TECHNICAL MANUAL

OPERATOR'S AND UNIT MAINTENANCE MANUAL

FOR

OPTICAL FIBER TEST SET

TS-4320(P)/G

(NSN 6625-01-355-4087) (EIC:N/A)

HEADQUARTERS, DEPARTMENT OF THE ARMY
15 SEPTEMER 1993

TM 11-6625-3271-12
C1

CHANGE
No. 1

Headquarters
Department of the Army
Washington, D.C., 30 September 2005

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2. This change implements Army Maintenance Transformation and changes the Maintenance Allocation Chart (MAC) to support Field and Sustainment Maintenance.

3. File this change sheet in front of the publication for reference purposes.

Remove Pages	**Insert Pages**
None	E/(F blank)
i, ii	i, ii
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TM 11-6625-3271-12
C1

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0526505

Distribution:

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

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

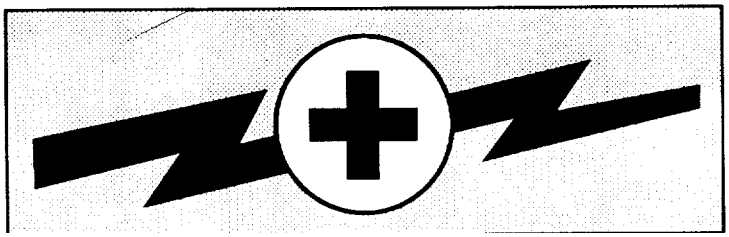
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A 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



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 administrating first aid. When technicians are aided by operators, they must warn them 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 touching 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-volts ac input when installing or operating the equipment.

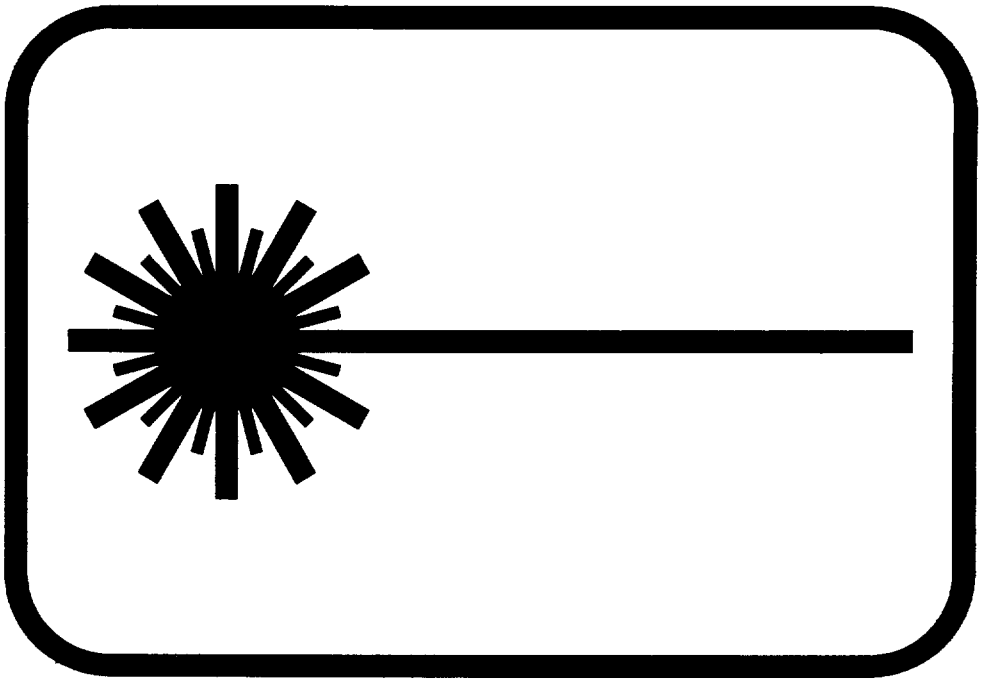
To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The instrument is equipped with a three conductor ac power cable. The power cable must either be plugged into an approved three contact electrical outlet or used with a three contact to two adapter with a grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet. The power jack and mating plug of the power cable must meet International Electrotechnical Commission (IEC) safety standards.

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.



WARNING

LASER RADIATION

Infrared radiation is produced at the fiber connection port on the right side of the front cover and at the end of unterminated optical fibers that are attached to this port. Avoid long, direct exposure to the light that comes from these sources.

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

LIST OF EFFECTIVE PAGES

NOTE

ON CHANGED PAGES, THE PORTION OF THE TEXT AFFECTED BY THE LATEST CHANGE IS INDICATED BY A VERTICAL LINE OR OTHER CHANGE SYMBOLS IN THE OUTER MARGIN OF THE PAGE.

Date of issue for original and changed pages are:

Original	0	15 SEP 1993
Change	1	30 SEP 2005

Total number of pages in this publication is 181 consisting of the following:

* Zero in this column indicates an original page.

ARMY

Technical Manual
No. 11-6625-3271-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 September 1993

OPERATOR'S AND UNIT MAINTENANCE MANUAL FOR OPTICAL FIBER TEST SET TS-4320(P)/G (NSN 6625-01-355-4087) (EIC: N/A)

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 back of this manual direct to: Commander, U. S. Army Communications-Electronics Command, ATTN: AMSEL-LC-LM-LT, Fort Monmouth, New Jersey 07703-5007.

In either case, a reply will be furnished to you.

TABLE OF CONTENTS - Continued

HOW TO USE THIS MANUAL

This manual tells about the Optical Fiber Test Set TS-4320(P)/G and contains instructions about how to use it during maintenance on fiber optical cable.

When first receiving the TS-4320(P)/G, start at the front of the manual and go all the way through to the back. Become familiar with every part of the manual and the TS-4320(P)/G.

This manual has an edge index which will help find specific information in a hurry. Simply spread the pages on the right edge of the manual until the printed blocks can be seen. Open the manual where the block on the edge of the page lines up with the selected topic printed on the front cover block.

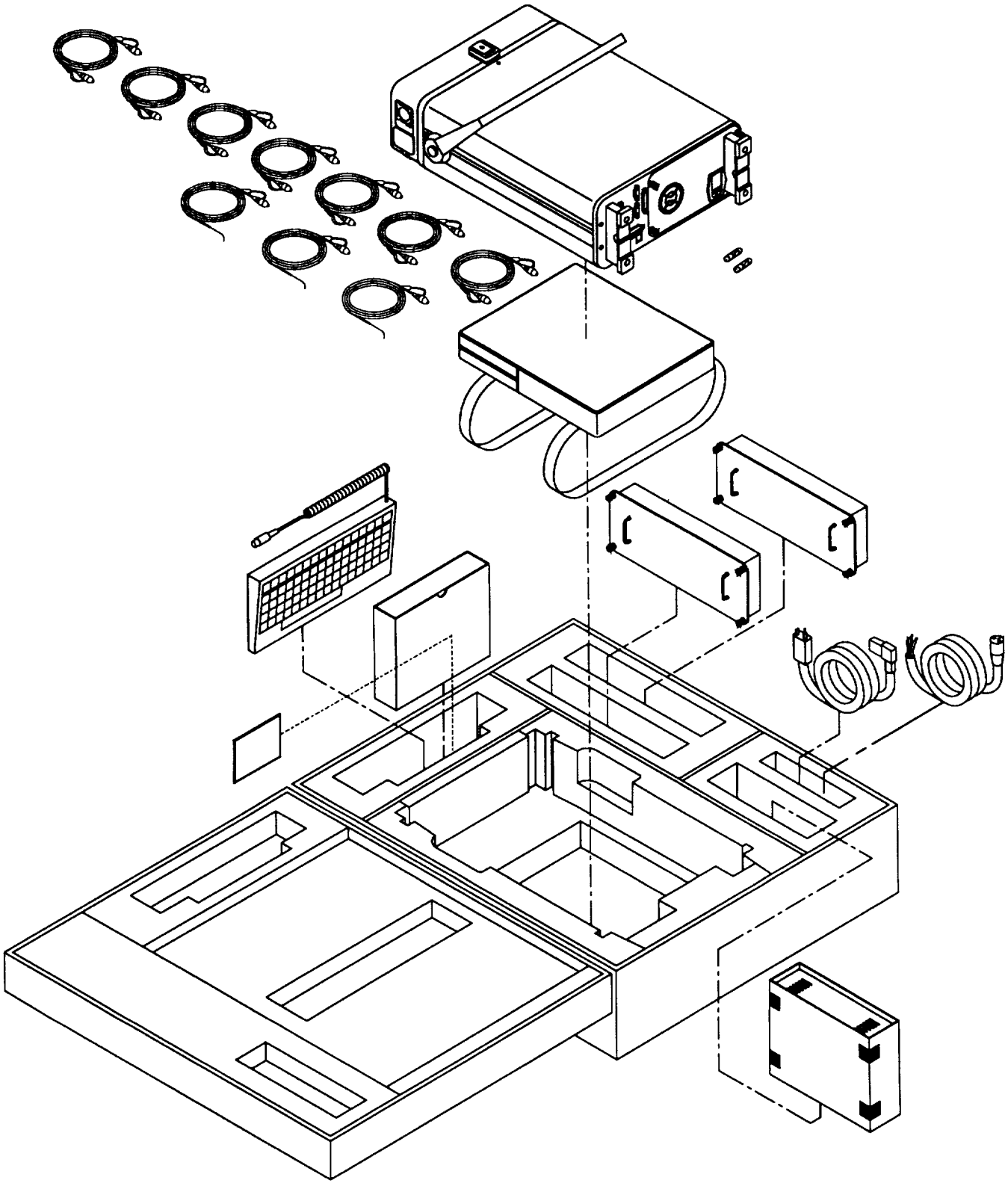


Figure 1-1. Optical Fiber Test Set TS-4320 (P)/G.

CHAPTER 1

INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE.

a. Type of Manual: Operator's and Unit Maintenance Manual.

b. Model Number and Equipment Name: Optical Fiber Test Set TS-4320(P)/G (fig. 1-1).

c. Purpose of Equipment: Test fiber optic cable.

1-2. 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.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS.

a. Reports of Maintenance and Unsatisfactory Equipment. Department of Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738750, as contained in Maintenance Management Update.

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.

1-4. DESTRUCTION OF ARMY ELECTRONICS MATERIEL TO PREVENT ENEMY USE.

Destruction of Army materiel to prevent enemy use is described in TM 750-244-2.

1-5. ADMINISTRATIVE STORAGE.

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness.

1-6. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your TS-4320(P)/G 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, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-ED-CFO, Fort Monmouth, New Jersey 07703-5023. We'll send you a reply.

1-7. WARRANTY INFORMATION.

The TS-4320(P)/G is warranted by Laser Precision Corporation for two years. Warranty starts on the date of shipment to the original buyer. Report all defects in material or workmanship to your supervisor, who will take appropriate action.

1-8. NOMENCLATURE CROSS REFERENCE LIST.

Common names will be used when the Optical Fiber Test Set TS-4320(P)/G is mentioned in this manual.

Common Name	*Official Nomenclature*
Optical Time Domain Reflectometer (OTDR)	Optical Fiber Test Set TS-4320(P)/G
TS-4320 (P)/G	Optical Fiber Test Set TS-4320(P)/G
TS-4320	Optical Fiber Test Set TS-4320(P)/G

Section II. EQUIPMENT DESCRIPTION AND DATA

1-9. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES.

a. CHARACTERISTICS.

- CRT for information display.
- Visual characteristic of fiber under test.
- Singlemode or Multimode operation.
- Softkey control allows for easy operation of equipment.
- LED indicators on front panel for constant equipment status.
- Interactive HELP display.
- Programmable interface for remote operation.
- Programmable interface for printer operation.
- Keyboard for entering header data.
- Image storage to RAM Card.
- Self test confirms operational status.
- Error messages define incorrect operating procedures.
- Designed for bench top use.
- Operates on AC or DC power.

b. CAPABILITIES AND FEATURES.

- Distance from origin measurement.
- Distance between points measurement.
- Loss between points measurement.
- Average loss measurement.
- Splice loss measurement.
- Reflectance measurement.
- Fiber trace storage.
- Fiber trace retrieval.
- Fiber trace printout.
- Fiber trace overlay.

1-10. EQUIPMENT DATA.

WEIGHTS AND DIMENSIONS

TS-4320(P)/G

Weight	32.5 lbs (14.74 Kg)
Length	22.1 5 in (56.26 cm)
Width	16.3 in (41.40 cm)
Height	6.5 in (16.51 cm)

WEIGHTS AND DIMENSIONS - Continued

Inverter

Weight	12 lbs (5.44 Kg)
Length	8 in (20.32 cm)
Width	10 in (25.4 cm)
Height	3 in (7.62 cm)

Transit Case with all items

Weight	104.0 lbs (47.164 Kg)
Length	33.0 in (83.82 cm)
Width	29.0 in (73.66 cm)
Height	12.0 in (30.48 cm)

POWER REQUIREMENTS

Voltage:

100 Vac operation	90 to 110 Vac
120 Vac operation	103 to 127 Vac
220 Vac operation	193 to 237 Vac
240 Vac operation	207 to 253 Vac

Frequency	50, 60 or 400 Hz
Power	95 VA maximum

Fuse Rating:

100/120 Vac operation	2.0 amp, SLO-BLO, 250 volt
220/240 Vac operation	1.5 amp, SLO-BLO, 250 volt

POWER REQUIREMENTS
(INVERTER)

Voltage:

12 Vdc operation	10 to 15 Vdc
24 Vdc operation	20 to 28 Vdc
28 Vdc operation	28 to 32 Vdc

Recommended Minimum Load	25 VA
Overload and Reverse Polarity	Protected

Fuse Rating:

Input	30 amp
Output	3 amp SLO-BLO

ENVIRONMENTAL

Operating temperature range	+14°F to +131°F (-10°C to +55°C)
Storage temperature range	+14°F to +131°F (-10°C to +55°C)
Relative humidity:	
86°F (30°C)	95% maximum
104°F (40°C)	75% maximum
122°F (50°C)	45% maximum
Operating altitude	0 to 15,000 ft (4,570 meters)
Storage altitude	0 to 15,000 ft (4,570 meters)
Vibration	3 g
Shock	40 g

PERFORMANCE

Resolution	
Readout Resolution	0.1 m
Display Resolution	0.01 dB
Index of Refraction	Five significant digits, with range 1.0001 to 1.9999 digital entry; values retained in non volatile memory for each optical module.
Distance Accuracy	0.01% ± Distance Sampling ± Index Uncertainty

TD260C, Multimode, Wavelength 850 ±20 nm

Pulse Width	Short
Dynamic Range	10 dB
Attenuation Dead Zone	4 m
Spatial Resolution	3 m
Pulse Width	Medium
Dynamic Range	18 dB
Attenuation Dead Zone	20 m
Spatial Resolution	18 m
Pulse Width	Long
Dynamic Range	22 dB
Attenuation Dead Zone	290 m
Spatial Resolution	270 m

PERFORMANCE - Continued

TD261C, Multimode, Wavelength 1300 ±20 nm

Pulse Width	Short
Dynamic Range	5 dB
Attenuation Dead Zone	30 m
Spatial Resolution	3 m
Pulse Width	Medium
Dynamic Range	14 dB
Attenuation Dead Zone	30 m
Spatial Resolution	18 m
Pulse Width	Long
Dynamic Range	22 dB
Attenuation Dead Zone	290 m
Spatial Resolution	270 m

TD285C, Singlemode, Wavelength 1310 ±20 nm

Pulse Width (Short)	Short
Dynamic Range	10 dB
Attenuation Dead Zone	18 m
Spatial Resolution	13 m
Pulse Width	Medium
Dynamic Range	18 dB
Attenuation Dead Zone	120 m
Spatial Resolution	110 m
Pulse Width	Long
Dynamic Range	26 dB
Attenuation Dead Zone	1200 m
Spatial Resolution	1180 m

TD285C, Singlemode, Wavelength 1550 ±30 nm

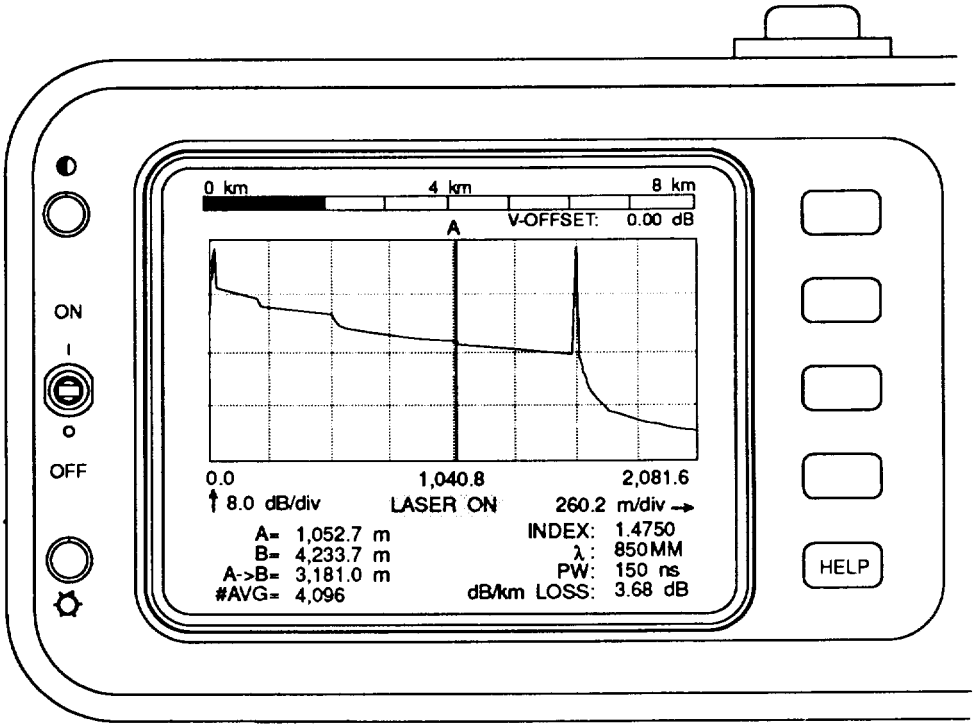
Pulse Width	Short
Dynamic Range	10 dB
Attenuation Dead Zone	18 m
Spatial Resolution	11 m
Pulse Width	Medium
Dynamic Range	16 dB
Attenuation Dead Zone	130 m
Spatial Resolution	120 m
Pulse Width	Long
Dynamic Range	23 dB
Attenuation Dead Zone	1200 m
Spatial Resolution	1180 m

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-11. FUNCTIONAL DESCRIPTION OF EQUIPMENT OPERATION.

The TS-4320(P)/G measures fiber optic cable and connector loss by analyzing the backscatter power detected at the launch end of the cable. Backscattering in a fiber optic cable, is the result of Rayleigh scattering and Fresnel reflections. Rayleigh scattering is caused by inhomogenities in the fiber cable. Fresnel reflections are the result of changes in the index of refraction at splices, connections, and fiber ends (i.e. broken cables, fiber ends).

The TS-4320(P)/G consists of an optical transmitter and receiver, central processing unit, data acquisition section, and a display. The TS-4320(P)/G operates by firing short pulses of light into the fiber and analyzing the light (Rayleigh scattering and Fresnel reflections) reflected back to the detector. This backscatter information is presented in the form of a trace profile on the display. Illustrated below is the TS-4320(P)/G front panel and trace. The TS-4320(P)/G screen displays power (dB) vertically and distance horizontally. The attenuation of the fiber appears on the display as a gentle downward sloping line from left to right. The decrease in the slope is proportionate to the amount of attenuation in the fiber. Spikes, or reflections, appearing on the display are a result of Fresnel reflections. Gradual drop-offs in the trace, or steps, are typically the result of fusion splices or macrobending.



Distances to features on the trace are calculated by:

$$D = Ct/2n$$

where D is the distance along the fiber, C is the speed of light, t is the round-trip travel time of the input pulse, and n is the index of refraction.

1-12. FUNCTIONAL BLOCK DIAGRAM.

The block diagram (fig. 1-2) gives the basic organization of the TS-4320(P)/G.

(1) A laser in the optical module is pulsed to send a burst of energy down the fiber under test. Rayleigh backscatter light and reflections from imperfections and joints are recorded as a function of time. By observing the amplitude of light which is reflected back toward the detector, and knowing at what time the reflected light is received with respect to when the pulse was sent, a determination can be made as to the amount of power loss in the line, and where the losses occur.

Rayleigh backscatter is caused by intrinsic spatial variations in the index of refraction of the fiber and fluctuations in the doping material. It is inversely proportional to the fourth power of the wavelength used. It accounts for most of the power loss in the fiber. Other types of scatter loss include loss from micro bending, core-cladding interface scattering, and fiber imperfections.

Anywhere a fiber is joined to another fiber there is a loss of power. The better the splice, the less loss that will be incurred. Most mechanical splices create a reflection of part of the power passing through the splice. These reflections can be identified on the instrument as large positive spikes in the data displayed.

The laser and detector are coupled to the fiber to be tested by an optical directional coupler. Light passed into the coupler by any of the leads is distributed evenly among the remaining leads.

A Photo Diode Detector is used to sense the amount of light returning from the laser pulse. The detector acts as a light controlled current source. The output current is amplified, at the Pre-Amp stage, before passing to the Analog-to-Digital (A/D) Converter.

(2) The A/D converter digitizes the Detector output and feeds it to a 16K x 24 bit Accumulator on the Data Acquisition System (DAS). The A/D converter is also controlled by the DAS.

(3) Timing is critical, as the pulse of light sent down a fiber must have enough time to travel the full length of the fiber and back before the laser is fired again. Furthermore, the laser must be fired as many times in a second as possible, to maximize the number of times the data points will be averaged to create a display. Averaging reduces displayed noise so that a clear, detailed image of the fiber profile is achieved.

The Accumulator produces a running average of the Detector output after the laser has fired. This data is then available to the Central Processor Unit (CPU).

The function of the Data Acquisition System is to:

- Provide main timebase in the TS-4320(P)/G
- Contain 16K x 24 bit Accumulator
- Control pulsing of the laser
- Sample A/D Converter

In turn, the DAS is controlled by the CPU, which commands the DAS as to when to start a laser fire/data acquisition cycle.

(4) All activity in the TS-4320(P)/G is coordinated by the CPU. The I/O Interfaces, Display Control, Data Acquisition, Memory Card Interface and other sections of the instrument communicate through the CPU.

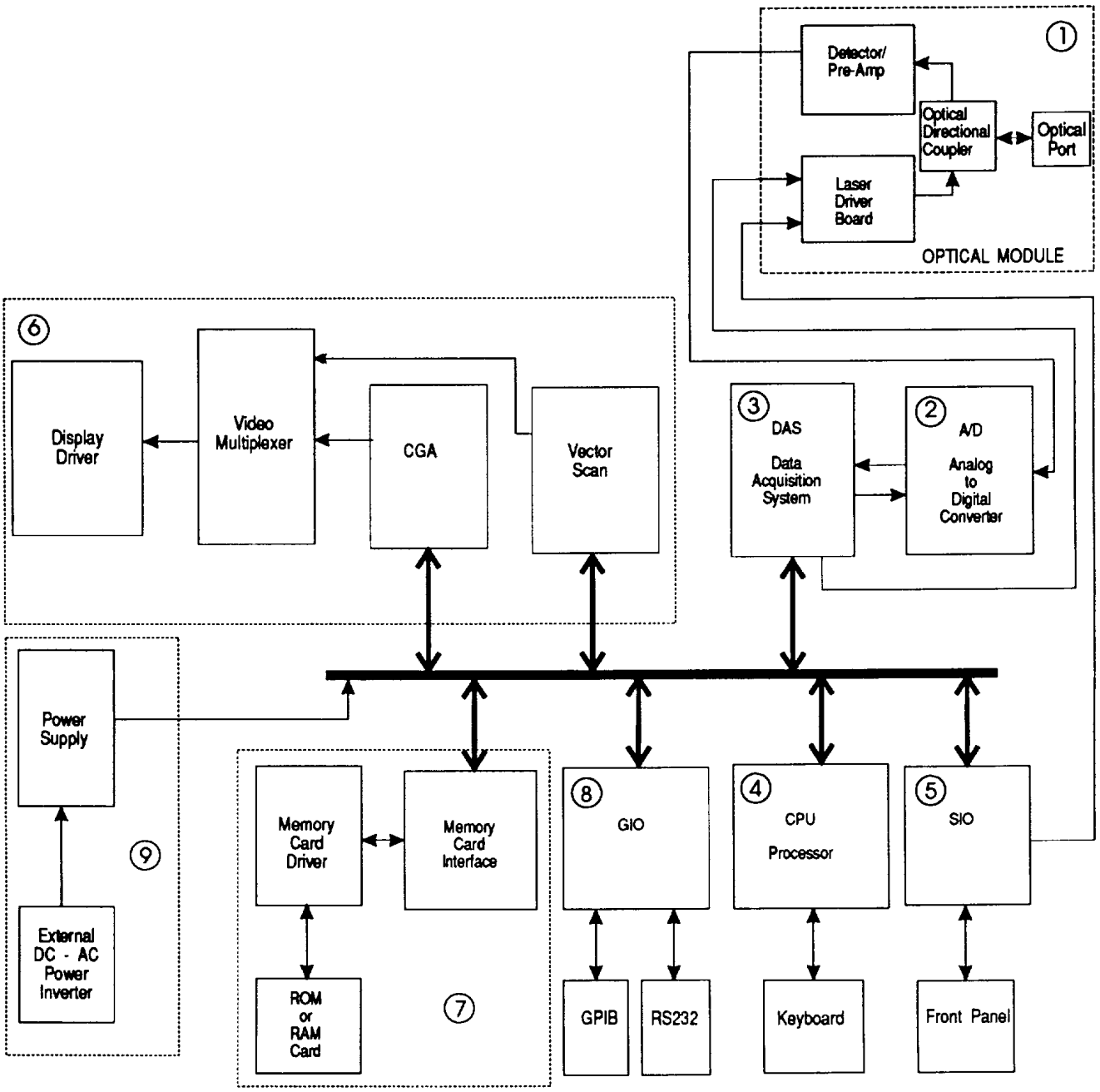


Figure 1-2. Optical Fiber Test Set TS-4320 (P)/G Functional Block Diagram.

(5) The Special Input/Output (SIO) acts as a medium through which the Front Control Panel (FCP) interfaces to the CPU. The FCP interacts directly with the user. The SIO interface contains non-volatile memory used for storing various system parameters.

(6) Also governed by the CPU are the Vector Scan and Color Graphics Adapter (CGA) which pass video and timing signals through the Video Multiplexer, to the Display Driver, to the CRT. A Video Out signal is created by the Video Multiplexer, providing a connection for an external monitor.

(7) Backup program loading and trace image output are provided through the Memory Card Interface, under control of the CPU. Should the system software be destroyed the software can be reloaded from the PROGRAMMED ROMCARD. When required, a trace can be stored in a RAM Card for later evaluation.

(8) The CPU connects to IEEE-488 and RS-232C interfaces, via the General Input/Output (GIO) interface, available from ports at the rear of the unit.

(9) Power is supplied to the TS-4320(P)/G by a 90-135/180-260 Volt, single phase, 47-63 and 400 Hz nominal, power supply. In addition, an external DC/AC inverter connected to a +12, +24, +28 Volt DC source can supply the 120 Volt AC input to the power supply.

CHAPTER 2
OPERATING INSTRUCTIONS

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

2-1. INTRODUCTION.

This section describes all of the operator controls, indicators, and connectors for the TS-4320(P)/G. Due to the large number of controls, indicators, and connectors on the front panel, it is necessary to separate the panel into six portions. Figure 2-1 shows each portion of the front panel. The rear panel is shown in Figure 2-2. The DC/AC inverter is shown in figure 2-3.

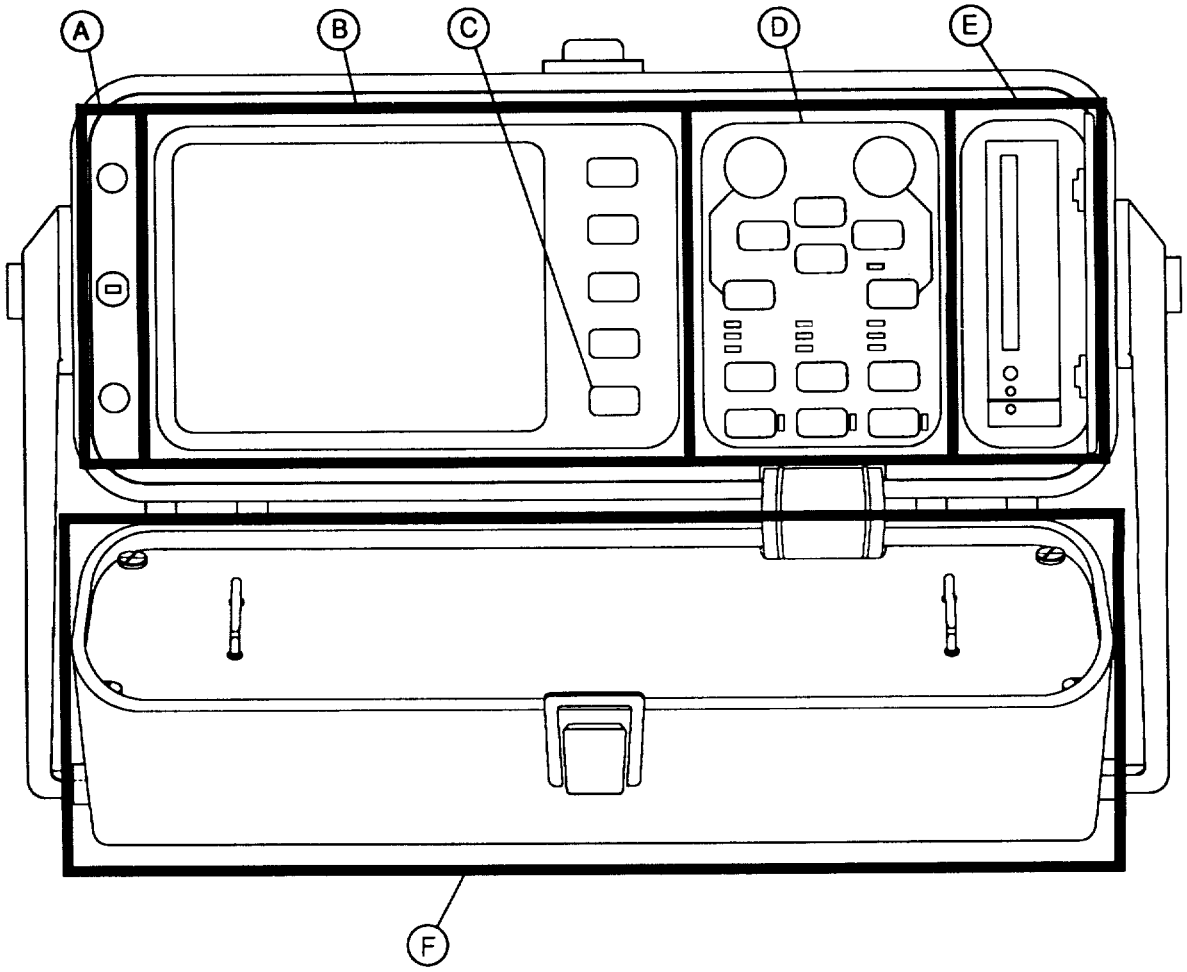
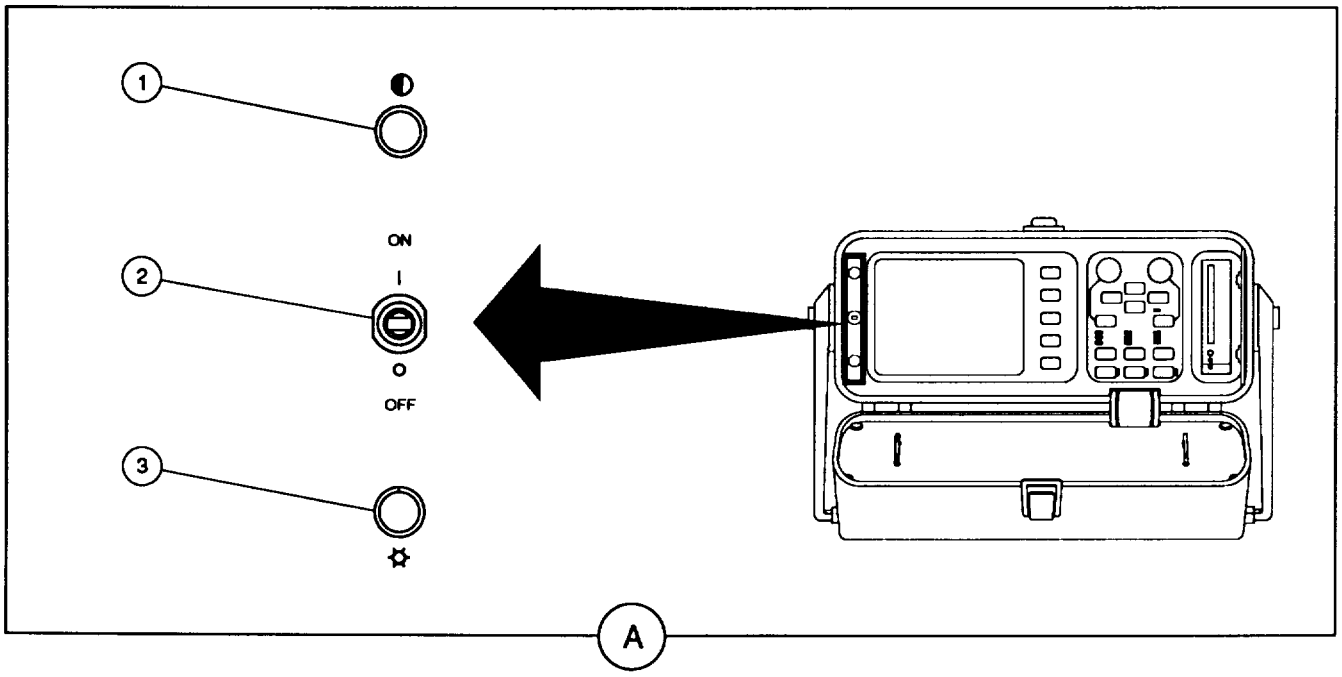
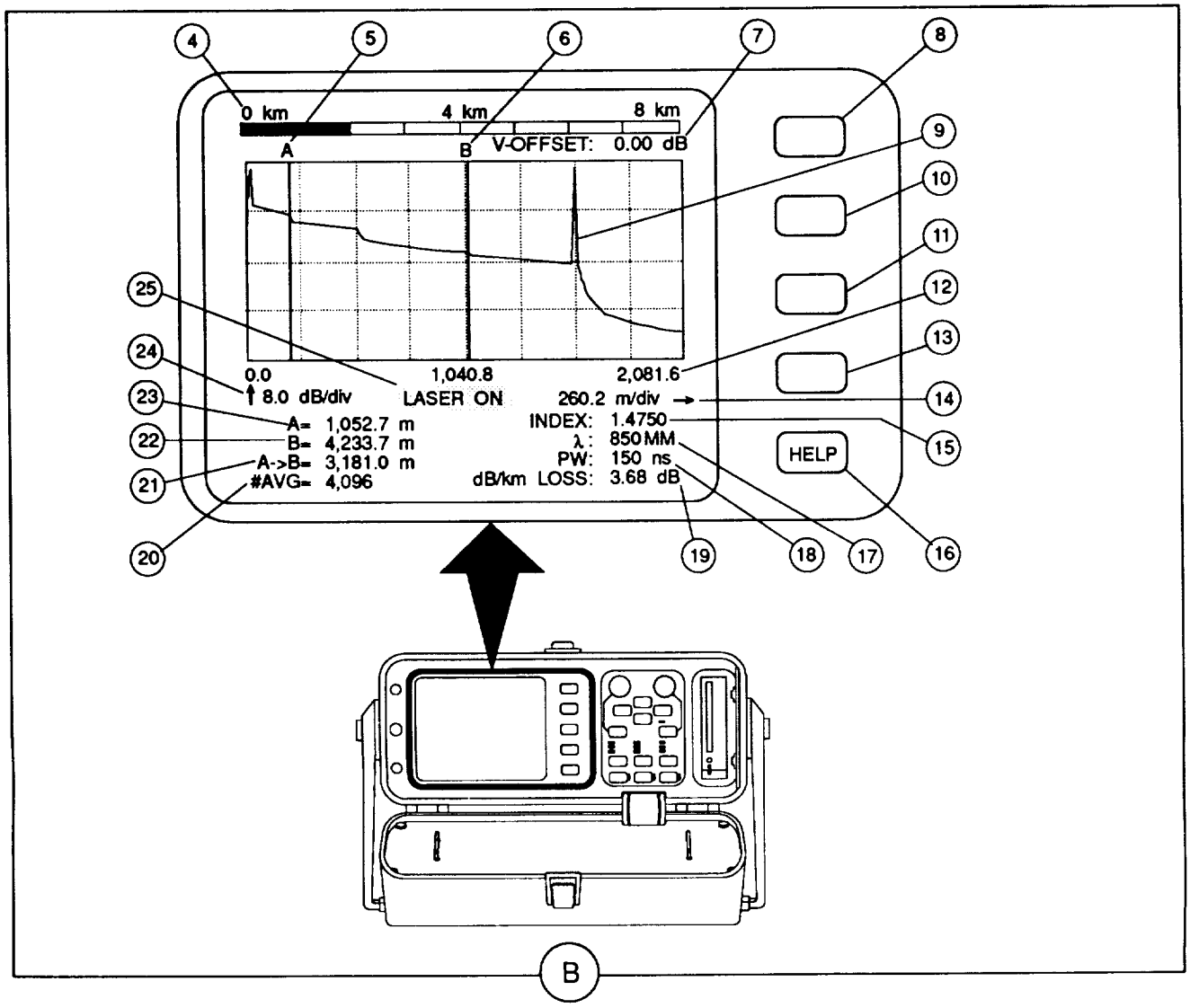


Figure 2-1. Operator's Controls, Indicators, and Connectors, front view.



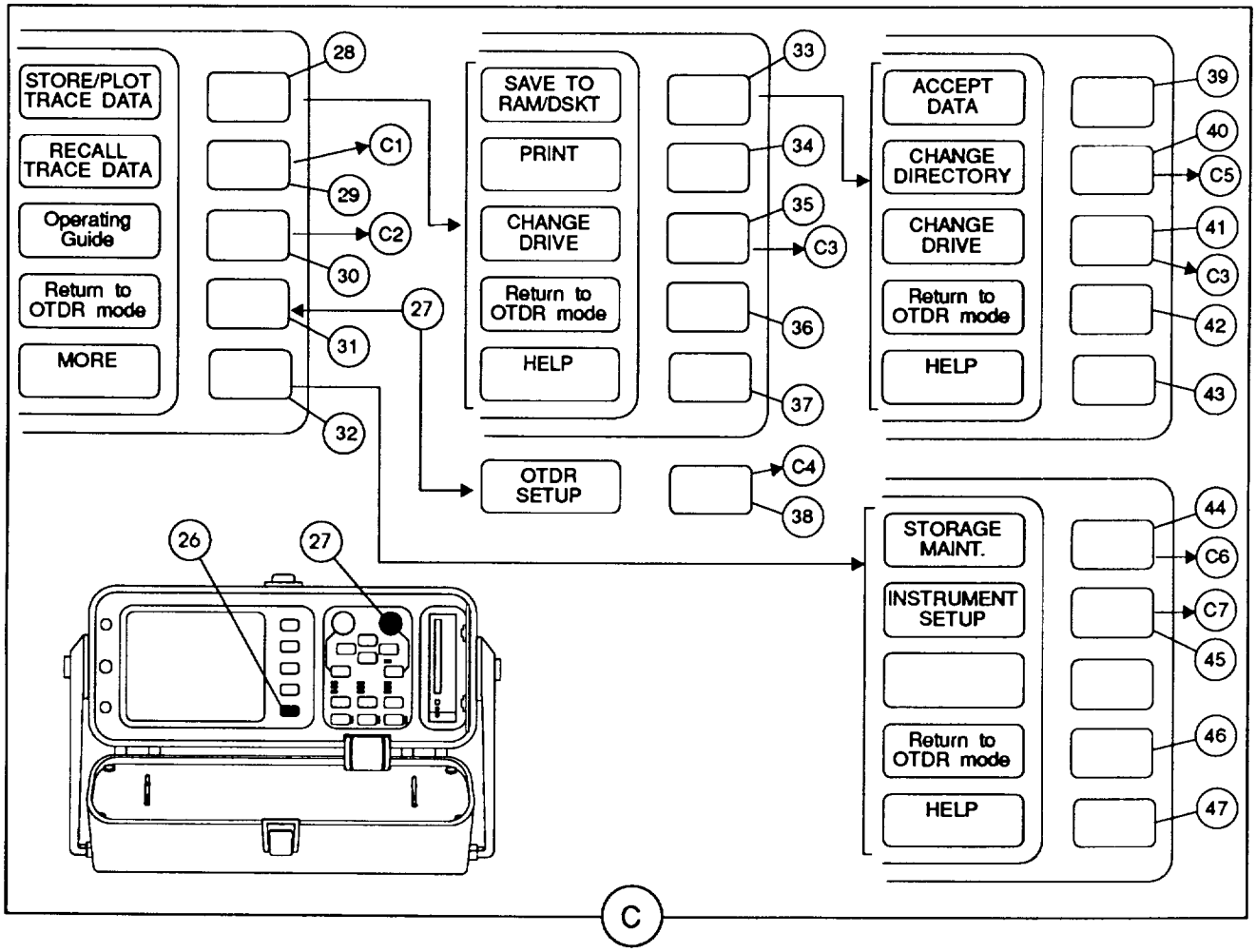
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
1	Character Intensity Control knob	Used to adjust the relative brightness of highlighted text. Turn clockwise to increase brightness. Turn counterclockwise to decrease brightness
2	Power switch	Used to turn the TS-4320 ON (1) or OFF(0). ON when switch is up, OFF when switch is down.
3	Display Brightness Control knob	Turn clockwise to increase display brightness. Turn counterclockwise to decrease brightness.



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
4	Display Window locator	A grid line representing the beginning, mid-point, and maximum range of the OTDR. A bright bar shows the location and range that the display represents.
5	CURSOR A	A movable, vertical line used to mark the location of features. Moved by rotating the CURSOR A knob (354).
6	CURSOR B	A movable, vertical line used to mark a location to the right (further down the fiber) of CURSOR A. Moved by rotating the CURSOR B knob (355).

