGNOSTIC EQUIPMENT (TMDE) AND SUPPORT EQUIPMENT.

Repair parts, special tools, test measurement and diagnostic equipment (TMDE), and support equipment are listed and illustrated in the Repair Parts and Special Tools List, TM 11-6625-3205-23P, covering unit and direct support maintenance of this equipment.

3-8 TESTING.

The Chassis Assembly and Electronics Subassembly listed in the Maintenance Allocation Chart (MAC), Appendix B, contains the following direct support maintenance items:

a. Power Switch Cable Assembly, P/N A3097901

b. Lamp Cable Assembly, P/N A3097903

c. Fan Cable Assembly, P/l A3097904

d. Panel Assembly, P/N A3097923

e. LCD Display Assembly, P/N A3097929-1

f. LCD Display Assembly, P/N A3097929-2

g. Input Attenuator Assembly, P/N A3097927

h. Distribution CCA, P/N A3097945.

No testing of any of these parts is required prior to installation of the TS-4295/G.

3-9 TROUBLESHOOTING.

Use table 3-1, Power-up Troubleshooting, to troubleshoot the front panel POWER switch and POWER LED.

3-10 DIRECT SUPPORT MAINTENANCE PROCEDURES.

WARNING

Ensure all power is disconnected from the TS-4295/G before performing maintenance.

Direct support maintenance procedures for the TS-4295/G consist of removal and replacement of field repairable parts. Refer to figure FO-3 unless otherwise noted.

a. Removal of TS-4295/G (figure 3-1)). Refer to paragraph 3-6a for removal procedures.

b. Installation of TS-4295/G (Figure 3-1). Refer to paragraph 3-6b for installation procedures.

c. Removal of Power Switch.

(1) Loosen 22 captive studs (1) and remove the cover assembly (2).

(2) Disconnect Power Switch Assembly cable connector W4P1 (43) from AC Power Receptacle and Fuse assemblies cable connector P1 (47).

(3) Disconnect Power Switch Assembly cable connector W4P2 (44) from Power Supply Assembly cable connector A3P1 (48).

(4) Depress both Power Switch Assembly locking wings, located on opposite sides of the Power Switch Assembly (45) against the inner/back surface of the front panel, while simultaneously removing the Power Switch Assembly through the outer/front surface of the front panel (83).

d. Installation of Power Switch.

(1) Insert the Power Switch Assembly (45), cable connectors first, through the outer/front surface of the front panel (83).

(2) Press the Power Switch Assembly (45) into place until its locking wings, located on opposite sides of the Power Switch Assembly, securely lock it in.

(3) Connect cable assembly connector W4P1 (43), Power Switch Assembly cable, to AC Power Receptacle and Fuse assemblies' cable connector P1 (47).

(4) Connect Power Switch Assembly cable connector W4P2(44) to Power Supply Assembly cable connector A3P1(48).

(5) Position the cover assembly (2) on top of the TS-4295/G and secure with the 22 captive studs(1).

e. Removal of Lamp Assembly.

(1) Loosen the 22 captive studs (1) and remove the cover assembly (2).

(2) Disconnect Lamp Assembly cable connector W3P1 (42) from the Distribution CCA connector A1A5J8 (73).

(3) Unscrew the Lamp Assembly (46) lens cap and locking collar located on the front surface of the front panel.

(4) Remove the Lamp Assembly (46) from the back of the front panel (83).

f. Installation of Lamp Assembly.

(1) Insert the Lamp Assembly (46), from the rear surface of the front panel and secure with the locking collar and lens cap.

(2) Connect Lamp Assembly cable connector W2P1 (42), to the Distribution CCA Connector A1A5J8(73).

(3) Position the cover assembly (2) on top of the TS-4295/G and secure with the 22 captive studs (1).

g. Removal of Fan Assembly.

(1) Loosen the 22 captive studs(l) and remove the cover assembly(2).

(2) Disconnect cable assembly connector W2P1 (39) from the Fan Assembly cable connector W5P1 (25).

(3) Loosen and remove the four screws (28), eight washers (29, 37), four lock washers (36), and four nuts (38) and remove the Fan Assembly (33), exit screen (31), screen frame (30), and the fan guard (34).

h. Installation of Fan Assembly.

(1) Position the Fan Assembly (33), the fan guard (34), the exit screen (31) and the screen frame (30), into the chassis assembly.

(2) Make sure the wiring from the fan is positioned between the fan housing and the Quad Detector Module.

(3) Secure with four screws (28), eight washers (29, 37), four lockwashers (36) and four nuts (38).

(4) Connect cable assembly connector W2P1 (39) to Fan Assembly cable connector W5P1 (25).

(5) Position the cover assembly (2) on top of the TS-4295/G and secure with the 22 captive studs(1).

i. Removal of Input Attenuator.

(1) Loosen the 22 captive studs(l) and remove the cover assembly (2).

(2) Disconnect cable assembly connector A1W5P2 from Input Attenuator connector A1A6J3 (75).

(3) Disconnect cable assembly connector A1W1P2 from Input Attenuator connector A1A6J1 (77).

(4) Disconnect cable assembly connector A1W1OP2 from Input Attenuator connector A1A6J2 (82).

(5) Loosen thumb screws (76) and lift Input Attenuator out of mounting bracket attached to chassis.

j. Installation of Input Attenuator.

(1) Set Input Attenuator onto chassis mounting bracket and secure with the two thumb screws (76).

(2) Connect cable assembly connector AIW1OP2 to Input Attenuator connector A1A6J2 (82).

(3) Connect cable assembly connector A1W1 P2 to Input Attenuator connector A1A6J1 (77).

(4) Connect cable assembly connector A1W5P2 to Input Attenuator connector A1A6J3 (75).

(5) Position the cover assembly (2) on top of the TS-4295/G and secure with the 22 captive studs(l).

k. Removal of Distribution Circuit Card Assembly (CCA).

(1) Loosen the 22 captive studs(l) and remove the cover assembly (2).

(2) Disconnect Power Supply cable connector A3P2 (49) from CCA connector A1A5J1 (63).

(3) Disconnect cable assembly connector A1W2P2 from CCA connector A1A5J3 (64).

(4) Disconnect cable assembly connector A1W4P2 from CCA connector A1A5J4 (65).

(5) Disconnect cable assembly connector W2P2 from CCA connector A1A5J2 (66).

(6) Disconnect cable assembly connector A1W9P2 from CCA connector A1A5J5 (67).

(7) Disconnect cable assembly connector A1W8P2 from CCA connector A1A5J6 (68).

(8) Disconnect cable assembly connector A1W5P1 from CCA connector A1A4J7 (72).

(9) Disconnect Lamp Assembly connector W3P1 (42) from CCA connector A1A5J8 (73).

(10) Disconnect cable assembly connector A1W10P1 from A1A2J1 on the IF/Combiner(9).

(11) Disconnect cable assembly connector A1W1 P2 from Input Attenuator connector A1A6J1(77).