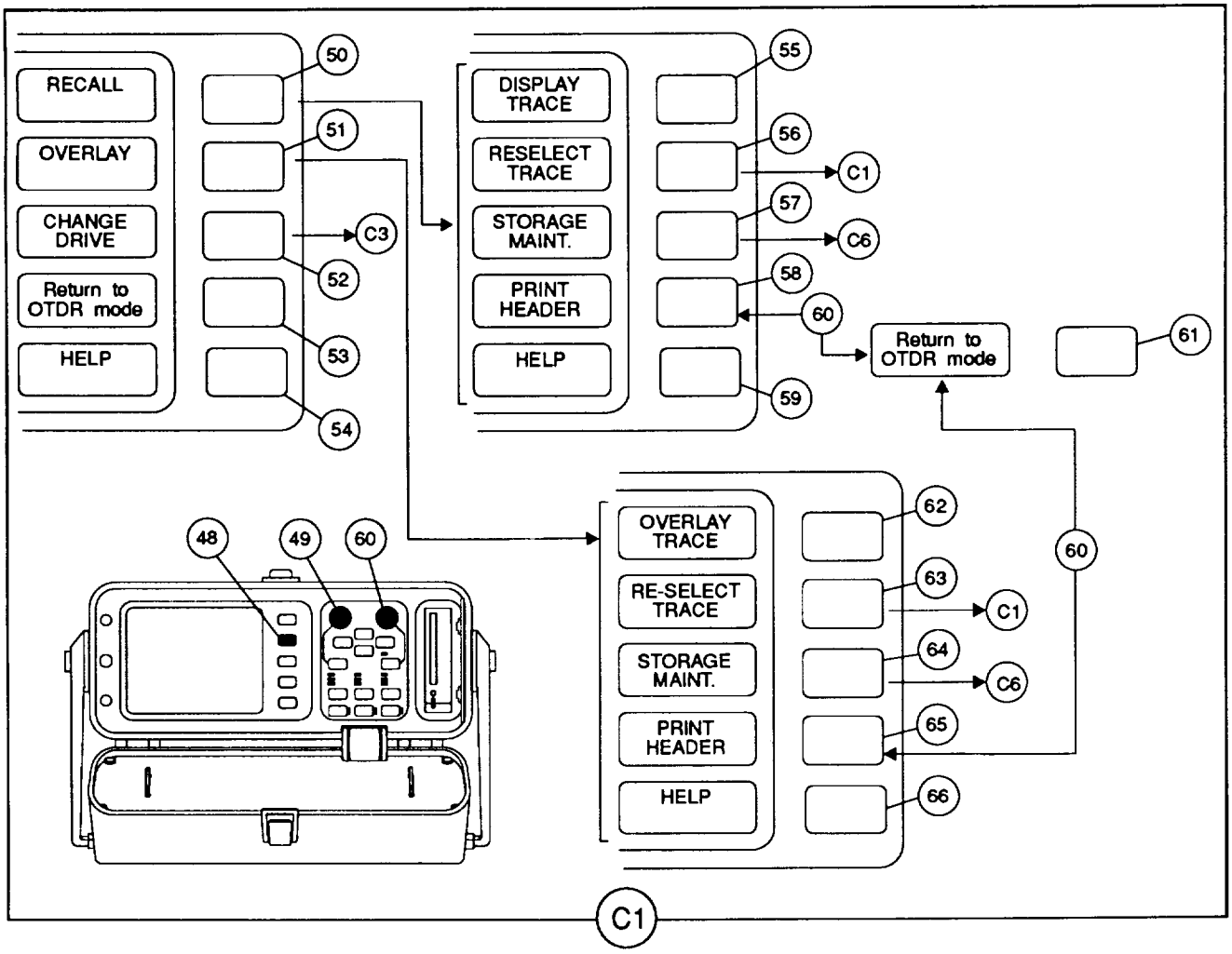
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
7	V-OFFSET:	The amount in dB that the trace is offset vertically. The value is set by using the Vertical Expand key (356) and the CURSOR B knob (355). RESTRICTIONS: Displayed only in Display From Origin mode (360).
8	Digital Filter key	When using the TD-285C Optical Module, pressing this key twice after a fiber scan is complete will activate the digital filter and increase the dynamic range. The LASER ON/DIGITAL FILTER INDICATOR (25) displays "WORKING" in this case.
9	Trace Profile	A pictorial graph of the fiber being tested. It shows loss over distance and can be used to locate and evaluate splices.
10	LSA key	Depressing this key toggles between normal and LSA (Least Squares Approximation) measurement techniques.
11	Print key	Pressing this key plots the CRT display to the printer/plotter that has been selected as the default.
12	Grid Locators 0.0 1,040.8 2,081.6	Three numbers indicate the horizontal location of left side, center, and right side of the display grid in relation to the fiber start. Units are not displayed, but are the same as those shown for the cursor positions (22) and (23).
13	Wavelength Key	Changes wavelengths when using the TD-285C dual wavelength optical module.
14	Horizontal Grid Division annotation (260.2 m/div)	Displays the distance represented by one horizontal division on the grid. The value can be changed with the Horizontal Scale Control keys (357 & 367). The default unit of measurement is meters. This may be changed to feet or miles using the HELP Facility (16).
15	INDEX:	This is the index of refraction for the test fiber. The value should be taken from the fiber manufacturer. Entering it by holding down the N-LASER OFF key (366) and turning the CURSOR A knob (354) stores it in nonvolatile memory. The Test Set maintains a default index for each module and wavelength. Restrictions: Range 1.0001 to 1.9999.
16	HELP key	Pressing this key activates the HELP Facility. Also re-displays screen after screen saver has activated. See VIEW C.
17	λ:	The mode (SM Singlemode or MM Multimode) and wavelength in nanometers of the optical module in use. 850 MM TD-260C 1300 MM TD-261C 1310 SM TD-285C (13) 1550 SM TD-285C (13)

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
18	PW:	Pulse Width. Set to SHORT, MEDIUM, or LONG with the PULSE WIDTH key. (360) Pulse Width TD- 260C TD- 261C TD- 285C SHORT 5ns 5ns 40ns MEDIUM 40ns 50ns 800ns LONG 150ns 500ns 8.00µs
19	LOSS:/REFL:	Loss or reflectance is displayed in one of the modes listed below, depending on the selection made with LOSS MODE key (362)and LSA key (10). • 2-POINT LOSS: Loss between the intersections of the trace and the two cursors. • dB/distance LOSS: Average loss between the two cursors, expressed in selected distance units (km, kft, mi). • LSA/SPL LOSS: Loss at a splice (SPL) indexed by CURSOR A and calculated using Least Squares Approximation (LSA) techniques. • LSA/2PT LOSS: Loss between the two cursors, using LSA. • LSA/AVG LOSS: Average loss between the two cursors, using LSA. • REFL: Reflectance of a feature. If it is not reflective, displays N/A.
20	#AVG=	A running count of the number of times averaging of the trace data has occurred while performing a fiber scan. If no trace is displayed, N/A appears.
21	A→B=	Distance between the two cursors.
22	B=	CURSOR B position. The distance that Cursor B is from the origin, or beginning of the fiber.
23	A=	CURSOR A position. The distance that Cursor A is from the origin.
24	↑ 8.0 dB/div	Vertical Scale. The number of decibels per vertical division on the grid. The value can be changed with the Vertical Scale Control keys. (356 & 358)
25	LASER ON/Digital Filter Indicator	A back-lit indication that displays one of the following. The area is usually blank. • LASER ON/AVG The laser is on and trace data averaging is taking place during a fast, slow, or super-slow scan. • LASER ON Laser is on in real time mode. • WORKING TD-285C digital filter has been selected. (8) • FILENAME.TRC Filename for a recalled trace.



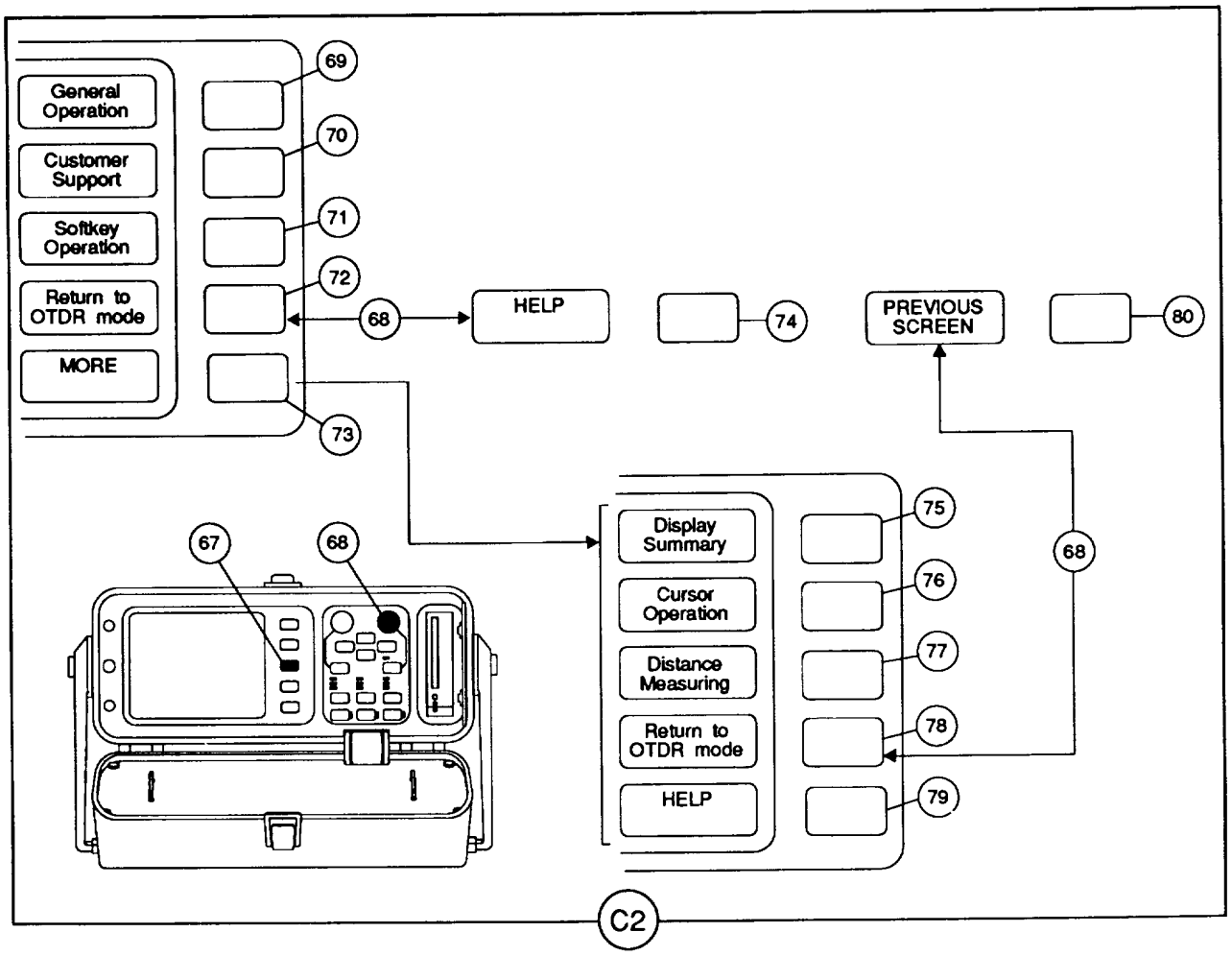
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
26	HELP key	Used to activate the TS-4320 HELP FACILITY Function Select Mode. Function descriptive icons are displayed opposite each softkey. Selections are made by pressing the corresponding softkey.
27	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
28	STORE/PLOT TRACE DATA softkey	Used to start the process of storing or plotting/printing a fiber trace on the default device.
29	RECALL TRACE DATA softkey	Used to start the process of recalling a stored fiber trace for display. Displays a directory of the trace files on the default storage device. See C1.
30	Operating Guide softkey	Used to display a screen that offers selections for displaying operating instructions. See C2.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
31	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (27) to switch between softkeys (31) and (38).
32	MORE softkey	Used to display additional storage and instrument setup functions.
33	SAVE TO RAM/DSKT softkey	Used to display a screen that allows entry of identification data before saving, (storing), a fiber trace.
34	PRINT softkey printer/plotter.	Used to print, (plot), the active trace on the default
35	CHANGE DRIVE softkey device to be changed. See C3.	Used to display a screen that allows the default storage
36	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
37	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys 28 through 32.
38	OTDR SETUP softkey	Used to display a screen that allows setting units of measure, fiber length, and GPIB address. See C4. Use the CURSOR B knob (27) to switch between softkeys (31) and (38).
39	ACCEPT DATA softkey	Used to accept trace file header data that has been entered either by use of the keyboard or CURSOR A (354) and CURSOR B (355) knobs. Causes the trace and its header to be stored on the default storage device.
40	CHANGE DIRECTORY softkey	Used to display a screen that allows changing of the directory in which trace files may be stored. See C5.
41	CHANGE DRIVE softkey	Used to display a screen that allows the default storage device to be changed. See C3.
42	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
43	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys 28 through 32.
44	STORAGE MAINT. softkey	Used to display a screen that allows changing of the default storage device and performance of trace file maintenance procedures. See C6.
45	INSTRUMENT SETUP softkey	Used to display a screen that allows entry of setup parameters such as date/time and units of measure. See C7.
46	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
47	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
48	RECALL TRACE DATA softkey	See C, 29. Used to display a directory of the trace files on the default storage device and display softkeys (50) through (54).
49	CURSOR A knob	Used to highlight a trace file in the directory of trace files displayed by pressing the RECALL TRACE DATA softkey (48). Turn clockwise to move down in the directory. Turn counterclockwise to move up.
50	RECALL softkey	Used to display softkeys (55) through (59) and the header of the trace file selected with the CURSOR A knob (49).
51	OVERLAY softkey	Used to display softkeys (62) through (66) and the header of the trace file selected with the CURSOR A knob (49).
52	CHANGE DRIVE softkey	Used to display a screen that allows the default storage device to be changed. See C3.

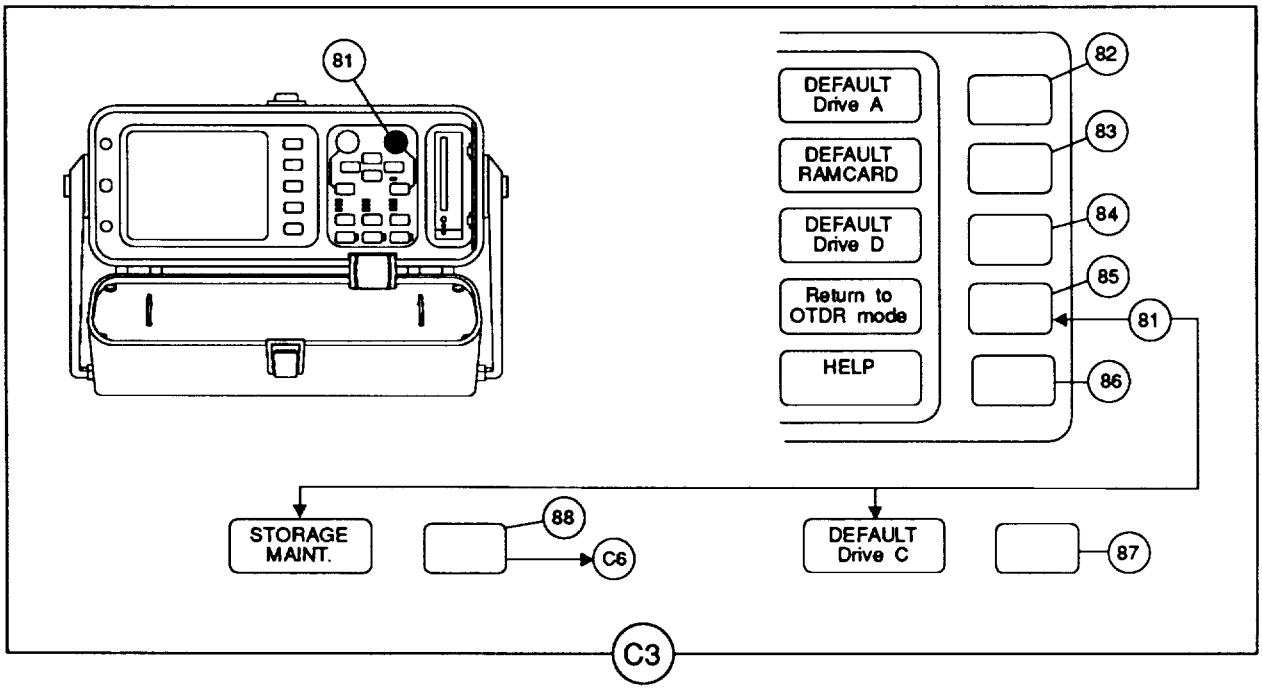
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
53	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
54	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
55	DISPLAY TRACE softkey	Used to exit from the HELP Facility and display the trace that was selected using the CURSOR A knob (49). The filename of the trace is displayed in the LASER ON/Digital Filter indicator (25).
56	RESELECT TRACE softkey	Used to re-display softkeys (50) through (54) if the information in the header indicates that the wrong trace file was selected and recalled.
57	STORAGE MAINT. softkey	Used to display a screen that allows changing of the default storage device and performance of trace file maintenance procedures. See C6.
58	PRINT HEADER softkey	Used to print/plot the header being displayed on the default printer/plotter. Use the CURSOR B knob (60) to switch between softkeys (58) and (61).
59	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
60	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
61	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (60) to switch between softkeys (61) and (58) or between (61) and (65).
62	OVERLAY TRACE softkey	Used to display a directory of the trace files on the default storage device and softkeys (62) through (66).
63	RE-SELECT TRACE softkey	Used to re-display softkeys (50) through (54) if the information in the header indicates that the wrong trace file was selected and recalled for overlay.
64	STORAGE MAINT. softkey	Used to display a screen that allows changing of the default storage device and performance of trace file maintenance procedures. See C6.
65	PRINT HEADER softkey	Used to print/plot the header being displayed on the default printer/plotter. Use the CURSOR B knob (60) to switch between softkeys (65) and (61).
66	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



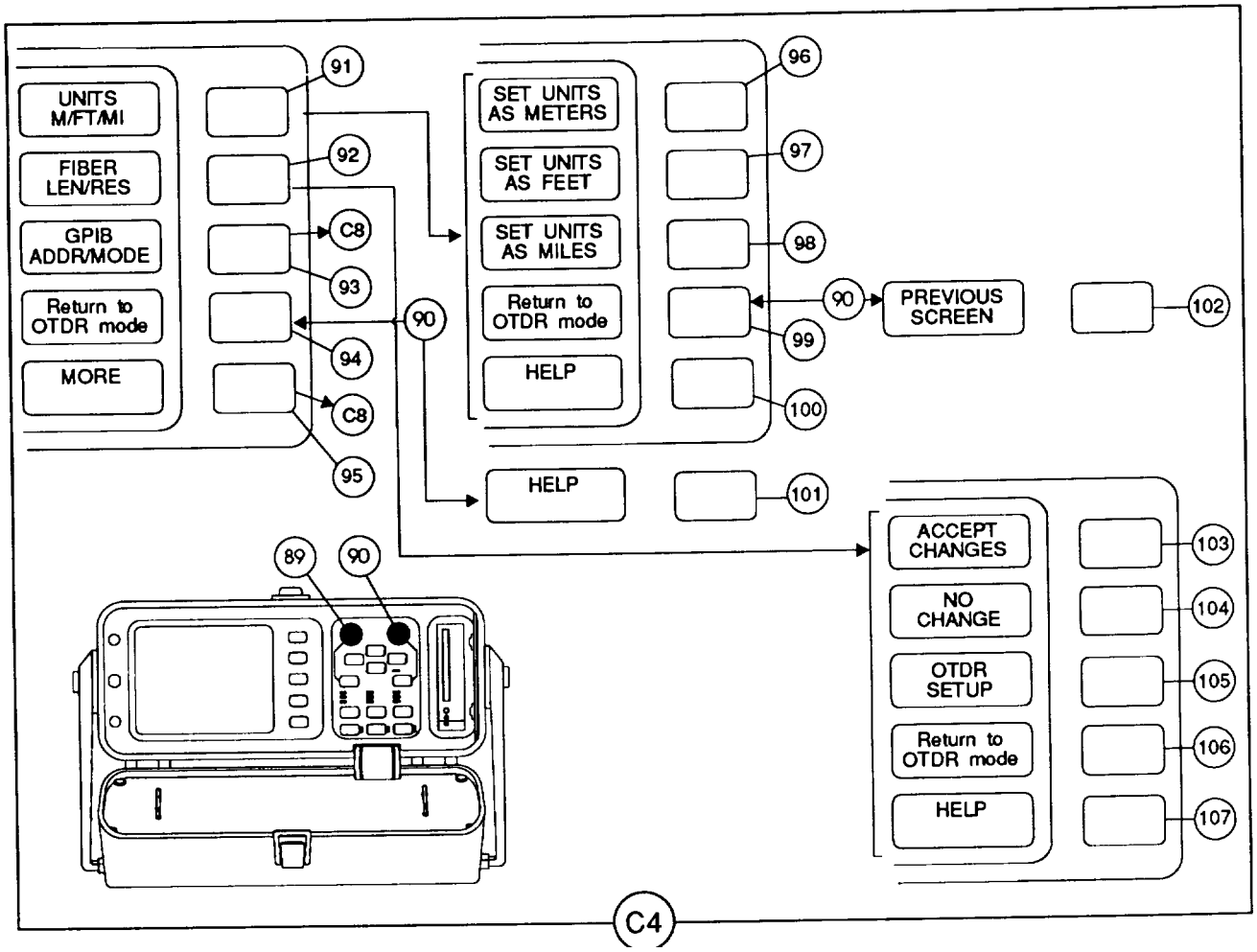
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
67	Operating Guide softkey	See C, 30. Used to display softkeys (69) through (73) that allow brief operating instructions to be displayed.
68	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
69	General Operation softkey	Used to display a series of screens that present general information about the TS-4320. Use the following keys to move between these screens: *Key* — *Function* VERT EXP (356) — Display the prior page. VERT CONT (358) — Display the next page. HOR EXP (357) — Exit from the HELP Facility HOR CONT (367) — Return to the HELP FACILITY Function Select Mode screen; softkeys (28) through (32).

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
70	Customer Support softkey	Used to display a screen that describes how to obtain assistance with unresolved problems. Use the following keys to exit from this screen: *Key* — *Function* HOR EXP (357) — Exit from the HELP Facility HOR CONT (367) — Return to the HELP FACILITY Function Select Mode screen; softkeys (28) through (32).
71	Softkey Operation softkey	Used to display a series of screens that present brief instructions for using the softkeys. Use the following keys to move between these screens: *Key* — *Function* VERT EXP (351) — Display the prior page. VERT CONT (358) — Display the next page. HOR EXP (357) — Exit from the HELP Facility HOR CONT (367) — Return to the HELP FACILITY Function Select Mode screen; softkeys (28) through (32).
72	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
73	MORE softkey	Used to display more options for displaying operating information. Displays softkeys (75) through (79).
74	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32). Use the CURSOR B knob (68) to switch between softkeys (74) and (72).
75	Display Summary softkey	Used to display a series of screens that explain information that appears on the OTDR trace screen. Use the following keys to move between these screens: *Key* — *Function* VERT EXP (356) — Display the prior page. VERT CONT (358) — Display the next page. HOR EXP (357) — Exit from the HELP Facility HOR CONT (367) — Return to the HELP FACILITY Function Select Mode screen; softkeys (28) through (32).
76	Cursor Operation softkey	Used to display a brief explanation of using the A and B cursors. Use the following keys to exit from this screen: *Key* — *Function* HOR EXP (357) — Exit from the HELP Facility HOR CONT (367) — Return to the HELP FACILITY Function Select Mode screen; softkeys (28) through (32).

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
77	Distance Measuring softkey	Used to display a brief explanation of how to measure distance on a fiber trace. Use the following keys to exit from this screen: *Key* — *Function* HOR EXP (357) — Exit from the HELP Facility HOR CONT (367) — Return to the HELP FACILITY Function Select Mode screen: softkeys (28) through (32).
78	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (68) to switch between softkeys (78) and (80).
79	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32). Used to return to the screen that displays softkeys (69)
80	PREVIOUS SCREEN softkey	through (73). Use the CURSOR B knob (68) to switch between softkeys (78) and (80).

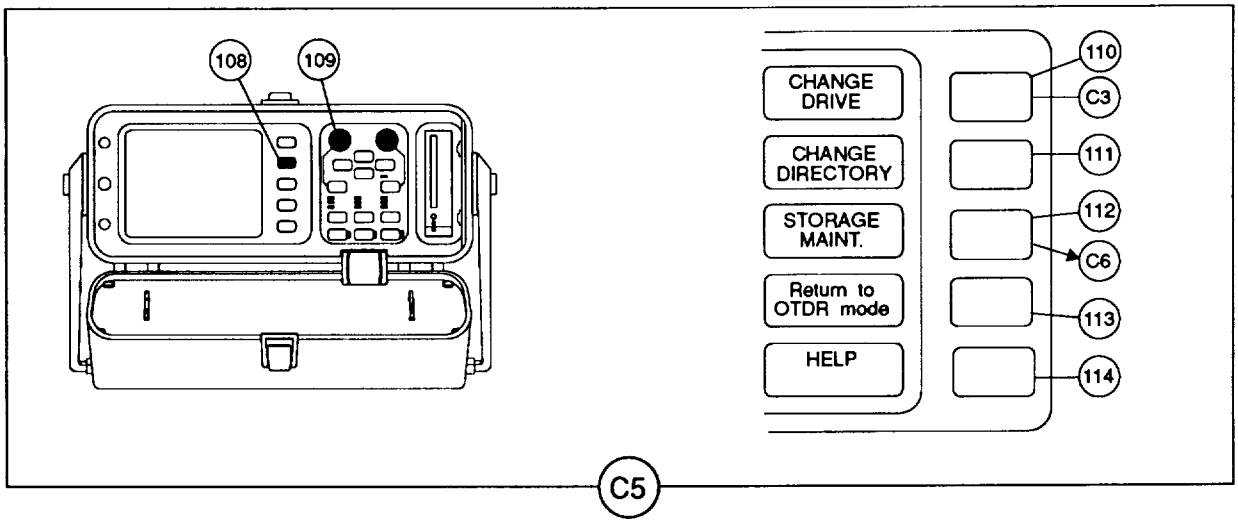


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
81	CURSOR B knob	Used to select softkey (85), (87), or (88). Rotate the knob to change the softkey icon.
82	DEFAULT Drive A softkey	Used to set an external disk drive as the default storage device. RESTRICTION: Not presently available.
83	DEFAULT RAMCARD softkey	Used to set the RAMCARD drive as the default storage device.
84	DEFAULT Drive D softkey	Used to set the internal CMOS RAM as the default storage device.
85	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (81) to switch between softkeys (85), (87) and (88).
86	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
87	DEFAULT Drive C softkey	May be used to set part of the internal memory as the default storage device. Use the CURSOR B knob (81) to switch between softkeys (85), (87) and (88). NOTE: Not recommended for use.
88	STORAGE MAINT. softkey	Used to display a screen that allows changing of the default storage device and performance of trace file maintenance procedures. See C6.

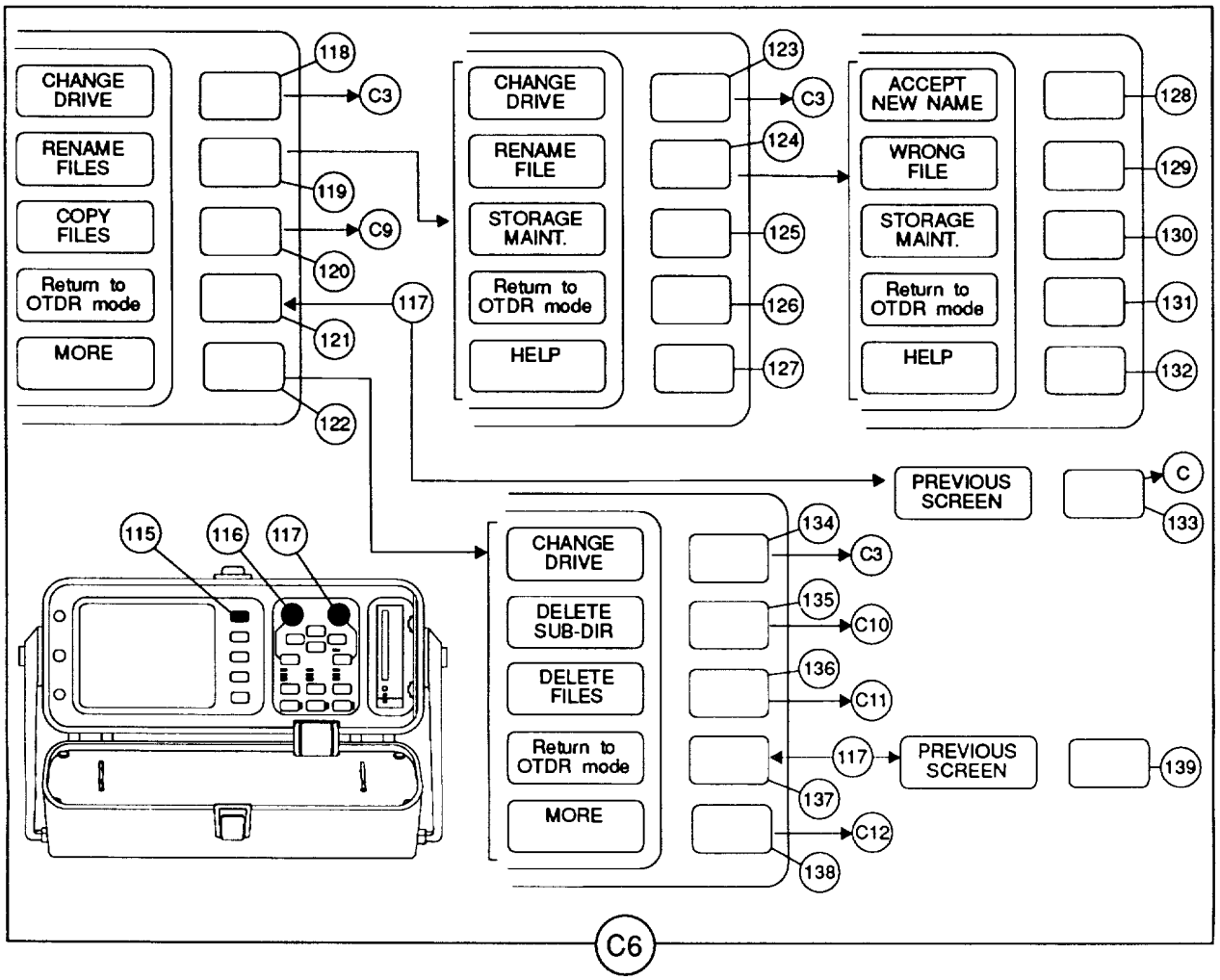


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
89	CURSOR A knob	Used to enter the fiber length and resolution after softkey (92) is pressed. Turn clockwise to increase the setting. Turn counterclockwise to decrease the setting. RESTRICTIONS: Valid entries are dependent on the optical module in use. See Table 2-1.
90	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
91	UNITS M/FT/MI softkey	Used to display a screen allowing the unit of measurement to be set as either meters (M), feet (FT), or miles (MI).
92	FIBER LEN/RES softkey	Used to display a screen that allows entry of a known fiber length, together with a measurement resolution.
93	GPIB ADDR/MODE softkey	Used to display a screen that allows the address and mode parameters for the GPIB function to be set. See C8.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
94	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (90) to switch between softkeys (94), and (101).
95	MORE softkey	Used to display a screen that allows the address and mode parameters for the GPIB function to be set. See C8.
96	SET UNITS AS METERS softkey	Used to set the unit of measurement as meters. Changes the display to show softkeys (91) through (95).
97	SET UNITS AS FEET softkey	Used to set the unit of measurement as feet. Changes the display to show softkeys (91) through (95).
98	SET UNITS AS MILES softkey	Used to set the unit of measurement as miles. Changes the display to show softkeys (91) through (95).
99	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (90) to switch between softkeys (99), and (102).
100	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
101	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32). Use the CURSOR B knob (90) to switch between softkeys (101) and (94).
102	PREVIOUS SCREEN softkey	Used to return to the screen displaying softkeys (91) through (95).
103	ACCEPT CHANGES softkey	Used to accept the new fiber length and resolution that was entered with CURSOR A (89). Changes the display to show softkeys (91) through (95).
104	NO CHANGE softkey	Used to return to the screen that shows softkeys (91) through (95), without changing the fiber length and resolution.
105	OTDR SETUP softkey	Used to return to the screen displaying softkeys (91) through (95).
106	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
107	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



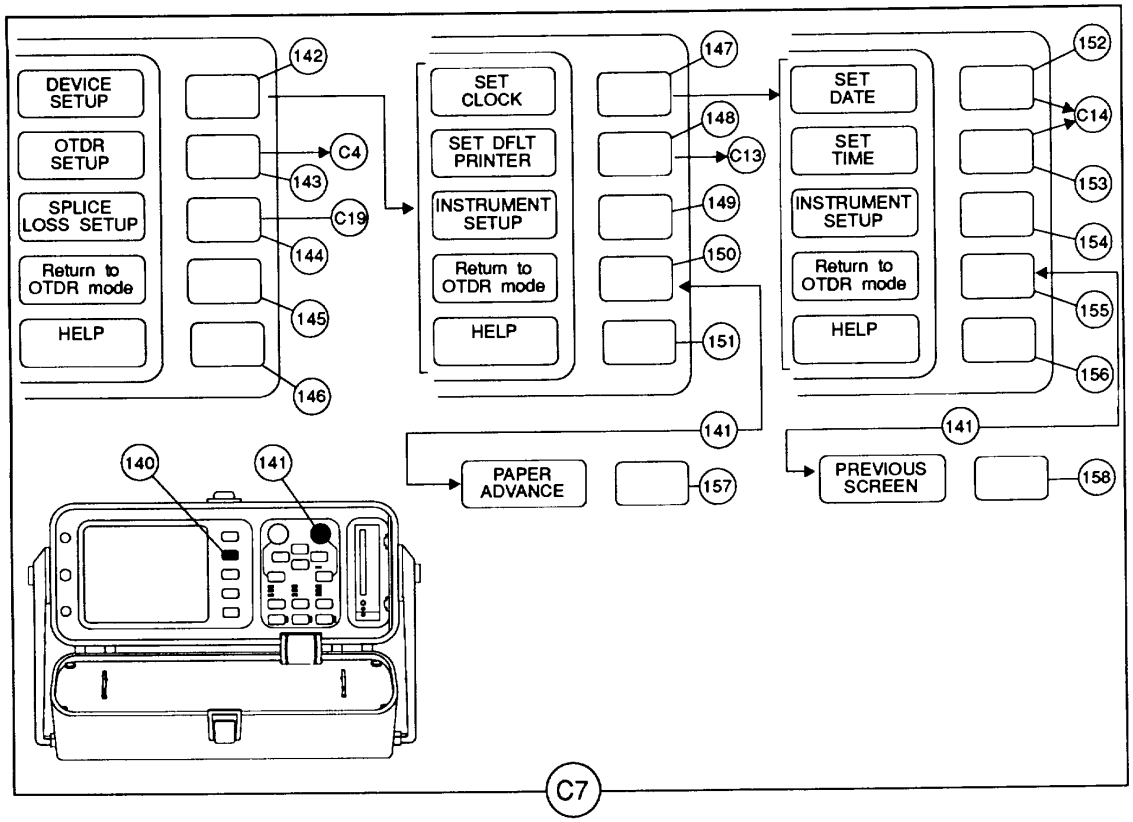
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
108	CHANGE DIRECTORY softkey	See C, 40. Used to display a directory of the trace files on the default storage device. If there is more than one directory on the device, the current directory is highlighted.
109	CURSOR A knob	Used to change the highlighted directory. Turn clockwise to move down. Turn counterclockwise to move up.
110	CHANGE DRIVE softkey	Used to display a screen that allows the default storage device to be changed. See C3.
111	CHANGE DIRECTORY softkey	Used to set the highlighted directory as the default directory.
112	STORAGE MAINT. softkey	Used to display a screen that allows changing of the default storage device and performance of trace file maintenance procedures. See C6.
113	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
114	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
115	STORAGE MAINT. softkey	See C, 44. Used to display a screen that allows changing of the default storage device and performance of trace file maintenance procedures.
116	CURSOR A knob	Used to highlight trace files in a directory (119), highlight a directory (135), and select characters for entry (124).
117	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon. Also used to enter characters (124) that have been selected with the CURSOR A knob (116), or the keyboard.
118	CHANGE DRIVE softkey	Used to display a screen that allows the default storage device to be changed. See C3.
119	RENAME FILES softkey	Used to display a directory of the default storage device and softkeys (123) through (127).

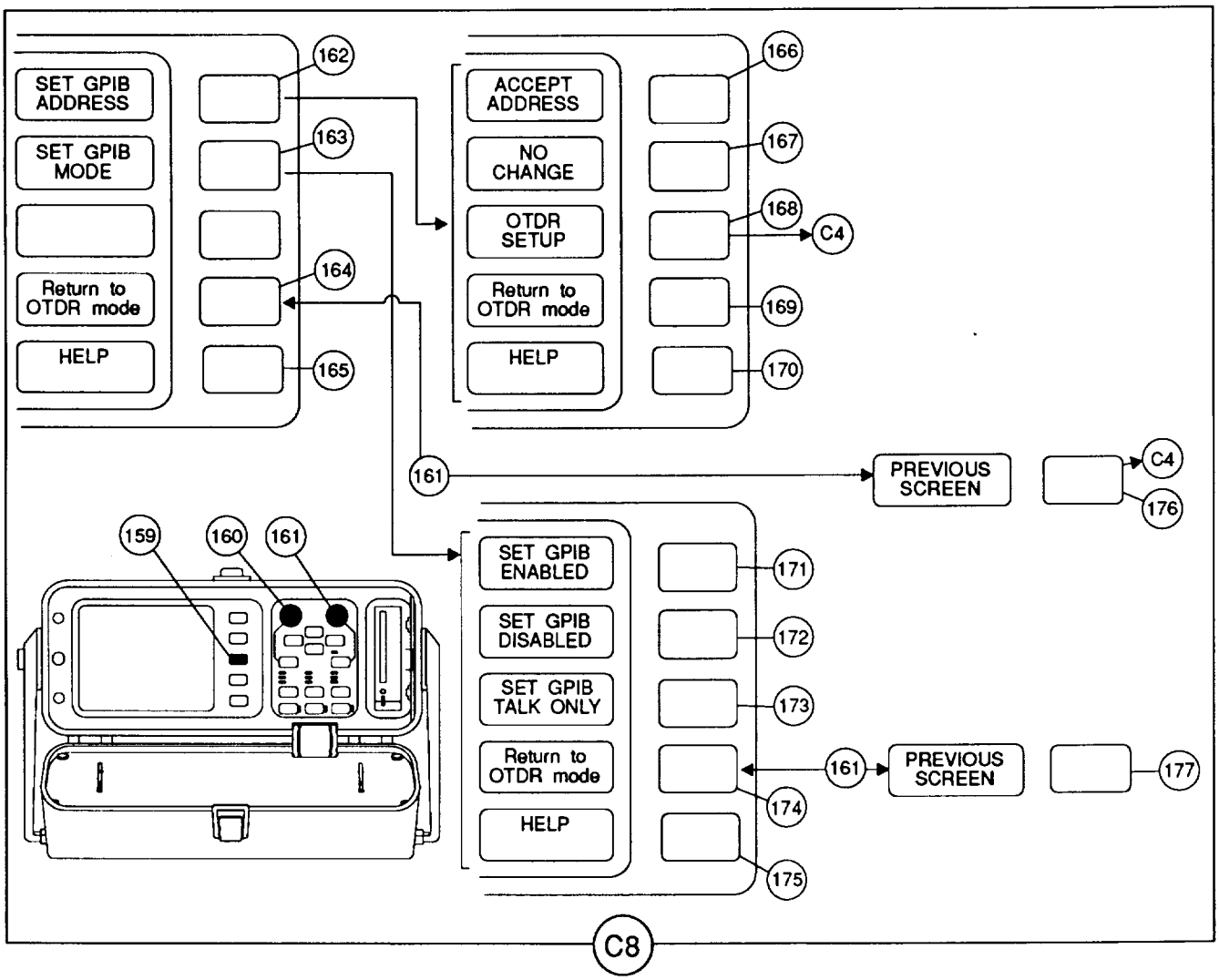
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
120	COPY FILES softkey	Used to display a directory of the default storage device and softkeys that allow copying one or more trace files.
121	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (117) to switch between softkeys (121) and (133).
122	MORE softkey	Used to display softkeys (134) through (138) that allow changing the default storage device, and deleting of sub-directories and trace files.
123	CHANGE DRIVE softkey	Used to display a screen that allows the default storage device to be changed. See C3.
124	RENAME FILE softkey	Used to display softkeys (128) through (132) and the header of a file that was highlighted by turning the CURSOR A knob (116).
125	STORAGE MAINT. softkey	Used to re-display softkeys (118) through (122).
126	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
127	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
128	ACCEPT NEW NAME softkey	Used to store the new trace file name that was entered either with the keyboard or the CURSOR A (116)and CURSOR B (117) knobs.
129	WRONG FILE softkey	Used to re-display softkeys (123) through (127) if the wrong trace file was selected.
130	STORAGE MAINT. softkey	Used to re-display softkeys (118) through (122).
131	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
132	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
133	PREVIOUS SCREEN softkey	Used to re-display softkeys (44) through (47). Use the CURSOR B knob (117) to switch between softkeys (133) and (121).
134	CHANGE DRIVE softkey	Used to display a screen that allows the default storage device to be changed. See C3.
135	DELETE SUB-DIR softkey	Used to display a directory of the default storage device and softkeys that allow deletion of a sub-directory. See C10.
136	DELETE FILES softkey	Used to display a directory of the default storage device and softkeys that allow deletion of one or more trace files. See C11.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
137	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (117) to switch between softkeys (137) and (139).
138	MORE softkey	Used to display softkeys (211) through (215) allowing creation of sub-directories and formatting of storage devices.
139	PREVIOUS SCREEN softkey	Used to re-display softkeys (118) through (122).



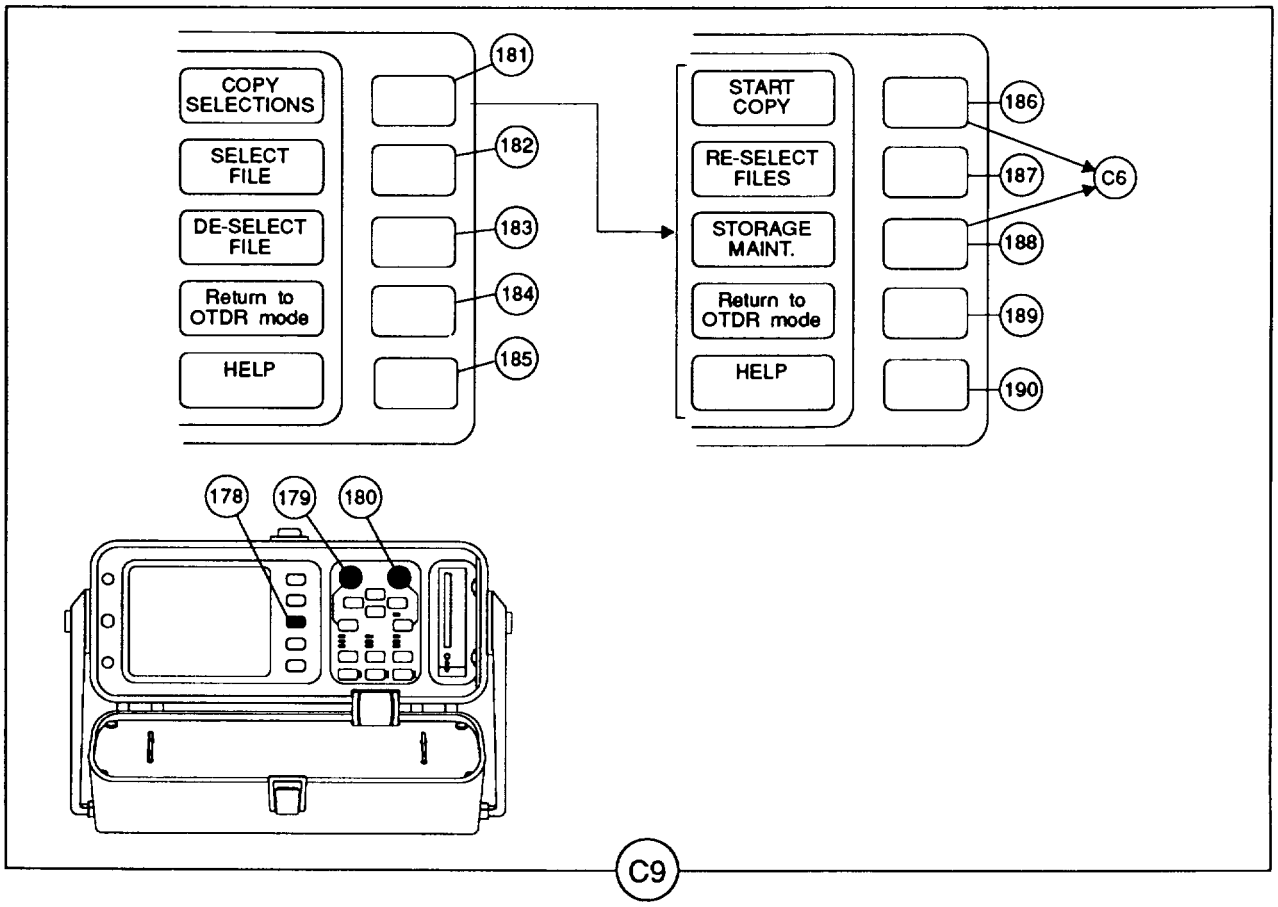
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
140	INSTRUMENT SETUP softkey	See C, 45. Used to display softkeys (142) through (146).
141	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
142	DEVICE SETUP softkey	Used to display softkeys (147) through (151).
143	OTDR SETUP softkey	Used to display softkeys (91) through (95). See C4.
144	SPLICE LOSS SETUP softkey	Used to display the current trace on the Splice Loss Setup screen. Sets the loss mode (362) to SPLICE. See C19.
145	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
146	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
147	SET CLOCK softkey	Used to display softkeys (152) through (156).

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
148	SET DEFAULT PRINTER Softkey	Used to display softkeys (230) through (234). See C13.
149	INSTRUMENT SETUP	Used to re-display softkeys (142) through (146). Softkey
150	Return to OTDR mode	Used to exit from the TS-4320 HELP FACILITY and, if softkey present, display the active fiber trace. Use the CURSOR B knob (141) to switch between softkeys (150) and (157).
151	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
152	SET DATE softkey	Used to display softkeys (253) through (257). See C14.
153	SET TIME softkey	Used to display softkeys (260) through (264). See C15.
154	INSTRUMENT SETUP Softkey	Used to re-display softkeys (142) through (146).
155	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (141) to switch between softkeys (155) and (158).
156	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
157	PAPER ADVANCE softkey	RESTRICTION: Inoperative.
158	PREVIOUS SCREEN softkey	Used to re-display softkeys (147) through (151).



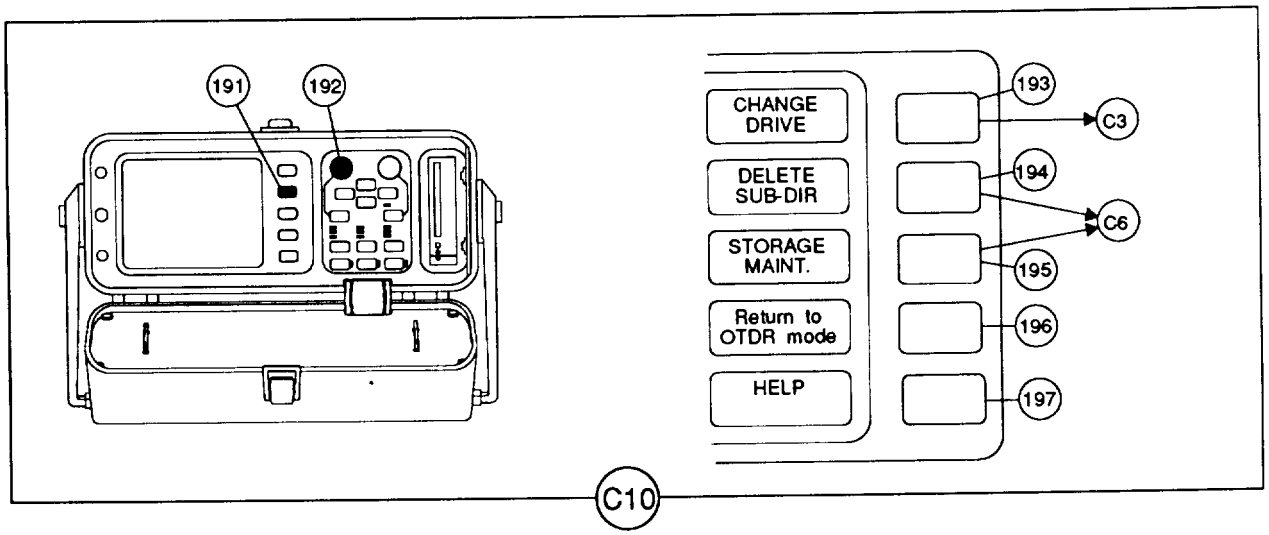
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
159	GPIB ADDR/MODE softkey	See C4, 93. Used to display softkeys (162) through (165) and the current GPIB mode; Enabled, Disabled, or Talk-Only.
160	CURSOR A knob	Used to enter the GPIB address after pressing softkey (162). Turn clockwise to increase the address. Turn counterclockwise to decrease the address. RESTRICTIONS: Address range limited to 1 through 30.
161	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
162	SET GPIB ADDRESS softkey	Used to display softkeys (166) through (170) and the current (Initial) GPIB address.
163	SET GPIB MODE softkey	Used to display softkeys (171) through (175).

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
164	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (161) to switch between softkeys (164) and (176).
165	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
166	ACCEPT ADDRESS softkey	Used to set the GPIB address to the value entered with the CURSOR A knob (160). Displays softkeys (91) through (95).
167	NO CHANGE softkey	Used to display softkeys (91) through (95), leaving the initial GPIB address unchanged.
168	OTDR SETUP softkey	Used to display softkeys (91) through (95). See C4.
169	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
170	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
171	SET GPIB ENABLED	Used to set the GPIB function to enabled and display softkeys (91) through (95).
172	SET GPIB DISABLED	Used to set the GPIB function to disabled and display softkeys (91) through (95).
173	SET GPIB TALK ONLY	Used to set the GPIB function to TALK ONLY and display softkeys (91) through (95).
174	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (161) to switch between softkeys (174) and (177).
175	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
176	PREVIOUS SCREEN softkey	Used to re-display softkeys (91) through (95). See C4.
177	PREVIOUS SCREEN softkey	Used to re-display softkeys (162) through (165).

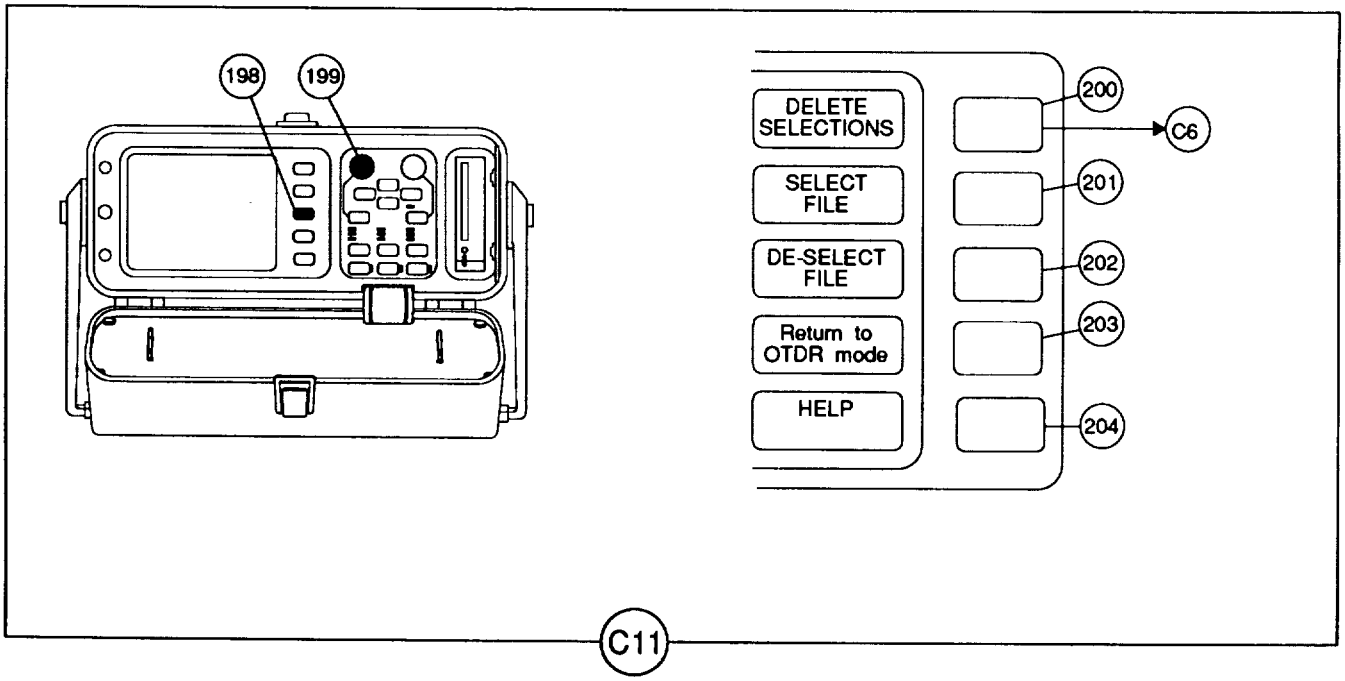


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
178	COPY FILES softkey	See C6, 120. Used to display softkeys (181) through (185) and a directory of the trace files on the default storage device. Use the CURSOR A knob (179) to highlight trace files for selection or de-selection. Use softkey (182) to select a file for copying and display a # character with it. Use softkey (183) to de-select a file and remove the # character.
179	CURSOR A knob	Used to highlight trace files in a directory for selection (182) or de-selection (183), and to select characters for entry (181).
180	CURSOR B knob	Used to enter characters (181) that have been selected with the CURSOR A knob (179).
181	COPY SELECTIONS softkey	Used to display softkeys (186) through (190) and a list of the trace files that were selected with softkey (182).
182	SELECT FILE softkey	Used to select a file that has been highlighted with the CURSOR A knob. Places a # character after the filename.

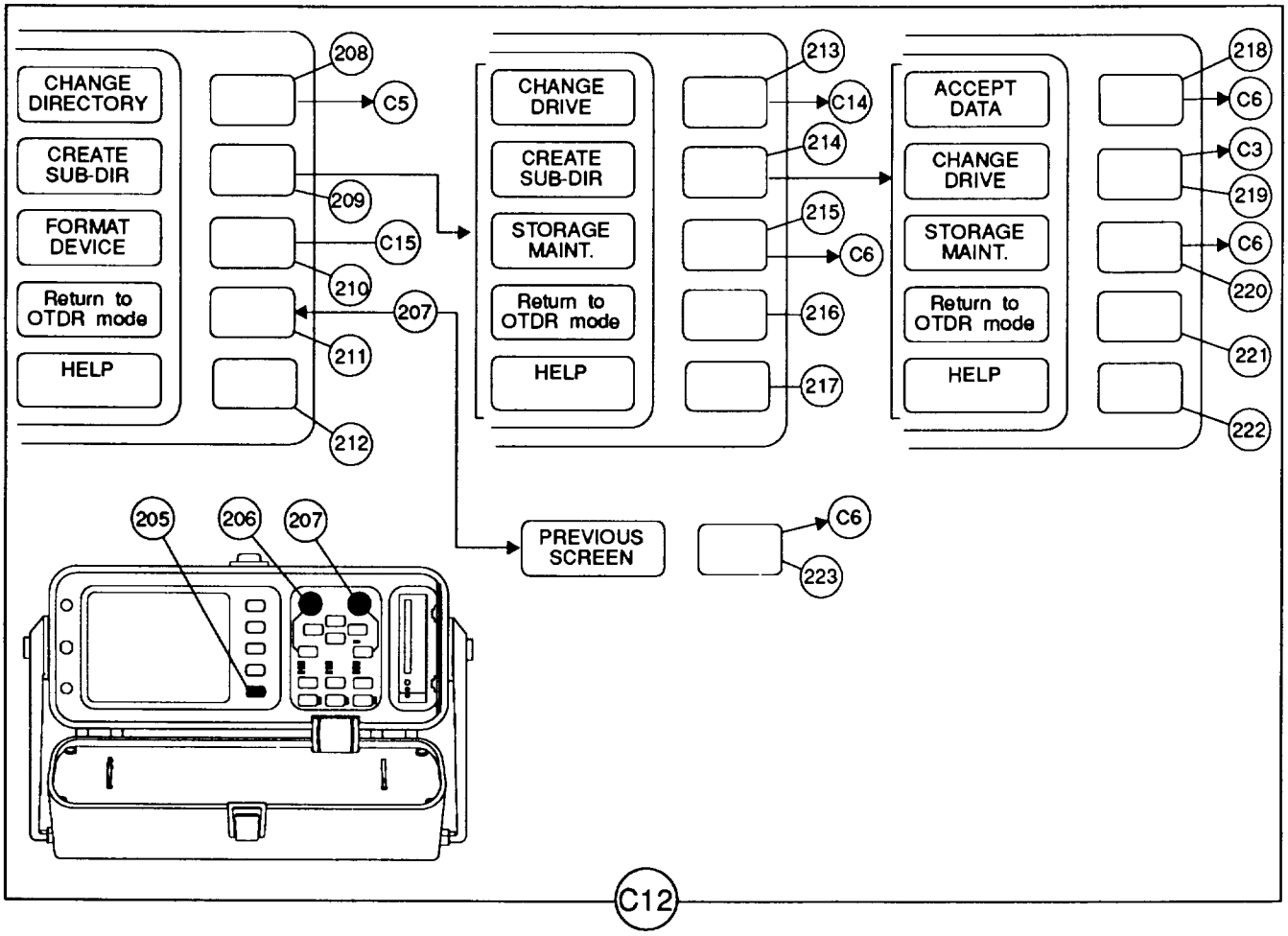
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
183	DE-SELECT FILE softkey	Used to de-select a trace file that has been highlighted with the CURSOR A knob. Removes the # character from after the filename.
184	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
185	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
186	START COPY softkey	Used to copy the selected trace files to the destination drive/directory entered with the CURSOR A (179) and CURSOR B (180) knobs. When copy is complete, displays softkeys (118) through (122). RESTRICTIONS: The drive/directory must be existing and valid.
187	RE-SELECT FILES softkey	Used to re-display softkeys (181) through (185) if an error was made in selecting files to be copied.
188	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
189	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
190	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
191	DELETE SUB-DIR softkey	See C6, 135. Used to display softkeys (193) through (197) and a directory of the trace files on the default storage device. Use the CURSOR A knob (192) to highlight the sub-directory to be deleted.
192	CURSOR A knob	Used to highlight the sub-directory to be deleted. Turn clockwise to move down. Turn counterclockwise to move up.
193	CHANGE DRIVE softkey	Used to display a screen that allows the default storage device to be changed. See C3.
194	DELETE SUB-DIR softkey	Used to delete the sub-directory that was highlighted with the CURSOR A knob. Displays softkeys (118) through (122) upon completion. See C6. RESTRICTIONS: Sub-directory must be empty to be deleted.
195	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
196	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
197	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).

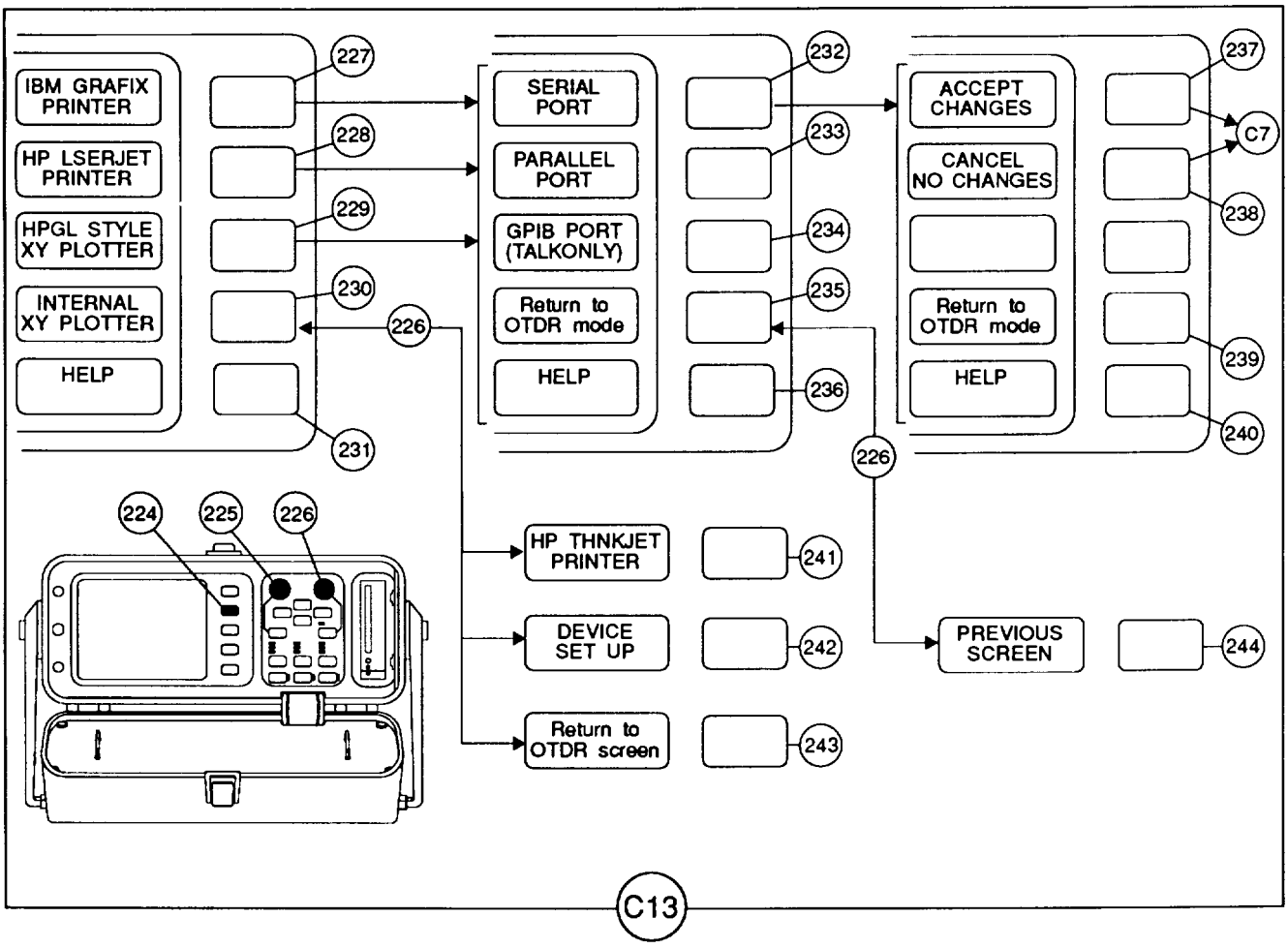


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
198	DELETE FILES softkey	See C6, 136. Used to display softkeys (200) through (204) and a directory of the trace files on the default storage device. Use the CURSOR A knob to select trace files to be deleted.
199	CURSOR A knob	Used to highlight trace files to be deleted. Turn clockwise to move down. Turn counterclockwise to move up.
200	DELETE SELECTIONS softkey	Used to delete the trace files selected with the CURSOR A knob (199) and softkey (201). Displays softkeys (118) through (122) upon completion. See C6.
201	SELECT FILE softkey	Used to select a file that has been highlighted with the CURSOR A knob. Places a # character after the filename.
202	DE-SELECT FILE softkey	Used to de-select a trace file that has been highlighted with the CURSOR A knob. Removes the # character from after the filename.
203	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
204	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



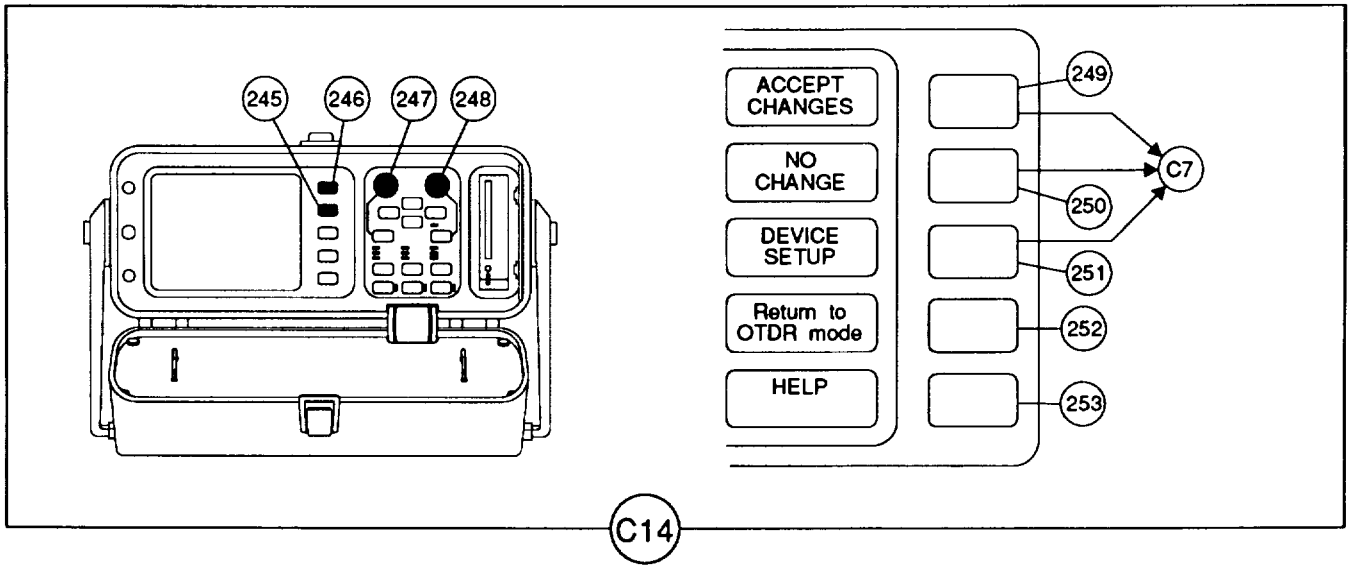
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
205	MORE softkey	See C6, 138. Used to display softkeys (208) through (212).
206	CURSOR A knob	Used to highlight sub-directories. Turn clockwise to move down. Turn counterclockwise to move up. Also used to select characters for entry in a sub-directory name.
207	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
208	CHANGE DIRECTORY softkey	Used to display softkeys (110) through (114). See C5.
209	CREATE SUB-DIR softkey	Used to display softkeys (213) through (217) and a directory of trace files on the default storage device. Use the CURSOR A knob to highlight the sub-directory under which a new sub-directory is to be created.
210	FORMAT DEVICE softkey	Used to display softkeys (256) through (260). See C15.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
211	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (207) to switch between softkeys (211) and (223).
212	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
213	CHANGE DRIVE softkey	Used to display softkeys (82) through (86). See C3.
214	CREATE SUB-DIR softkey	Used to display softkeys (218) through (222) and the name of the sub- directory that was highlighted with the CURSOR A knob. Use the CURSOR A knob to select characters and the CURSOR B knob to enter them in the new sub- directory name.
215	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
216	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
217	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
218	ACCEPT DATA softkey	Used to accept data entered as the new sub- directory name. When completed, displays softkeys (118) through (122). See C6.
219	CHANGE DRIVE softkey	Used to display softkeys (82) through (86). See C3.
220	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
221	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
222	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
223	PREVIOUS SCREEN softkey	Used to display softkeys (134) through (138). See C6.

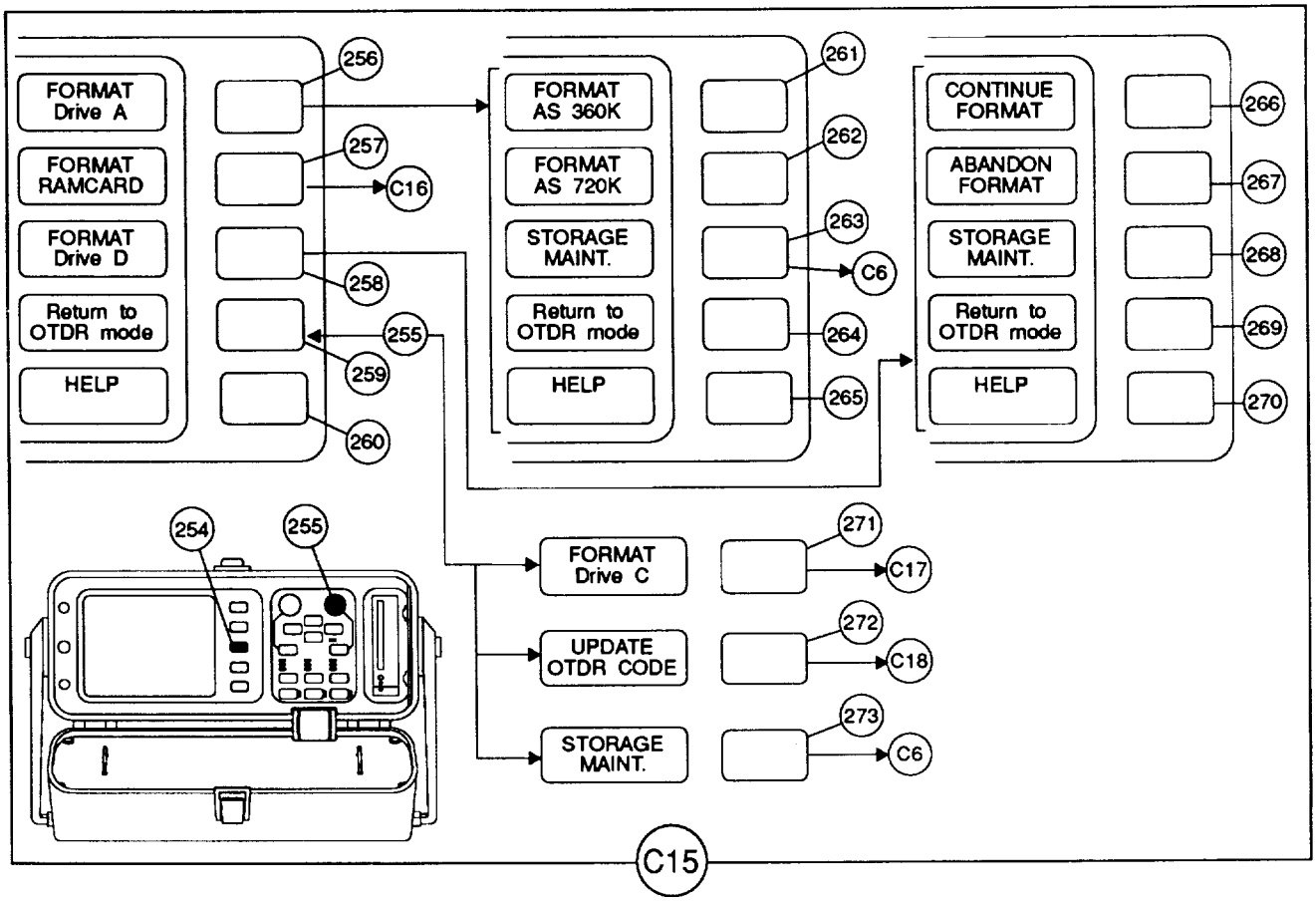


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
224	SET DFLT PRINTER softkey	See C7, 148. Used to display softkeys (227) through (231)
225	CURSOR A knob	Used to select serial port configuration parameter values.
226	CURSOR B knob	Used to select serial port configuration parameters for change.
227	IBM GRAFIX PRINTER softkey	Used to select output format for an IBM compatible graphics printer and to display softkeys (232) through (236).
228	HP LSERJET PRINTER softkey	Used to select output format for an HP LaserJet printer and to display softkeys (232) through (236).
229	HPGL STYLE XY PLOTTER softkey	Used to select output format for an HP-GL compatible X-Y plotter and to display softkeys (232) through (236).
230	INTERNAL XY PLOTTER softkey	Used to select output format for an optional internal plotter. Use the CURSOR B knob (226) to switch between softkeys (230), (241), (242), and (243). NOTE: Internal plotter not presently available.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
231	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
232	SERIAL PORT softkey	Used to select the RS-232 Serial Port (old55) as the output port and to display softkeys (237) through (240). Use the CURSOR B knob to select the following parameters and the CURSOR A knob to select the desired value: Parameter | Selectable Values BAUD RATE | 110 | 300 | 600 | 1200 | 2400 | 4800 | 9600 | 19.2k DATA BITS | 7 | 8 | STOP BITS | 01 | 02 | PARITYI NONE | ODD | EVEN |
233	PARALLEL PORT softkey	Used to select the EXT.PRN/PLT parallel connector (375) as the output port and to display softkeys (147) through (151). See C7.
234	GPIB PORT (TALKONLY) softkey	Used to select the IEEE-488 GPIB interface connector (380) as the output port and to display softkeys (147) through (151). See C7.
235	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (226) to switch between softkeys (235) and (244).
236	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
237	ACCEPT CHANGES softkey	Used to the new serial port configuration parameters and to display softkeys (147) through (151). See C7.
238	CANCEL NO CHANGES softkey	Used to display softkeys (147) through (151) without making any changes in the existing serial port configuration parameters.
239	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
240	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
241	HP THNKJET PRINTER softkey	Used to select output format for an HP ThinkJet compatible printer and to display softkeys (232) through (236).
242	DEVICE SET UP softkey	Used to display softkeys (147) through (151). See C7.
243	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
244	PREVIOUS SCREEN softkey	Used to re-display softkeys (227) through (231).

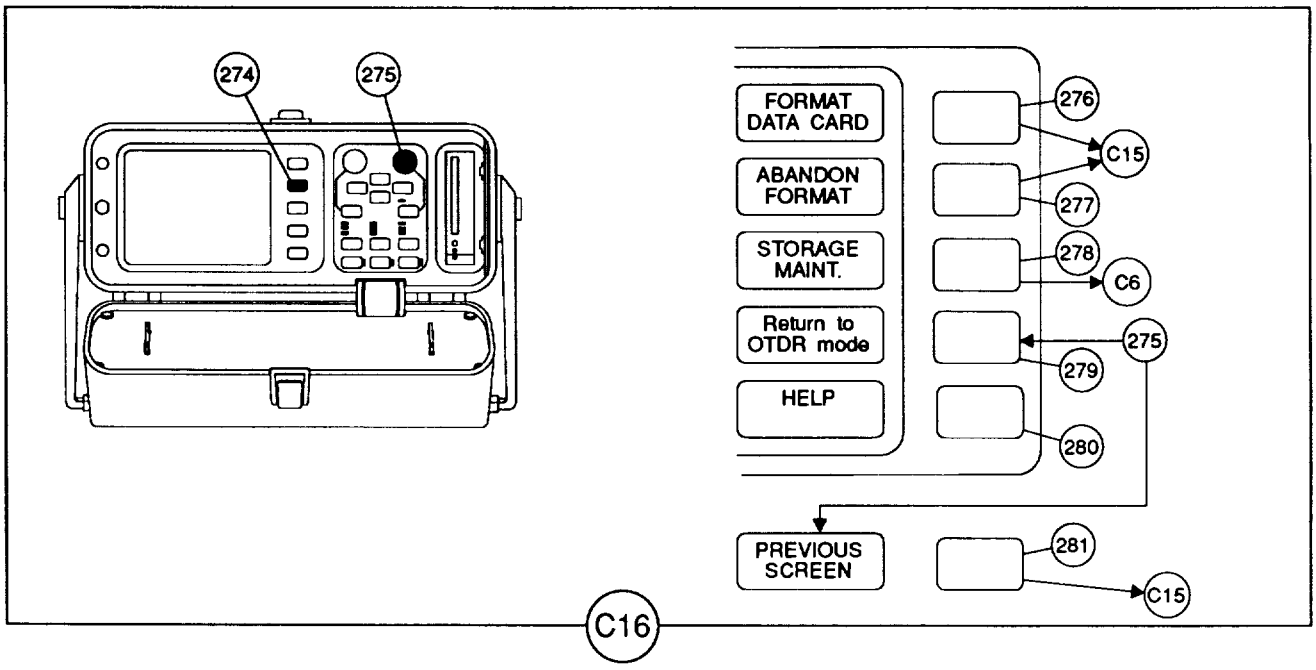


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
245	SET TIME softkey	See C7, 153. Used to display softkeys (249) through (253) and the Current Time in the TS-4320. Use the CURSOR A knob to set the hour, minute, and second. Use the CURSOR B knob to switch between the hour, minute, and second fields.
246	SET DATE softkey	See C7, 152. Used to display softkeys (249) through (253) and the Current Date in the TS-4320. Use the CURSOR A knob to set the month, day, and year. Use the CURSOR B knob to switch between the month, day, and year fields.
247	CURSOR A knob	Used to change the value of the time and date fields. Turn clockwise to increase. Turn counterclockwise to decrease.
248	CURSOR B knob fields .	Used to switch between the different date and time
249	ACCEPT CHANGES softkey	Used to accept the new date or time that was entered. Displays softkeys (147) through (151) upon completion. See C7.
250	NO CHANGE softkey	Used to display softkeys (147) through (151) without changing the time or date.
251	DEVICE SETUP softkey	Used to display softkeys (147) through (151) without changing the time or date.
252	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
253	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).

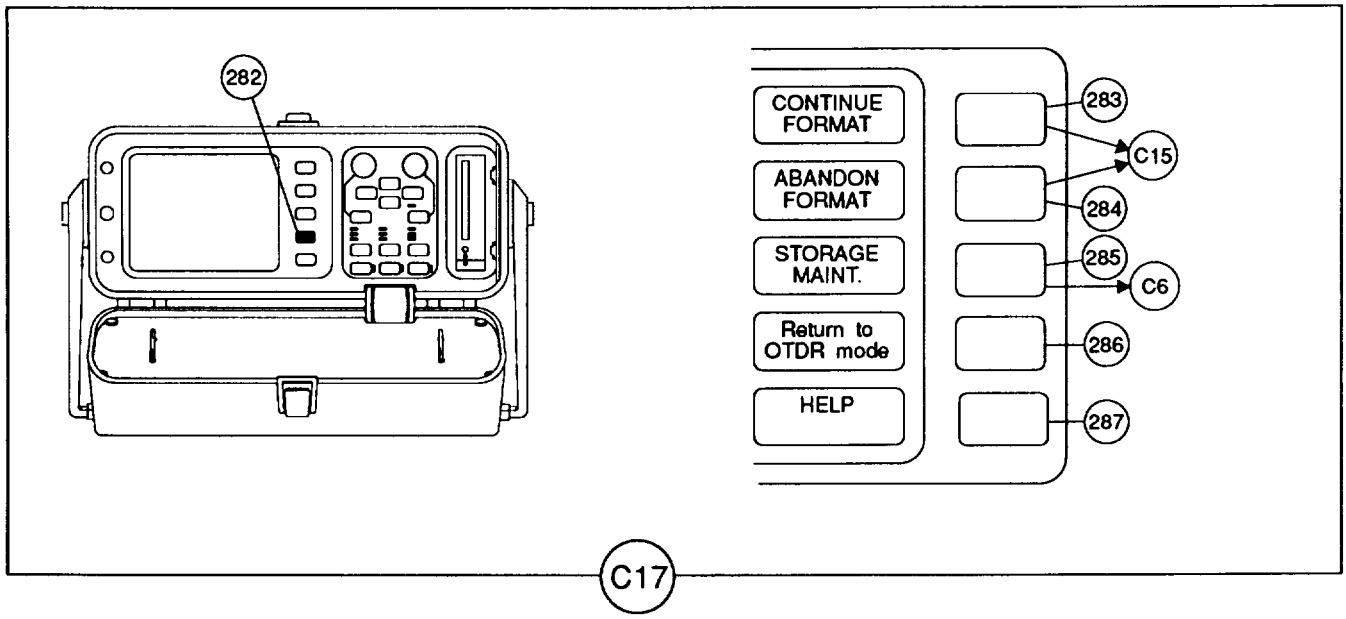


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
254	FORMAT DEVICE softkey	See C12, 210. Used to display softkeys (256) through (260)
255	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
256	FORMAT Drive A softkey	Used to display softkeys (261) through (265) which allow formatting of a diskette on an external disk drive. RESTRICTIONS: External disk drive not available.
257	FORMAT RAMCARD softkey	Used to display softkeys (276) through (280) which allow formatting of RAMCARDS for trace data storage.
258	FORMAT Drive D softkey	Used to display softkeys (266) through (270) and to check for expanded CMOS RAM to be used as Drive D for trace storage.
259	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace. Use the CURSOR B knob (255) to switch between softkeys (259), (271), (272),and (273).

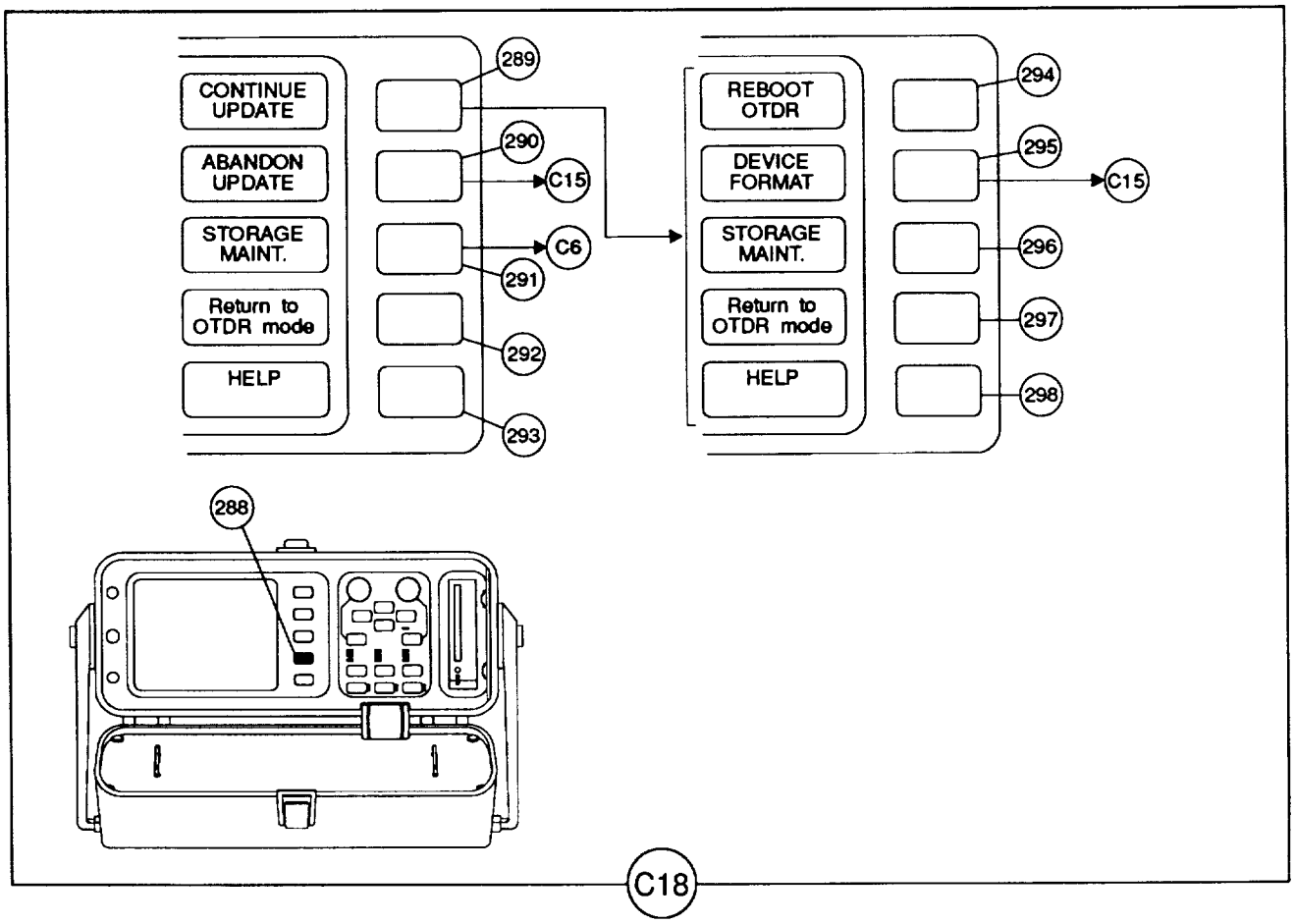
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
260	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
261	FORMAT AS 360K	Used to format a diskette on an external disk drive for 360 kilobytes of data storage space and to display softkeys (266) through (270). RESTRICTIONS: External disk drive not available.
262	FORMAT AS 720K	Used to format a diskette on an external disk drive for 720 kilobytes of data storage space and to display softkeys (266) through (270). RESTRICTIONS: External disk drive not available.
263	STORAGE MAINT.	Used to display softkeys (118) through (122). See C6.
264	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
265	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
266	CONTINUE FORMAT softkey	Used to format the expanded CMOS RAM as Drive D for storing trace files. Must be pressed twice to confirm formatting. Re-displays softkeys (256) through (260) after formatting is complete. NOTE : Formatting will erase any files already stored.
267	ABANDON FORMAT softkey	Used to re-display softkeys (256) through (260) without formatting.
268	STORAGE MAINT.	Used to display softkeys (118) through (122). See C6.
269	Return to OTDR mode softkey	Used to exit from the TS-4320 HELP FACILITY and, if present, display the active fiber trace.
270	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
271	FORMAT Drive C softkey	Used to display softkeys (283) through (287) and check the integrity of the internal CMOS RAM boot area for trace file storage. See C17.
272	UPDATE OTDR CODE softkey	Used to display softkeys (289) through (293) and a message requesting insertion of a RAMCARD containing updated OTDR system files. See C18.
273	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
274	FORMAT RAMCARD softkey	See C15, 257. Used to display softkeys (276) through (280) and a message requesting insertion of a RAMCARD into the RAMCARD slot (364).
275	CURSOR B knob	Used to change the softkey icon for the fourth softkey from the top of the screen, where indicated. Rotate the knob to change the icon.
276	FORMAT DATA CARD softkey	Used to format a RAMCARD that has been inserted into the RAMCARD slot. Displays softkeys (256) through (260) when formatting is complete. NOTE: Formatting will erase any files already stored on the inserted RAMCARD.
277	ABANDON FORMAT softkey	Used to re-display softkeys (256) through (260) without formatting.
278	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
279	Return to OTDR mode softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
280	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
281	PREVIOUS SCREEN softkey	Used to re-display softkeys (256) through (260) without formatting a RAMCARD.

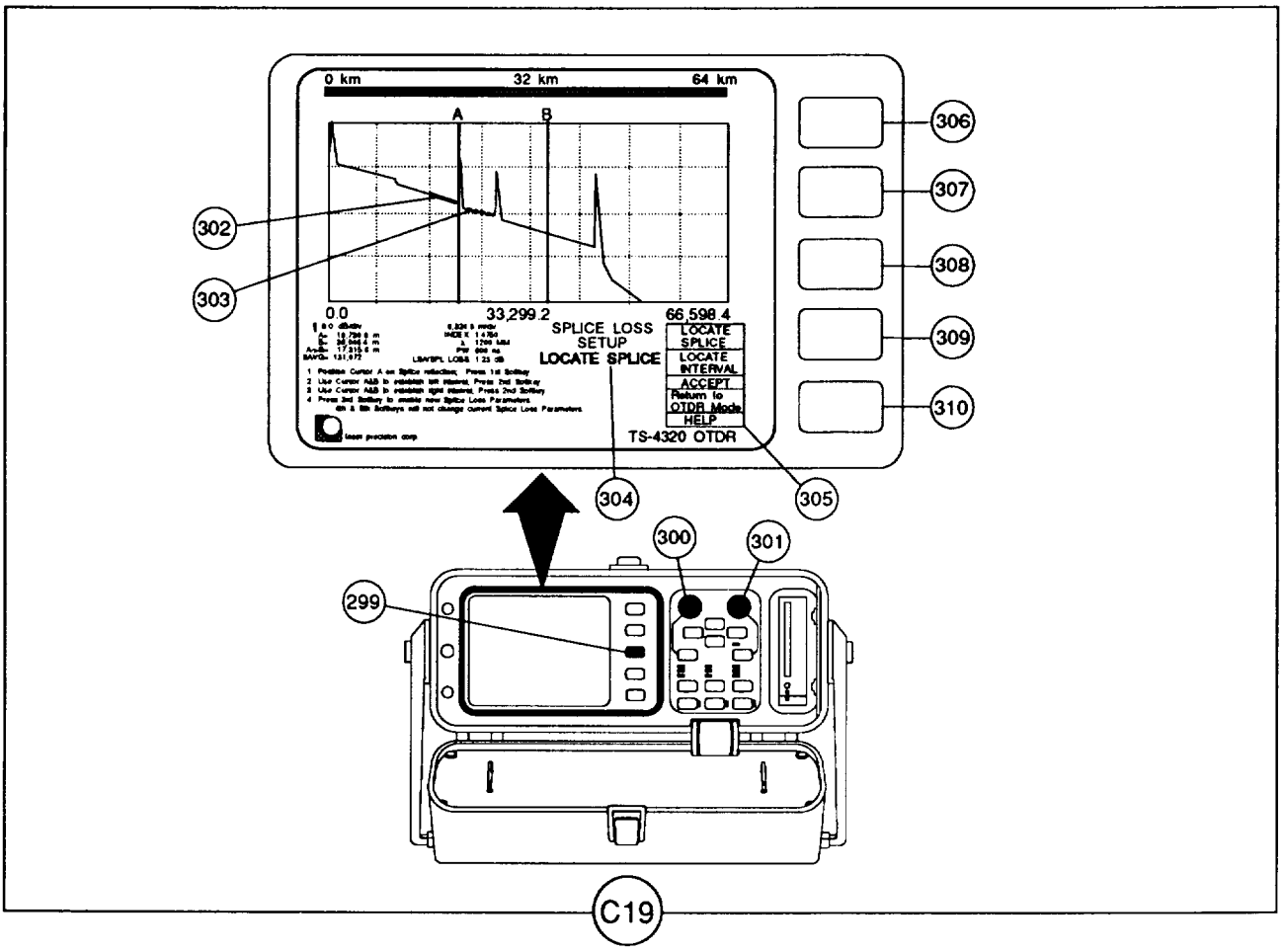


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
282	FORMAT Drive C softkey	See C15, 271. Used to display softkeys (283) through (287) and a message indicating that the integrity of the internal CMOS RAM (Drive C) is being checked.
283	CONTINUE FORMAT softkey	Used to format a portion of the internal CMOS RAM as Drive C for storing trace files. Must be pressed twice to confirm formatting. Re- displays softkeys (256) through (260) after formatting is complete. NOTE: Formatting will erase any files already stored.
284	ABANDON FORMAT softkey	Used to re-display softkeys (256) through (260) without formatting.
285	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
286	Return to OTDR mode softkey	Used to return to the original TS- 4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
287	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (280 through (32).