(12) Disconnect cable assembly connector A1W1 P1(60) from Modulator Module connector A1A4J8.

(13) Loosen and remove six screws (69), washers (70), and lockwashers (71) and remove the Distribution CCA (62).

l. Installation of Distribution Circuit Card Assembly (CCA).

(1) Position the Distribution CCA (62) into chassis and secure with six lockwashers (71), washers (70), and screws (69).

(2) Connect cable assembly connector A1W1P1 (60) to Modulator Module connector A1 A4J8.

(3) Connect cable assembly connector A1W1P2 to Input Attenuator connector A1A6J1(77).

(4) Connect cable assembly connector A1W10P1(18) to J2 on the IF/Combiner Module(9).

(5) Connect Lamp Assembly connector W3P1 (42) to CCA connector A1A5J8 (73).

(6) Connect cable assembly connector A1W5P1 to CCA connector A1A5J7 (72).

(7) Connect cable assembly connector A1W8P2 to CCA connector AIA5J6 (68).

(8) Connect cable assembly connector A1W9P2 to CCA connector A1A5J5 (67).

(9) Connect cable assembly connector A1W2P2 to CCA connector A1A5J2 (66).

(10) Connect cable assembly connector A1W4P2 to CCA connector A1A5J4 (65).

(11) Connect cable assembly connector A1W2P2 to CCA connector A1A5J3 (64).

(12) Connect Power Supply cable connector A3P2 (49) to CCA connector A1A5J1 (63).

(13) Position the cover assembly (2) on top of the TS-4295/G and secure with the 22 captive studs (1).

m. Removal of Liquid Crystal Displays (LCD).

(1) Loosen 22 captive studs(l) and remove cover assembly(2).

(2) Remove Power Supply Assembly per paragraph 3-6k.

(3) Removal of LCD2.

(a) Disconnect cable assembly connector W1P3 from LCD2 connector DS3J1 (91).

(b) Loosen and remove four screws (88), washers (89), and lockwashers (90).

(c) Cut and remove cable ties.

(d) Remove LCD2 (87).

(4) Removal of LCDI.

(a) Disconnect cable assembly connector W1 P2 from LCD1 connector DS2J1 (92).

(b) Loosen and remove four screws (95), washers (94), and lockwashers (93).

(c) Cut and remove cable ties.

(d) Remove LCD1 (96).

n. Installation of Liquid Crystal Displays (LCD)

(1) Installation of LCD1.

(a) Position LCD1 (96) onto rear of front chassis and secure with four lockwashers (93), washers (94), and screws (95).

(b) Connect cable assembly connector W1 P2 to LCDI connector DS2J1 (92).

(c) Install cable ties.

(2) Installation of LCD2.

(a) Position LCD2 (87) onto rear of front chassis and secure with four lockwashers (90), washers (89), and screws (88).

(b) Connect cable assembly connector W1P3 to LCD2 connector DS3J1 (91).

(c) Install cable ties.

(3) Install Power Supply Assembly per paragraph 3-6I.

(4) Position cover assembly (2) on top of TS-4295/G and secure with the 22 captive studs(1).

o. Removal of Front Panel Assembly

(1) Loosen 22 captive studs(l) and remove cover assembly(2).

(2) Disconnect Power Switch Assembly cable connector W4PI (43) from AC Power Receptacle cable connector P1 (47).

(3) Disconnect Power Switch Assembly cable connector W4P2 (44) from Power Supply cable connector A3P1 (48).

(4) Disconnect Lamp Assembly cable connector W3P1 (42) from Distribution CCA connector A1A5J8 (73).

(5) Disconnect cable assembly connector W1 P4 from keypad connector A2J1 (86).

(6) Loosen and remove six self-locking nuts (85) and washers (84).

(7) Remove Front Panel Assembly (83).

NOTE

When replacing damaged Front Panel Assembly, remove and retain the Power Switch Assembly, Lamp Assembly, and handles as they are not supplied as part of a new Front Panel Assembly.

p. Installation of Front Panel Assembly.

(1) Install the Power Switch Assembly, Lamp Assembly and handles that were removed from the damaged Front Panel Assembly.

(2) Position the Front Panel Assembly (83) in front of the chassis and feed the Power Switch Assembly and Lamp Assembly cables and connectors into the chassis.

(3) Secure the Front Panel Assembly to the chassis with six washers (84) and self-locking nuts (85).

(4) Connect cable assembly connector W1P4 to keypad connector A2J1 (86).

(5) Connect Lamp Assembly cable connector W3P1 (42) to Distribution CCA connector A1A5J8 (73).

(6) Connect Power Switch Assembly cable connector W4P2 (44) to Power Supply cable connector A3P1 (48).

(7) Connect Power Switch Assembly cable connector W4P1 (43) to AC Power Receptacle cable connector P1 (47).

(8) Position the cover assembly(2) on top of the TS-4295/G and secure with the 22 captive studs(1).

q. Removal/Installation of Miscellaneous Direct Support Maintenance Items. As the procedures for removing/installing the following items are obvious, no instructions are listed:

(1) Mounting Bars

(2) Slide Mounting Block

(3) Chassis Slide

(4) Handles

(5) Power Cord

APPENDIX A

REFERENCES

A-1 INTRODUCTION

This appendix lists all forms, field manual and technical manuals referenced in, or required for use with this technical manual.

A-2 FORMS

Equipment Inspection and Maintenance Worksheet ..... DA Form 2404

Product Quality Deficiency Report ..... Form SF 368

Transportation Discrepancy Report (TDR) ..... Form SF 361

Recommended Changes to Equipment Technical Publications ..... DA Form 2028-2

Recommended Changes to Publications and Blank Forms ..... DA Form 2028

Maintenance Request ..... DA Form 2407

Report of Discrepancy (ROD) ..... SF 364

A-3 TECHNICAL MANUALS

Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command) ..... TM 750-244-2

Unit and Direct Support Maintenance Repair Parts and Special Tools List for Test Set, Modem TS-4295/G ..... TM 11-6625-3205-23P

A-4 MISCELLANEOUS PUBLICAITONS

Consolidated index of Army Publications and Blank Forms ..... DA PAM 25-30

The Army Maintenance Management System (TAMMS) ..... DA Pam 738-750

Painting and Preservation Supplies Available for Field Use for Electronic Command Equipment SB-11-573

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

Section I. INTRODUCTION

B-1 GENERAL.

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance categories.

b. The Maintenance Allocation Chart (MAC) in section II designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component will be consistent with the capacities and capabilities of the designated maintenance categories.

c. Section III lists the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from section II.

d. Section IV contains supplemental instructions and explanatory notes for a particular maintenance function.

B-2 MAINTENANCE FUNCTIONS.

A detailed explanation of maintenance functions as they apply to the TS-4295/G Modem Test Set are as follows:

a. *Inspect* - To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. *Test*- To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. *Replace* - To substitute a serviceable like type part, subassembly, or module for an unserviceable counterpart.

d. *Repair*- The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, etc.) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, assembly, subassembly, module, end item, or system.

e. *Overhaul*- That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards in appropriate technical publications (i.e., DMWR).