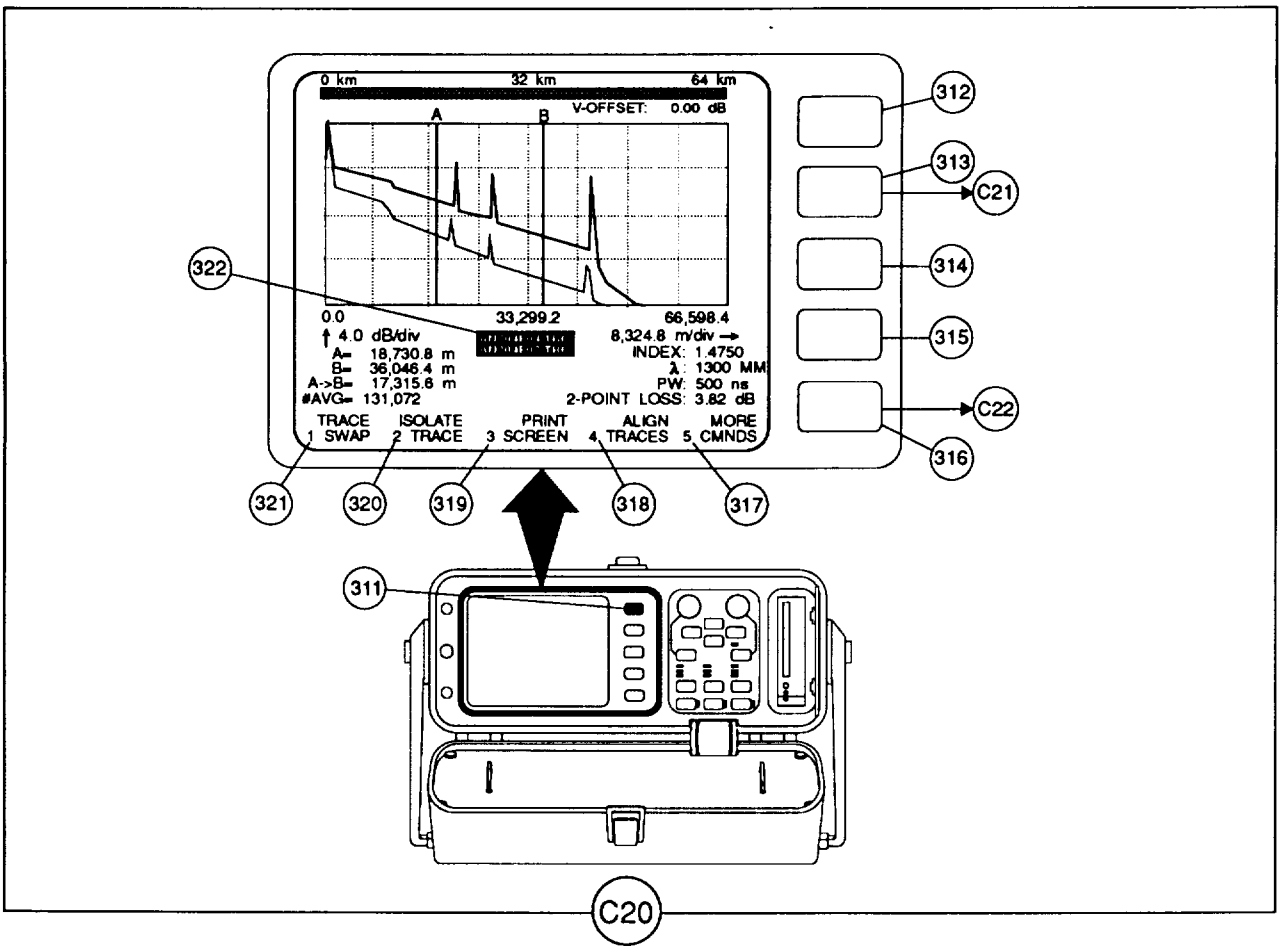
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
288	UPDATE OTDR CODE softkey	See C15, 272. Used to display softkeys (289) through (293) and a message requesting insertion of a RAMCARD containing updated system files.
289	CONTINUE UPDATE softkey	Used to begin copying updated OTDR system files from a RAMCARD and to display softkeys (294) through (398) upon completion of the copy process.
290	ABANDON UPDATE softkey	Use display softkeys (256) through (260) without updating the OTDR system files. See C15
291	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
292	Return to OTDR mode softkey	Used to return to the original TS- 4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
293	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
294	REBOOT OTDR softkey	Used to initiate a Turn-On Procedure (para 2-7) using the updated OTDR code.
295	DEVICE FORMAT softkey	Used to display softkeys (256) through (260). See C15

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
296	STORAGE MAINT. softkey	Used to display softkeys (118) through (122). See C6.
297	Return to OTDR mode softkey	Used to return to the original TS- 4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
298	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



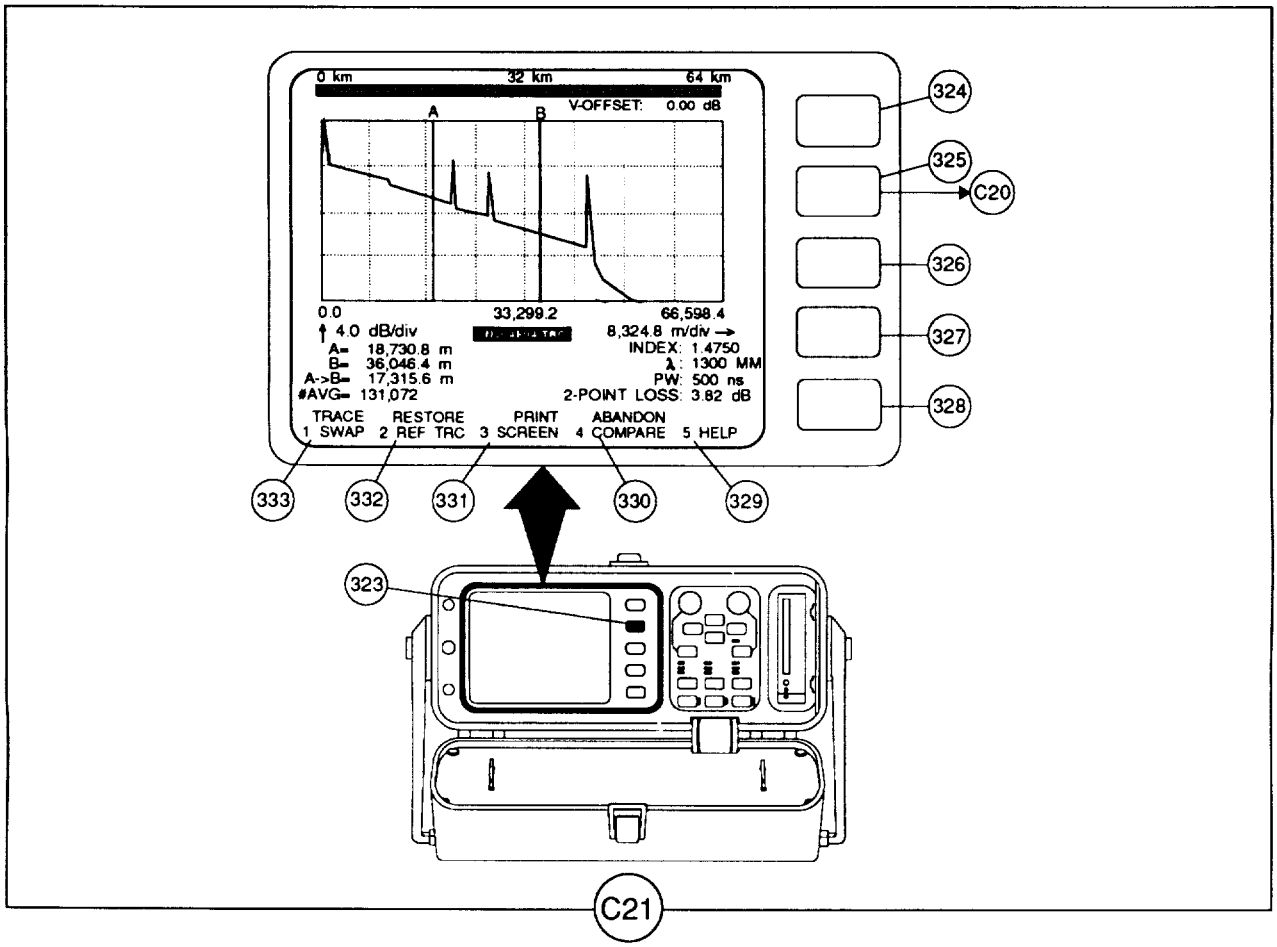
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
299	SPLICE LOSS SETUP softkey	See C7, 144. Used to display softkeys (306) through (310) and the current trace on the Splice Loss Setup Screen.
300	CURSOR A knob	Used to locate the left edge of the left (302) and right (303) interval markers.
301	CURSOR B knob	Used to locate the right edge of the left (302) and right (303) interval markers.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
302	Left Splice Loss Interval	A highlighted interval on the trace that should be located to the left of the splice being measured. NOTE: Should be at least 8 meters in length.
303	Right Splice Loss Interval	A highlighted interval on the trace that should be located to the right of the splice being measured. NOTE: Should be at least 8 meters in length.
304	Setup Instruction area	Displays brief instructions for setting the splice loss intervals, (302) and (303). Instructions include: LOCATE SPLICE — Locate the splice using CURSOR A (300). LOCATE LFT&RGT — Set the length of the left splice loss interval using CURSOR A and CURSOR B (301). LOCATE RIGHT — Set the length of the right splice loss interval using CURSOR A and CURSOR B.
305	Softkey Label area	Names of the five softkeys from top to bottom.
306	LOCATE SPLICE softkey	Used to locate the position of the splice to be measured as being at CURSOR A.
307	LOCATE INTERVAL softkey	Used to locate the left and right splice loss intervals after setting their length with CURSOR A and CURSOR B
308	ACCEPT softkey	Used to accept the settings previously made and to display the active trace.
309	Return to OTDR mode softkey	Used to return to the original TS- 4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).
310	HELP softkey	Used to return to the original TS-4320 HELP FACILITY Function Select Mode screen that displays softkeys (28) through (32).



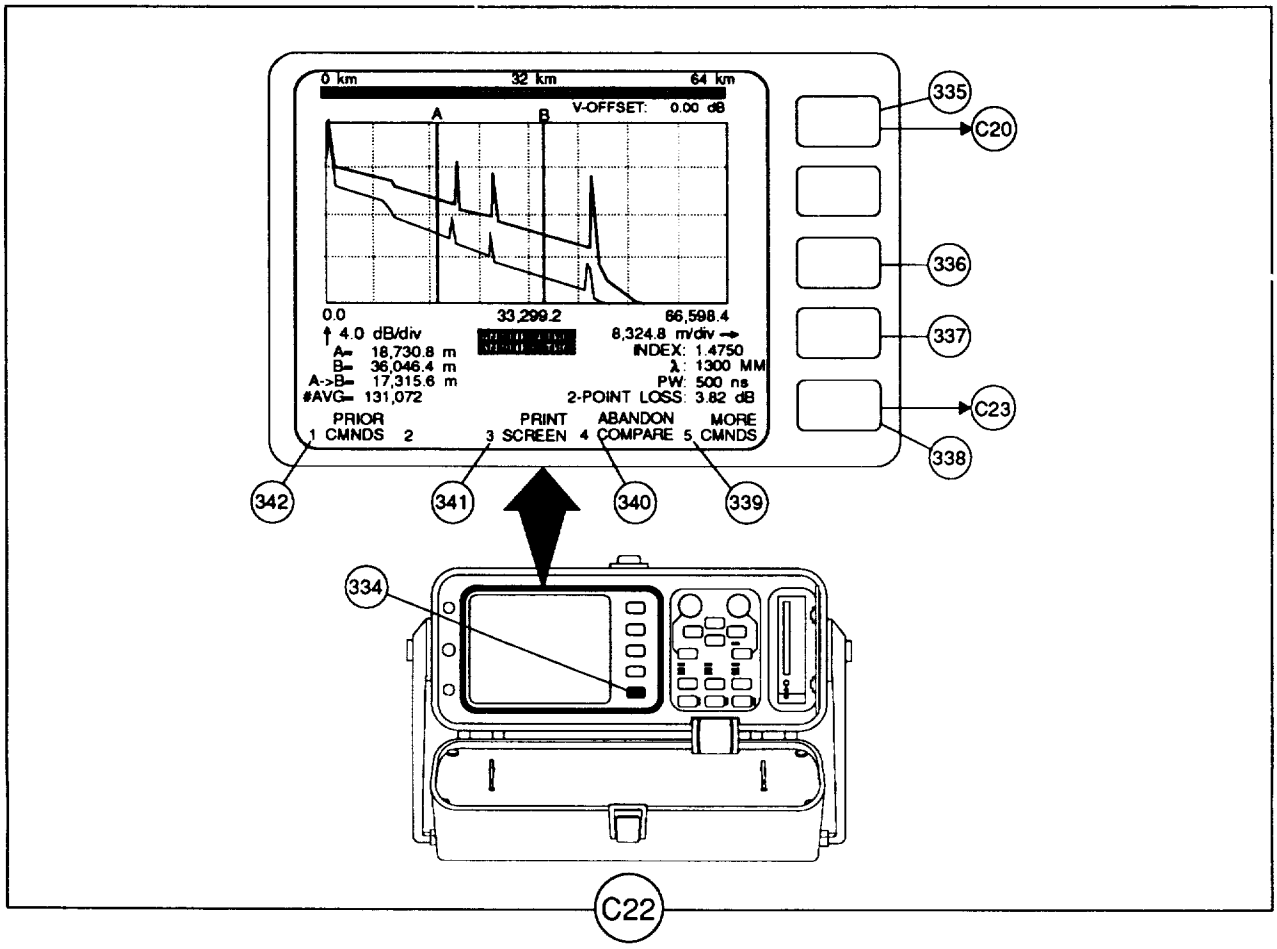
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
311	OVERLAY TRACE softkey	See C1, 62. Used to display a second trace on a screen formatted as in C20.
312	Softkey 1	Used to implement softkey command (321).
313	Softkey 2	Used to implement softkey command (320).
314	Softkey 3	Used to implement softkey command (319).
315	Softkey 4	Used to implement softkey command (318).
316	Softkey 5	Used to implement softkey command (317).
317	MORE CMNDS softkey command	Displays softkey commands (343) through (346). See C22.
318	ALIGN TRACES softkey command	Shifts the secondary trace vertically so it intersects the primary trace at the CURSOR A position. When shifted, a second depression moves the secondary trace to its original position.
319	PRINT SCREEN softkey command	Prints an image of the screen on the default device.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
320	ISOLATE TRACE softkey command	Removes the secondary trace from the screen and displays softkey commands (329) through (333). See C21.
321	TRACE SWAP softkey command	Will alternate the primary and secondary traces. This allows measurements to be made on either trace. This key is disabled while a scan is in progress.
322	Trace Filenames	The filenames of the two trace files that are overlaid on the screen. The active trace is highlighted and is the one upon which measurements can be made.

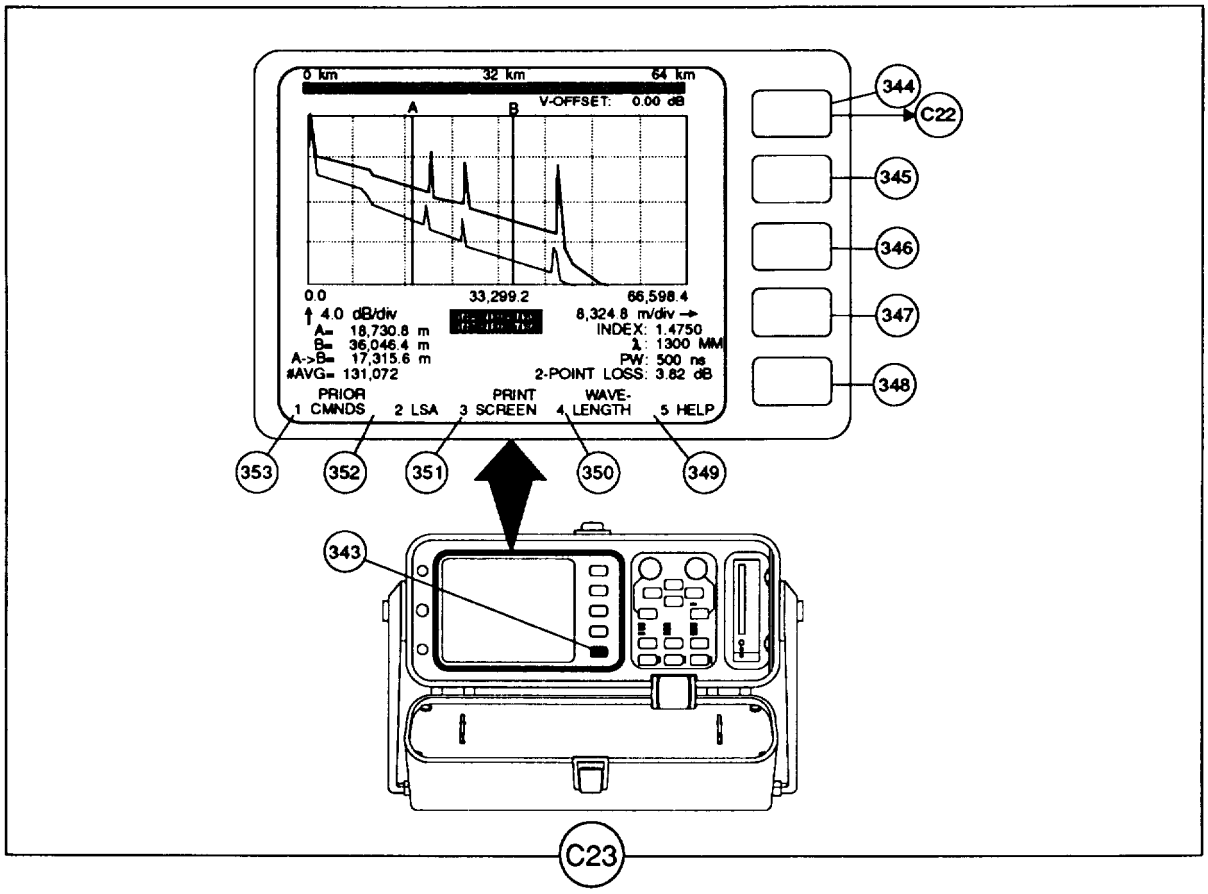


KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
323	ISOLATE TRACE softkey	See C20, 313. Removes the secondary trace from the screen and displays softkey commands (329) through (333).
324	Softkey 1	Used to implement softkey command (333).
325	Softkey 2	Used to implement softkey command (332).

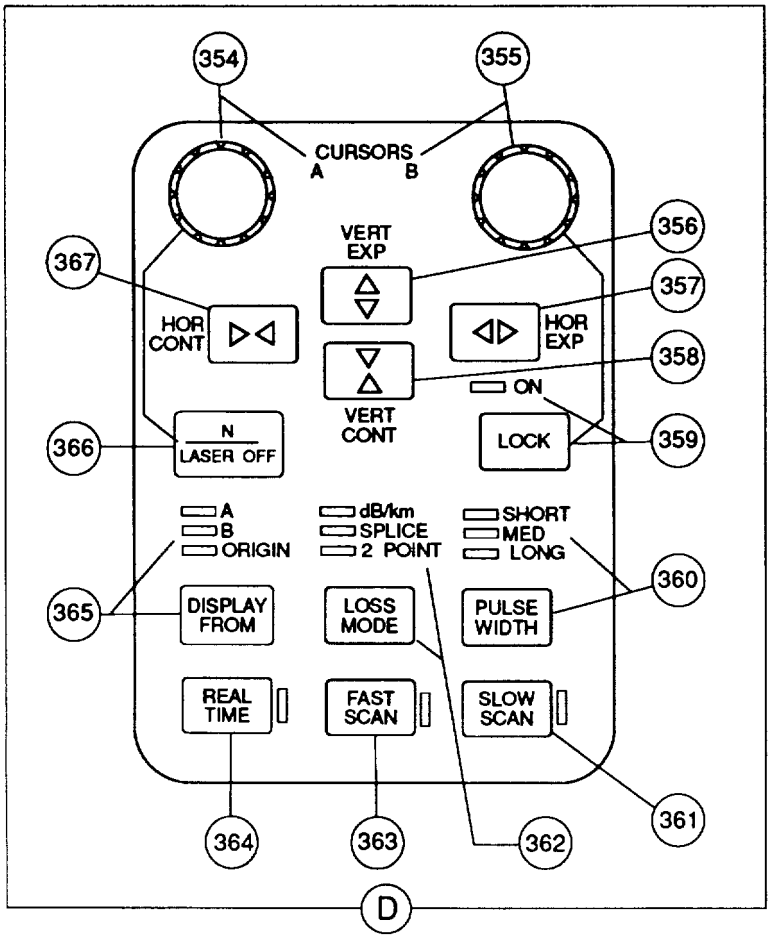
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
326	Softkey 3	Used to implement softkey command (331).
327	Softkey 4	Used to implement softkey command (330).
328	Softkey 5	Used to implement softkey command (329).
329	HELP softkey command	Displays a brief description of softkey commands (330) through (333).
330	ABANDON COMPARE softkey command	Exits from trace overlay mode. The secondary trace and soft key functions are removed from the display.
331	PRINT SCREEN softkey command	Prints an image of the screen on the default device.
332	RESTORE REF TRC softkey command	Restores the secondary trace to the screen and changes the soft key commands to (317) through (321). See C20.
333	TRACE SWAP softkey command	Will alternate the primary and secondary traces. This allows measurements to be made on either trace. This key is disabled while a scan is in progress.



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
334	MORE CMNDS softkey command	See C20, 316. Displays softkey commands (349) through (353).
335	Softkey 1	Used to implement softkey command (342).
336	Softkey 3	Used to implement softkey command (341).
337	Softkey 4	Used to implement softkey command (340).
338	Softkey 5	Used to implement softkey command (339).
339	MORE CMNDS softkey command	Displays softkey commands (349) through (353). See C23.
340	ABANDON COMPARE softkey command	Exits from trace overlay mode. The secondary trace and soft key functions are removed from the display.
341	PRINT SCREEN softkey command	Prints an image of the screen on the fault device.
342	PRIOR CMNDS softkey command	Displays softkey commands (349) through (353). See C23.



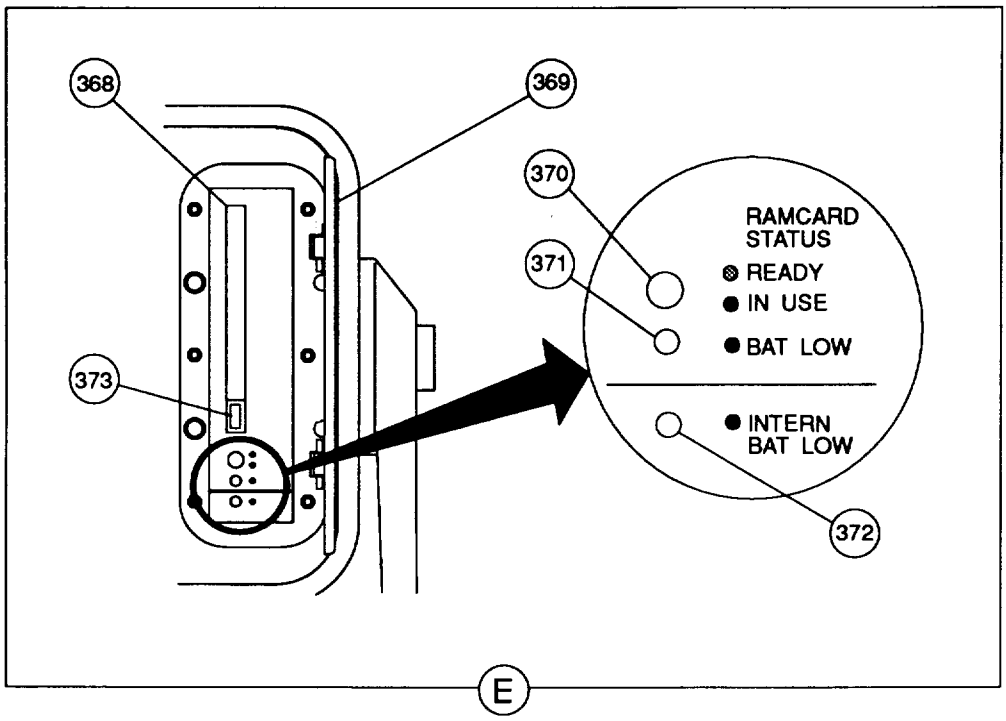
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
343	MORE CMNDS softkey command	See C22, 338. Displays softkey commands (349) through (353).
344	Softkey 1	Used to implement softkey command (353).
345	Softkey 2	Used to implement softkey command (352).
346	Softkey 3	Used to implement softkey command (351).
347	Softkey 4	Used to implement softkey command (350).
348	Softkey 5	Used to implement softkey command (349).
349	HELP softkey command	Displays brief descriptions of the softkey commands used in Overlay Trace mode.
350	WAVE-LENGTH softkey command	Changes the wavelength when using the TD- 285C dual wavelength optical module.
351	PRINT SCREEN softkey command	Prints an image of the screen on the fault device.
352	LSA softkey command	Toggles between normal and LSA (Least Squares Approximation) measurement when using 2-POINT or dB/km LOSS modes.
353	PRIOR CMNDS softkey command	Displays softkey commands (339) through (342). See C22.



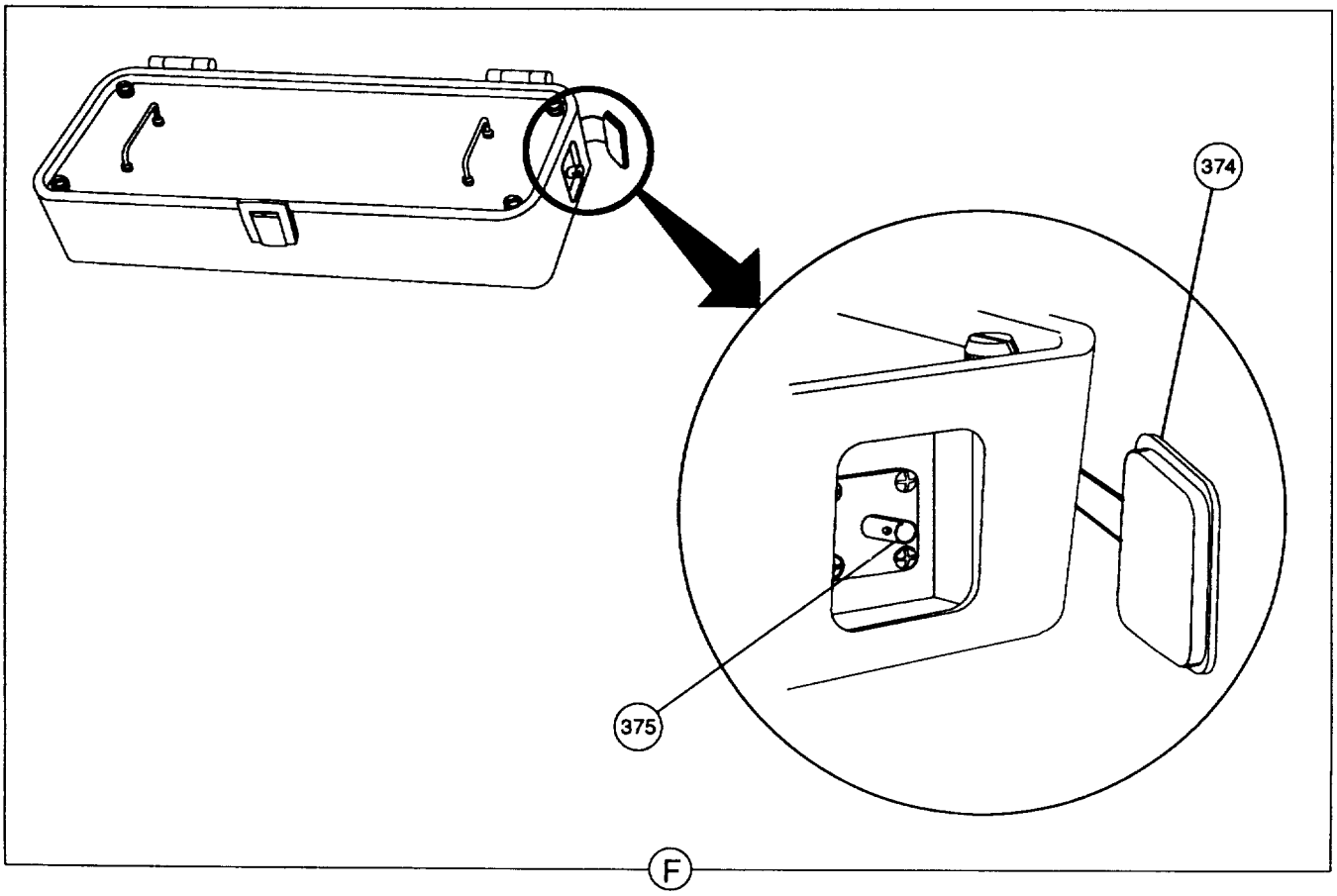
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
354	CURSOR A Knob	Turn clockwise to move CURSOR A to the right. Turn counter-clockwise to move it to the left.
355	CURSOR B Knob	Turn clockwise to move CURSOR B to the right. Turn counter-clockwise to move it to the left.
356	VERT EXP	Vertical Expansion. Press to halve the number of dB/division on the vertical scale. (B,24) Restrictions: Trying to expand beyond 0.1 25 dB/div will cause an error tone. Vertical Shift. Press and hold while turning the CURSOR B knob clockwise to move the trace upward on the display. Turn the knob counterclockwise to move the trace downward. The offset is displayed in B,7. Turning the CURSOR A knob while holding the key down resets the trace position to 0.00 dB. Restrictions: Operational only in Display from Origin mode (365).

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
357	HOR EXP	Horizontal Expansion. Press to halve the number of units/division on the horizontal scale. (B,14) Units may be meters, feet, or miles as set by the soft-keys. Restrictions: Trying to expand beyond the lower limit (Approximately 1 m/div) will cause an error tone. The lower limit is dependent on the index of refraction, units, and optical module in use.
358	VERT CONT	Vertical Contract. Press to double the number of dB/division on the vertical scale. (B,24) Restriction: Trying to contract beyond 8 dB/div will cause an error tone.
359	LOCK	Press the key to light the ON indicator and allow movement of both cursors with the CURSOR B knob while maintaining their current separation. Restrictions: Does not affect the CURSOR A knob.
360	PULSE WIDTH	Press to select a SHORT, MEDIUM, or LONG laser pulse width, light the appropriate indicator above the key and update the display. The pulse width varies with the optical module in use. See B,18 for the values that are displayed.
361	SLOW SCAN	Press once to select SLOW SCAN, which provides more data averaging than FAST SCAN but takes longer. Lights the indicator next to the key. The screen displays LASER ON/AVG (B,25), and #AVG indicator (B,20) begins counting. Press twice in rapid succession to select Super Slow Scan, for the most data averaging and dynamic range.
362	LOSS MODE	Press to select a loss measurement mode which will light the appropriate indicator above the key. If no indicator is lit, the unit is set to measure reflectance and the LOSS:/REFL: line reads REFL: (B,19). For selection of normal or LSA measurement technique, see B,10.
363	FAST SCAN	Press to select FAST SCAN for the quickest display of the trace profile, but the least amount of averaging.
364	REAL TIME	Press to turn the laser on and continuously update the trace display.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
365	DISPLAY FROM	Press to select a reference point for the display. The horizontal scale controls, (357) & (367), expand or contract the display relative to the selected point. Each depression steps through the three indicator lights above the key. • DISPLAY FROM A places CURSOR A in the center of the display. Moving that cursor knob then moves the trace instead of the cursor. • DISPLAY FROM B does the same as the above, but for CURSOR B. • DISPLAY FROM ORIGIN starts the left edge of the display from the beginning of the fiber (OTDR bulkhead connector).
366	N-LASER OFF	Press and release to turn the laser off and interrupt a fiber scan in progress. Press and hold down while turning the CURSOR A knob clockwise to increase the Index of Refraction. Turn the knob counterclockwise to decrease the Index of Refraction. The value is displayed in B,15.
367	HOR CONT	Horizontal Contract. Press to double the number of units/division on the horizontal scale. (B,14) Units may be meters, feet, or miles as set by the soft-keys. Restrictions: Trying to contract beyond the upper limit will cause an error tone. (The upper limit is dependent on the refraction index (B,15), units, and optical module in use.



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
368	RAMCARD insertion slot	Insert RAMCARD to store data.
369	Door	Protects RAMCARD slot. Keep closed when not in use.
370	READY/IN USE light	Indicates status of the RAMCARD as follows: Green - RAMCARD inserted & ready for use. Red - Data being stored on RAMCARD Restriction: Do not remove RAMCARD when light is red.
371	BAT LOW light	Battery in the RAMCARD is low.
372	INTERN BAT LOW light	The internal battery in the TS-4320(P)/G is low. Change the internal batteries (para 3-12) and perform Preliminary Service and Adjustment of Equipment (para 3-5).
373	EJECT BUTTON	Press to Eject RAMCARD.



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
374	Dust Cover	Protects the fiber connection port from dirt. Keep closed when not in use.
375	Fiber Connector	A keyed connector for attaching a fiber optic patchcord.

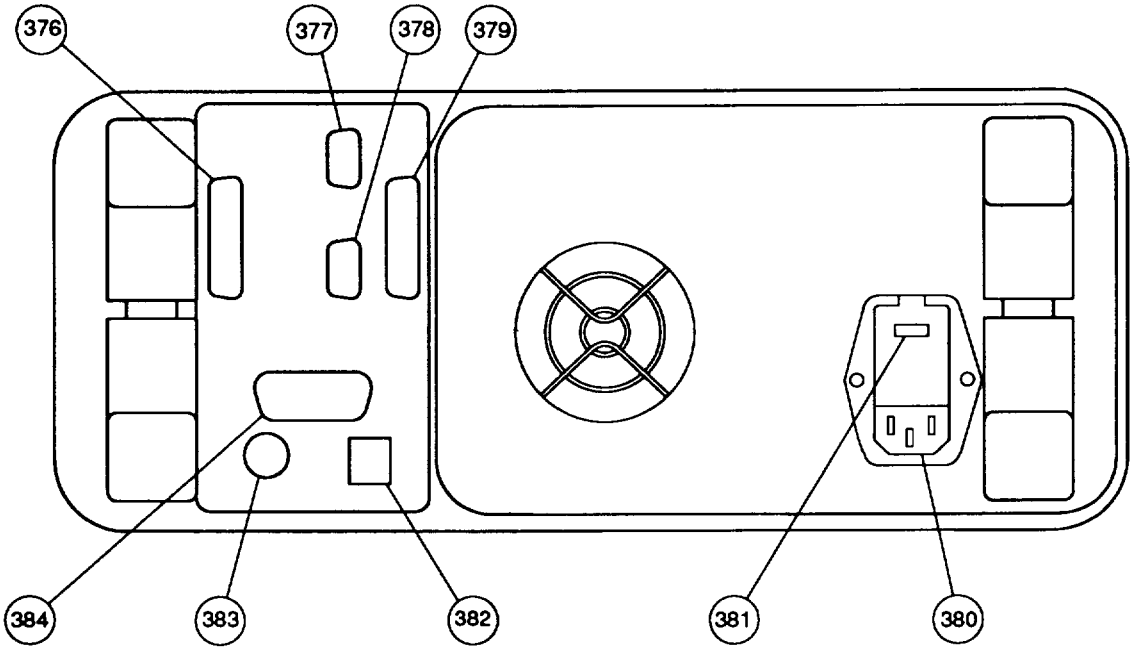


Figure 2-2. Operator's Controls, Indicators, and Connectors, rear view.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
376	EXT. DISK	Not used. Proprietary interface for connection to an external disk drive, either 5-1/4" or 3-1/2".
377	EXT. DISP.	Not used. Connector for an external TTL-RGBI monitor.
378	RS-232	Standard RS-232C(DTE) serial port.
379	EXT. PRN/PLT	Standard parallel interface for connection to a printer.
380	Input Power Connector	Used as AC power input connector for the OTDR. Also contains line fuse and voltage selection facilities. Voltage selection from 100/120/220/240 VAC. Number visible in window indicates nominal line voltage for which OTDR is set to operate. Power input connector accepts female end of power cable. Line power fuse is 2 amp 100/120 VAC and 11/2 amp 220/240 VAC operation.
381	Voltage Setting Window	Shows the voltage setting for the test set.
382	RJ-11C	Not used. Standard telephone line interface to an optional modem.
383	KEY BD.	Connector for the keyboard.
384	IEEE-488	GPIB interface connector.

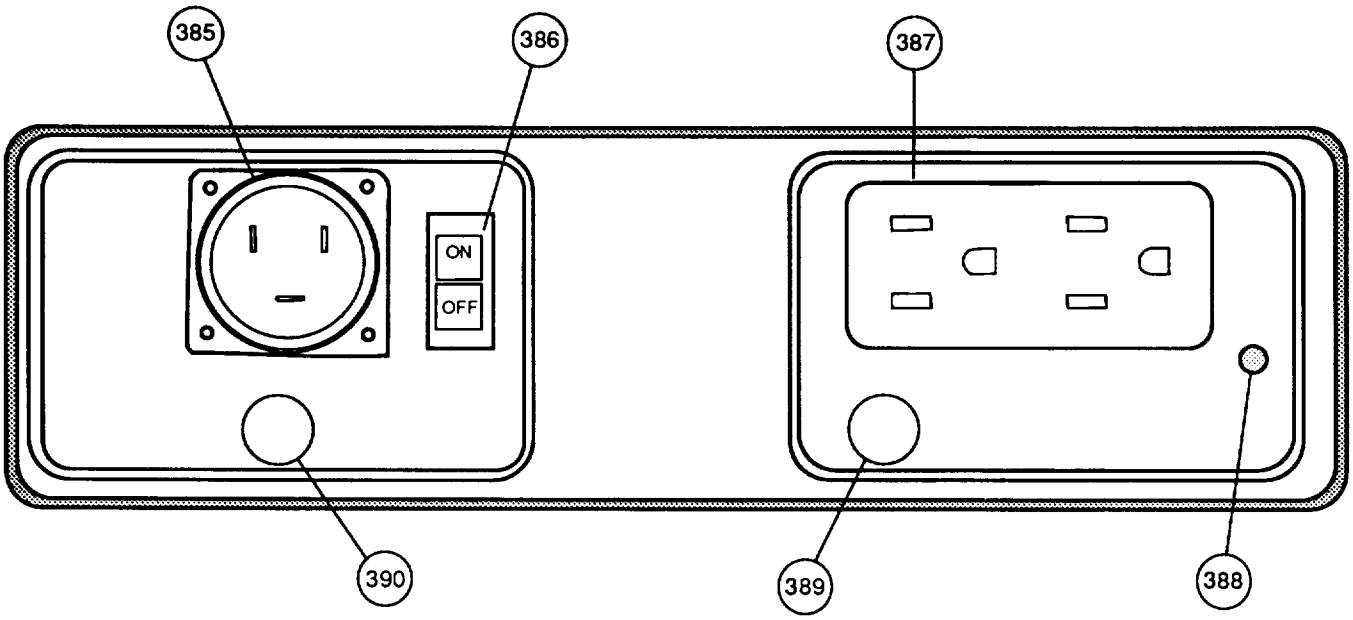


Figure 2-3. Operator's Controls, Indicators, and Connectors, DC/AC Inverter.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
385	DC Input Connector	Connector for DC power input; 12, 24, or 28 VDC. Do not connect power cord with ON/OFF switch (386) ON.
386	ON/OFF Switch	Rocker switch to turn input power ON/OFF.
387	AC Output Connector	Connector for AC power cord to TS- 4320(P)/G. 110 VAC, 60 HZ output.
388	Power ON Indicator Light	Illuminated when AC power is available.
389	AC Fuse Holder	Contains fuse for AC circuits. (150VA, 2A)
390	DC Fuse Holder	Contains fuse for DC circuits. (30A)

SECTION II. OPERATOR'S PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-2. GENERAL.

To be sure that the equipment is always ready for the mission, perform scheduled preventive maintenance checks and services (PMCS). When doing any PMCS or routine checks, keep in mind the WARNINGS and CAUTIONS about electrical shock and bodily harm.

2-3. PMCS PROCEDURES.

a. Tools, Materials, and Equipment Required for Preventive Maintenance. No tools or equipment are required for operator preventive maintenance. Cleaning materials required are listed in Appendix D, items 1, 2, and 3.

b. PMCS for TS-4320(P)/G is limited to routine checks such as shown below.

- cleaning
- dusting
- wiping
- checking for frayed cables
- storing items not in use
- covering unused receptacles
- checking for loose nuts, bolts, and screws

c. Perform these routine checks anytime they must be done.

SECTION III. OPERATION UNDER USUAL CONDITIONS

2-4. INTRODUCTION.

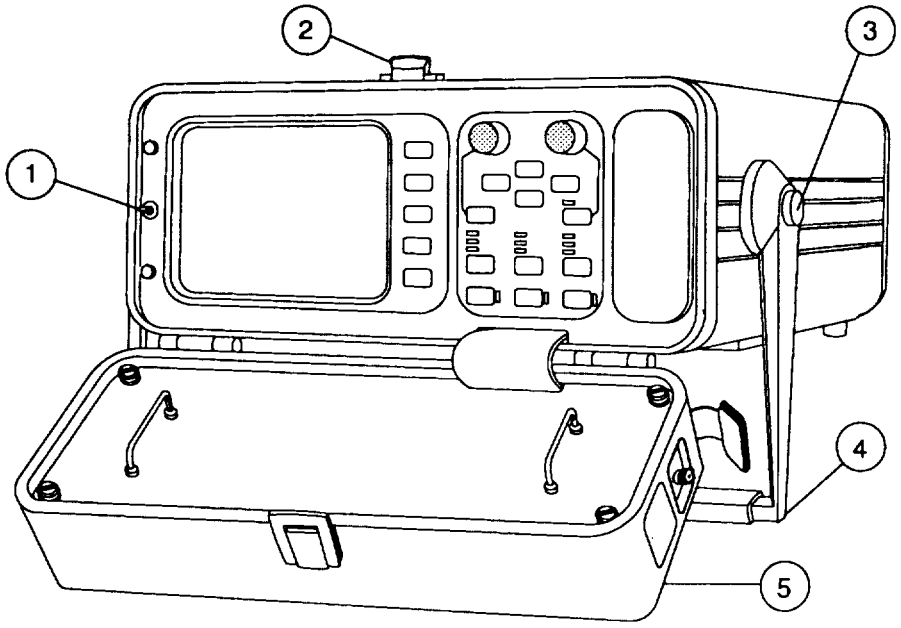
This section provides the information required to set up and operate the Optical Fiber Test Set TS-4320(P)/G. It includes instructions for setting up the parts of the system, checking system parameter values, and making different kinds of measurements. The instructions are divided into three categories:

- Paragraphs 2-5 through 2-8 must be done prior to making measurements.
- Paragraphs 2-9 through 2-15 provide procedures for making measurements.
- Paragraphs 2-16 through 2-36 are utility and setup procedures.

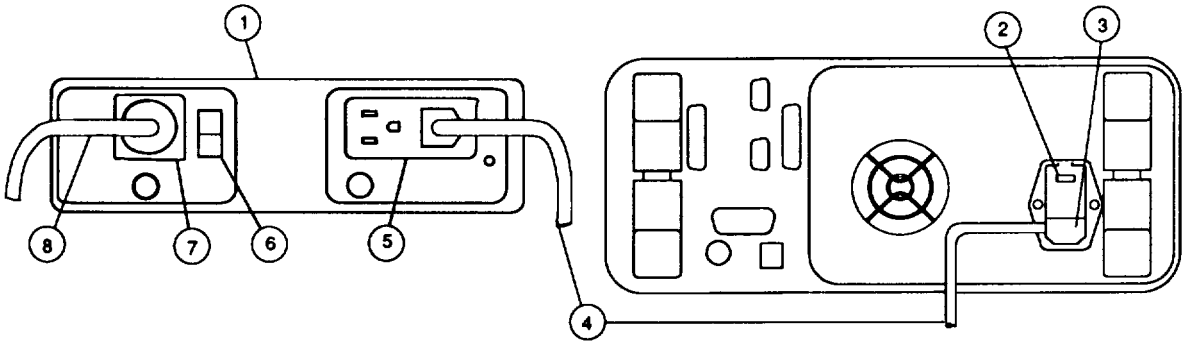
2-5. PREPARATION FOR USE.