B-3 EXPLANATION OF COLUMNS IN THE MAC, SECTION II.

a. *Column 1, Group Number*. Column 1 lists functional group code numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the next higher assembly. End item group number shall be "00".

b. *Column 2, Component/Assembly*. Column 2 contains the names of components, assemblies, subassemblies and modules for which maintenance is authorized.

c. *Column 3, Maintenance Function*. Column 3 lists the functions to be performed on the item listed in Column 2. (For detailed explanation of these functions, see paragraph B-2).

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a work time figure in the appropriate subcolumn(s), the category of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate work time figures will be shown for each category. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. The symbol designations for the various maintenance categories are as follows:

C.....Operator or crew

O.....Organizational Maintenance

F .....Direct Support Maintenance

H.....General Support Maintenance

L .....Specialized Repair Activity (SRA)

D.....Depot Maintenance

e. Column 5, Tools and Equipment. Column 5 specifies, by code, those common tool sets (not individual tools) and special tools, TMDE, and support equipment required to perform the designated function.

f. Column 6, Remarks. This column shall, when applicable, contain a letter code, in alphabetic order, which shall be keyed to the remarks contained in Section IV.

B-4 EXPLANATION OF COLUMNS IN TOOLS AND TEST EQUIPMENT REQUIREMENTS, SECTION III.

a. Column 1, Reference Code. The tool and test equipment reference code correlates with a code used in the MAC, Section II, Column 5.

b. Column 2, Maintenance Category. The lowest category of maintenance authorized to use the tool or test equipment.

c. Column 3, Nomenclature. Name or identification of the tool or test equipment.

d. Column 4, National Stock Number. The National stock number of the tool or test equipment.

e. Column 5, Tool Number. The manufacturer's part number.

B-5 EXPLANATION OF COLUMNS IN REMARKS, SECTION IV.

a. Column 1, Reference Code. The code recorded in column 6, Section II.

b. Column 2, Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART FOR TS-4295/G MODEM TEST SET

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT	(6) REMARKS
00	Eb/No MODEM TEST SET, TS-4295/G	INSPECT		0.1					C
		TEST		0.1			0.2	7,8	B, E
		REPLACE		0.1				2	
		REPAIR					0.3	1-8	
		OVERHAUL					2.0	1-8	
01	CHASSIS ASSEMBLY	TEST		0.1					
		REPAIR		0.2			0.3	1,2	D
0101	POWER SUPPLY A3	TEST		0.1					A
		REPLACE		0.1				2	
		REPAIR					1.0	1,2	
02	ELECTRONIC SUBASSEMBLY A1	TEST					0.2		
		REPAIR		0.4			0.2		F
0201	PROCESSOR MODULE A1A1	INSPECT					0.4		A
		TEST					0.8	1-7,9	B
		REPLACE		0.2				2	
		REPAIR					1.0	2	
0202	IF/COMB MODULE A1A2	INSPECT					0.4	1-7,10	A
		TEST					0.8		B
		REPLACE		0.2				2	
		REPAIR					1.0	2	
0203	QUAD DETECTOR MODULE A1A3	INSPECT					0.4	1-7,11	A
		TEST					0.8		B
		REPLACE		0.2				2	
		REPAIR					1.0	2	
0204	MODULATOR MODULE A1A4	INSPECT					0.4	1-7,12	A
		TEST					0.8		B
		REPLACE		0.2				2	
		REPAIR					1.0	2	

Section III. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR TS-4295/G MODEM TEST SET

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE LEVEL	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O, F, D	AN/PSM-45A DIGITAL MULTIMETER	6625-01-139-2512	T00377 (56026)
2	0, F, D	TC-100/ST TOOL KIT, ELECTRONIC EQUIPMENT	5180-01-046-4980	TC-100/ST (96508)
3	D	SIGNAL GENERATOR	6625-01-209-2468	8656B (28480)
4	D	LOGIC ANALYZER	6625-01-209-2606	1631D (28480)
5	D	RF POWER METER	6625-01-203-0541	438A (28480)
6	D	POWER SENSOR	6625-01-015-4412	8482A (28480)
7	D	AUTOMATIC TEST EQUIPMENT	(TBD)	(TBD)
8	D	TEST PROGRAM SET (FOR Eb/No MODEM TEST SET)	(TBD)	(TBD)
9	D	TEST PROGRAM SET (PROCESSOR MODULE)	(TBD)	(TBD)
10	D	TEST PROGRAM SET (I/F COMBINER MODULE)	(TBD)	(TBD)
11	D	TEST PROGRAM SET (QUAD DETECTOR MODULE)	(TBD)	(TBD)
12	D	TEST PROGRAM SET (MODULATOR MODULE)	(TBD)	(TBD)

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	DEPOT INSPECT HOURS INCLUDES TIME TO PERFORM RECEIVING, IN-PROCESS, AND OUT-GOING INSPECTIONS.
B	TEST HOURS INCLUDES INCOMING TEST TO VERIFY REPORTED DISCREPANCY AND TEST TO VERIFY REPAIR CORRECTED PROBLEM
C	ORGANIZATION LEVEL MAINTENANCE PERSONNEL SHOULD INSPECT THE CONNECTOR(S) DURING THE PERFORMANCE OF REPLACE MAINTENANCE AND VERIFY CONNECTOR PINS ARE NOT FUNCTION TO CHECK FOR CRACKED CONNECTORS RECESSED.
D	REPAIR OF THE CHASSIS INCLUDES REPLACEMENT OF THE POWER SWITCH ASSEMBLY, LAMP ASSEMBLY, FAN ASSEMBLY, PANEL ASSEMBLY, AND LCD DISPLAYS AT DIRECT SUPPORT LEVEL. CABLES ARE REPLACED AT DEPOT LEVEL ORGANIZATIONAL LEVEL TESTING OF THE TS-4295/G IS COMPRISED OF BUILT-IN-TEST (BIT) ONLY.
E	REPAIR OF THE ELECTRONIC SUBASSEMBLY AT DIRECT SUPPORT INCLUDES REPLACEMENT OF MODULE MOUNTING BARS, INPUT ATTENUATOR AND DISTRIBUTION CCA. DEPOT REPAIR IS PRIMARILY CABLE ASSEMBLIES
F	REPAIR OF THE ELECTRONIC SUBASSEMBLY AT DIRECT SUPPORT INCLUDES REPLACEMENT OF MODULE MOUNTING BARS, INPUT ATTENUATOR AND DISTRIBUTION CCA. DEPOT REPAIR IS PRIMARILY CABLE ASSEMBLIES.

APPENDIX C

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

C-1 SCOPE.