WARNING

The TS-4320(P)/G is equipped with a three-wire power cable. When connected to a grounded AC power receptacle, this cable grounds the instrument front panel, cover, and cabinet. Do not use extension cords without a ground.



1. Lift the front of the unit while pressing on the two handle release buttons (3).
2. Allow handle (4) to rotate 900 and then lock it in position by releasing handle buttons.
3. Lower the TS-4320(P)/G to rest on the handle.
4. Release the cover latch (2) on the front of the TS- 4320(P)/G by lifting with a thumb to unlock and then rotating the rear of the latch forward.
5. Lower the cover (5) until it rests on the work surface.
6. Verify that the POWER switch (1) is set to OFF.



Front View Rear View

CAUTION

If the DC/AC Inverter (1) is to be used, the voltage must be set to 120V.

7. Verify that the voltage in the Voltage Setting Window (2) indicates the available line voltage.
8. Connect power cable (4) to the Input Power Connector (3). If the DC/AC Inverter (1) is not to be used, connect the other end of the power cable to the AC power source.
9. If the DC/AC Inverter is to be used, perform steps 10 through 12.
10. Verify that the ON/OFF switch (6) is OFF.
11. Connect the power cable (4) to the AC Output Connector (5).

NOTE

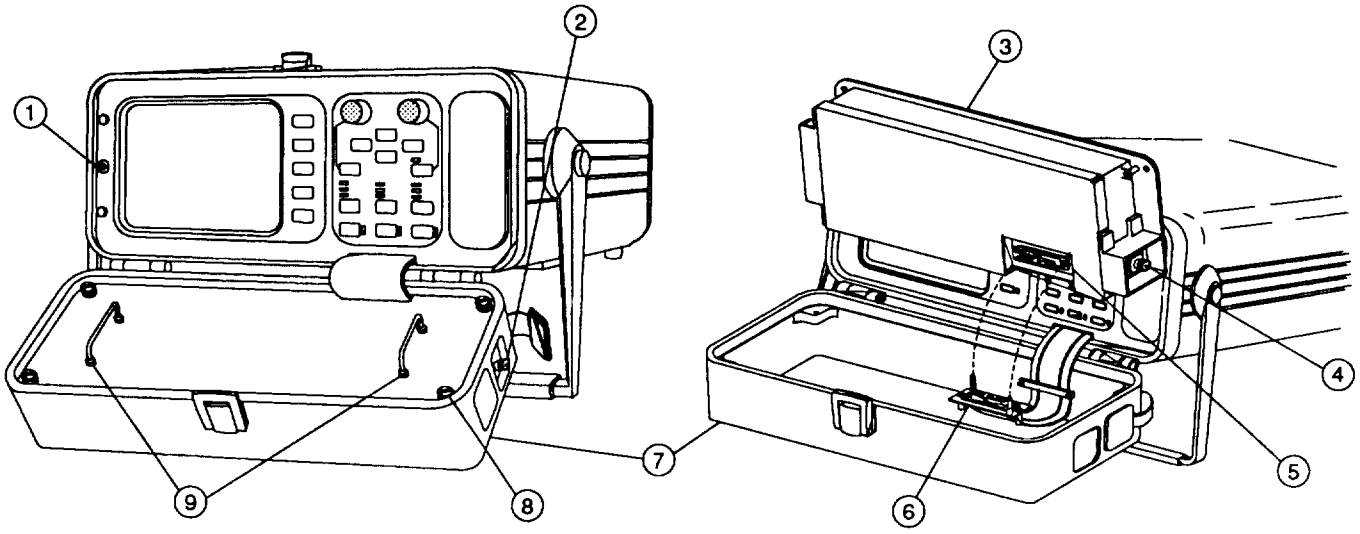
If the DC power source is a battery, connect the green ground wire in the DC power cable (8) to chassis ground.

12. Connect the DC power cable (8) to the DC Input Connector (7) and to the DC power source.

CAUTION

Any required electrical connections to the interface panel (keyboard, printer, etc.) must be made before power is turned ON.

2-6. OPTICAL MODULE SELECTION.

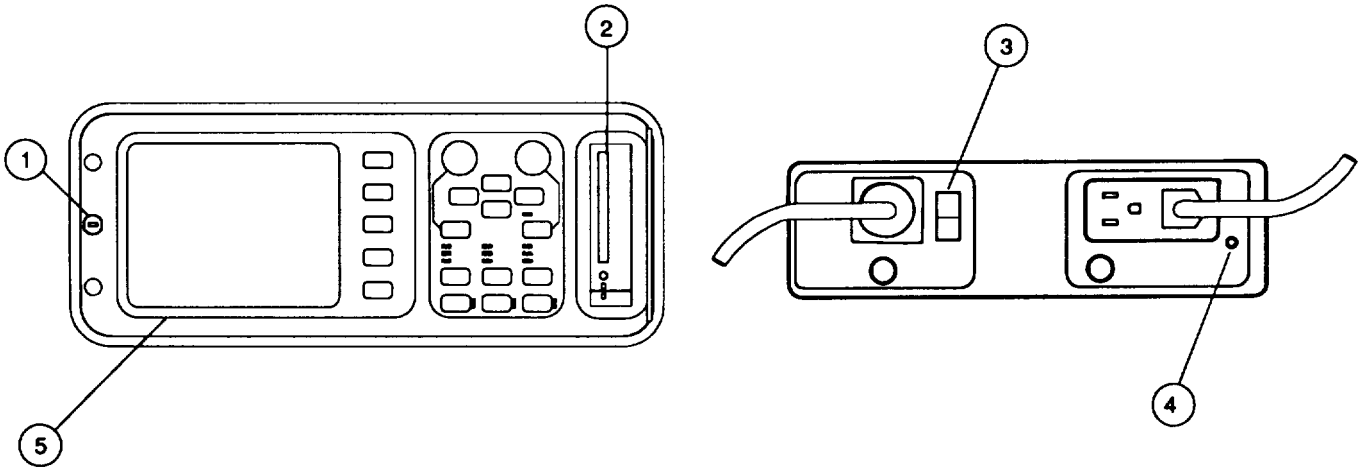


1. Check the documentation for the fiber to be tested against the table below. If the Optical Module in the TS-4320(P)/G does not match the Fiber Type and Wavelength, perform steps 2 through 8 to install the proper Optical Module.

Fiber Type	Wavelength (nm)	Optical Module
Single Mode	1310/1550	TD-285C
Multimode	850	TD-260C
	1300	TD-261C

2. Set POWER switch (1) to OFF.
3. If a test fiber is connected, remove it from the fiber connector (2).
4. Loosen captive slotted thumbscrews (8).
5. Grasp the handles (9) and lift the optical module up and out of the cover (7).
6. Lower the optical module (3) that was selected from the table above into the cover (7) with the test fiber connector (4) to the right and the cable cutout (5) toward the rear of the cover.
7. Jiggle the optical module (3) slightly to ensure the underside connector (6) is properly aligned and push down until the module is firmly seated.
8. Tighten captive slotted thumbscrews (8).

2-7. TURN-ON PROCEDURE.



1. Verify that there is not a RAMCARD in the RAMCARD insertion slot (2).
2. If the DC/AC Inverter is not being used, go to Step 4.
3. Set DC/AC Inverter switch (3) from OFF to ON and verify that the Power On Indicator (4) lights.
4. Set POWER switch (1) to ON.

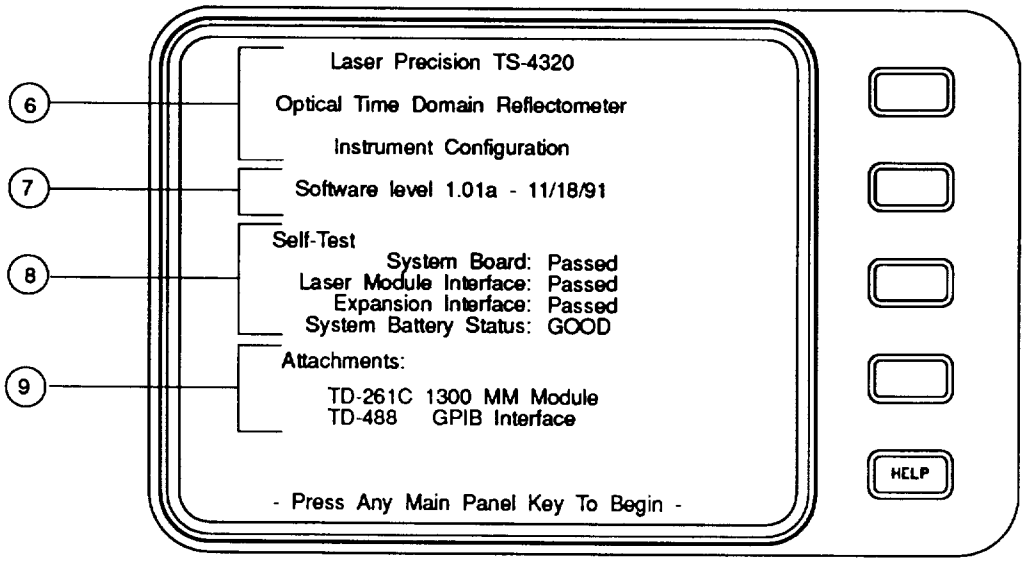
    - The TS-4320 performs a Power-On Self Test. The progress of the test is shown on the screen (5) by indicators advancing beneath a line graph. When the self-test is complete, the term "Loading" appears.

5. If the error message shown below appears, set POWER switch (1) to OFF.

    Stand-alone ROM version not supported.
    Loading Failed!!
    Insert TS-4320 System Card

6. Insert the PROGRAMMED ROMCARD labeled "TS-4320(P)/G SYSTEM BOOT CODE" into the RAMCARD insertion slot (2).
7. Set POWER switch (1) to ON.
8. If loading is still not completed or any other error message appears, notify unit maintenance.
9. When loading is complete, the screen (5) changes to read "TS-4320 OTDR STARTING Please Wait".

10. When the starting process is complete, the Instrument Configuration screen displays a screen title (6), the software level (7), the results of four internal Self-Tests (8), and a list of attached features (9).



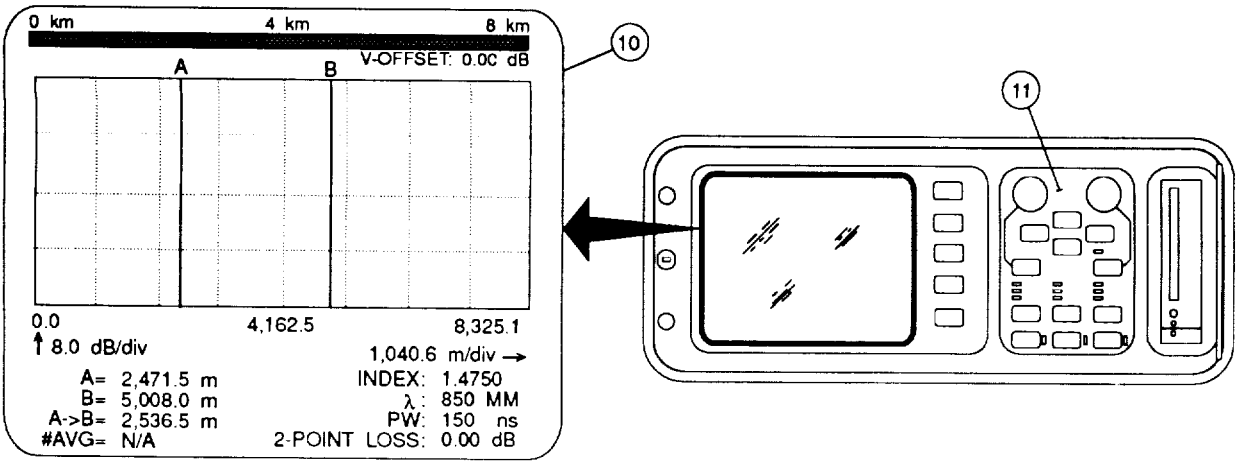
NOTE

- **The Software Level (7) may appear different than the example.**
- **If any of the Self-Tests (8) display "Failed", or the System Battery Status displays "LOW", notify unit maintenance.**

11. Press any key on the Main Panel (11) to display an OTDR Trace Screen (10).

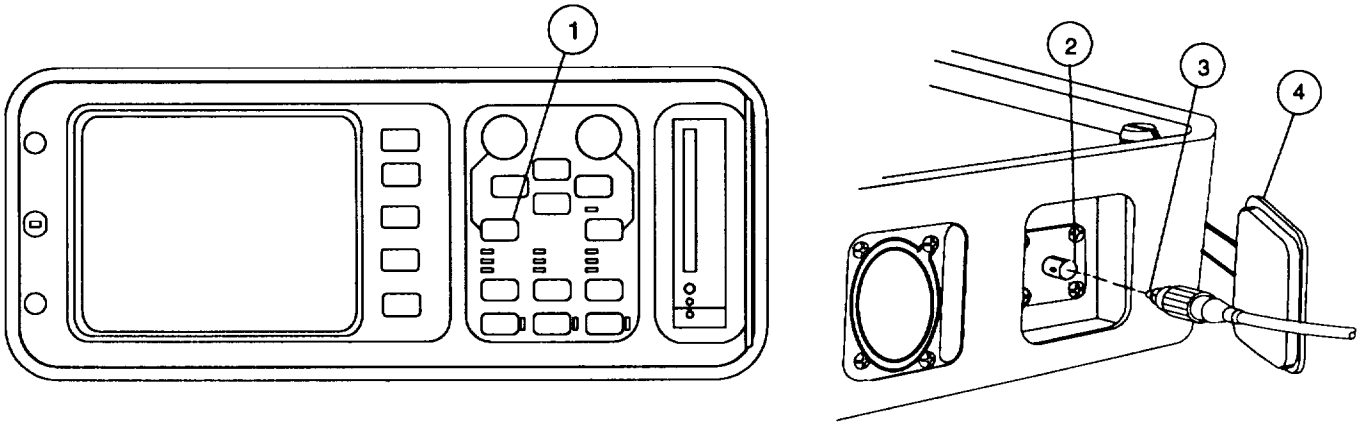
NOTE

- **The appearance of the screen will be as it was in the previous configuration.**
- **Press HELP key to re-display screen after screen saver has activated.**



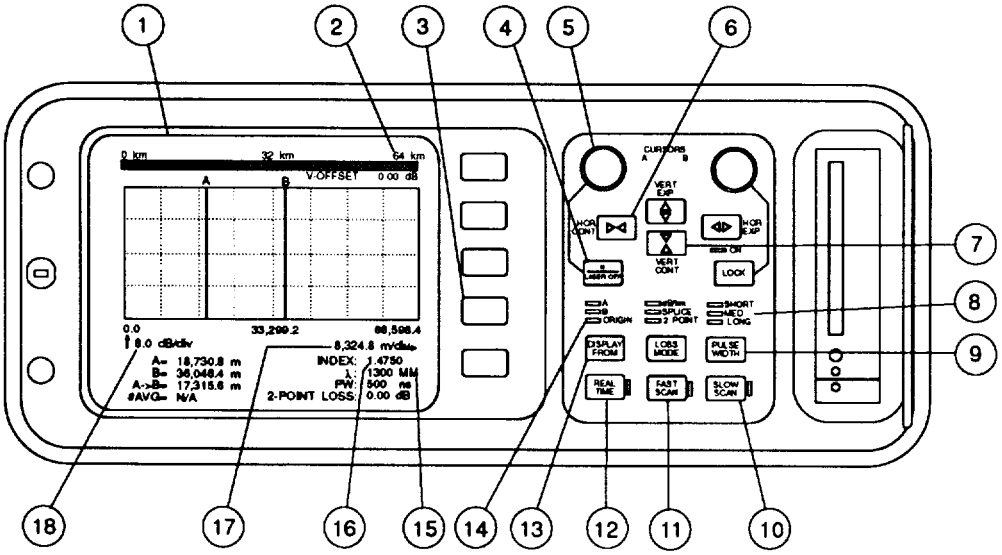
2-8. FIBER OPTIC CABLE ASSEMBLY SELECTION AND FIBER CONNECTION.

The fiber optic cable assembly used to connect the TS-4320 to the fiber to be tested must match the fiber type and have the proper connector.



1. If the LASER ON indicator (fig. 2-1, Key 25) is ON, depress the N/LASER OFF key (1) to turn the laser OFF.
2. Select the proper optical module (para 2-6).
3. Check the documentation for the fiber to be tested to find the fiber type (singlemode or multimode) and the type of connector with which it is terminated. If not terminated with a connector, find the fiber core and cladding diameter in microns. Choose the proper fiber optic cable assembly from Appendix C, Section II.
4. Open the dust cover (4) on the optical module fiber connection port.
5. Clean the fiber receptacle (2) with lintless cloth and alcohol (Appendix D, items 1 and 2).
6. Clean the fiber optic cable assembly connectors (3) with lintless cloth and alcohol (Appendix D, items 1 and 2).
7. Ensure both the receptacle and fiber optic cable assembly connectors are dry.
8. Align the slots on the fiber optic cable connector (3) with the pins on the fiber receptacle (2) and press it onto the fiber receptacle.
9. Turn the fiber optic cable connector (3) one-quarter turn clockwise to fasten it securely.
10. Connect the other end of the fiber optic cable assembly to the fiber to be tested.

2-9. SCAN A FIBER.



1. Select the proper optical module (para 2-6).
2. Connect the fiber to be tested to the fiber optic cable assembly selected (para 2-8).
3. Perform the Turn-On Procedure (para 2-7) to obtain the OTDR Trace screen (1) or press the softkey labeled Return to OTDR mode, if operating in the HELP Facility (fig. 2-1, Keys 16 and 31).
4. Set the fiber length/resolution (2) for the length of the fiber to be tested (para 2-27).
5. Determine index of refraction (16), using available documentation for the fiber. If documentation is not available, use the defaults shown below.

Module	Default Index of Refraction
TD-260C	1.4750
TD-261C	1.4700
TD-285C (1310nm)	1.4640
TD-285C (1550nm)	1.4640

NOTE

Distance measurement accuracy can be affected by the value input for refractive index.

6. Set the index of refraction (16) by holding the N/LASER OFF key (4) down while turning the CURSOR A knob (5).
7. If the TD-285C optical module is installed, set the wavelength (15) by pressing the wavelength key (3).

8. Use the HORZ CONT key (6) and VERT CONT key (7) to set the horizontal (17) and vertical (18) display divisions to their maximum.

- The test set will beep when the maximum is reached.

9. Press the DISPLAY FROM key (13) to light the ORIGIN LED (14).

10. Press the PULSE WIDTH key (9) to light the desired pulse width LED (8); SHORT, MED, OR LONG. See Figure 2-1, Key 18 for the available pulse widths.

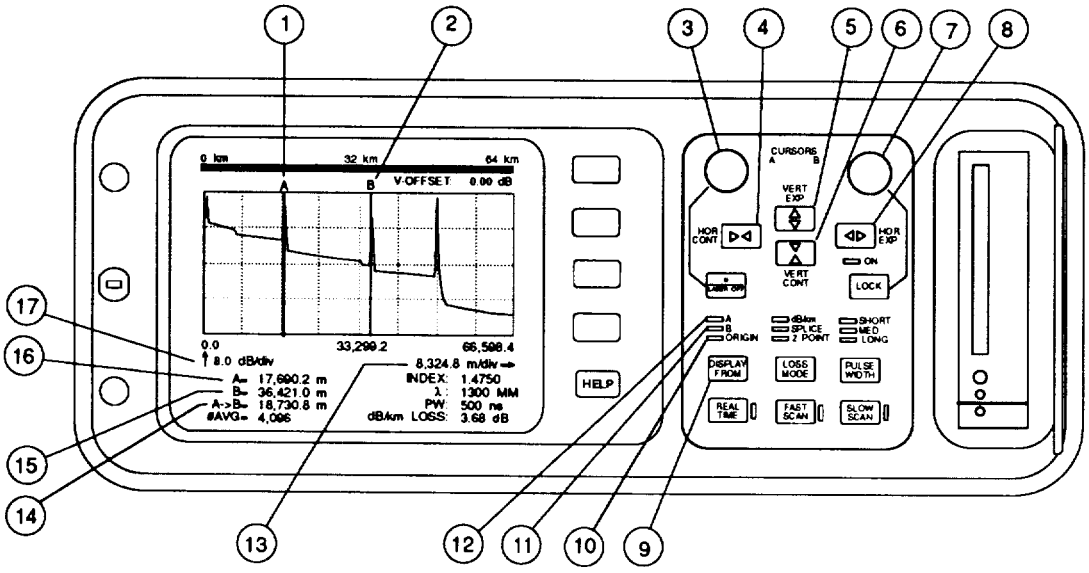
11. Press the REAL TIME key (12) to activate the laser.

12. Check the display to ensure proper setup and then press the FAST SCAN Key (11) or SLOW SCAN key (10) to begin acquiring data. To acquire data in super slow scan mode, press the SLOW SCAN key twice in rapid succession.

- The test set beeps when scanning is complete.

2-10. DISTANCE MEASUREMENT.

This procedure describes how to measure distance from the fiber beginning to a feature and also how to measure the distance between two features. Either cursor can measure the distance from the fiber beginning. To measure the distance between features, CURSOR A must be located at the leftmost feature.



1. Display a trace, either by scanning a fiber (para 2-9) or by recalling a trace from storage (para 2-17).

2. Use the HOR CONT key (4) and the VERT CONT key (6) to set the horizontal (13) and vertical (17) display divisions to their maximum.

   - The test set will beep when the maximum is reached.

3. Rotate the CURSOR A knob (3) to place CURSOR A (1) on the left edge of the feature, where the backscatter slope just begins to change.

4. Press DISPLAY FROM (9) to light the A (12) LED.

   - The intersection of CURSOR A and the trace is centered horizontally on the screen.

5. Press VERT EXP (5) once.

   - The vertical display divisions (17) are expanded by a factor of 2 and the cursor/trace intersection is centered vertically.

6. Use the HOR EXP (8), HOR CONT (4), VERT EXP (5), and VERT CONT (6) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

7. Use the CURSOR A knob (3) to adjust the cursor position for greater accuracy.

8. Read the distance to the feature at A= (16) on the screen.

9. Press DISPLAY FROM (9) repeatedly until the ORIGIN LED (10) is lit.

10. Rotate the CURSOR B knob (7) to place Cursor B (2) on the left edge of the second feature where the backscatter slope just begins to change.

11. Press DISPLAY FROM (9) until the B LED (11) is lit.

- The intersection of CURSOR B and the trace is centered horizontally on the screen.

12. Press VERT EXP (5) once.

- The vertical display divisions (17) are expanded by a factor of 2 and the cursor/trace intersection is centered vertically.

13. Use the HOR EXP (8), HOR CONT (4), VERT EXP (5), and VERT CONT (6) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

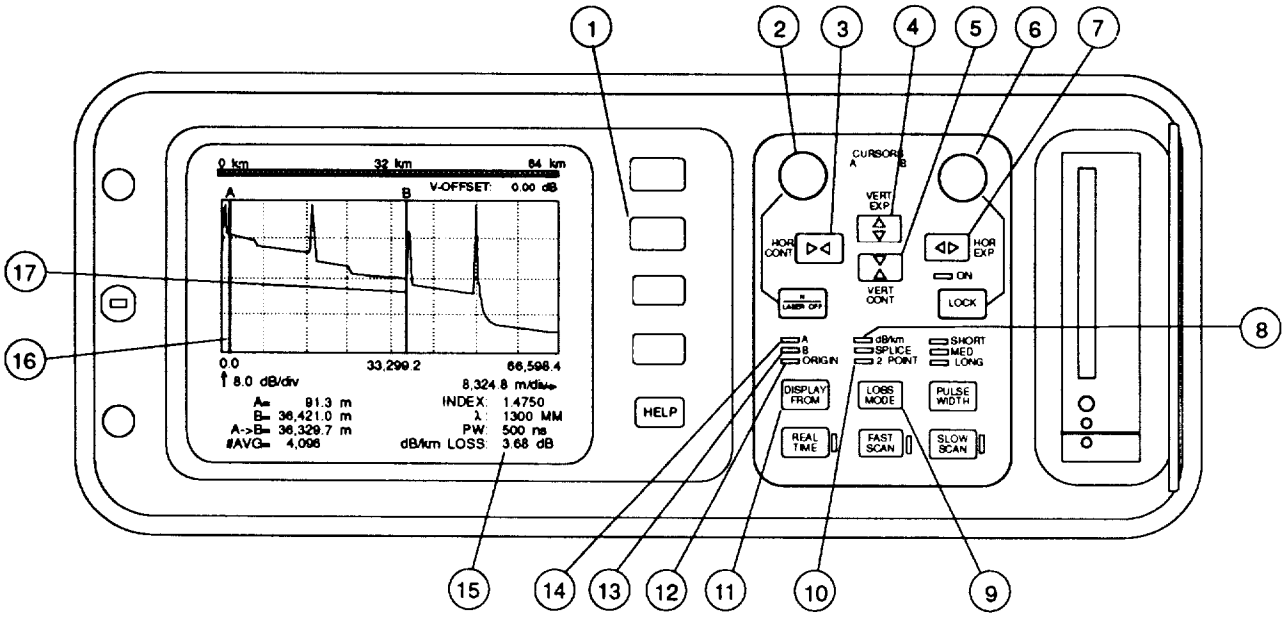
14. Use the CURSOR B knob (7) to adjust the cursor position for greater accuracy.

15. Read the distance to the feature at B= (15) on the screen.

16. Read the distance between the features at A→B= (14).

2-11. TWO POINT AND dB/DISTANCE LOSS MEASUREMENT.

This procedure describes how to measure loss between any two points of the trace and also how to obtain the average loss over a distance.



1. Display a trace, either by scanning a fiber (para 2-9) or by recalling a trace from storage (para 2-17).

2. Press DISPLAY FROM (11) repeatedly until the ORIGIN LED (12) is lit.

3. Press the HOR CONT KEY (3) and the VERT CONT KEY (5) repeatedly until the full trace is displayed.

4. Rotate the CURSOR A knob (2) to place CURSOR A (16) at the leftmost point being measured.

5. Rotate the CURSOR B knob (6) to place CURSOR B (17) at the rightmost point being measured.

6. For more precise cursor placement, go to Step 7. Otherwise, go to Step 13.

7. Press DISPLAY FROM (11) to light the A LED (14).

8. Use the HOR EXP (7), HOR CONT (3), VERT EXP (4), and VERT CONT (5) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

9. Use the CURSOR A (2) knob to adjust the cursor position for greater accuracy.

10. Press DISPLAY FROM (11) to light the B LED (13).

11. Use the HOR EXP (7), HOR CONT (3), VERT EXP (4), and VERT CONT (5) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

12. Use the CURSOR B (6) knob to adjust the cursor position for greater accuracy.

13. For TWO POINT LOSS, go to Step 14. Go to Step 17 for dB/distance LOSS.

14. Press LOSS MODE (9) repeatedly until the 2 POINT LED (10) is lit.

15. If the LOSS/REFL indicator (15) displays LSA/2PT LOSS, press the LSA key (1).

- The LOSS/REFL indicator (15) reads: 2-POINT LOSS 16. Go to Step 19.

17. Press LOSS MODE (9) repeatedly until the dB/km LED (8) is lit.

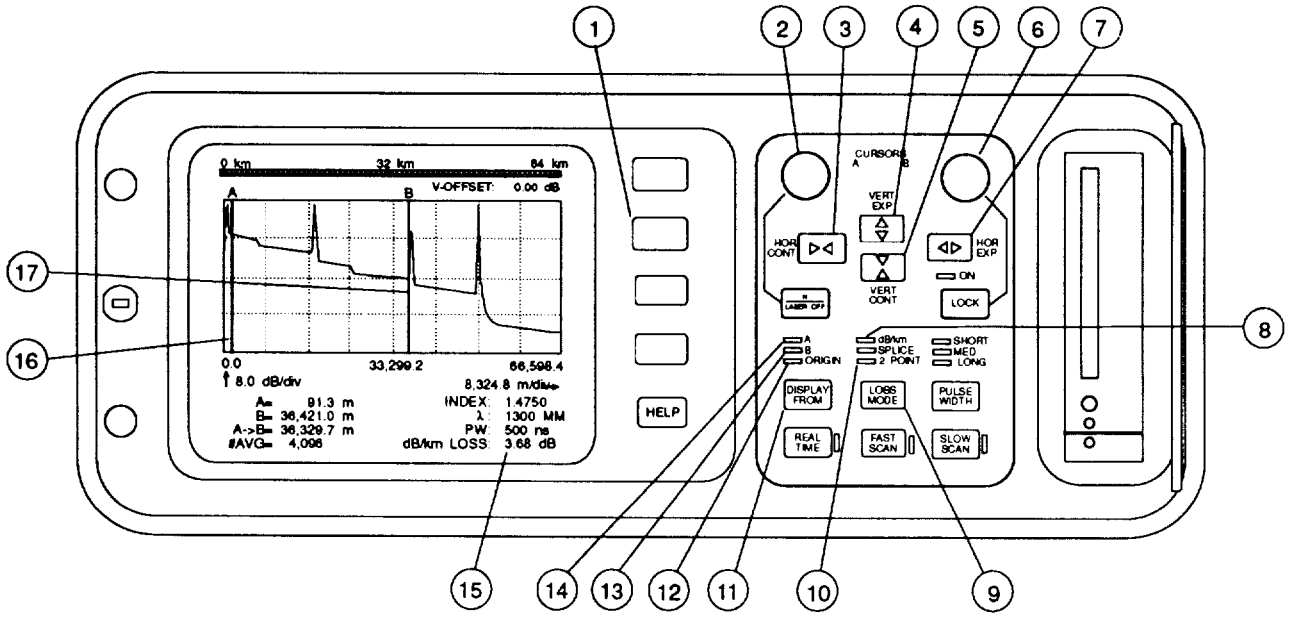
18. If the LOSS/REFL indicator (15) displays LSA/AVG LOSS, press the LSA key (1).

- The LOSS/REFL indicator (15) reads: dB/km LOSS

19. Read the loss from the LOSS/REFL indicator (15).

2-12. LSA TWO POINT AND dB/DISTANCE LOSS MEASUREMENT.

Least Squares Approximation (LSA) technique can correct errors in loss measurement that might be introduced if the cursor/trace intercept is in a noisy area of the trace.



NOTE

Do not use LSA technique if there is a splice or connection within 545 yards (500 meters) to the right of Cursor A or within 545 yards (500 meters) to the left of Cursor B.

1. Display a trace, either by scanning a fiber (para 2-9) or by recalling a trace from storage (para 2-17).

2. Press DISPLAY FROM (11) repeatedly until the ORIGIN LED (12) is lit.

3. Press the HOR CONT KEY (3) and the VERT CONT KEY (5) repeatedly until the full trace is displayed.

4. Rotate the CURSOR A knob (2) to place CURSOR A (16) at the leftmost edge of the interval being measured.

5. Rotate the CURSOR B knob (6) to place CURSOR B (17) at the rightmost edge of the interval being measured.

6. For more precise cursor placement, go to Step 7. Otherwise, go to Step 13.

7. Press DISPLAY FROM (11) to light the A LED (14).

8. Use the HOR EXP (7), HOR CONT (3), VERT EXP (4), and VERT CONT (5) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

7

9. Use the CURSOR A (2) knob to adjust the cursor position for greater accuracy.

10. Press DISPLAY FROM (11) to light the B LED (13).

11. Use the HOR EXP (7), HOR CONT (3), VERT EXP (4), and VERT CONT (5) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

12. Use the CURSOR B (6) knob to adjust the cursor position for greater accuracy.

13. For LSA TWO POINT LOSS, go to Step 14. Go to Step 17 for LSA dB/distance LOSS.

14. Press LOSS MODE (9) repeatedly until the 2 POINT LED (10) is lit.

15. If the LOSS/REFL indicator (15) displays 2-POINT LOSS, press the LSA key (1).

- The LOSS/REFL indicator (15) reads: LSA/2PT LOSS

16. Go to Step 19.

17. Press LOSS MODE (9) repeatedly until the dB/km LED (8) is lit.

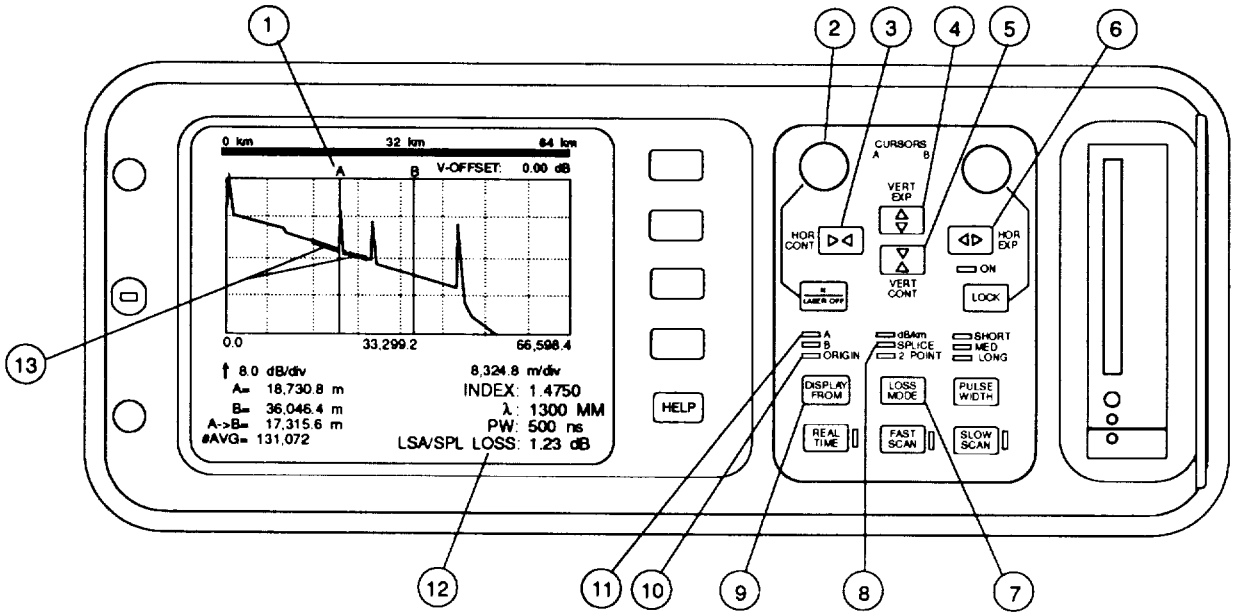
18. If the LOSS/REFL indicator (15) displays dB/km LOSS, press the LSA key (1).

- The LOSS/REFL indicator (15) reads: LSA/AVG LOSS

19. Read the loss from the LOSS/REFL indicator (15).

2-13. SPLICE LOSS MEASUREMENT.

Splice Loss Measurement mode always uses Least Squares Approximation (LSA) in calculating the loss of a feature identified by CURSOR A. This mode produces two highlighted areas on the trace a specified distance on each side of CURSOR A.

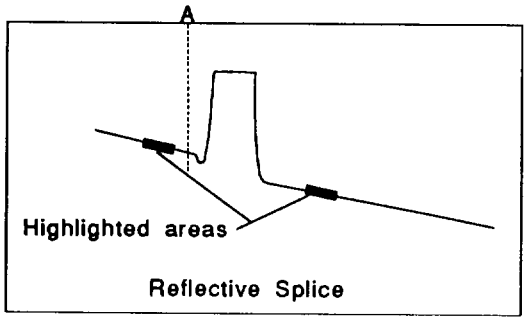


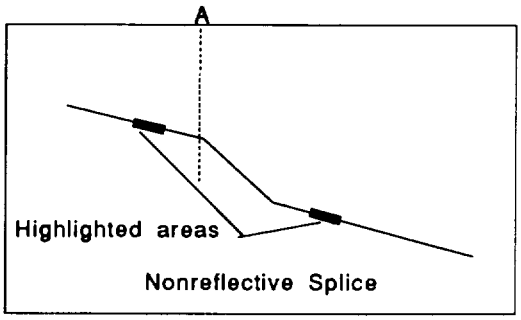
1. Display a trace, either by scanning a fiber (para 2-9) or by recalling a trace from storage (para 2-17).
2. Press DISPLAY FROM (9) repeatedly until the ORIGIN LED (10) is lit.
3. Press the HOR CONT key (3) and the VERT CONT key (5) repeatedly until the full trace is displayed.
4. Press LOSS MODE (7) repeatedly until the SPLICE LED (8) is lit.
   - The LOSS/REFL indicator (12) reads: LSA/SPL LOSS: ·
   - Highlighted areas (13) appear to the left and right of CURSOR A (1).
5. Rotate the CURSOR A knob (2) to center the feature to be measured evenly between highlighted areas.

6. Observe the position of the highlighted areas (13) to the left and right of CURSOR A (1).

NOTE

These areas must be located on linear portions of the trace on each side of the feature being measured. Under normal circumstances, the default setting for the highlighted areas will provide this result. If the highlighted regions are not adequately spaced, modify them using the SPLICE LOSS SETUP procedure (para 2-22).





7. For more precise cursor placement, go to Step 8. Otherwise, go to Step 11.

8. Press DISPLAY FROM (9) to light the A LED (11).

9. Use the HOR EXP (6), HOR CONT (3), VERT EXP (4), and VERT CONT (5) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

10. Use the CURSOR A knob (2) to adjust the cursor position for greater accuracy.

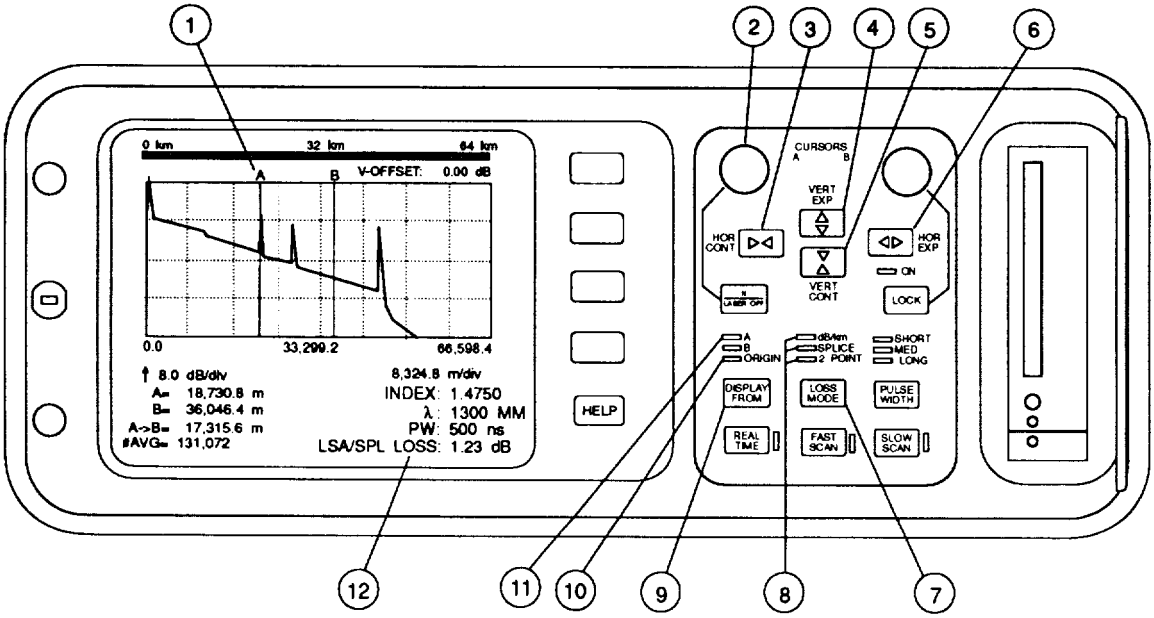
11. Read the splice loss value from the LOSS/REFL indicator field (12).

NOTE

If the highlighted area is excessively noisy, or splice loss measurements are attempted too near the extremes of the horizontal range, an N/A reading will be produced.

2-14. REFLECTANCE MEASUREMENT.

Use the following procedure to measure the reflectance of an event. Valid reflectance measurements are in the range of -60 dB to -10 dB.



1. Display a trace, either by scanning a fiber (para 2-9) or by recalling a trace from storage (para 2-17).

2. Press DISPLAY FROM (9) repeatedly until the ORIGIN LED (10) is lit.

3. Press the HOR CONT key (3) and the VERT CONT key (5) repeatedly until the full trace is displayed.

4. Rotate the CURSOR A knob (2) to place CURSOR A (1) at the leftmost point of the reflection being measured.

5. For more precise cursor placement go to Step 6. Otherwise, go to Step 9.

6. Press DISPLAY FROM (9) to light the A LED (11).

7. Use the HOR EXP (6), HOR CONT (3), VERT EXP (4), and VERT CONT (5) keys to expand the horizontal and vertical scales until the desired trace representation is displayed.

8. Use the CURSOR A knob (2) to adjust the cursor position for greater accuracy.

9. Press LOSS MODE (7) repeatedly until all of the loss mode LED's (8) are off.

   - The LOSS/REFL indicator (12) reads:

     REFL:

10. Read the reflectance from the LOSS/REFL indicator (12).

NOTE

If the calculated reflectance is not valid for some reason, possible results are:

Display	Cause
REFL: -nn.nn dB	Normal reflectance measurement.
REFL: N/A	Reflectance measured is less than -60 dB
REFL: -10 dB	Reflectance measured is greater than -10 dB
>> REFL: -nn.nn dB	Reflection is saturated. (The reflectance exceeds the displayed value -nn dB.)
> REFL: -nn.nn dB	Not enough data points per pulse width. (The reflectance exceeds the displayed value -nn dB). Try using a higher resolution and/or longer pulse width.

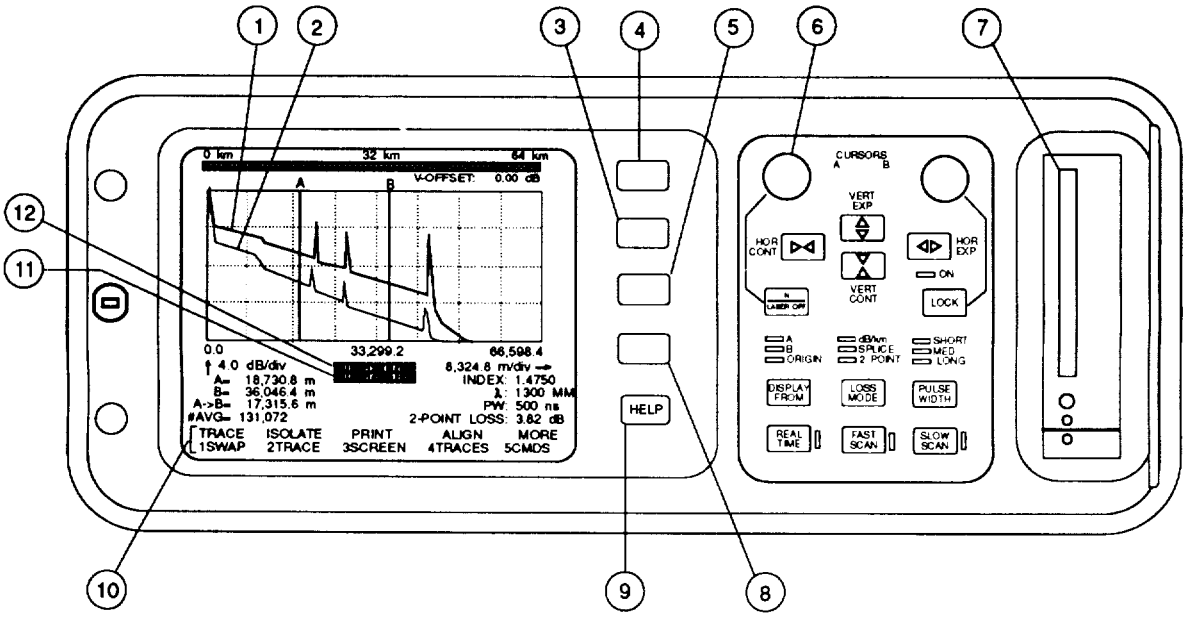
2-15. TRACE OVERLAY.

The trace overlay feature displays two traces simultaneously so that comparisons between the two can be made.

The primary trace (1) and its identification label (12) are shown at the normal intensity. The secondary trace (2) and its identification label (11) are shown at a lower intensity (the same as the background grid).

All of the main front panel controls operate in the normal manner, but only on the primary trace. The measurement data displayed applies only to the primary trace.

In Trace Overlay mode, Softkey functions are shown across the bottom two lines of the screen (10). Refer to Figure 2-1, Keys 311 through 353, for details on using softkeys in Trace Overlay mode.



1. To overlay a Real Time fiber scan on a stored trace, perform Steps 4 through 13 and then go to Step 15.

2. If the primary trace to be examined is already displayed, go to Step 4.

3. If the primary trace to be examined is stored, perform RECALL TRACE (para 2-17).

4. Perform SET DEFAULT STORAGE DEVICE (para 2-30) to set the device where the secondary trace is stored as the default device.

5. If the RAMCARD Drive is the default device, insert the RAMCARD that contains the trace to be recalled into the RAMCARD drive (7).

6. Note that the text opposite key (3) reads:

   Press this key to recall a trace from RAMCARD or Internal Storage.

   RECALL TRACE DATA

7. Press the RECALL TRACE DATA key (3).

   - The screen temporarily displays:

     WAIT ! until Directory is read and displayed.

     Select Filename for RECALL using Cursor A.

     Press appropriate Softkey for function desired.

   - then the contents of the device are displayed.

8. Use the CURSOR A knob (6) to highlight the desired file.

9. Press key (3) ..... OVERLAY

   - The screen displays a WAIT advisory while it reads the selected file and then displays the header information for the file.

10. If the wrong file was selected, go to Step 11. Otherwise, go to Step 13.

11. Press key (5) ..... RE-SELECT

    - The contents of the default device are displayed again.

12. Repeat Steps 8 through 10.

13. Press key (5) ..... OVERLAY TRACE

    - The secondary trace (2) and its filename (11) are displayed along with the primary trace (1) and its identification filename (12).

14. Go to Step 16.

15. Recall the secondary trace by performing Steps 4 through 13 and then go to Step 16.

    - The secondary trace (2) and its filename (11) are displayed.

NOTE

If there was not a primary trace present prior to recalling the secondary trace, there will not be a primary trace displayed and the identification label (12) will display 'No Data'.

16. Perform SCAN A FIBER (para 2-9).

17. Obtain any measurements desired.

NOTE

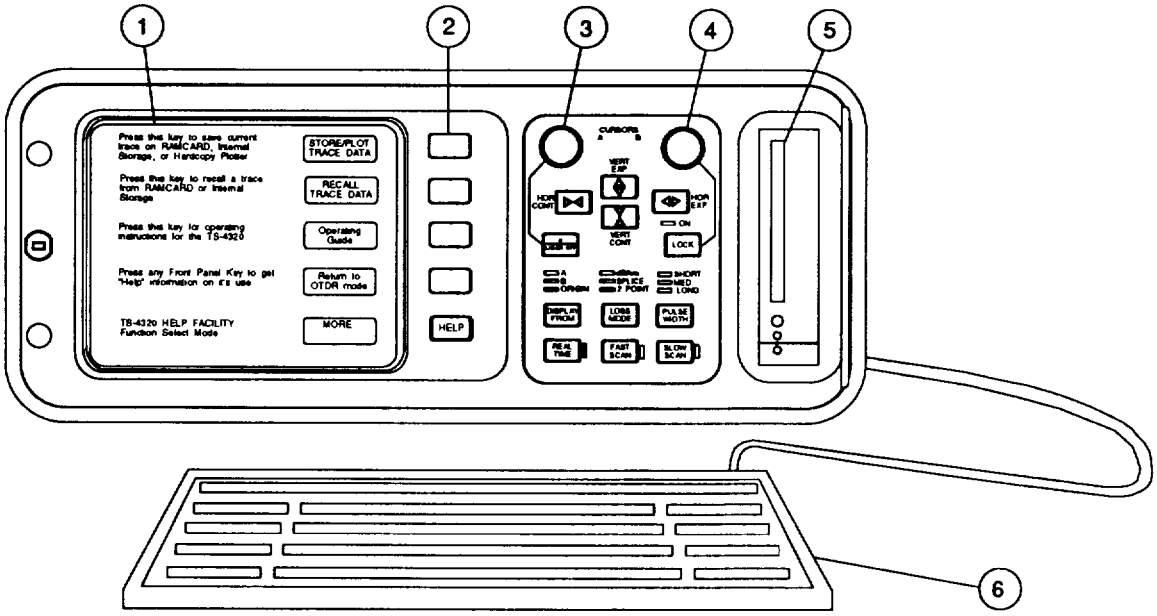
Measurements are made on the primary trace. To obtain measurements of the secondary trace, press the TRACE SWAP key (4).

18. To return to the normal OTDR mode, press the MORE CMNDS key (9).

19. Press the ABANDON COMPARE key (8).

- The primary trace remains on the screen.

2-16. STORE TRACE.



1. Connect the keyboard (para 2-29) to speed entry of header information.
2. Set the default storage device (para 2-30).
3. Insert a formatted RAMCARD into the RAMCARD drive (5), if it is the default device.
4. The text opposite key (2) on the screen (1) reads:

   Press this key to save current trace on RAMCARD, Internal Storage, or Hardcopy Plotter. — STORE/PLOT TRACE DATA

5. Press the STORE/PLOT TRACE DATA key (2).
   - The text opposite key (2) reads:

     Press to copy current trace to the default device. — SAVE TO RAM/DSKT

6. Press the SAVE TO RAM/DSKT key (2).
   - The screen temporarily displays:

     Formatting Header Screen
     PLEASE WAIT

- then a blank header form:

B:*Sub-Directory*
Enter File Name: [ ]

OPERATOR:

SITE:

CABLE #: FIBER #:
FIBER TYPE:

TRUCK CODE:
NOTES: 1-
2-
3-

NOTE

- **The device letter indication may be different depending on the current default device.**
- ***Sub-Directory* may be blank. If a Sub-Directory is displayed and it is not where the trace should be stored, perform Step 7. Otherwise go to Step 8.**

7. Change the Sub-Directory and go to Step 4.

8. Use the keyboard (6), or the CURSOR A (3) and CURSOR B (4) knobs, to enter the File Name. When done, press the Return (Return) key on the keyboard, or turn the CURSOR B knob, to advance to the OPERATOR: field.

NOTE

A file name consists of a maximum of eight characters, a period, and a three-character extension; i.e. FILENAME.EXT. If no extension is entered, the OTDR will create a .TRC extension. Do not use spaces or the following characters in file names: (*/*), (-), (\), (:), (;), (.), (*).

9. Information can be entered into the other fields using the keyboard or cursor knobs. Use the keyboard Retrn (Return) key or the CURSOR B knob to advance to the next field. The keyboard left arrow key or counter-clockwise rotation of the CURSOR B knob will back up to a previous field.

NOTE

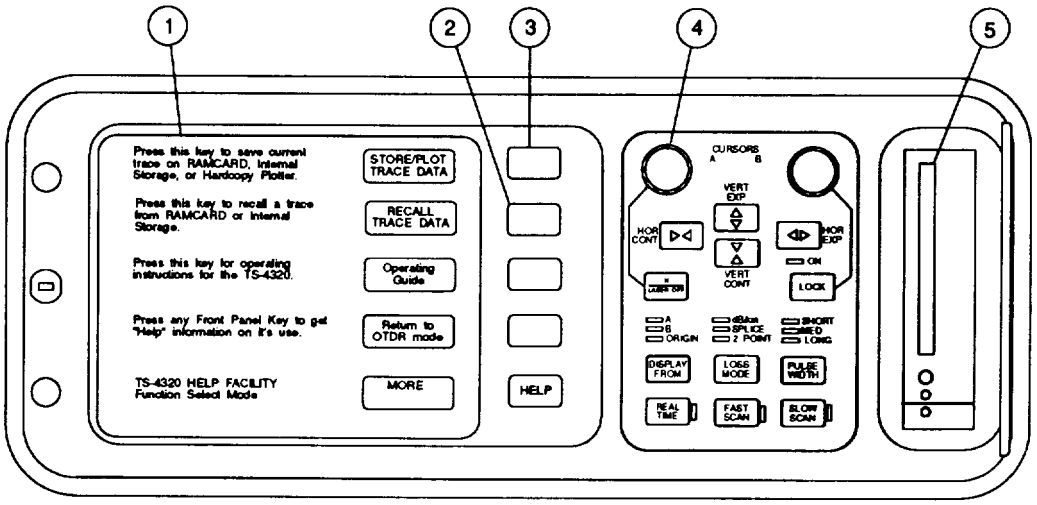
Only the File Name is required. The other fields are optional.

10. When complete, press the ACCEPT DATA key (2) ..... ACCEPT DATA

- After writing data, the display returns to the original HELP screen.

2-17. RECALL TRACE.

Use the following procedure to recall trace data from the default device to the screen.



1. Set the default storage device (para 2-30).

2. If the RAMCARD drive (5) is set as the default storage device, insert the RAMCARD that contains the trace to be recalled into the RAMCARD drive.

3. The text opposite key (2) on the screen (1) reads:

> Press this key to recall a trace from RAMCARD or Internal Storage.

RECALL TRACE DATA

4. Press the RECALL TRACE DATA key (2).

- The screen temporarily displays:

> WAIT ! until Directory is read and displayed.
>
> Select Filename for RECALL using Cursor A.
>
> Press appropriate Softkey for function desired.

- then the contents of the device are displayed.

5. Use the CURSOR A knob (4) to highlight the desired file.

6. Press key (3) ..... RECALL

   • The screen displays a WAIT advisory while it reads the selected file and then displays the header information for the file.

7. If the wrong file was selected, go to Step 8. Otherwise, go to Step 10.

8. Press key (2) ..... RE-SELECT TRACE

   • The contents of the default device are displayed again.

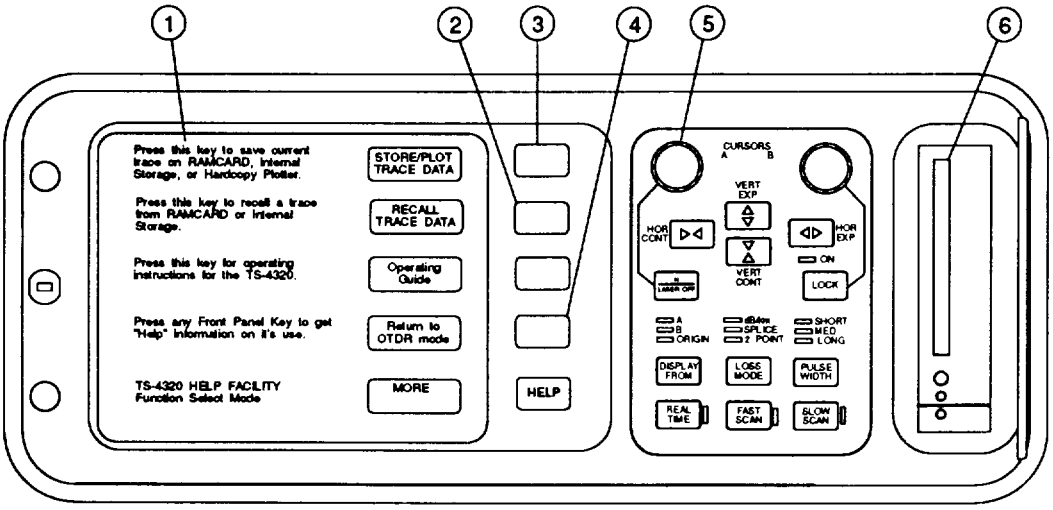
9. Repeat Steps 5 through 7.

10. Press key (3) ..... DISPLAY TRACE

    • The selected trace is displayed.

2-18. PRINT RECALLED TRACE HEADER.

Use the following procedure to print the header information of a recalled trace on the default print device.



1. Set the default printer or plotter (para 2-28).
2. Set the default storage device (para 2-30).
3. If the RAMCARD drive (6) is the default device, insert the RAMCARD that contains the trace to be recalled.
4. The text opposite key (2) on the screen (1) reads:

   Press this key to recall a trace from RAMCARD or Internal Storage .

   RECALL TRACE DATA

5. Press the RECALL TRACE DATA key (2).
   - The screen temporarily displays:

     WAIT ! until Directory is read and displayed.

     Select Filename for RECALL using Cursor A.

     Press appropriate Softkey for function desired.

   - then the contents of the device are displayed.
6. Use the CURSOR A knob (5) to highlight the desired file.

7. Press key (3) ..... RECALL

   • The screen displays a WAIT advisory while it reads the selected file and then displays the header information for the file.

8. If the wrong file was selected, go to Step 9. Otherwise, go to Step 11.

9. Press key (2)..... RE-SELECT TRACE

   • The contents of the default device are displayed again.

10. Repeat Steps 6 through 8.

11. Press key (4) ..... PRINT HEADER

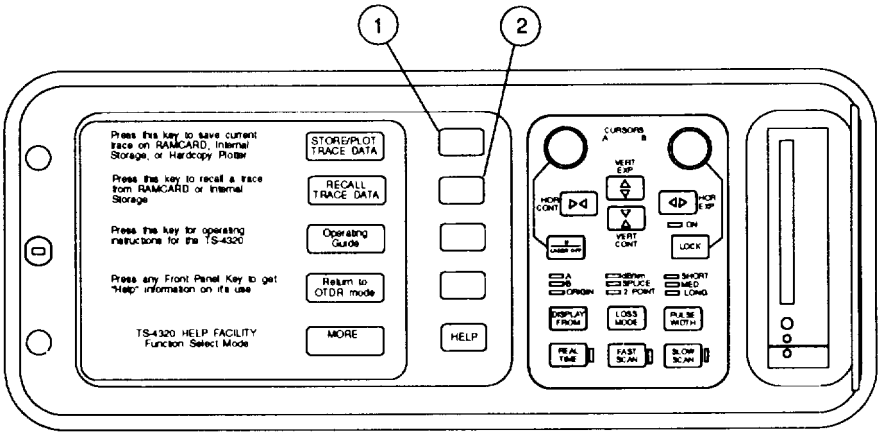
   • The header shown on the screen is printed to the default printer/plotter.

12. Press key (3) ..... DISPLAY TRACE

   • The OTDR display is shown.

2-19. PRINT TRACE.

Use the following procedure to print a displayed trace. If the trace was recalled from storage, the header and measurement conditions will also be printed.



1. Set the default printer or plotter (para 2-28).

2. Set the default storage device (para 2-30).

3. Press the STORE/PLOT TRACE DATA key (1) ..... STORE/PLOT TRACE DATA

The text opposite key (2) reads:

Press to Plot current trace ..... PRINT

4. Check that the default printer is connected and turned ON.

5. Press the PRINT key (2).

   - The SCREEN PRINT Wait screen shows the following information for printer only:

     Current Format: (The default printer.)

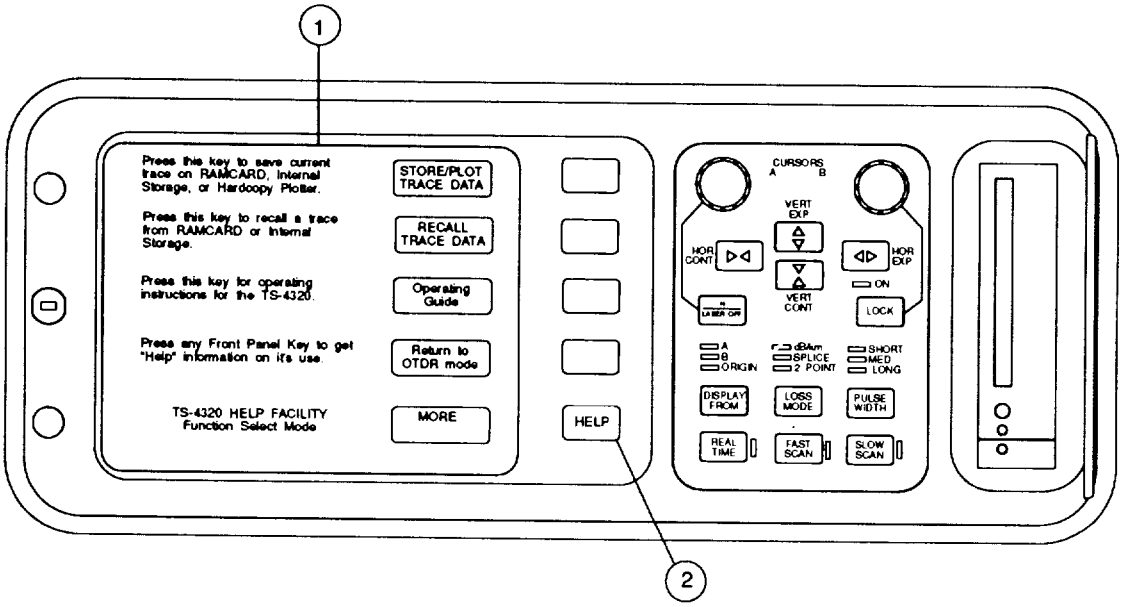
     Current Interface: (The interface port in use.)

     Completion Status: (An updating percentage of completed image generation.)

6. When the Completion Status reaches 100%, the screen returns to the OTDR display mode and printing begins.

2-20. THE HELP FACILITY.

The HELP Facility may be entered from any screen. Use the procedure below to display the Function Select Mode screen (1).



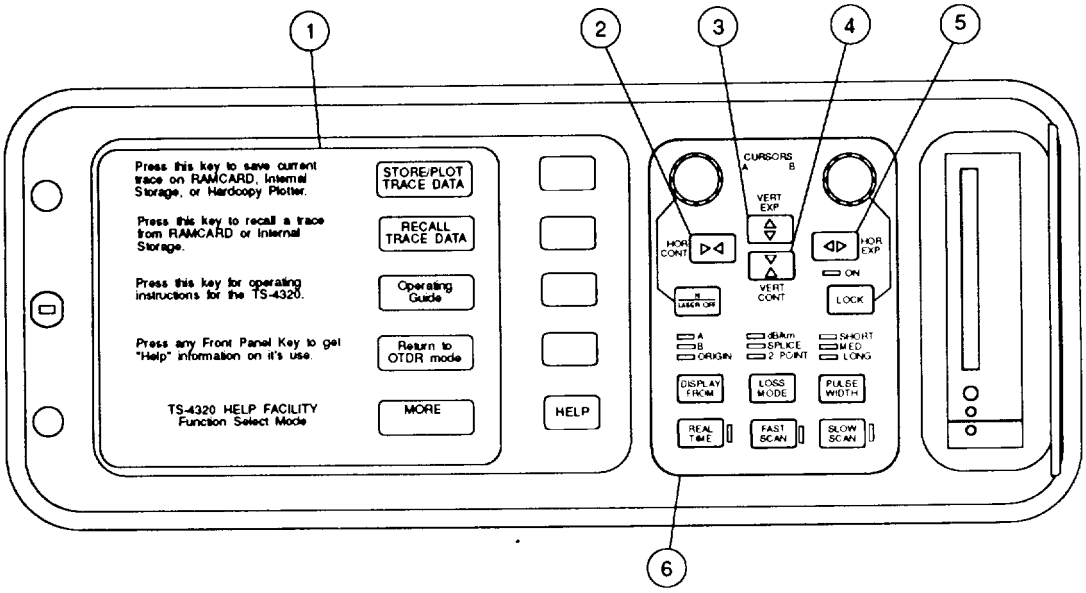
1. Press the HELP key (2).

2. Wait for the display (1) to change.

3. If the Function Select Mode screen (1) is not displayed, repeat Steps 1 and 2 until the Function Select Mode screen appears.

2-21. INTERACTIVE HELP.

HELP screens can be displayed for each of the function keys on the main control panel (6) by pressing the appropriate key. Use the following procedure to display an interactive HELP screen.



1. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).

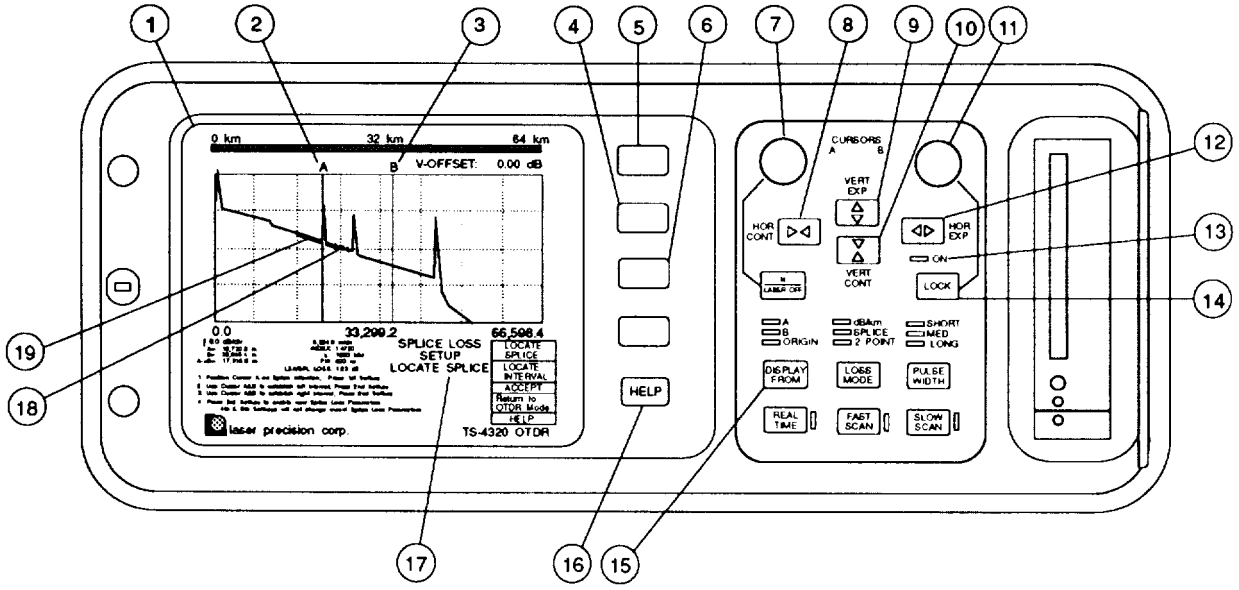
2. Press the key on the control panel (6) about which there is a question.

   - An explanation of how the key that was pressed is used appears on the screen.
   - Icons describing the keys used to move around in the HELP screens appear on the bottom of the screen and are described below.

Key	Function
▷◁ Help Menu (2)	Press to display the HELP Facility Function Select Mode screen
△ ▽ Prior Page (3)	Press to return to the previously displayed HELP screen.
▽ △ Next Page (4)	Press to display the next HELP screen of the series.
◁▷ Leave Help (5)	Press to leave Interactive Help Mode and return to the OTDR screen

2-22. SPLICE LOSS SETUP.

The highlighted intervals used to calculate a SPLICE LOSS measurement may be changed, if necessary. Perform the following steps to adjust the SPLICE LOSS mode highlighted interval settings.



1. Obtain a trace either by RECALL TRACE (para 2-17) or SCAN A FIBER (para 2-9).

2. Obtain the HELP Facility Function Select Mode screen (para 2-20).

3. Press the MORE key (16).

   - The text opposite key (4) reads:

     Set Initial values for TS-4320 Operation. — INSTRUMENT SETUP

4. Press key (4).

   - The text opposite key (6) reads:

     Press this key to change left and right intervals for splice loss calculation. — SPLICE LOSS SETUP

5. Press key (6).

   - The screen temporarily displays:

     Formatting Screen - PLEASE WAIT

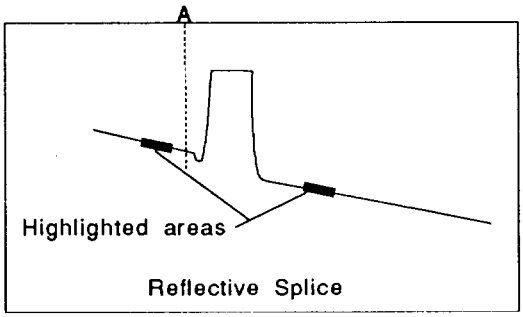
   - The splice loss setup version of the data display (1) is shown.

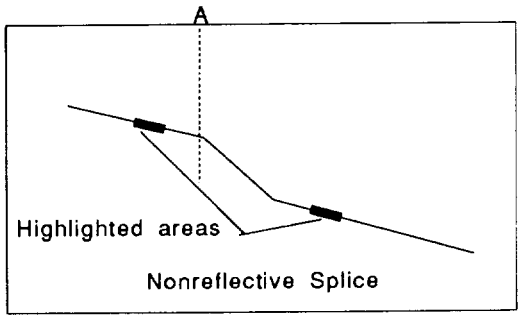
   - The setup instruction text area (17) reads: LOCATE SPLICE.

NOTE

- **The highlighted intervals, (18) and (19), represent the previous interval settings and will not be updated until the setup is completed.**
- **At any time during splice loss setup, the DISPLAY FROM key (15) may be used to change the Display From mode to A or B; and the HOR EXP (12), HOR CONT (8), VERT EXP (9), and VERT CONT (10) keys may be used to expand the horizontal and vertical scales until the desired trace representation is displayed.**

6. Rotate CURSOR A knob (7) to the leftmost point of the splice.





7. Verify that the LOCK ON indicator (13) is OFF.

8. Press key (5) ..... LOCATE SPLICE

- The setup instruction text area (17) reads:

LOCATE LFT&RGT

9. Rotate CURSOR B knob (11) counterclockwise, placing CURSOR B (3) prior to the start of the splice.

- The CURSOR B location will redefine the right edge of the desired left highlighted region (19) used for SPLICE LOSS measurement.

10. Rotate CURSOR A knob (7) counterclockwise, placing CURSOR A (2) at the start of the desired left interval (19). This distance should be at least eight meters from CURSOR B (3) position.

- The CURSOR A location will redefine the left edge of the desired left highlighted region (19) used for SPLICE LOSS measurement.

11. Press key (4) ..... LOCATE INTERVAL

- The setup instruction text area (17) reads:

LOCATE RIGHT

12. If the LOCK ON indicator (13) is not lit, press LOCK key (14).

- The LOCK ON indicator (13) will light.

13. Rotate CURSOR B knob (11) clockwise until the CURSOR A (2) is to the right of the end of the splice. This will define the right highlighted region (18).

- CURSOR A will move as CURSOR B is being moved.

14. Press key (4) ..... LOCATE INTERVAL

- The setup instruction text area (17) reads:

SPLICE LOSS
SETUP

15. Press key (6) ..... ACCEPT

16. If the display does not return to the standard OTDR display, go to Step 17. Otherwise, SPLICE LOSS SETUP is complete.

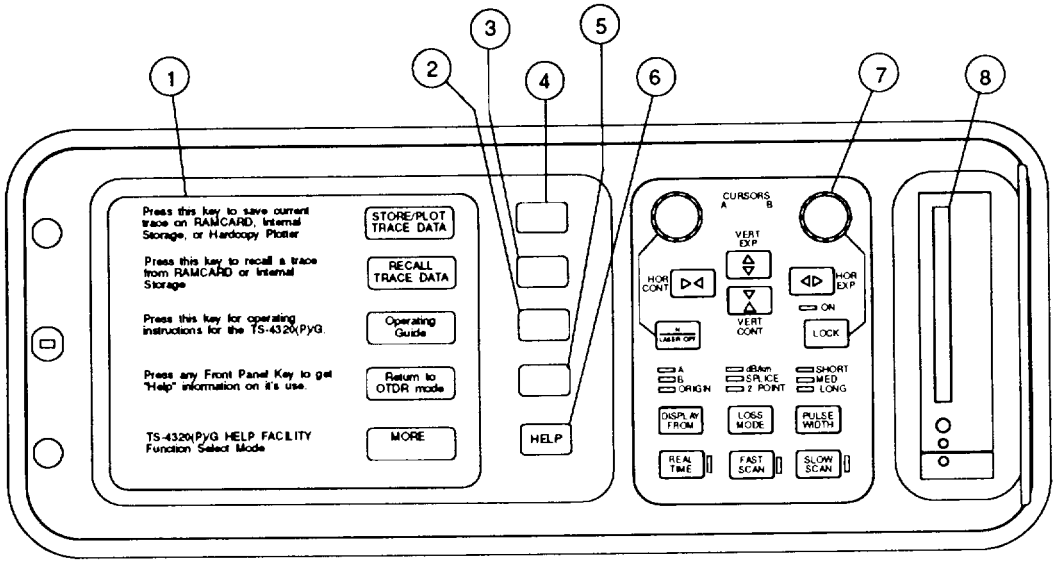
17. If the message INTERVAL ERROR is displayed in the setup instruction text area (17), the interval was set incorrectly. The intervals may be too short, too long, or too close to the reference feature. Repeat the procedure from Step 6 through Step 16.

18. Press the LOCK key (14).

- The LOCK On indicator (13) will be OFF.

2-23. FORMAT RAMCARD.

A new RAMCARD must be formatted before it can be used for storage. Perform the steps in the following procedure to format a RAMCARD.



1. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).

2. Press the MORE key (6).

   - The text opposite key (4) reads:

     General RAMCARD and Disk Handling Utilities. — STORAGE MAINT.

3. Press the STORAGE MAINT. key (4)

   - The Storage Maintenance screen appears.

4. Press the MORE key (6) twice.

   - The text opposite key (2) reads:

     Press to Select a Device to be Formatted (RAMCARD, Disk, or Internal RAM). — FORMAT DEVICE

5. Press the FORMAT DEVICE key (2).

- The text opposite key (3) reads:

Press to Prepare the as a Data Card for use in the TS-4320.

FORMAT RAMCARD

6. Press the FORMAT RAMCARD key (3).

- The text opposite key (4) reads:

Insert RAMCARD into slot and, Press to format RAMCARD as a DATA CARD.

FORMAT DATA CARD

7. Insert a RAMCARD (Appendix D, Section 2, Item 4) into the slot (8), press the FORMAT DATA CARD key (4) and wait for formatting to complete.

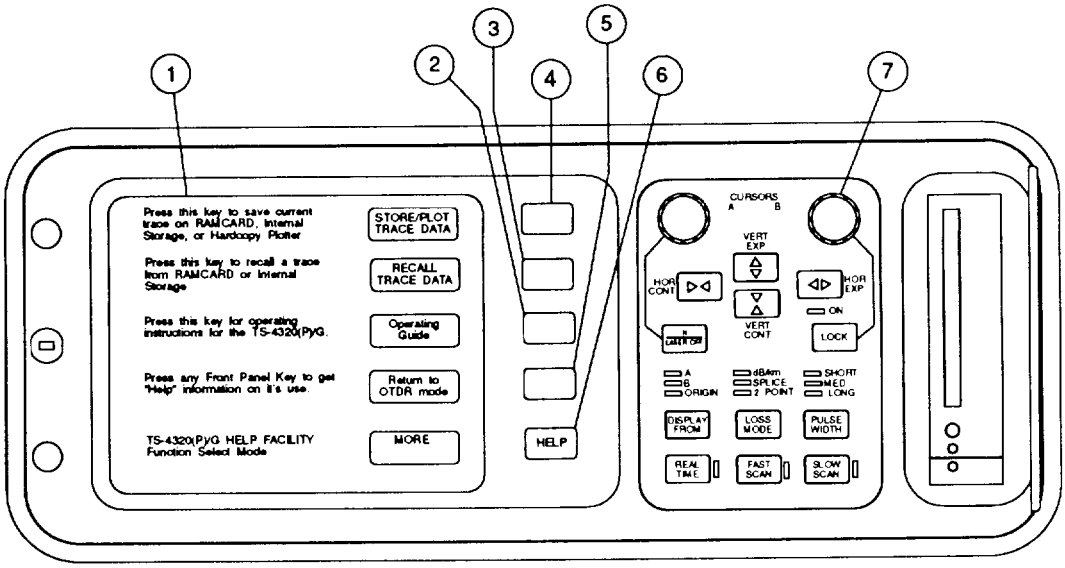
- The Storage Maintenance-Format screen reappears.

8. Repeat steps 6 and 7 to format another RAMCARD.

9. If key (5) icon reads "Return to OTDR Mode", press key (5). Otherwise, rotate the CURSOR B knob (7) until the icon reads "Return to OTDR Mode" and then press key (5).

2-24. FORMAT INTERNAL CMOS RAM - DRIVE D.

Use the following procedure to format part of the internal memory for storing traces.



1. Obtain the HELP Facility Function Select Mode screen (1) (para 2-20).
2. Press the MORE key (6).
   - The text opposite key (4) reads:

     General RAMCARD and Disk handling Utilities. — STORAGE MAINT.
3. Press key (4).
   - Key (6) displays — MORE
4. Press MORE key (6) twice.
   - The text opposite key (2) reads:

     Press to Select a Device to be Formatted (RAMCARD, Disk or Internal RAM). — FORMAT
5. Press key (2).
   - The text opposite key (2) reads:

     Press to Set Up the Internal RAM disk (Drive D) as a 720K Data Disk — FORMAT Drive D

6. Press key (2).

- The screen displays:

  Checking for Existence of
  CMOS RAM Drive D.
  ...Please wait...

7. If the message

  Drive D is not Properly
  FORMATTED.
  Press CONTINUE FORMAT to Proceed.

  is displayed, go to Step 11. Otherwise, the screen displays:

  Drive D is Already Formatted.
  DO YOU WISH TO PROCEED WITH
  FORMAT? (Press button next to
  your response)

8. If formatting is desired, go to Step 11. Otherwise, go to Step 9.

9. Press key (3) ..... ABANDON FORMAT
   to retain the data stored.

- The display returns to the FORMAT screen.

10. Go to Step 12.

11. Press key (4) ..... CONTINUE FORMAT

- The screen temporarily displays:

  Now Formatting CMOS RAM Drive
  D as a 720K Data Disk.
  Please wait...

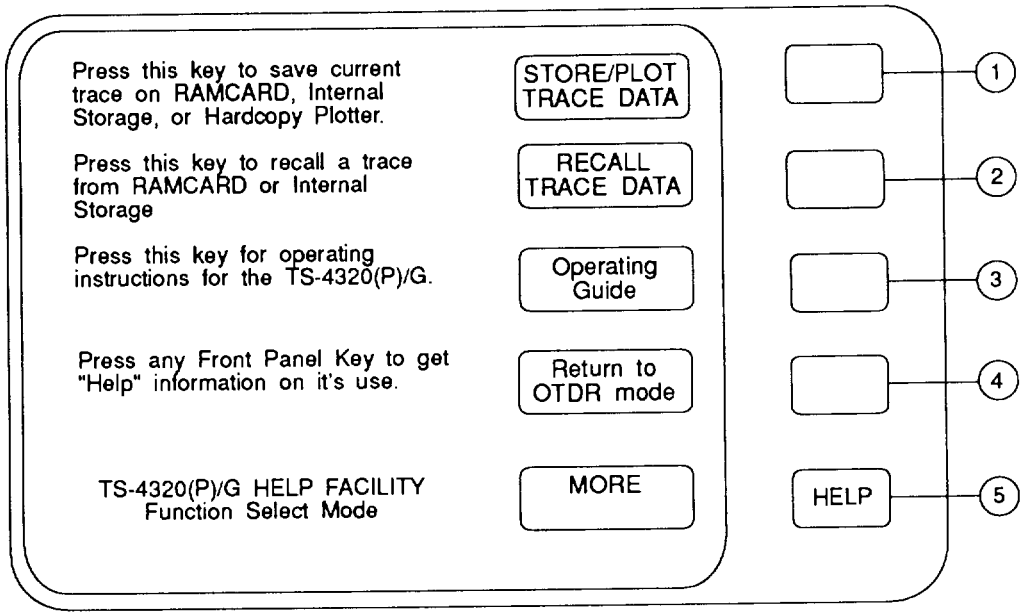
  Drive D FORMATTING is complete.

- The display returns to the FORMAT screen.

12. If key (5) icon reads "Return to OTDR Mode", press key (5). Otherwise, rotate the CURSOR B knob (7) until the icon reads "Return to OTDR Mode" and then press key (5).

2-25. SET UNIT OF MEASUREMENT.

Check the cursor locations on the OTDR Start Screen for the proper unit of measurement. Options are meters (m or km), feet (ft or kft), or miles (mi). Perform the following steps to change the unit of measurement.



1. Obtain the HELP Facility Function Select Mode screen (para 2-20).

2. Press the MORE key (5)

   - The screen text opposite key (2) changes to read:

     Set Initial values for TS-4320 Operation. — INSTRUMENT SETUP

3. Press the INSTRUMENT SETUP key (2).

   - The screen text opposite key (2) changes to read:

     Press this key to change Display Units, Fiber Length & Resolution, GPIB Address & Mode. — OTDR SETUP

4. Press the OTDR SETUP key (2).

   - The screen text opposite key (1) changes to read:

     Press to set Display Units to Meters (km), Feet (Kft) or Miles. — UNITS M/FT/MI

5. Press the UNITS M/FT/MI key (1).

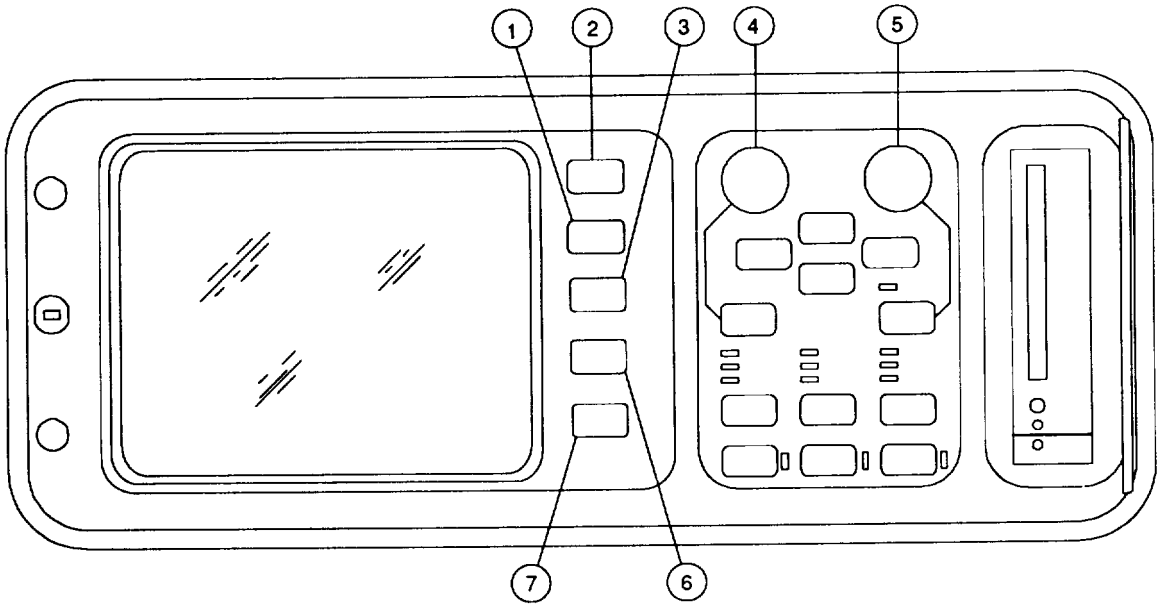
   - The screen offers the following choices on keys (1), (2), and (3).

Press to make Screen Display Units "Kilometers per Division".	SET UNITS AS METERS
Press to make Screen Display Units "Kilofeet per Division".	SET UNITS AS FEET
Press to make Screen Display Units "Miles per Division".	SET UNITS AS MILES

6. Press either key (1), key (2), or key (3) to select the desired unit of measurement.

7. Press the Return to OTDR mode key (4) to return to the OTDR Start screen.

2-26. SET INTERNAL CLOCK.



1. Obtain the HELP Facility Function Select Mode screen (para 2-20).

2. Press the MORE key (7).

   • The screen text opposite key (1) changes to read:

   Set Initial values for TS-4320 Operation. — INSTRUMENT SETUP

3. Press the INSTRUMENT SETUP key (1).

   • The screen text opposite key (2) changes to read:

   Press this key to Set Date, Time or Printer/Plotter Type. — DEVICE SETUP

4. Press the DEVICE SETUP key (2).

   • The screen text opposite key (2) changes to read:

   Press to change system TIME and/or DATE. — SET CLOCK

5. Press the SET CLOCK key (2).

   • The current date and time are displayed in 24 hour format opposite key (6).

   For example:

   Current Date and Time are:

   TUE 01-21-1992
   08:18:22

6. If the Date and Time are correct, press one of the following keys:

Press key (3) ..... INSTRUMENT SETUP
to display the screen for checking the measurement parameters,

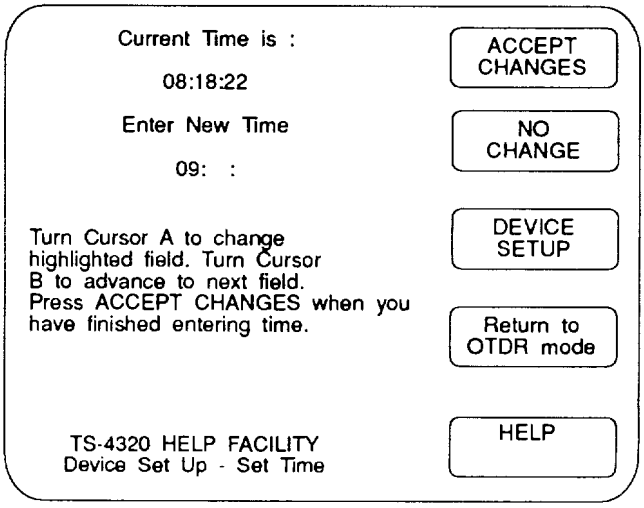
key (6) ..... Retum to OTDR mode
to return to the OTDR Start screen,

or key (7) ..... HELP
to return to the Function Select Mode screen.

7. Perform Steps 8 through 15 to change the time. Perform Steps 17 through 20 to change the date.

8. Press key (1) ..... TIME

- The current time is displayed together with an entry line with the hour field highlighted.



9. Set the hour, using the CURSOR A knob (4).

10. Turn the CURSOR B knob (5) clockwise to highlight the minute field.

11. Set the minutes, using the CURSOR A knob (4).

12. Turn the CURSOR B knob (5) clockwise to highlight the seconds field.

13. Set the seconds, using the CURSOR A knob (4).

14. Press key (2) ..... ACCEPT CHANGES

15. If the date needs to be changed, go to Step 16. If the date is correct, press one of the following keys:

Press key (3) ..... INSTRUMENT SETUP
to display the screen for checking the measurement parameters.

Press key (6) ..... Return to OTDR mode

to return to the OTDR Start screen.

Press key (7) ..... HELP
to return to the Function Select Mode screen.

16. Press key (2) ..... SET CLOCK

- The screen text opposite key (2) changes to read:

Press to change Month, Date, Year — SET DATE

17. Press the SET DATE key (2).

- The current date is displayed together with an entry line with the month field highlighted.

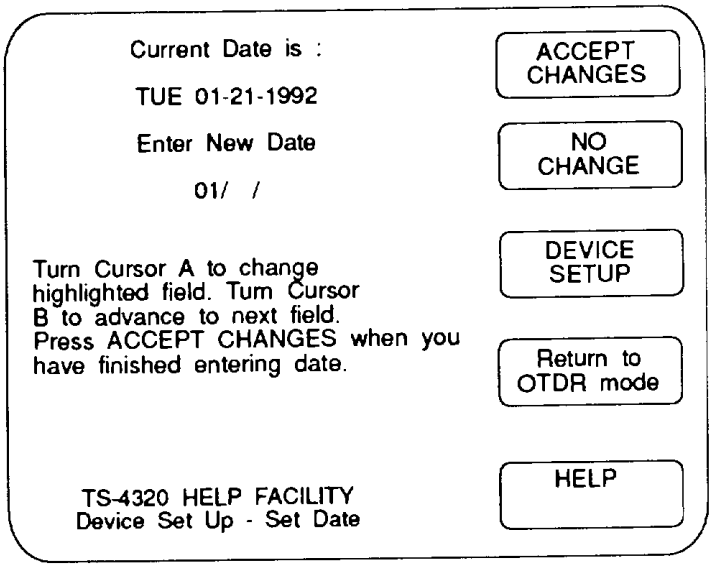
18. Use the cursor knobs to enter the new date.

19. Press the ACCEPT CHANGES key.

- The Device Set Up screen is displayed.