This appendix lists expendable supplies and materials you will need to operate and maintain the test set. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to your by CTA 50-970, Expendable/Durable Items (Except Medical, Class V, Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

C-1 EXPLANATION OF COLUMNS.

a. Column 1, Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., Use cleaning compound, item 2, appx C).

b. Column 2, Level. This column identifies the lowest level of maintenance that requires the listed item.

O - Organizational Maintenance
F - Direct Support Maintenance

c. Column 3, National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column 4, Description. Indicates the Federal item name and, as required, a description to identify the item. The last line for each item indicates the Federal supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column 5, Unit of Measure (U/M) Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. Expendable/Durable Supplies and Materials List

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C	6810-00-753-4993	Alcohol,. Isopropyl (81348) TTI-735	CN
2	C	7920-00-101-6686	Brush, Bristle (30239) BTS-4	EA
3	C	8305-00-222-2423	Cloth, Lint-Free	YD

GLOSSARY

A/D ..... Analog-to Digital
AC ..... Alternating Current
BIT ..... Built-in-Test
BPS ..... Bits-per-Second
BPSK ..... Binary Phase Shift Keying
C/kT ..... Carrier-to Noise Density
CAL ..... Calibrate
CCA ..... Circuit Card Assembly
CE ..... Constant Envelope
CF ..... Center Frequency
CLK ..... Clock
CW ..... Continuous Wave
dB ..... Decibel
dBM ..... Decibel referred to a Milliwatt
DC ..... Direct Current
DIFF ..... Differential
DMWR ..... Depot Maintenance Work Requirement
DR ..... Data Rate
DSCS ..... Defense Satellite Communications System
EbNo ..... Energy-per-BIT to Noise Power Density
EIR ..... Equipment Improvement Recommendation
ESD ..... Electrostatic Sensitive Device
EXT ..... External
FCN ..... Function
FE ..... Framing Error
FL ..... Filter
FSCM ..... Federal Supply Code for Manufacturers
Hz ..... Hertz
I/O ..... Input/Output
IAW ..... In Accordance with
IF ..... Intermediate Frequency
INT ..... Internal
LCD ..... Liquid Crystal Display
LED ..... Light Emitting Drode
LO ..... Local Oscillator

GLOSSARY

LOC/R.....Local/Remote
LRU .....Line Replaceable Unit
MAC..... Maintenance Allocation Chart
MB/S.....Megabits per Second
MDCS..... Maintenance Data Collection Subsystem
MHz ..... Megahertz
MTS.....Modem Test Set
OE .....Overrun Error
OQPSK.....Offset Quadrature Phase Shift Keying
PE.....Parity Error
PMCS .....Preventive Maintenance Checks and Services
PWRIN .....Power Input
QPSK.....Quadrature Phase Shift Keying
RAND .....Randomizer
ROD..... Report of Discrepancy
SEL..... Select
SENU..... Spectrum Efficient Network Unit
SIGOUT.....Signal (Power) Output
STAT .....Status
TDR ..... Transportation Discrepancy Report
TMDE .....Test Measurement and Diagnostic Equipment
T.O ..... Technical Order
U/M .....Unit of measure
UUT .....Unit Under Test
VAC .....Volts Alternating Current
VDC.....Volts Direct Current
VSWR.....Voltage Standing Wave Ratio

ALPHABETICAL INDEX

Subject, Para.

ALPHABETICAL INDEX

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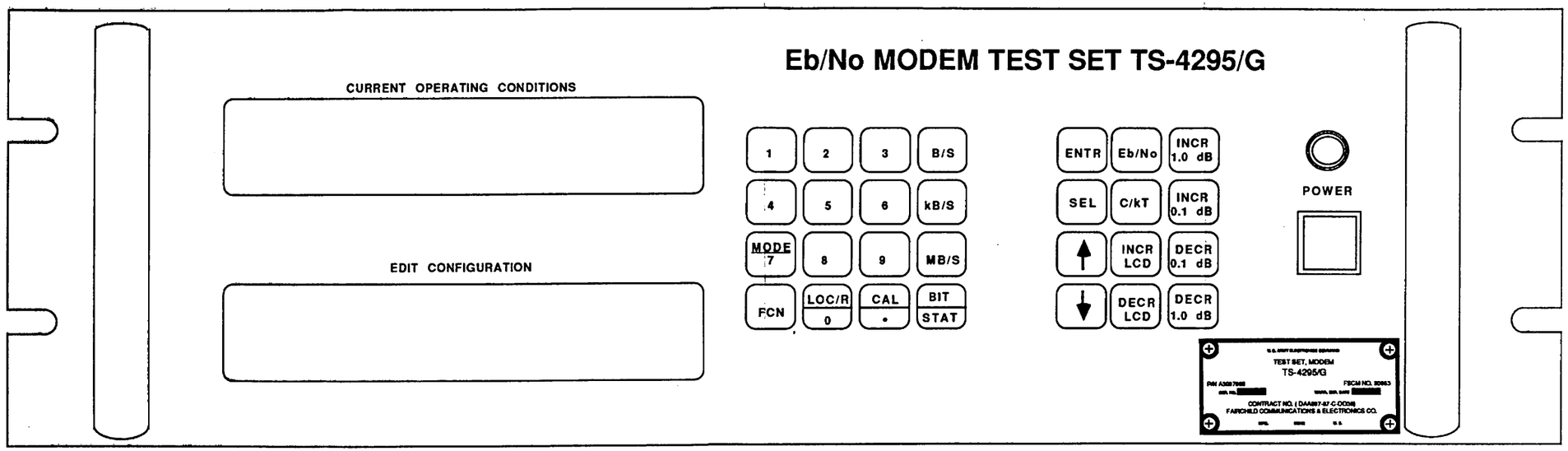

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Figure FO-1. TS-4295/G Front Panel

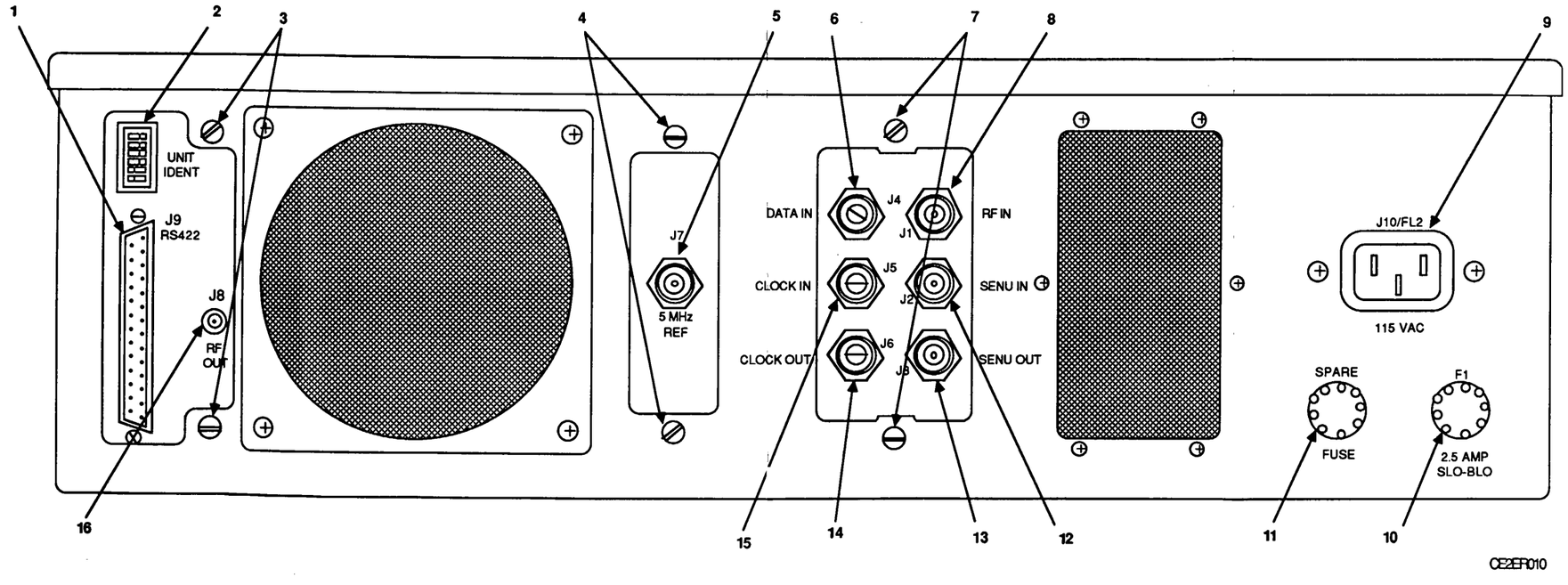


Figure FO-2. Rear Panel Controls and Connectors

LEGEND;

1. FASTENER (22)
2. COVER ASSEMBLY
3. MODULATOR MODULE
4. CONNECTOR, A1W7P1
5. CONNECTOR, A1W12P2
6. CONNECTOR, A1W11P2
7. CONNECTOR, A1W3P2
8. QUAD DETECTOR MODULE
9. IF/COMBINER MODULE
10. PROCESSOR MODULE
11. CONNECTOR, A1W13P1
12. CONNECTOR, A1W7P2
13. CAPTIVE SCREW (2)
14. CONNECTOR, A1W1P1
15. CONNECTOR, A1W12P1
16. CONNECTOR, A1W13P2
17. CONNECTOR, A1W6P2
18. CONNECTOR, A1W10Pi
19. CONNECTOR, A1W9P1
20. CONNECTOR, A1W81P1
21. CONNECTOR, W1P1
22. CAPTIVE SCREW (1)
23. GROUND TERMINAL
24. CAPTIVE SCREW (2)
25. CONNECTOR, WSP1
26. REAR PANEL
27. CAPTIVE SCREW (2)
28. SCREW (4)
29. WASHER (4)
30. SCREEN FRAME
31. EXIT SCREEN
32. CAPTIVE SCREW (2)
33. FAN
34. FAN GUARD
35. MOUNTING BAR
36. LOCKWASHER (4)
37. WASHER (4)
38. NUT (4)
39. CONNECTOR, W2P1
40. MOUNTING BAR
41. MOUNTING BAR
42. CONNECTOR, W3P1
43. CONNECTOR, W4P1
44. CONNECTOR, W4P2
45. POWER SWITCH ASSEMBLY
46. LAMP ASSEMBLY
47. AC RECEPTACLE
48. CONNECTOR, A3P1
49. CONNECTOR, A3P2
50. SCREW (6)
51. POWER SUPPLY
52. CONNECTOR, A3A1J2
53. CONNECTOR, A3A1J1
54. CAPTIVE SCREW (2)
55. CAPTIVE SCREW (2)
56. CAPTIVE SCREW (2)
57. CONNECTOR, A1W4P1
58. CONNECTOR, A1W2P1
59. CONNECTOR, A1W3P1
60. CONNECTOR, A1W1P1
61. CONNECTOR, A1W6P1

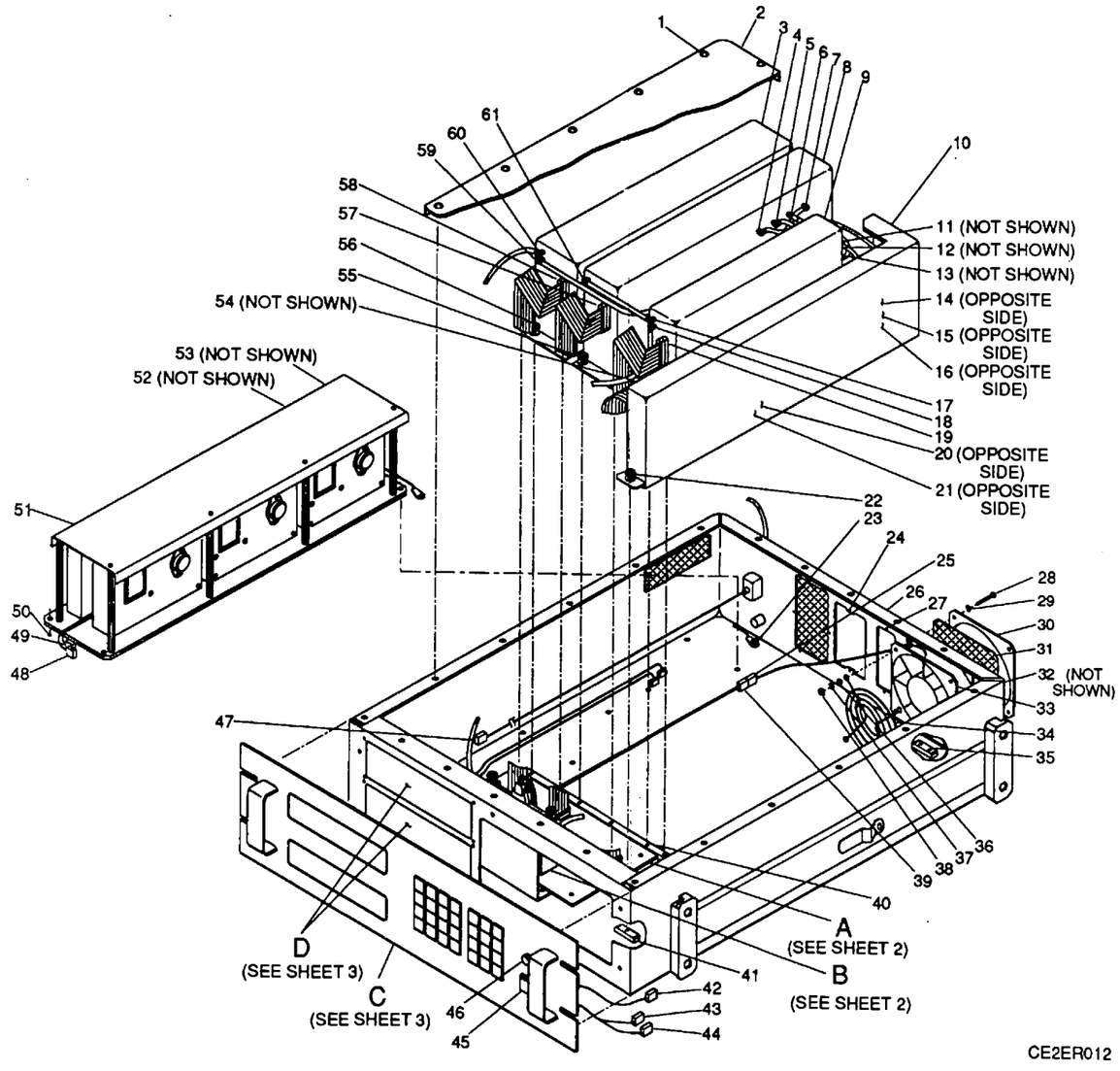
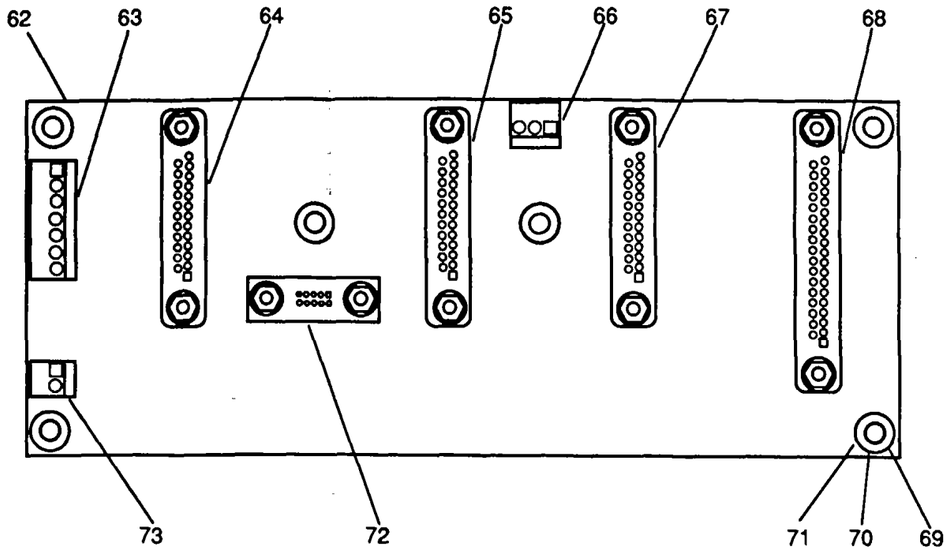