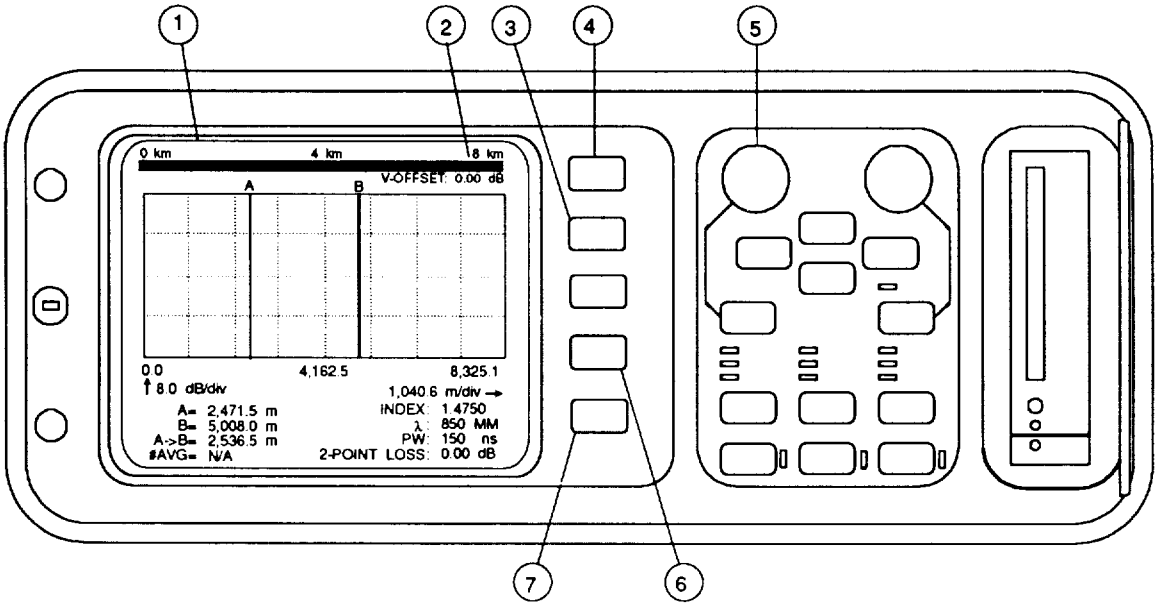
20. Press the Return to OTDR mode key.

- The OTDR screen is displayed.



2-27. CHANGE FIBER LENGTH/RESOLUTION.

The fiber length should typically be set as short as possible to get the best resolution.



1. On the Trace Display Screen (1), check the fiber length setting in the upper rightcorner of the display window locator bar (2).

2. Press the HELP key (7).

   - The HELP Facility Function Select Mode screen appears.

3. Press the MORE key (7).

   - The screen text opposite key (3) changes to read

Set Initial values for TS-4320 Operation.	INSTRUMENT SETUP

4. Press the INSTRUMENT SETUP key (3).

   - The screen text opposite key (3) changes to read

Press this key to change Display Units, Fiber Length & Resolution, GPIB Address & Mode.	OTDR SETUP

5. Press the OTDR SETUP key (3).

   - The screen text opposite key (3) changes to read

Press to adjust Fiber Length and Fiber resolution.	FIBER LEN/RES

6. Press the FIBER LEN/RES key (3).

- The Instrument Set-up screen appears.

7. Rotate the CURSOR A knob (5) to obtain the new length and resolution. The available choices are listed in Table 2-1.

8. Press the ACCEPT CHANGES key (4) to accept the changes.

9. Press the Return to OTDR mode key (6) to return to the OTDR Trace display.

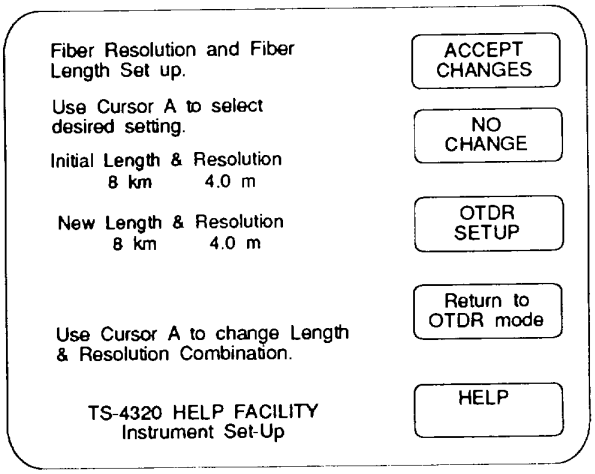


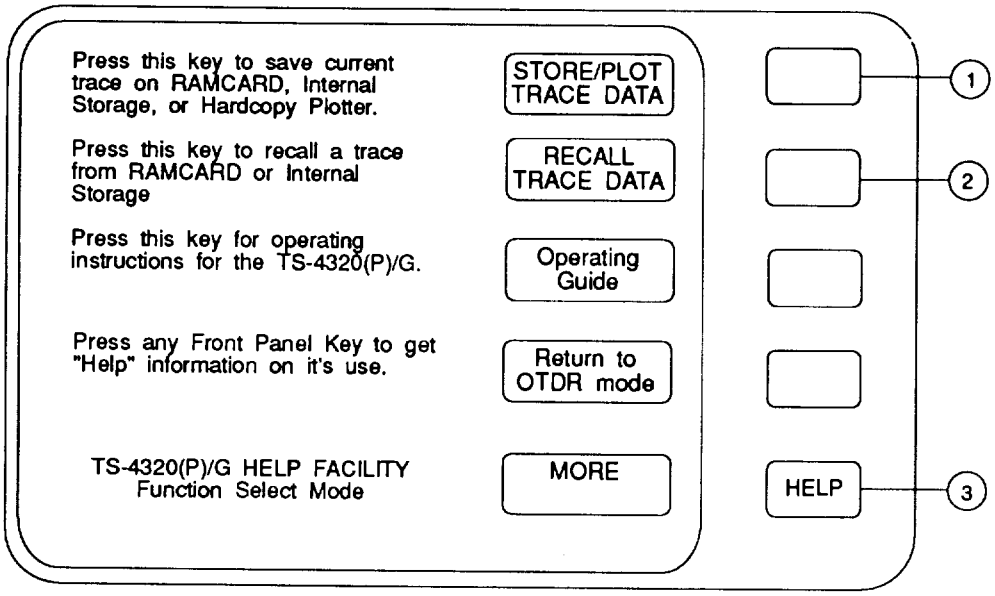
Table 2-1. Length/Resolution Options

Module	Length (km)	Resolution (m)	Module	Length (km)	Resolution (m)	Module	Length (km)	Resolution (m)
TD-260C	32	2.0	TD-261C	64	4.0	TD-285C	128	8.0
	16	2.0		32	4.0		64	8.0
		1.0			2.0			4.0
	8*	2.0		16	4.0		32	8.0
		1.0			2.0			4.0
		0.5*			1.0			2.0
				8*	4.0		16	8.0
					2.0			4.0
					1.0			2.0
					0.5*			1.0
							8*	8.0
								4.0
								2.0
								1.0
								0.5*

NOTE

- **Length/Resolution default settings are identified by asterisks.**
- **Fiber Length must be set at least two kilometers greater than the length of a fiber to be scanned with a TD-260C or TD-261C and four kilometers greater with a TD-285C.**

2-28. SET DEFAULT PRINTER.



1. Obtain the HELP Facility Function Select Mode screen (para 2-20).
2. Press the MORE key (3).
   - The text opposite key (2) changes to read:

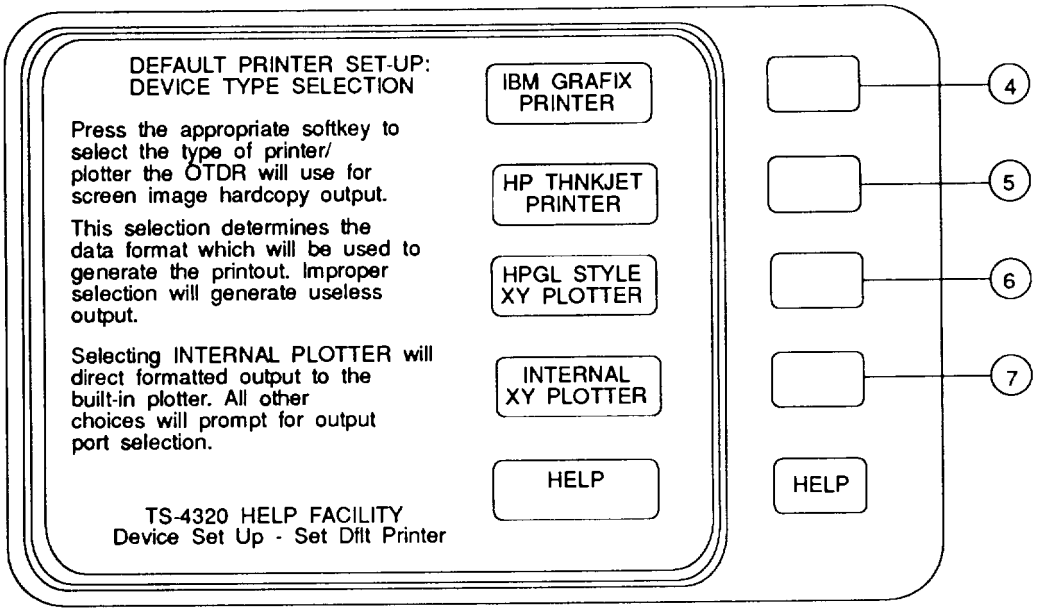
     Set Initial values for TS-4320 Operation. — INSTRUMENT SETUP
3. Press the INSTRUMENT SETUP key (2).
   - The text opposite key (1) changes to read:

     Press this key to Set Date, Time or Printer/Plotter Type. — DEVICE SETUP
4. Press the DEVICE SETUP key (1).
   - The text opposite key (2) changes to read:

     Press to select default printer/ plotter format and port. — SET DFLT PRINTER

5. Press the SET DFLT PRINTER key (2).

   - The DEFAULT PRINTER SET-UP: DEVICE TYPE SELECTION screen is displayed.

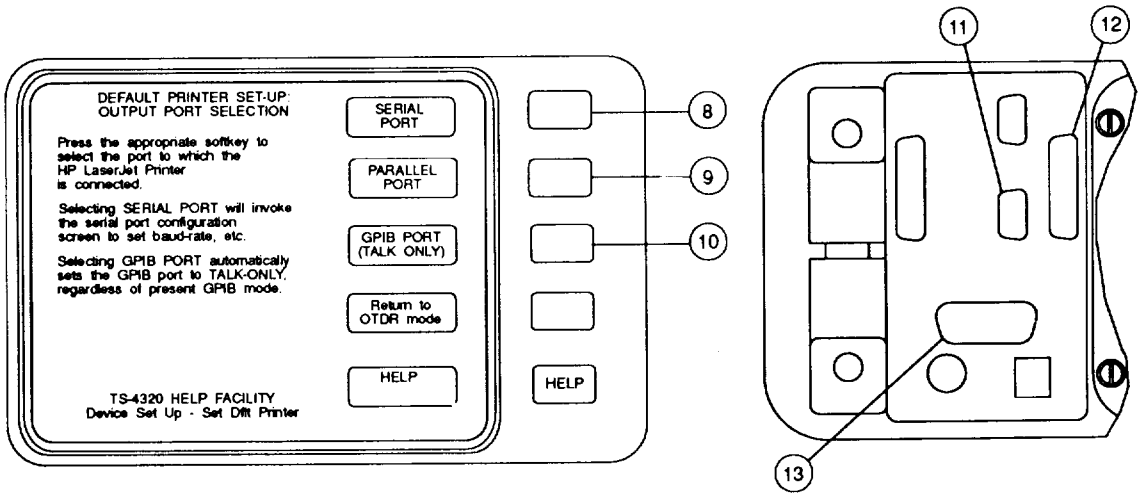


6. Press Key (4), Key (5), or Key (6) to select the desired printer.

NOTE

Pressing Key (7) will produce undesirable results.

   - The DEFAULT PRINTER SET-UP: OUTPUT PORT SELECTION screen appears with the printer selected on the previous screen appearing in the instructional text.



Front View Rear View

7. Press one of the following keys to select the desired output port on the rear of the TS-4320(P)/G.

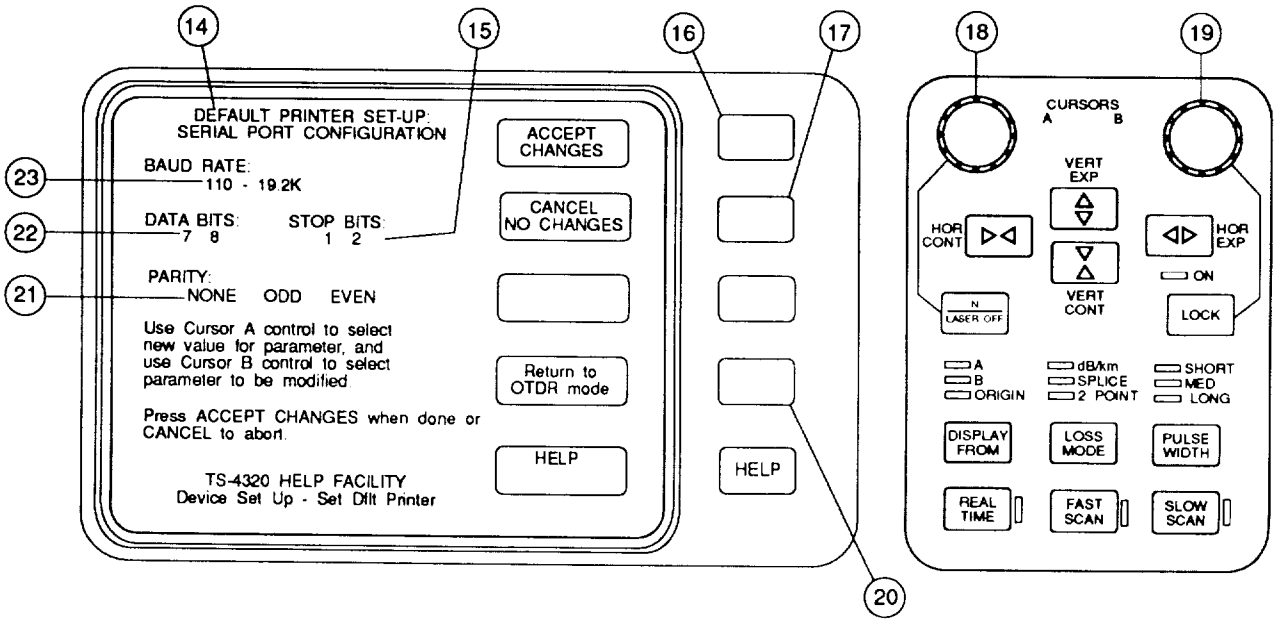
SERIAL PORT (8) - RS-232 (11).

PARALLEL PORT (9) - EXT. PRN/PLT (12).

GPIB PORT (TALK ONLY) (10) - IEEE-488 (13).

8. If either PARALLEL PORT (9) or GPIB PORT (TALK ONLY) (10) was selected, the screen will display the HELP mode Function Select screen. Go to Step 15. Otherwise, go to Step 9.

9. If SERIAL PORT was pressed, the SERIAL PORT CONFIGURATION screen appears.



10. If the parameters displayed on the SERIAL PORT CONFIGURATION screen (14) are acceptable, go to Step 15. Otherwise, go to Step 11.

11. Rotate the CURSOR A knob (18) to highlight the desired BAUD RATE (23).

NOTE

Selectable rates are:

110	300	600	1200	2400	4800	9600	19.2K

12. Rotate the CURSOR B knob (19) slightly to select the rate and move to the DATA BITS field (22).

13. Repeat Steps 11 and 12 to set the DATA BITS (22), STOP BITS (15), and PARITY (21).

NOTE

All options are displayed on the screen for these three parameters.

14. Press the ACCEPT CHANGES key (16) and go to Step 16.

15. Press the CANCEL NO CHANGES key (17).

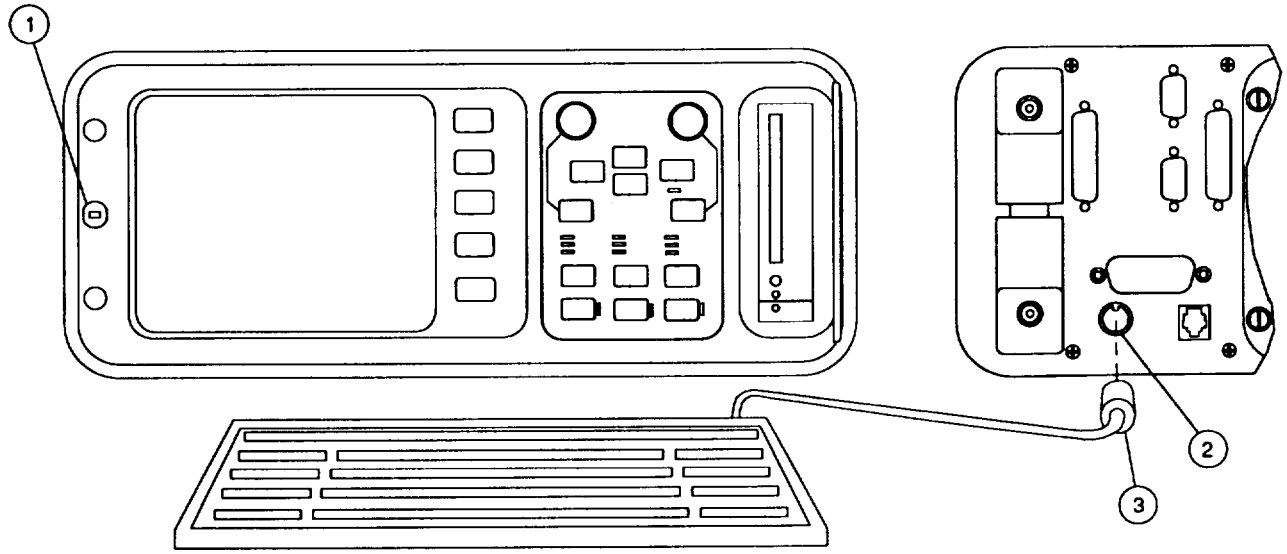
16. Press the Return to OTDR mode key (20) to exit from the HELP Facility.

17. Turn power OFF.

18. Connect the printer/plotter cable to the interface port that was selected in Step 7.

19. Turn power ON.

2-29. CONNECT KEYBOARD.



Front View Rear View

1. Set the Power Switch (1) to OFF.

2. Connect the keyboard cable (3) to the KEY BD. connector (2) on the rear of the test set.

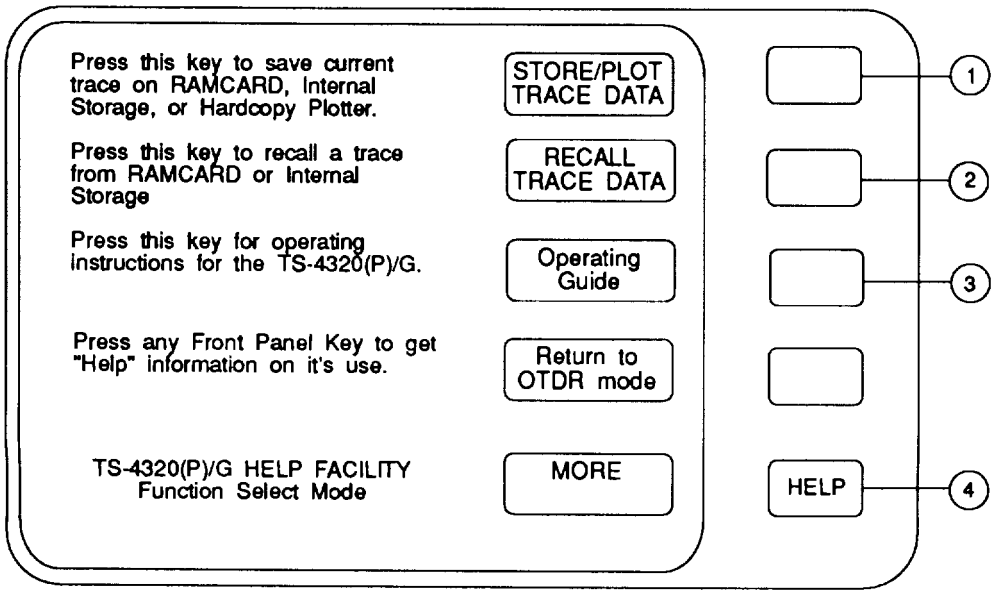
3. Set the Power Switch (1) to ON.

2-30. SET DEFAULT STORAGE DEVICE.

The TS-4320(P)/G stores and retrieves trace files on the designated default storage device. The options are:

- The RAMCARD drive on the front of the unit (factory default).
- Drive D - The internal CMOS RAM.
- Drive A - An optional external drive. (Not presently available.)

1. Obtain the HELP Facility Function Select Mode screen (para 2-20).



2. Press the MORE key (4).

- The text opposite key (1) changes to read:

General RAMCARD and Disk Handling Utilities.	STORAGE MAINT.

3. Press the STORAGE MAINT. key (1).

- The text opposite key (1) changes to read:

Press to change Default Drive Specification.	CHANGE DRIVE

4. Press the CHANGE DRIVE key (1).

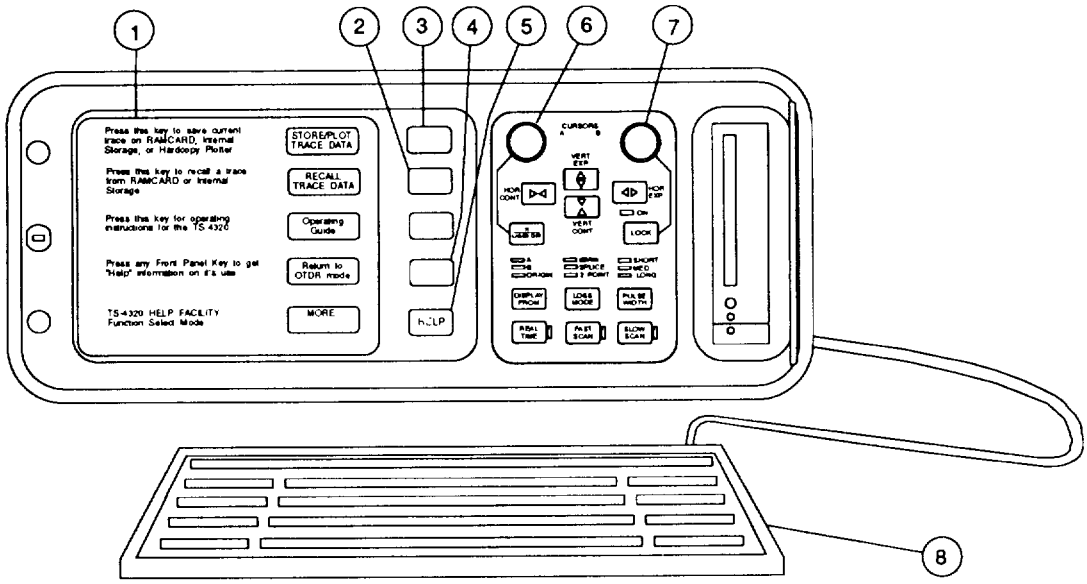
   • The text opposite key (2) and key(3) changes to read:

Press to make the internal RAMCARD the default.	DEFAULT RAMCARD
Press to make the Internal CMOS RAM the default.	DEAULT Drive D

5. Press either the DEFAULT RAMCARD key (2) or the DEFAULT Drive D key (3) to select the desired storage device.

2-31. CREATE A SUB-DIRECTORY.

Sub-directories are usually used to group stored trace files for easier access. Make sure there is at least one file existing in the root directory before attempting to create a sub-directory.



1. Connect the keyboard (8), (para 2-29).

2. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).

3. Press the MORE key (5).

   • The text opposite key (3) changes to read:

General RAMCARD and Disk Handling Utilities.	STORAGE MAINT.

4. Press the STORAGE/MAINT. key (3).

   • Key (5) changes to read:

   MORE

5. Press the MORE key (5), twice.

6. The text opposite key (2) changes to read:

   Press to Create a Sub-directory on Current Drive.

   CREATE SUB-DIR

6. Press the CREATE SUB-DIR key (2).

   • A WAIT screen appears until the existing directory, if present, is displayed.

7. Use the UP/DOWN arrow keys on the keyboard, or turn the CURSOR A knob (6) to highlight the directory under which the sub- directory is to be created.

8. Press the CREATE SUB-DIR key (2).

9. Use the keyboard (8) to enter the sub-directory name; up to eight characters. If creating a directory under a sub-directory begin name with ".

NOTE

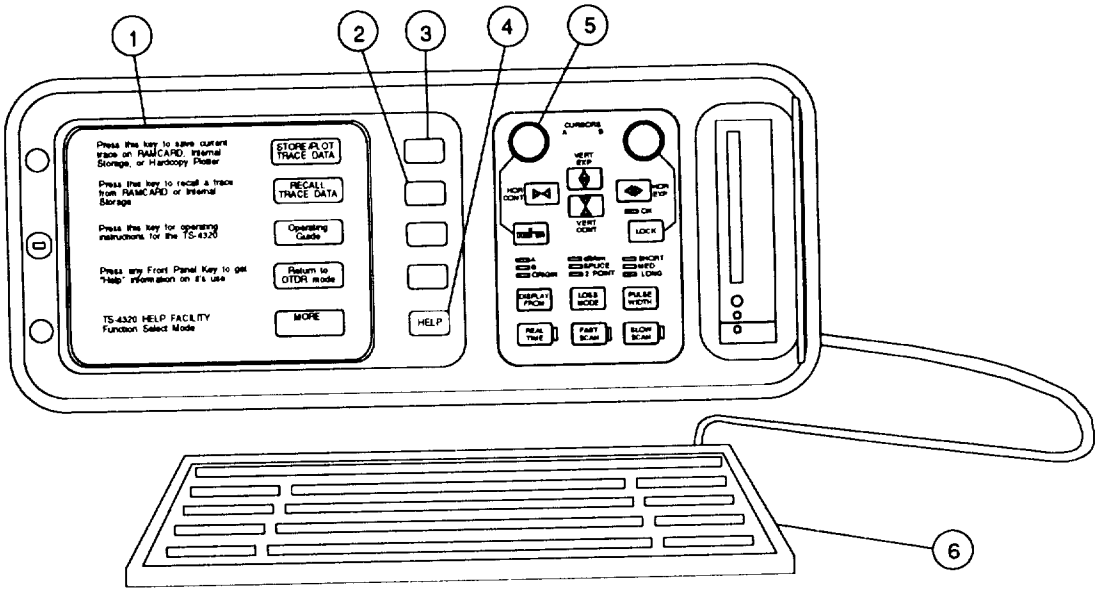
The sub-directory name may also be entered by turning the CURSOR A knob (6) to highlight a letter on the bottom of the screen and then slightly turning the CURSOR B knob (7) to advance to the next letter position.

10. Press the ACCEPT DATA key (3) to accept the data and create the sub-directory.

11. If key (4) icon reads "Return to OTDR Mode", press key (4).
Otherwise, rotate the CURSOR B knob (7) until the icon reads "Return to OTDR Mode" and then press key (4).

2-32. CHANGE DEFAULT SUB-DIRECTORY.

Fiber traces are stored in the default sub-directory. Use the following procedure to change the default sub-directory.



1. Connect the keyboard (6), (para 2-29).
2. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).
3. Press the MORE key (4).
   - The text opposite key (3) changes to read:

General RAMCARD and Disk Handling Utilities.	STORAGE MAINT.

4. Press the STORAGE/MAINT. key (3).
   - Key (4) changes to read: MORE

5. Press the MORE key (4) twice.

   • The text opposite key (3) changes to read:

   Press to change Default Sub-Directory.

   CHANGE DIRECTORY

6. Press the CHANGE DIRECTORY key (3).

   • A WAIT screen appears until the existing directory is displayed.

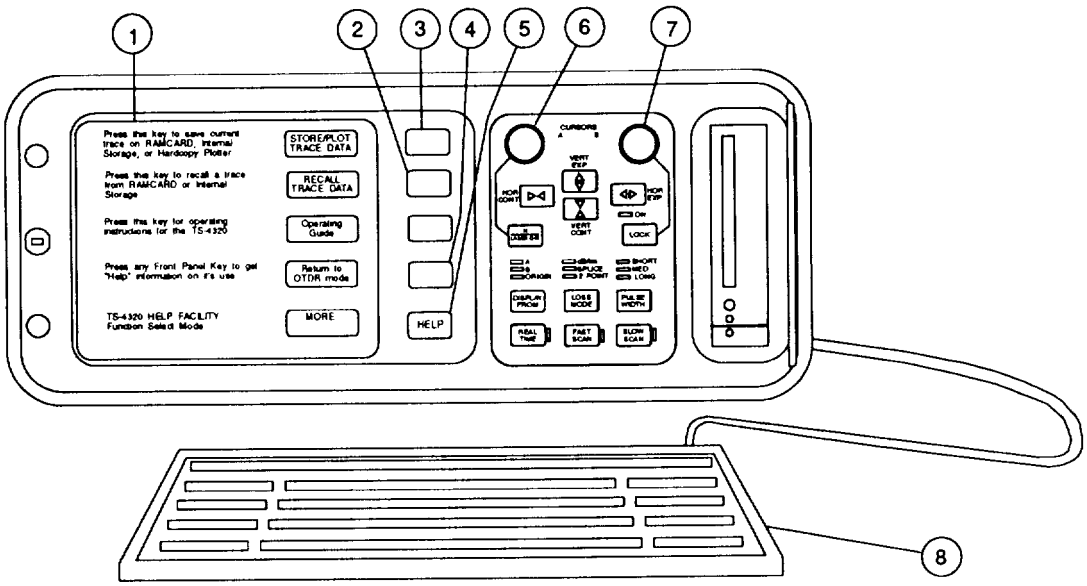
7. Use the keyboard UP/DOWN arrows or rotate CURSOR A knob (5) to select the sub-directory that will be made the default.

8. Press the CHANGE DIRECTORY key (2).

   • The HELP Facility Function Select Mode screen (1) is displayed.

2-33. DELETE A SUB-DIRECTORY.

You can delete a sub-directory only if it is empty and is not the default directory.



1. Connect the keyboard (8), (para 2-29).
2. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).
3. Press the MORE key (5).
   - The text opposite key (3) changes to read:

     General RAMCARD and Disk Handling Utilities. — STORAGE MAINT.
4. Press the STORAGE/MAINT. key (3).
   - Key (5) changes to read: — MORE

5. Press the MORE key (5).

   • The text opposite key (2) changes to read:

   Press to Delete a Sub-directory on Current Drive.

   DELETE SUB-DIR

6. Press the DELETE SUB-DIR key (2).

   • A WAIT screen appears until the existing directory is displayed.

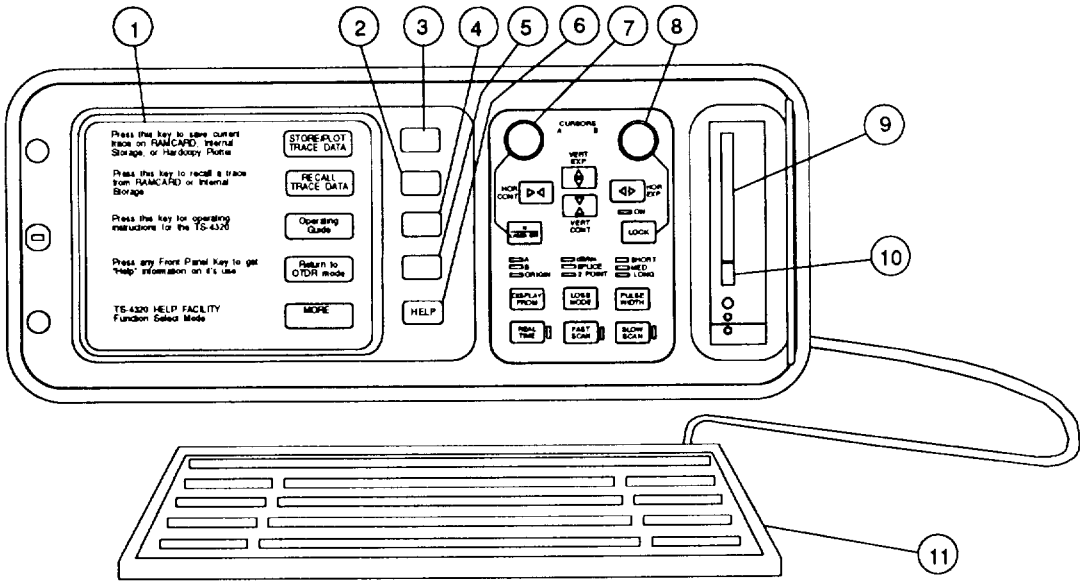
7. Use the keyboard UP/DOWN arrows or rotate CURSOR A knob (6) to select the sub-directory to be deleted.

8. Press the DELETE SUB-DIR key (2).

9. If key (4) icon reads "Return to OTDR Mode", press key (4).
Otherwise, rotate the CURSOR B knob (7) until the icon reads "Return to OTDR Mode" and then press key (4).

2-34. COPYING A FILE.

Files may be copied from the default storage device to a RAMCARD, the internal CMOS RAM or the optional external floppy disk drive (not presently available).



1. Connect the keyboard (11), (para 2-29).
2. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).
3. Set the default storage device (para 2-30)
4. Press the MORE key (6).
   - The text opposite key (3) reads:

     General RAMCARD and Disk Handling Utilities. — STORAGE MAINT.

5. Press key (3)
   - The text opposite key (4) reads:

     Press to Select and Copy Files to another Device or Directory. — COPY FILES

6. Press key (4).

   • The screen temporarily displays:

     WAIT ! until Directory is
     read and displayed.

     Select Filename(s) for COPY
     with Cursor A.

   • Then the contents of the device are displayed.

7. Use the keyboard (11) UP/DOWN arrows or rotate CURSOR A knob (7) to highlight a file to be copied.

8. Press key (2) ..... SELECT FILE

   • A '#' is displayed to the left of the date field and to the right of the selected filename.

9. If a file is selected that should not be copied, go to Step 10. Otherwise go to Step 12.

10. Use the keyboard (11) UP/DOWN ARROW or Rotate CURSOR A knob (7) to highlight a file to be de-selected.

11. Press key (4) ..... DE-SELECT FILE

    • The '#' located between the filenam3 and date disappears.

12. Repeat Steps 7 through 9 until all files to copy are tagged.

13. Press key (3) ..... COPY SELECTIONS

    • The screen displays:

      "Copy selected file(s) to:"
      []

    • The filenames selected in Steps 7 through 11 are displayed.

    • The screen then displays:

      Enter destination disk drive
      and directory. (Example: 'A:\')
      Press START COPY to begin.

14. If any of the filenames listed are not to be copied, go to Step 15. Otherwise, go to Step 17.

15. Press Key (2) ..... RE-SELECT FILES (S)

16. Repeat Steps 7 through 14.

17. If copying files from a RAMCARD to another RAMCARD, go to Step 18. Otherwise, go to Step 29.

18. Using keyboard (11), enter the destination 'B:\Subdirectory'.

NOTE

The destination may also be entered by turning the CURSOR A knob (7) to highlight a letter on the bottom of the screen and then slightly turning the CURSOR B knob (8) to advance to the next letter position. Also, if files to be copied are not in a subdirectory, only enter 'B:\' Otherwise, enter the same subdirectory name for the destination as the one where the files are stored in the source.

19. Press key (3)..... START COPY

- The screen temporarily displays:

  COPYING IN PROGRESS.
  Please wait !!

20. Wait for the message to appear on the screen:

  Please remove SOURCE RAMCARD
  and insert DESTINATION RAMCARD.
  Press CONTINUE COPY to proceed.

21. Remove source RAMCARD that is in the RAMCARD slot (9), using the eject button (10).

22. Insert the destination RAMCARD into RAMCARD slot (9).

23. Press key (3)..... CONTINUE COPY

- When transfer is completed, the following will appear on the screen:

  Please remove DESTINATION RAMCARD and
  insert SOURCE RAMCARD.
  Press CONTINUE COPY to proceed.

24. Remove destination RAMCARD that is in the RAMCARD slot (9), using the eject button (10).

25. Insert the source RAMCARD into RAMCARD slot (9).

26. Press key (3)..... CONTINUE COPY

27. Repeat Steps 20 through 26 until the Storage Maintenance screen is displayed.

28. Go to Step 31.

29. Using keyboard (11), enter the destination 'drive:subdirectory'.

NOTE

The destination may also be entered by turning the CURSOR A knob (7) to highlight a letter on the bottom of the screen and then slightly turning the CURSOR B knob (8) to advance to the next letter position. Also, if files to be copied are not in a subdirectory, only enter 'B:' if copying to a RAMCARD, 'D:' if copying to the internal CMOS RAM, or 'A:' if copying to the external disk drive (not presently available). Otherwise, enter the same subdirectory name for the destination as the one where the files are stored in the source.

30. Press key (3)..... START COPY

- The screen temporarily displays:

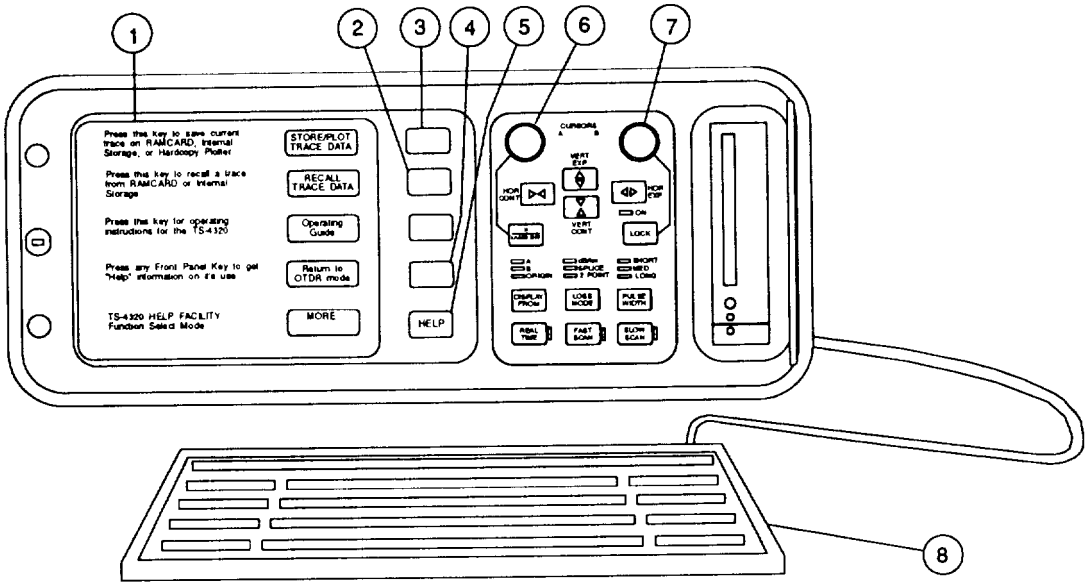
  Copying in Progress
  PLEASE WAIT

- The display returns to the Storage Maintenance screen.

31. If key (5) icon reads "Return to OTDR Mode", press key (5). Otherwise, rotate the CURSOR B knob (8) until the icon reads "Return to OTDR Mode" and then press key (5).

2-35. RENAME A FILE.

Names assigned to files stored on the default storage device can be changed.



1. Connect the keyboard (8), (para 2-29).
2. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).
3. Set the default storage device (para 2-30)
4. Press the MORE key (5).
   - The text opposite key (3) reads:

     General RAMCARD and Disk Handling Utilities. — STORAGE MAINT.

5. Press key (3).
   - The text opposite key (2) reads:

     Press to Rename a selected file. — RENAME

6. Press key (2).
   - Before displaying the contents of the device, the screen temporarily displays:

     WAIT ! until Directory is read and displayed.

     Select Filename for RENAME using Cursor A.

     Press appropriate Softkey for function desired.

- Then the contents of the device are displayed.

7. Use the keyboard (8) UP/DOWN arrows or rotate CURSOR A knob (6) to highlight the desired file.

8. Press key (2) ..... RENAME FILES

- The screen displays:

```
Selected File is:
B:
filename

Change Name to:
[]
```

NOTE

The 'B:' may be 'D:' or 'A:' depending on the default device. Also, 'Subdirectory' may be blank. 'Filename' will be the name selected on the previous screen.

9. If the wrong file was selected, go to Step 10. Otherwise go to Step 12.

10. Press key (2)..... WRONG FILE

- The contents of the default device is displayed again.

11. Repeat Steps 7 through 9.

12. Using keyboard (8), enter new filename desired.

NOTE

The filename may also be entered by turning the CURSOR A knob (6) to highlight a letter on the bottom of the screen and then slightly turning the CURSOR B knob (7) to advance to the next letter position.

13 Press key (3)..... ACCEPT NEW NAME

- The screen temporarily displays:

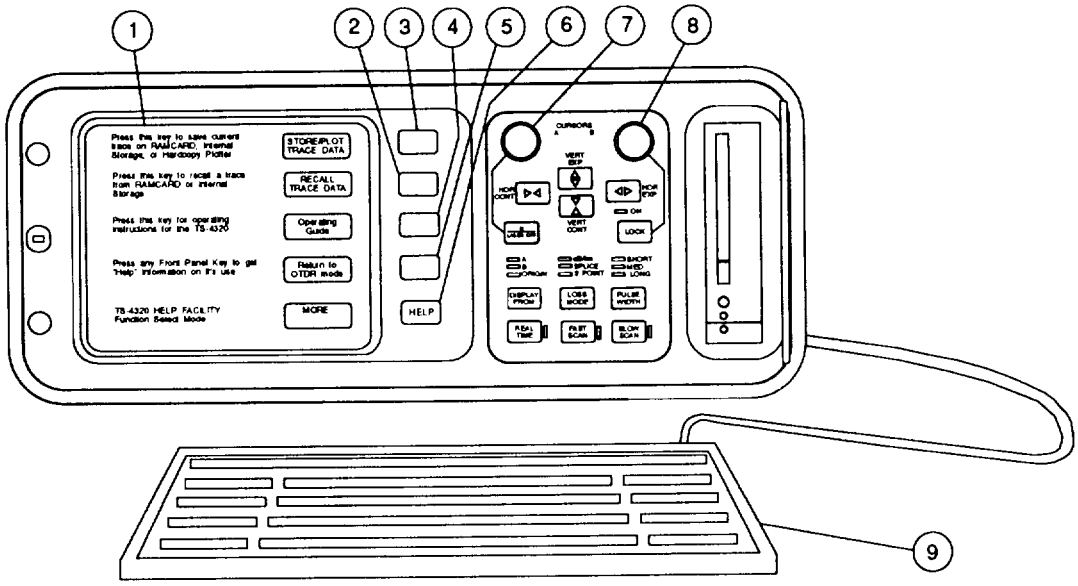
```
Renaming File - PLEASE WAIT
```

- The Storage Maintenance screen reappears.

14. If key (4) icon reads "Return to OTDR Mode", press key (4). Otherwise, rotate the CURSOR B knob (7) until the icon reads "Return to OTDR Mode" and then press key (4).

2-36. DELETE A FILE.

Files stored on the default storage device can be deleted.



1. Connect the keyboard (9), (para 2-29)
2. Obtain the HELP Facility Function Select Mode screen (1), (para 2-20).
3. Set the default storage device (para 2-30).
4. Press the MORE key (6).
   - The text opposite key (3) reads:

     General RAMCARD and Disk Handling Utilities. — STORAGE MAINT.

5. Press key (3).
   - Key (6) changes to read: — MORE
6. Press the MORE key (6).
   - The text opposite key (4) changes to read:

     Press to Select and Delete files. — DELETE FILES

7. Press key (4).

   • The screen temporarily displays:

   WAIT ! until Directory is
   read and displayed.

   Select Filename(s) for DELETE
   using Cursor A.

   • Then the contents of the default device are displayed.

8. Use the keyboard (9) UP/DOWN arrows or rotate CURSOR A knob (7) to highlight a file to be deleted.

9. Press key (2) ..... SELECT FILE

   • A '#' character is displayed to the left of the date field and to the right of the selected filename.

10. If a file is selected that should not be deleted, go to Step 11. Otherwise go to Step 13.

11. Use the keyboard (9) UP/DOWN Arrow or Rotate CURSOR A knob(7) to highlight the file to be de-selected.

12. Press key (4) ..... DE-SELECT FILE

   • The '#' located between the filename and date disappears.

13. Repeat Steps 8 and 9 until all files to delete are tagged.

14. Press key (3)..... DELETE SELECTIONS

   • The screen temporarily displays:

   Deleting File:
   B:\Subdirectory
   Filename

NOTE

The 'B:' may be 'D:' or 'A:' depending on the default device. Also, Subdirectory may be blank. 'Filename' will show the file currently being deleted and will change as each file is deleted.

   • The Storage Maintenance screen reappears.

15. If key (5) icon reads "Return to OTDR Mode", press key (5). Otherwise, rotate the CURSOR B knob (8) until the icon reads "Return to OTDR Mode" and then press key (5).