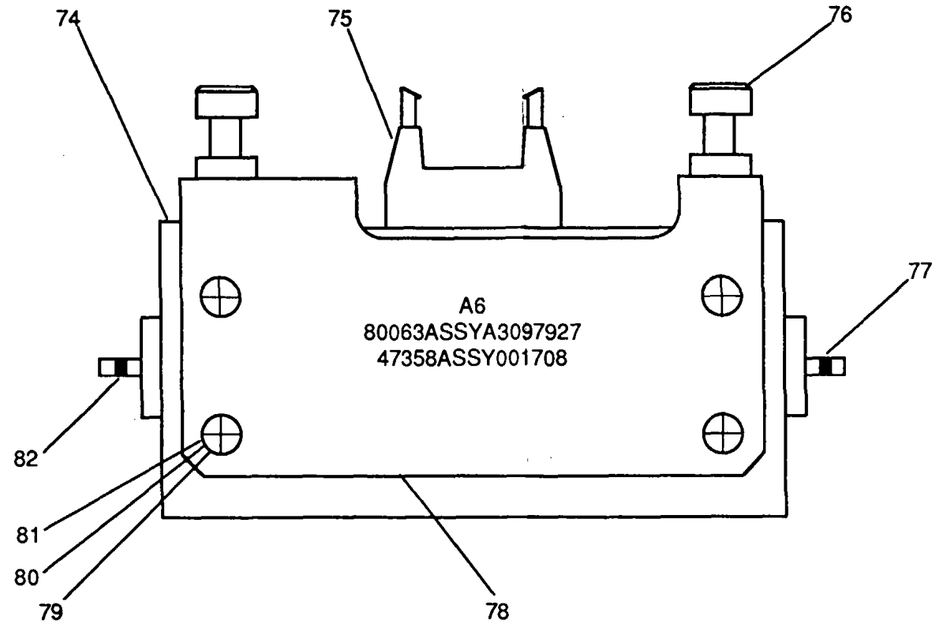
Figure FO-3. TS-4295/G Exploded View (Sheet 1 of 3)



LEGEND:

62. DISTRIBUTION CCA
63. CONNECTOR, A1A5J1
64. CONNECTOR, A1A5J3
65. CONNECTOR, A1A5J4
66. CONNECTOR, A1A5J2
67. CONNECTOR, A1A5J5
68. CONNECTOR, A1A5J6
69. SCREW (6)
70. WASHER (6)
71. LOCKWASHER (6)
72. CONNECTOR ,A1A5J7
73. CONNECTOR, A1A5J8

A **DISTRIBUTION CCA CONNECTORS**

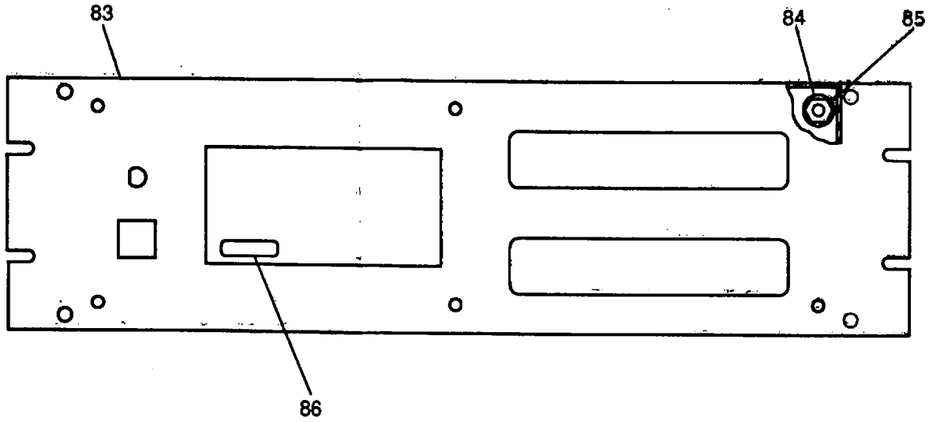


LEGEND:

74. INPUT ATTENUATOR
75. CONNECTOR, A1A6J3
76. THUMB SCREW (2)
77. CONNECTOR, A1A6J1
78. MOUNTING BRACKET
79. SCREW (4)
80. WASHER (4)
81. LOCKWASHER (4)
82. CONNECTOR, A1A6J2

B **INPUT ATTENUATOR**

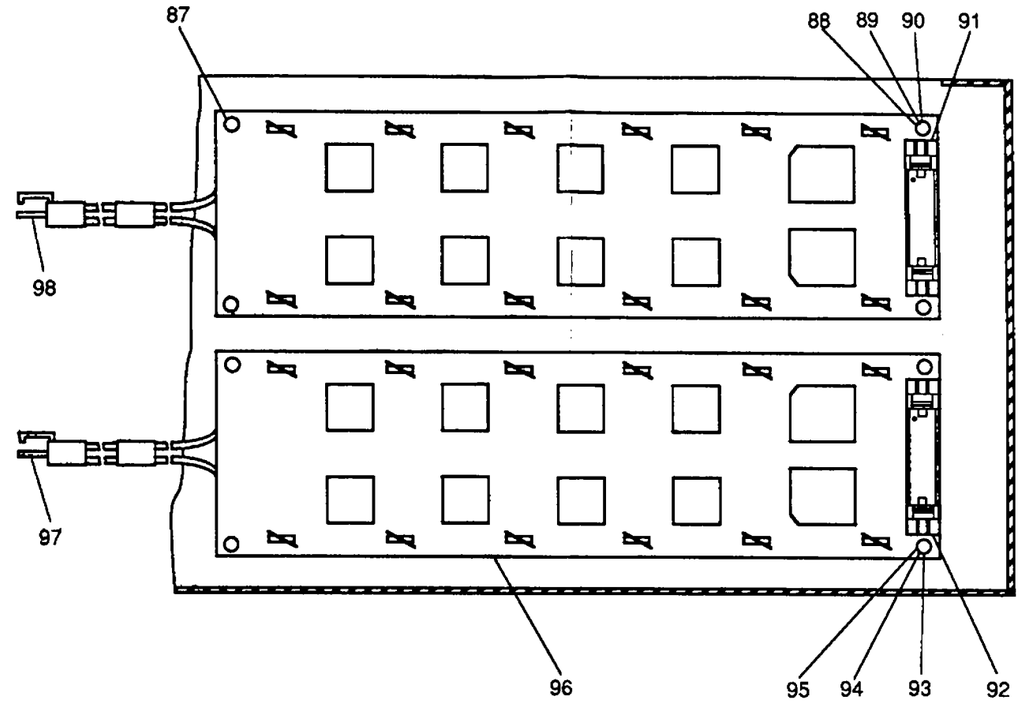
Figure FO-3. TS-4295/G Exploded View (Sheet 2 of 3)



LEGEND

83. FRONT PANEL ASSEMBLY
84. WASHER (6)
85. SELF-LOCKING NUT (6)
86. CONNECTOR, A2J1

C **REAR VIEW OF FRONT PANEL ASSEMBLY**



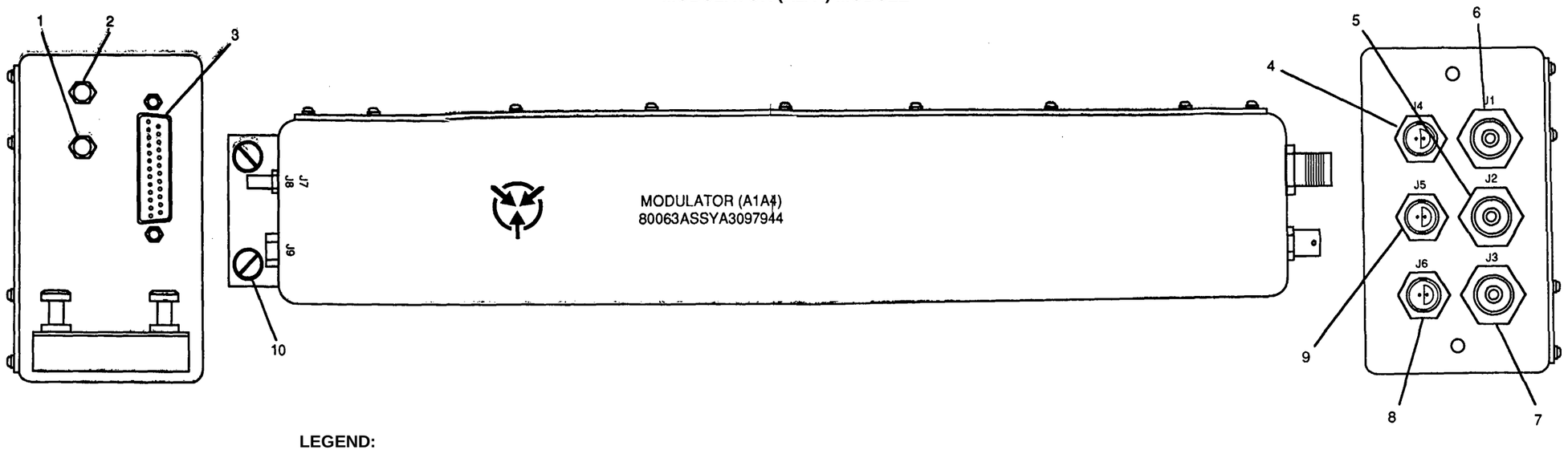
LEGEND:

87. LIQUID CRYSTAL DISPLAY, LCD2
88. SCREW (4)
89. WASHER (4)
90. LOCKWASHER (4)
91. CONNECTOR, DS3J1
92. CONNECTOR, DS2J1
93. LOCKWASHER (4)
94. WASHER (4)
95. SCREW (4)
96. LIQUID CRYSTAL DISPLAY, LCD1
97. CONNECTOR, DS2P1
98. CONNECTOR, DS3P1

D **REAR VIEW OF LCD'S INSIDE CHASSIS FRONT**

Figure FO-3. TS-4295/G Exploded View (Sheet 3 of 3)

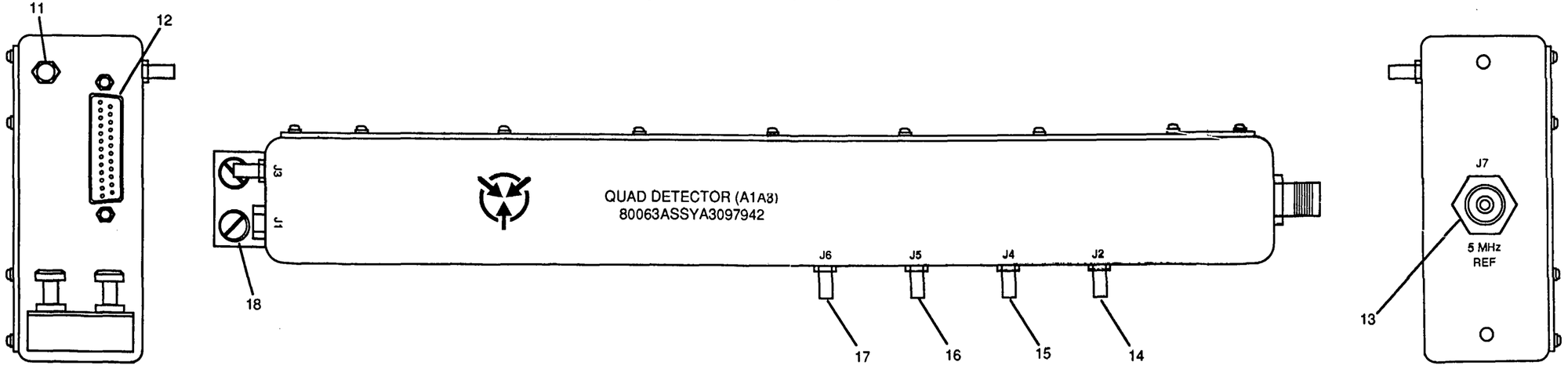
MODULATOR (A1A4) MODULE



LEGEND:

1. CONNECTOR A1A4J8
2. CONNECTOR A1A4J7
3. CONNECTOR A1A4J9
4. CONNECTOR A1A4J4
5. CONNECTOR A1A4J2
6. CONNECTOR A1A4J1
7. CONNECTOR A1A4J3
8. CONNECTOR A1A4J6
9. CONNECTOR AIA4J5
10. CAPTIVE SCREW (2)

QUAD DETECTOR (A1A3) MODULE



LEGEND:

11. CONNECTOR A1A3J3
12. CONNECTOR A2A3J1
13. CONNECTOR A2A3J7
14. CONNECTOR A2A3J2
15. CONNECTOR A2A3J4
16. CONNECTOR A1A3J5
17. CONNECTOR A1A3J6
18. CAPTIVE SCREW (2)

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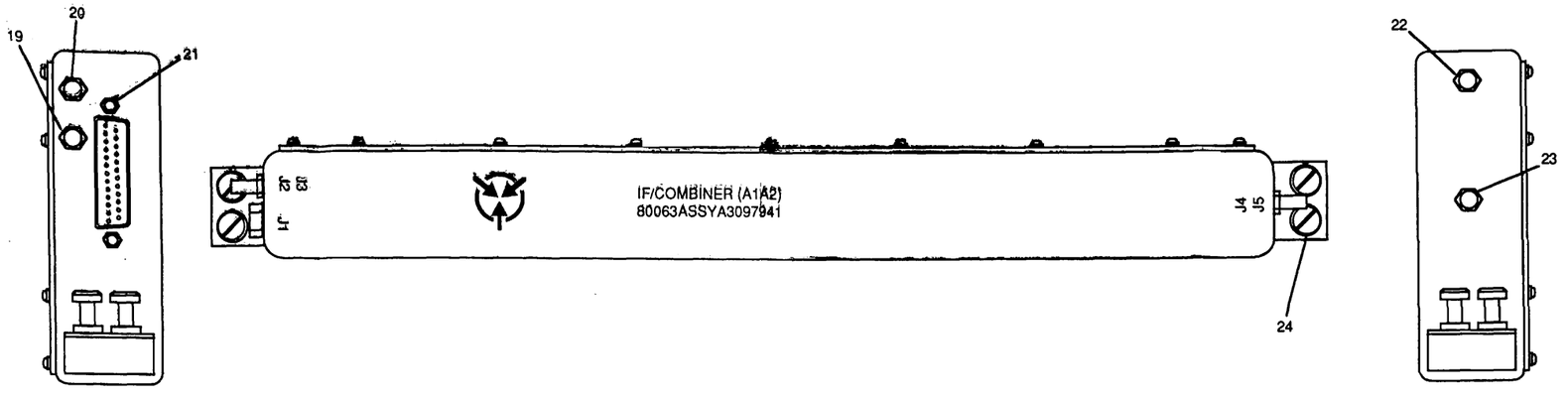
Figure FO-4. Module Connectors and Captive Screws (Sheet 1 of 2)

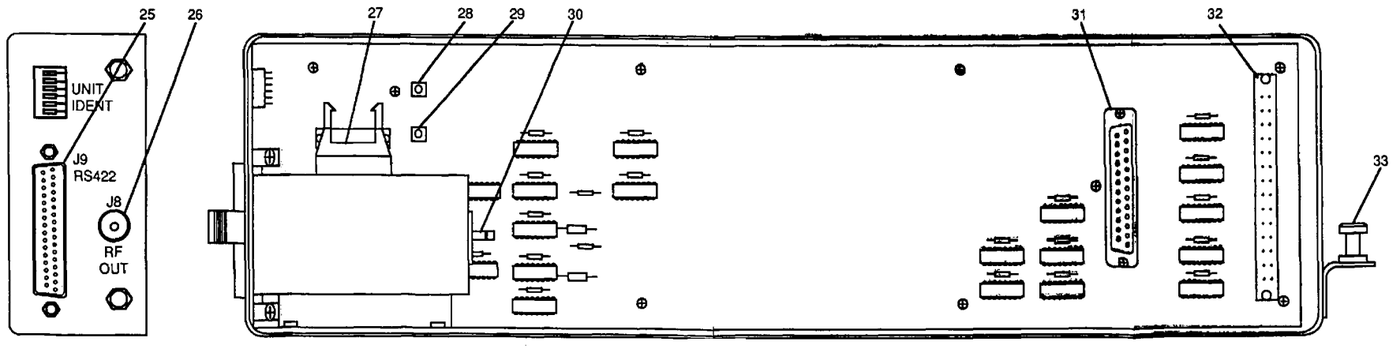
IF/COMBINER(A1A2) MODULE



LEGEND:

19.	CONNECTOR A1A2J2	22.	CONNECTOR A1A2J4
20.	CONNECTOR A1A2J3	23.	CONNECTOR A1AWJ5
21.	CONNECTOR A1A2J1	24.	CAPTIVE SCREW (4)

PROCESSOR(A1A1) MODULE



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LEGEND:

25.	CONNECTOR A1A1J9	28.	CONNECTOR A1A1J6	31.	CONNECTOR A1A1J1
26.	CONNECTOR A1A1J8	29.	CONNECTOR A1A1J5	32.	CONNECTOR A1A1J2
27.	CONNECTOR A1A1J3	30.	CONNECTOR A1A1J4	33.	CAPTIVE SCREW (1)

Figure FO-4. Module Connectors and Captive Screws (Sheet 2 of 2)

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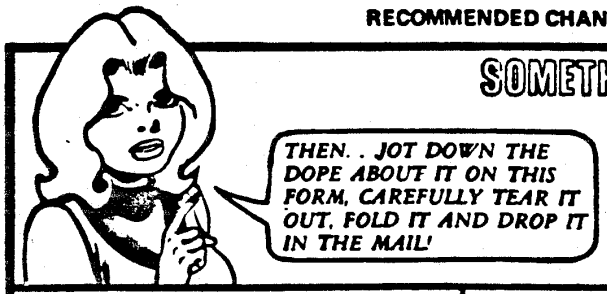

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