CHAPTER 3
UNIT MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, SPECIAL TOOLS, TMDE AND SUPPORT EQUIPMENT

3-1. COMMON TOOLS AND EQUIPMENT.

Common tools and equipment required for unit maintenance of Optical Fiber Test Set TS-4320(P)/G are listed in the Maintenance Allocation Chart (MAC) Appendix B.

3-2. SPECIAL TOOLS, TMDE, AND SUPPORT EQUIPMENT.

There are no special tools and support equipment required for unit maintenance.

3-3. REPAIR PARTS.

Repair parts are listed and illustrated in the repair parts and special tools list, RPSTL, TM 11-6625-3271-24P.

Section II. SERVICE UPON RECEIPT

3-4. SERVICE UPON RECEIPT OF MATERIAL.

a. *Unpacking*. Transit case provides maximum protection for TS-4320(P)/G. Avoid damaging transit case and inside material during equipment unpacking. Use the following steps for unpacking TS-4320(P)/G.

- Release latches and open transit case.
- Grasp Optical Time Domain Reflectometer firmly and lift vertically to remove from transit case
- Remove remaining items.

b. *Check Unpacked Equipment*.

- Inspect equipment for damage incurred during shipment. If equipment has been damaged, report damage on SF 364, Report of Discrepancy (ROD).
- Check equipment against packing slip to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.
- Check to see whether the equipment has been modified.

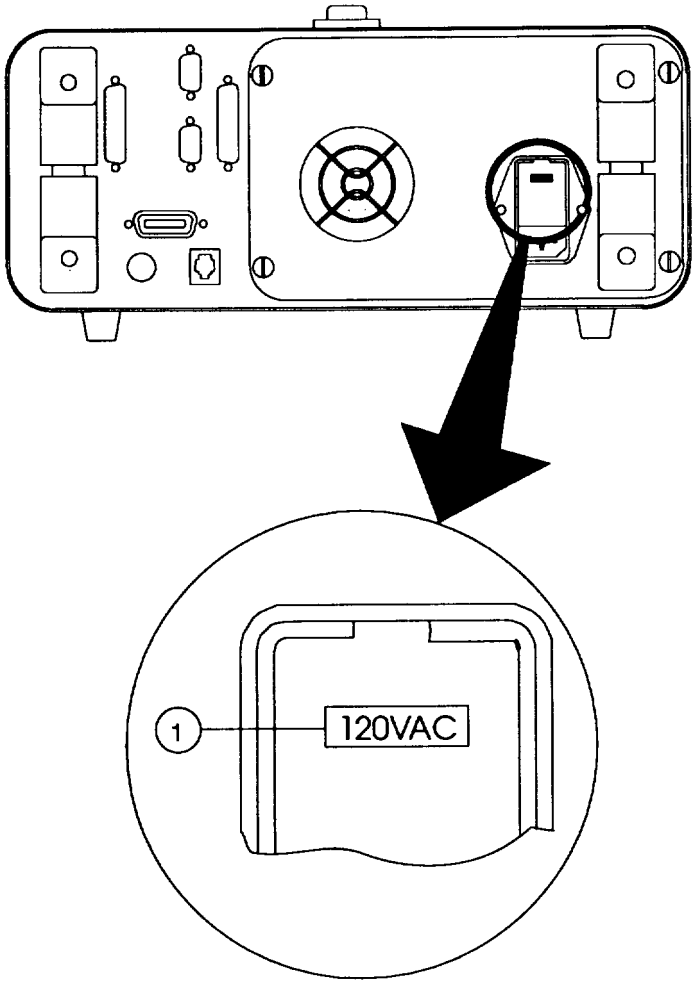
3-5. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT.

NOTE

The TS-4320(P)/G comes with a TD-260C Optical Module installed. If a different optical module is required, remove and reinstall correct optical module (para 2-6).

a. *Operation from AC Power*. Verify voltage selection wheel (1) is set to the line voltage locally available. If not, remove and reinstall wheel to correct voltage (para 3-7).

- Remove rear panel fuses (para 3-7). Check that fuses are correct for the local line voltage.
- Replace rear panel fuses (para 3-7).



Input Voltage	Voltage Selection Wheel	Rear Panel Fuse
90 to 110	100	2 amp slo-blo
103 to 127	120	2 amp slo-blo
193 to 237	220	1.5 amp slo-blo
207 to 253	240	1.5 amp slo-blo

b. *Operating With a DC/AC Inverter*. The TS-4320(P)/G may be powered by 12, 24, or 28V DC using the DC/AC inverter. When using an inverter the TS-4320(P)/G input voltage must be selected as 120V AC.

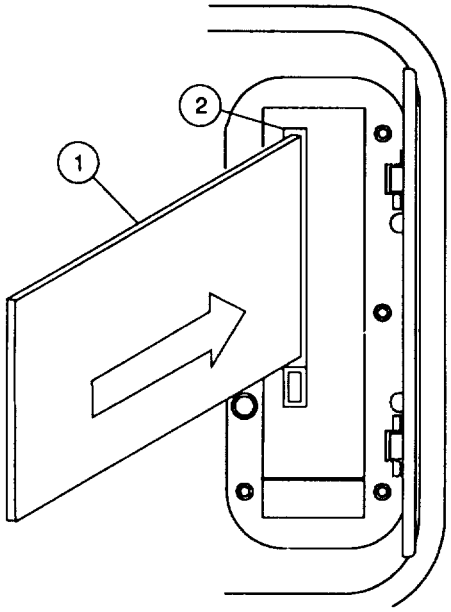
- Connect DC/AC inverter (para 2-5).

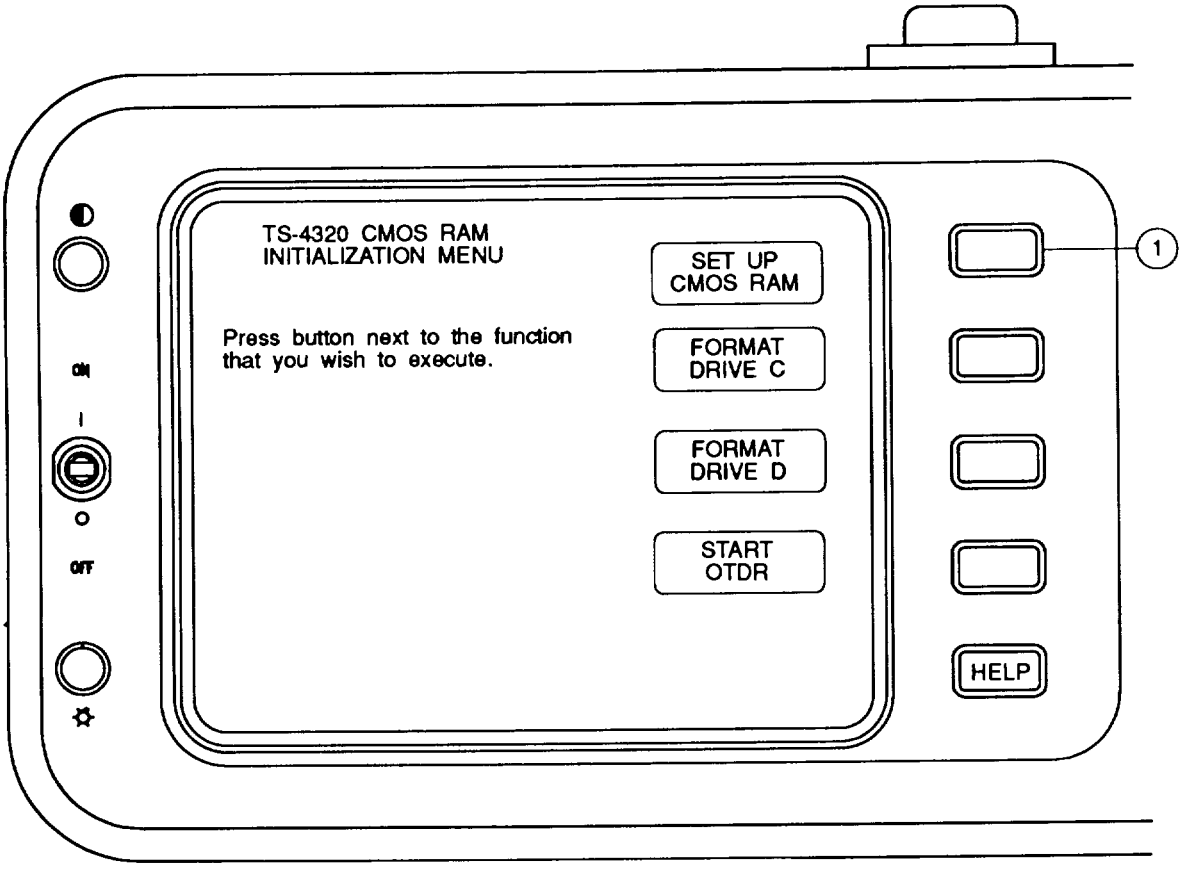
c. *Initial Loading of Operating Software*. Once started, the Operating Software loads itself. Only press keys when prompted by the screen. During the loading process, the internal CMOS RAM is designated as Drive C and is loaded with the TS-4320(P)/G operating code and the operating system. (The last item allows the unit to BOOTLOAD itself without using a system card.)

CAUTION

Do not connect or disconnect the keyboard while power is ON.

- Insert PROGRAMMED ROMCARD (1) in ROM/RAMCARD drive (2).
- Turn power ON (para 2-7). The RAM Initialization Menu is displayed.





- Press Softkey (1). The following messages are displayed:

  NOW TRANSFERRING SYSTEM FILES
  ....Please Wait...

then:

  Please assure that CARD
  containing TS-4320 UTILITIES
  CODE is in CARD SLOT.
  Press key to continue....

- Press Softkey (1) ..... CONTINUE
  The following message is displayed before returning to the Initialization Menu.

  NOW COPYING UTILITY FILES
  Please Wait...

- Turn power OFF.
- Remove PROGRAMMED ROMCARD.
- Perform Turn-On procedure (para 2-7).
- Perform Set Internal Clock procedure (para 2-26).

Section III. TROUBLESHOOTING

SYMPTOM INDEX

3-6. TROUBLESHOOTING TABLE.

Table 3-1 lists common malfunctions which may be found during operation or maintenance of the Optical Fiber Test Set TS-4320(P)/G. Perform the test/inspection and corrective action in order listed.

NOTE

This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed, or is not corrected by listed corrective actions, notify next higher level maintenance.

Table 3-1. Troubleshooting.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

1. TS-4320(P)/G NOT OPERATING.
   - Step 1. Check to see if fuses are blown or broken.
     - • Replace fuses (para 3-7).
   - Step 2. Verify voltage selection wheel is installed and set for correct voltage.
     - • Install voltage selection wheel for correct voltage (para 3-7).
   - Step 3. Check to see if voltage selector contacts are missing, burned, or broken.
     - • Notify next higher level maintenance.

2. TS-4320(P)/G NOT OPERATING WHEN CONNECTED TO DC/AC INVERTER.
   - Step 1. Check to see if fuses are blown or broken.
     - • Replace fuse (para 3-8).
   - Step 2. Verify DC Power Cable connection.
     - • Install DC cable correctly.
     - • Verify voltage selection wheel set for 120V AC (para 3-5a).
     - • If correct, notify next higher level maintenance.

3. TS-4320(P)/G DISPLAYS ERROR MESSAGE DURING POWER UP DIAGNOSTIC.
   - Error "Memory size error" displayed.
     - • Notify next higher level maintenance.
   - Error "Bad checksum" displayed.
     - • Notify next higher level maintenance.
   - Error "Bad address line" displayed.
     - • Notify next higher level maintenance.

4. TS-4320(P)/G UNABLE TO BOOTLOAD FROM INTERNAL CMOS RAM.
   - The following error message is displayed:
   - "Stand-alone ROM version not supported."
   - "Loading Failed!!"
   - "Insert TS-4320 System Card."
     - • Insert TS-4320(P)/G PROGRAMMED ROMCARD into ROM/RAMCARD Drive.
     - • If identical error appears, notify next higher level maintenance.

5. ONE OR MORE FRONT PANEL INDICATORS OR KEYS INOPERATIVE.
   - • Notify next higher level maintenance.

Table 3-1. Troubleshooting - Continued.

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
6. INTERNAL BATTERY LOW INDICATOR ON. • Replace batteries (para 3-12). • Perform Initial Loading of Operating Software (para 3-5c).

Section IV. UNIT MAINTENANCE INSTRUCTIONS

3-7. REPLACE VOLTAGE SELECTION WHEEL AND REAR PANEL FUSES.

DESCRIPTION

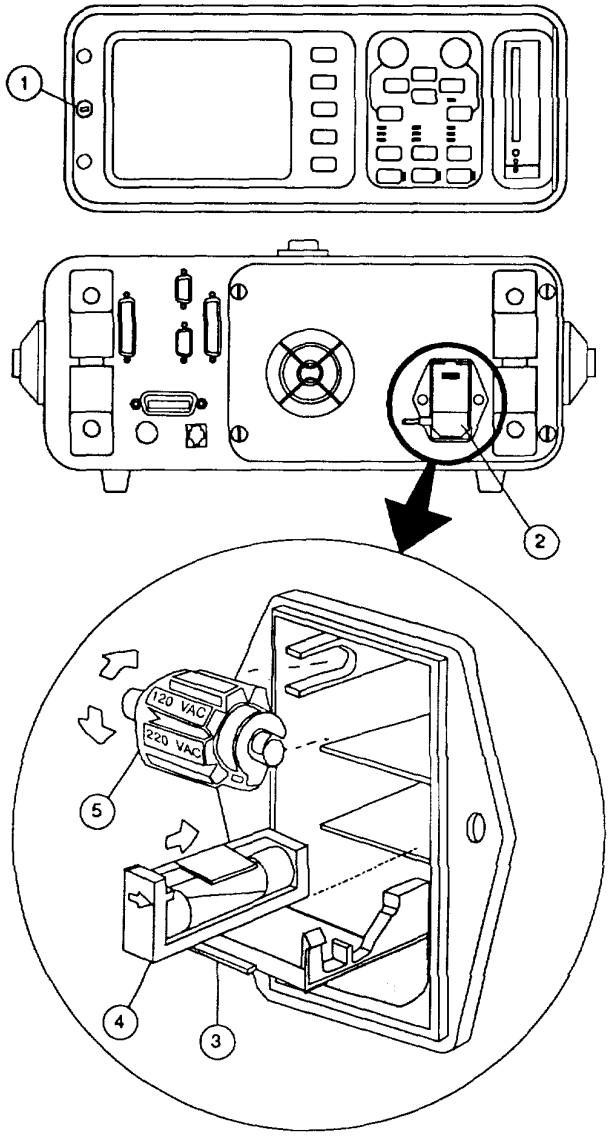
This procedure covers: Remove. Install.

REMOVE

1. Set POWER switch (1) to OFF.
2. Unplug power cable (2).
3. Open fuse cover (3).
4. Remove voltage selection wheel (5).
5. Remove both fuse holders (4).

INSTALL

1. Insert voltage selection wheel (5) with desired operating voltage visible outward.
2. Insert fuses into fuse holders (4).
3. Insert fuse holders (4) into unit.
4. Close fuse cover (3). Verify desired operating voltage is visible in window.
5. Install power cable (2).
6. Set POWER switch (1) to ON.



END OF TASK

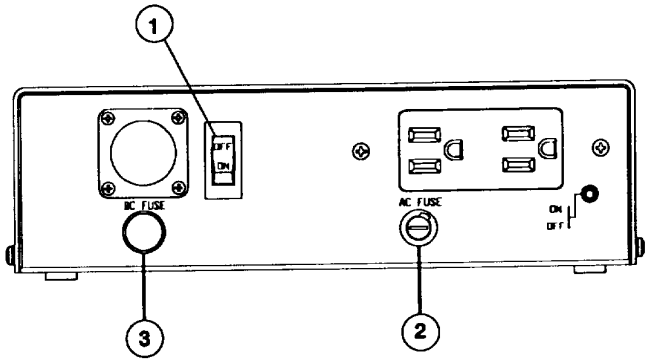
3-8. REPLACE AC AND DC FUSES IN INVERTER.

DESCRIPTION

This procedure covers: Remove. Install.

REMOVE

1. Set POWER switch (1) to OFF.
2. Disconnect from input power source (para 2-5).
3. Remove AC fuse holder (2).
4. Remove DC fuse holder (3).



INSTALL

1. Insert AC fuse into fuse holder (2).
2. Install AC fuse holder (2) into unit.
3. Insert DC fuse into fuse holder (3).
4. Install DC fuse holder (3) into unit.
5. Connect to input power source (para 2-5).
6. Set POWER switch (1) to ON.

END OF TASK

3-9. REPLACE CURSOR CONTROL KNOBS.

DESCRIPTION

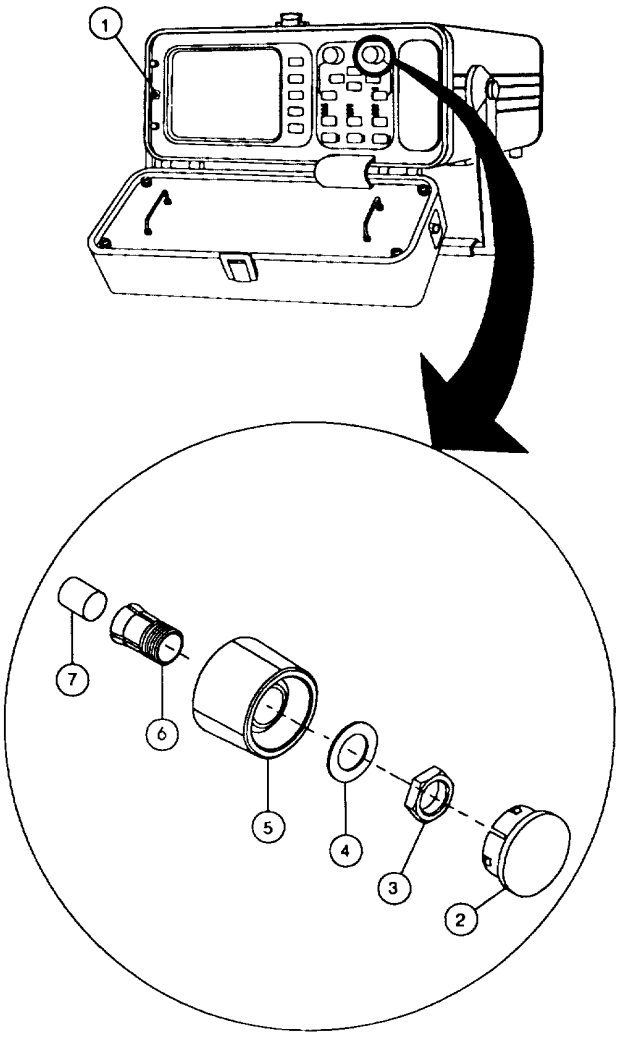
This procedure covers: Remove. Install.

REMOVE

1. Set POWER switch (1) to OFF.
2. Pry cover (2) from knob base (5).
3. Hold knob base (5) firmly and loosen nut (3) counterclockwise.
4. Remove nut (3) and washer (4).
5. Remove knob base (5) straight out.

INSTALL

1. Install knob base (5) onto (6) and then onto shaft (7).
2. Install washer (4) and nut (3).
3. Hold knob base (5) firmly and tighten nut (3) clockwise.
4. Press cover (2) onto knob base (5).
5. Set POWER switch (1) to ON.



END OF TASK

3-10. REPLACE DISPLAY BRIGHTNESS CONTROL AND CHARACTER INTENSITY KNOBS.

DESCRIPTION

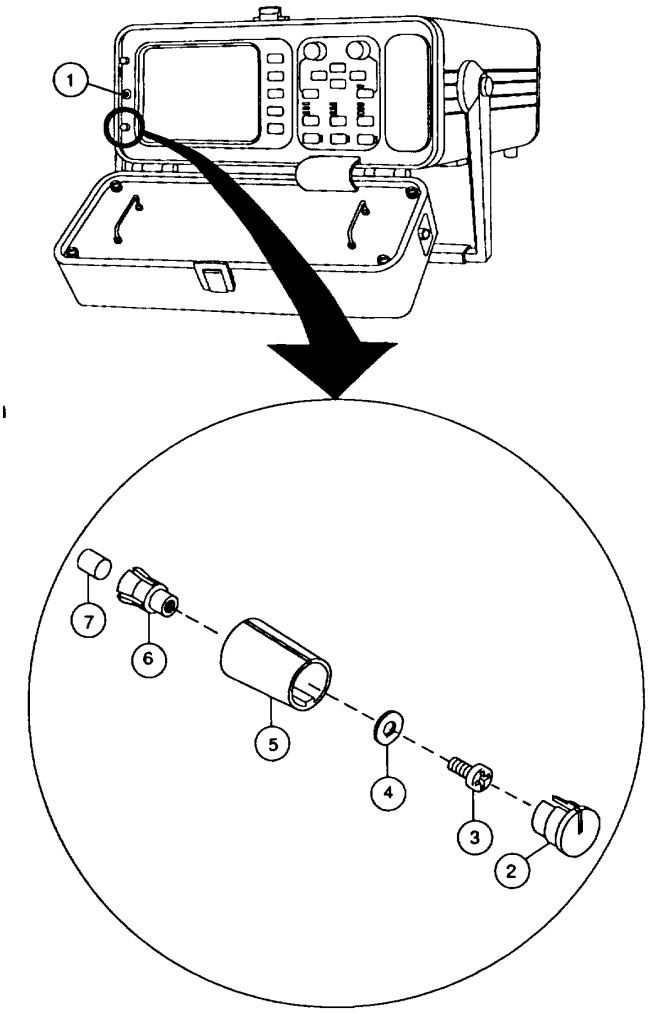
This procedure covers: Remove. Install.

REMOVE

1. Set POWER switch (1) to OFF.
2. Pry cover (2) from knob base (5).
3. Hold knob base (5) firmly and loosen screw (3) counterclockwise.
4. Remove screw (3) and washer (4).
5. Remove knob base (5) straight out.

INSTALL

1. Install knob base (5) onto (6) and then onto shaft (7).
2. Install washer (4) and screw (3).
3. Hold knob base (5) firmly and tighten screw (3) clockwise.
4. Press cover (2) onto knob base (5).
5. Set POWER switch (1) to ON.



END OF TASK

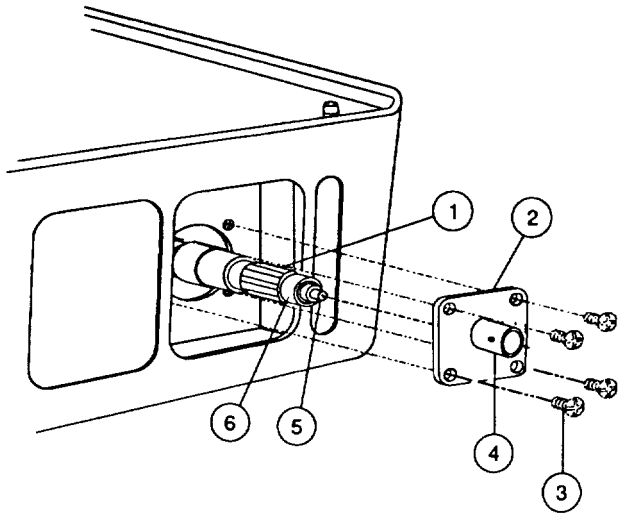
3-11. CLEAN TEST FIBER RECEPTACLE.

DESCRIPTION

This procedure covers: Remove. Clean. Install.

REMOVE

1. Set POWER switch to OFF.
2. Remove four screws (3).
3. Pull receptacle mounting assembly (2) out about two inches. Do not place undue strain on internal optical fiber attached to the receptacle.
4. Turn retaining sleeve (1) one quarter turn counterclockwise. Hold the interior fiber plug (6) while gently pulling the receptacle mounting assembly (2) off the end of the plug.



CLEAN

1. Clean facet (5) of interior fiber plug (6) by wiping with lintless cloth dampened with isopropyl alcohol (Appendix D, items 1 and 2).
2. Swab out any grease on receptacle interior (4) with dampened lintless cloth (Appendix D, items 1 and 5).

INSTALL

1. Align tab on interior fiber plug (6) with notch on rear section of receptacle mounting assembly (2). Push receptacle mounting assembly onto plug and turn retainer sleeve (1) one quarter turn clockwise to secure connection.
3. Move receptacle mounting assembly (2) back into place on module housing.
4. Install four screws (3).
5. Set POWER switch to ON.

END OF TASK

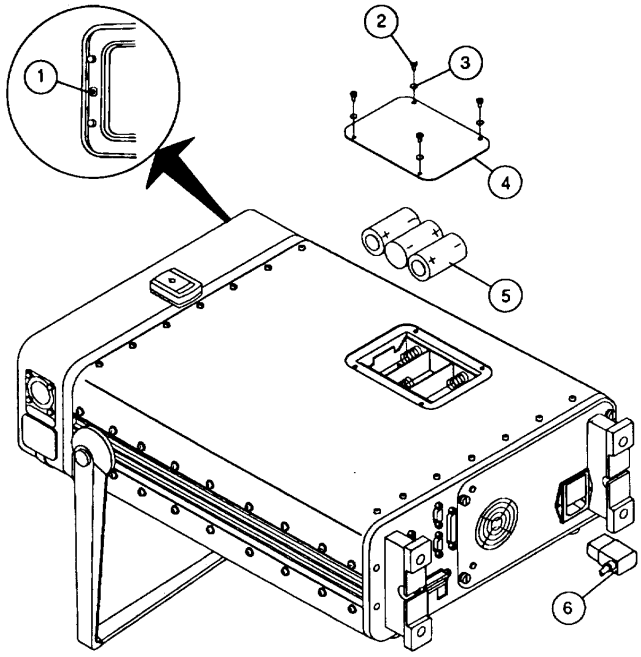
3-12. REPLACE BATTERIES.

DESCRIPTION

This procedure covers: Remove. Install.

REMOVE

1. Set POWER switch (1) to OFF.
2. Remove power plug (6).
3. Remove four screws (2) and four washers (3).
4. Remove battery cover (4).
5. Remove three batteries (5). Note polarity.



INSTALL

1. Install three "D" Cell Batteries (5). Note polarity.
2. Install battery cover (4).
3. Install four screws (2) and four washers (3).
4. Install power plug (6).
5. Set POWER switch (1) to ON.

END OF TASK

Section V. PREPARATION FOR STORAGE OR SHIPMENT

3-13. PACKAGING.

Package TS-4320(P)/G in original shipping container. When using packing materials other than the original, use following guidelines:

- Wrap TS-4320(P)/G in plastic packing material.
- Use double-wall cardboard shipping container.
- Protect all sides with shock-absorbing material to prevent TS-4320(P)/G movement within container.
- Seal the shipping container with approved sealing tape.
- Mark "FRAGILE" on all sides, top, and bottom of shipping container.

3-14. TYPES OF STORAGE.

- Short-Term (administrative) = 1 to 45 days.
- Intermediate = 46 to 180 days.
- Long term = over 180 days. After long term storage, perform Preliminary Service and Adjustment of Equipment (para 3-5). If this test fails, notify next higher level maintenance.

3-15. ENVIRONMENT.

TS-4320(P)/G should be stored in a clean, dry environment. In high humidity environments, protect TS-4320(P)/G from temperature variations that could cause internal condensation. The following environmental conditions apply to both shipping and storage:

Temperature ..... +14° F to +1310 F (-10° C to +55° C).
Relative Humidity..... less than 95%, non condensing.
Altitude..... less than 15,000 feet (4,570 meters).
Vibration. ..... less than 3 g.
Shock..... less than 40 g.

APPENDIX A

REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS.

Equipment Inspection and Maintenance Worksheet	DA Form 2404
Product Quality Deficiency Report	Form SF 368
Recommended Changes to Equipment Technical Manuals	DA Form 2028-2
Recommended Changes to Publications and Blank Forms	DA Form 2028
Report of Discrepancy (ROD)	Form SF 364
Transportation Discrepancy Report (TDR)	Form SF 361

A-3. TECHNICAL MANUALS.

Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command)	TM 750-244-2
Unit and Intermediate Direct Support and General Support, Repair Parts and Special Tools List, for Optical Fiber Test Set TS-4320(P)/G	TM 11-6625-3271-24P

A-4. MISCELLANEOUS.

Abbreviations for Use on Drawings, Specifications, Standards and in Technical Documents	MIL-STD-12
Calibration and Requirements for the Maintenance of Army Materiel	TB 43-180
Common Table of Allowances	CTA 50-970
Consolidated Index of Army Publications and Blank Forms	DA Pam 25-30
First Aid for Soldiers	FM 21-11
Safety Precautions for Maintenance of Electrical/Electronic Equipment	TB 385-4
The Army Maintenance Management System (TAMMS)	DA Pam 738-750

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

SECTION I. INTRODUCTION

B.1 GENERAL.

a. This introduction provides a general explanation of all maintenance and repair function authorized at the two maintenance levels under the Two-Level Maintenance System concept.

b. The 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 levels, which are shown on the MAC in column (4) as:

1. Field – includes two columns, Unit maintenance and Direct Support maintenance. The Unit maintenance column is divided again into two more subcolumns, C for Operator or Crew and O for Unit maintenance.
2. Sustainment – includes two subcolumns, general support (H) and depot (D).

c. The tools and test equipment requirements in Section III list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

d. The remarks in Section IV contain supplemental instructions and explanatory notes for a particular maintenance function.

B.2 MAINTENANCE FUNCTIONS.

Maintenance functions are limited to and defined 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 (e.g. by sight, sound, or feel). This includes scheduled inspection and gagings and evaluation of cannon tubes.

b. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.

c. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:

1. Unpack. To remove from packing box for service or when required for the performance of maintenance operations.
2. Repack. To return item to packing box after service and other maintenance operations.
3. Clean. To rid the item of contamination.
4. Touch up. To spot paint scratched or blistered surfaces.
5. Mark. To restore obliterated identification.

d. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Remove/install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

h. Paint. To prepare and spray color coats of paint so that the ammunition can be identified and protected. The color indicating primary use is applied, preferably, to the entire exterior surface as the background color of the item. Other markings are to be repainted as original so as to retain proper ammunition identification.

i. Replace. To remove an unserviceable item and install a serviceable counterpart in its place "Repair" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.

j. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item or system.

NOTE

The following definitions are applicable to the "repair" maintenance function:

1. Services. Inspect, test, service adjust, align, calibrate, and/or replace.
2. Fault location/troubleshooting. The process of investigating and detecting the case of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).
3. Disassembly/assembly. The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).
4. Actions. Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

k. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

l. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild

is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying army equipment/components.

B.3 EXPLANTION OF COLUMNS IN THE MAC, SECTION II.

a. Column (1) Group Number. Column (1) lists FGC numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

b. Column (2) Component/Assembly. Column (2) contains the item 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 a detailed explanation of these functions, refer to "Maintenance Functions" outlined above.)

d. Column (4) Maintenance Level. Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. The work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. 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 time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

1. Field:
   - C Operator or Crew maintenance
   - O Unit maintenance
   - F Direct Support maintenance

2. Sustainment:
   - L Specialized Repair Activity
   - H General Support maintenance
   - D Depot maintenance

NOTE

The "L" maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by work time figure in the "H" column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

e. Column (5) Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

f. Column (6) Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

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

a. Column (1) Tool or Test Equipment Reference Code. The tool or test equipment reference code correlates with a code used in column (5) of the MAC.

b. Column (2) Maintenance Level. The lowest level 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 (NSN). The NSN of the tool or test equipment.

e. Column (5) Tool Number. The manufacturer's part number, model number, or type number.

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

a. Column (1) Remarks Code. The code recorded in column (6) of the MAC.

b. Column (2) Remarks. This column lists information pertinent to the maintenance function being performed as indicated in the MAC."

SECTION II. MAINTENANCE ALLOCATION CHART (MAC)

FOR

OPTICAL FIBER TEST SET, TS-4320(P)/G

TABLE 1. MAC FOR OPTICAL FIBER TEST SET, TS-4320(P)/G

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REFERENCE CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	Test set, Optical Fiber TS-4320(P)/G	INSPECT TEST REPAIR REPLACE TEST REPAIR CALIBRATE REPAIR		0.5 0.3 0.1 0.1	 0.3 0.5 1.8		 3.5	 2 11 3A,4,11 3A,4,11	 A B C D E F
01	Reflectometer, Optical Time Domain 1	TEST REPLACE TEST REPAIR REPAIR		0.2 0.3	 1.5 0.2		 2.5	2,3 1,11,20,231,23 11	 G
0101	Test Set Subassembly 1A2	REPAIR TEST REPAIR REPLACE		0.1	 1.5 0.8 0.3			2 1,11,20,21,23 1,3A,4,6,11, 15-23	H
0102	Light Signal Receiver-Transmitter Subassembly, TD-285C 1A5	REPLACE TEST REPAIR ALIGN			0.2		 1.5 1.3 1.8	 11,24 3A,4,7-14,24 3A,4,11,14,24	 I
010201	Circuit Card Assembly, with Laser 1A5A2	TEST REPAIR REPLACE					1.5 2.5 2.0	3A,4,5 3A,4,5,7-14 7-10,12,13	J
0103	Light Signal receiver-Transmitter Subassembly, TD-260C 1A3	REPLACE TEST REPAIR ALIGN			0.2		 1.3 1.1 1.2	 11,24 3A,4,7,8,10-14,24 3A,4,11,14,24	 K
010301	Circuit Card Assembly, with Laser 1A3A1	TEST REPAIR REPLACE					1.0 2.8 1.4	3A,4,5 3A,4,5,7-11,14 7-10,12,13	L
0104	Light Signal Receiver-Transmitter Subassembly, TD-261C 1A4	REPLACE TEST REPAIR ALIGN			0.2		 1.3 1.1 1.2	 11,24 3A,4,7,8,10-14,24 3A,4,11,14,24	 M
010401	Circuit Card Assembly, with Laser 1A4A1	TEST REPAIR REPLACE					1.0 2.8 1.4	3A,4,5 3A,4,5,7-11,14 7-10,12,13	N
02	Inverter, Power, Static 15	TEST REPAIR REPLACE TEST REPAIR REPLACE		0.1 0.1 0.1	 0.1 0.5 0.5			3 1,3A,25,26 1	 O P

SECTION III. TOOLS AND TEST EQUIPMENT REQUIREMENTS
FOR
OPTICAL FIBER TEST SET, TS-4320(P)/G

TABLE 2. TOOLS AND TEST EQUIPMENT REQUIREMENTS FOR OPTICAL FIBER TEST SET, TS-4320(P)/G

(1) TOOLS/TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
1	F	Tool Kit, Electronic Equipment	5180-01-195-0855	TK-17
2	O	Tool Kit, Electronic Equipment	5180-00-064-5178	TK-101/G
3	O	Multimeter, Digital	6625-01-265-6000	AN/PSM-45A
3A	F,D	Multimeter, Digital	6625-01-221-9367	AN/GSM-64D
4	F,D	Oscilloscope	6625-01-470-7541	OS-303/G
5	D	Probe, Current (American Laser Systems, Inc.)		711
6	F	Counter, frequency	6625-00-531-4752	5345A
7	D	Cleaver, Fiber Optic	5110-01-246-7882	92208
8	D	Splices, Elastomeric		W01140
9	D	Strippers, Fiber Optic, 100m (Clauss)	5110-01-358-5207	NN-250
10	D	Strippers, Fiber Optic, .005” (Miller)		F0-102-1035
11	F,D	Fiber Optic Calibration Universal System (Focus)	6695-01-327-6776	13335460
12	D	Splicer, Fusion (Fujikura)	6080-01-296-3751	FSM-20
13	D	Holder, Fusion Splicer (ALCO Fujikura)	5975-01-328-5132	FP-3M
14	D	Cable Assembly, Electrical	5995-01-371-8116	LPTF-1055
15	F	Connector Assembly, Electrical	5935-01-371-5251	LPTF-1047
16	F	Extender Card, Electrical Test	5998-01-371-1042	LPTF-1048
17	F	Extender Card, Electrical Test (2 Required)	5998-01-371-1043	LPTF-1049
18	F	Disk drive Unit	7025-01-408-2197	LPTF-1107
19	F	Disk Program, Automatic Data Processing	7030-01-408-2199	LPTF-1108
20	F	Circuit Card Assembly, Module Simulator	5998-01-413-8415	LPTF-1056
21	F	Connector Assembly, Electrical	5935-01-413-8414	LPTF-1109
22	F	Circuit Card Assembly, A/D Data Simulator	5998-01-408-2200	LPTF-1111

(1) TOOLS/TEST EQUIPMENT REFERENCE CODE	(2) MAINTENANCE LEVEL	(3) NOMENCLATURE	(4) NATIONAL STOCK NUMBER	(5) TOOL NUMBER
23	F	Circuit Card Assembly, ROM Card Diagnostic	5998-01-408-2198	LPTF-1112
24	D	Test Set, Optical Fiber	6625-01-355-4087	TS-4320(P)/G
25	F	Rheostat, Carbon	4931-00-695-5483	BDE20
26	F	DC Power Supply	6130-01-229-3435	CS36CR30

SECTION III. REMARKS
FOR
OPTICAL FIBER TEST SET, TS-4320(P)/G

TABLE 3. REMARKS FOR OPTICAL FIBER TEST SET, TS-4320(P)/G

REMARKS CODE	REMARKS
A	Operational test.
B	Repair is limited to replacement of External Cables, Textile Bag, and Test Set Case.
C	Replace is for provisioning purpose only.
D	Performance test.
E	Repair is limited to replacement of the Data Entry Keyboard.
F	Perform calibration using Technical Bulletin listed in TB 43-180.
G	Repair consists of the replacement of 1A1, 1A3, 1A4 and 1A5.
H	Repair is limited to replacement of Batteries, fuses, and Knobs.
I	Repair consists of the replacement of 1A5A1, 1A5A3, 1A5A4, 1A5D5 and 1A5W1.
J	Repair is limited to replacement of 1A5A2A1, 1A5A2MY1 and 1A5A2MY2.
K	Repair consists of the replacement of 1A3A2, 1A3A3, 1A3A4, 1A3A5, 1A3A6, 1A3D1 and 1A3W1.
L	Repair is limited to replacement of 1A3A1A1 and 1A3A1MT1.
M	Repair is limited to replacement of 1A4A2, 1A4A3, 1A4A4, 1A4A5, 1A4D5 and 1A4W1.
N	Repair is limited to replacement of 1A4A1A1 and 1A4A1MT1.
O	Repair is limited to replacement of Fuses.
P	Repair is limited to replacement of Connectors, Switch, and Lamp.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

C-1. SCOPE.

This appendix lists components of the end item and basic issue items for the TS-4320(P)/G to help inventory items required for safe and efficient operation.

C-2. GENERAL.

The Components of End Item and Basic Issue Items List (BII) are divided into the following sections:

a. Section II, Components of End Item. This listing is for information purposed only and is not authority to requisition replacements. These are part of the end item, but are removed and/or separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section 111, Basic Issue Items. These are the minimum essential items required to place the TS-4320(P)/G in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the TS-4320(P)/G during operation and when it is transferred between property accounts. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

C3. EXPLANATION OF COLUMNS.

a. Column (1), Illustration Number (Illus. Number). This column indicates the number of the illustration in which the item is shown.

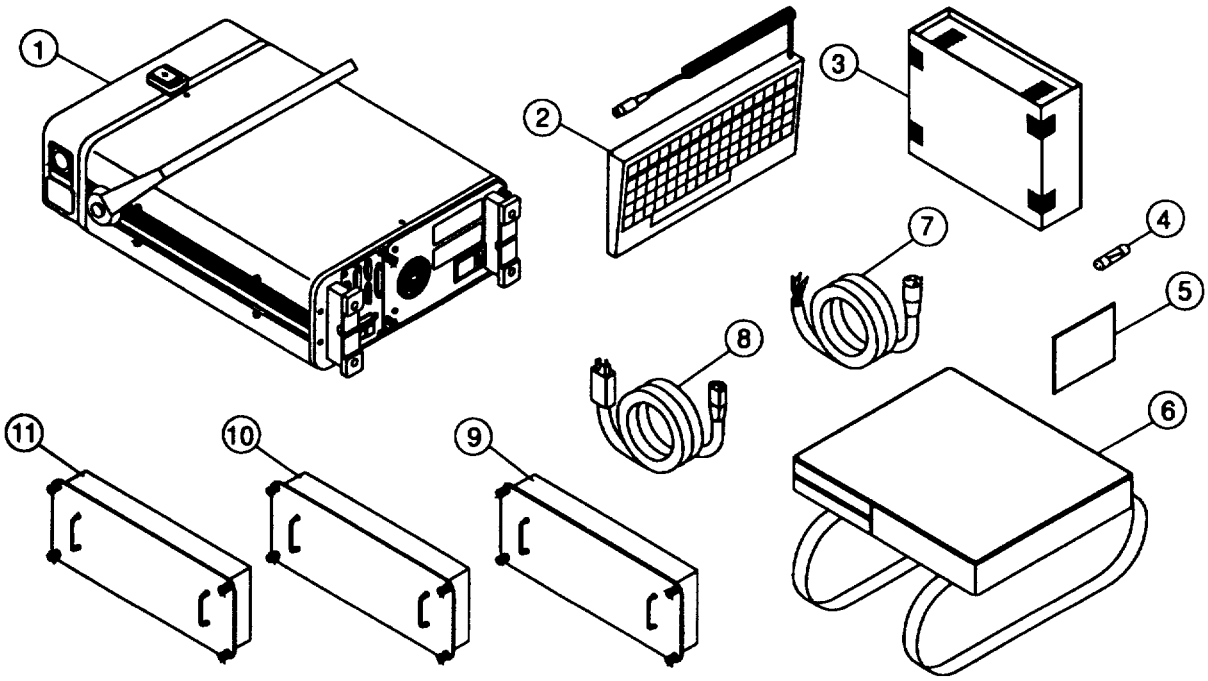
b. Column (2), National Stock Number. This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.

c. Column (3), Description. This column indicates the federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the CAGE (in parenthesis) followed by the part number.

d. Column (4), Unit of Measure (U/M). This column indicates the measure used in performing the actual operation/maintenance function. The measure is expressed by a two-character alphabetical abbreviation (e.g. ea., in., pr.).

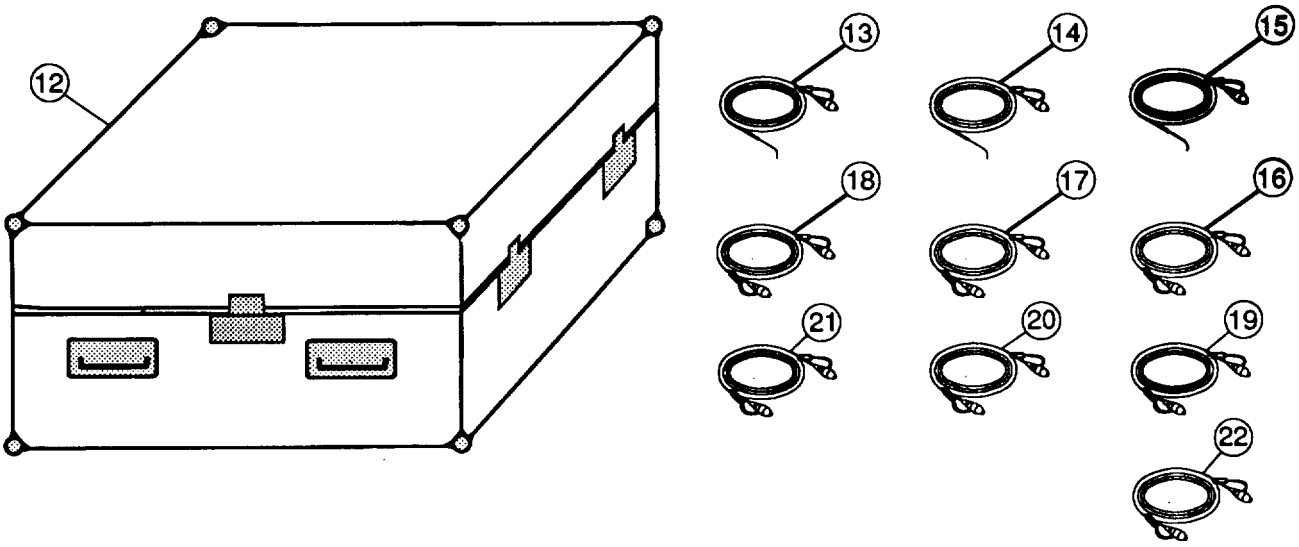
e. Column (5), Quantity Required (Qty. Rqd.). This column indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM



Illus Number	National Stock Number	Description CAGEC and Part Number	U/I	Qty Rqr
1		TEST SET SUBASSEMBLY		
		(51275) 21179	EA	1
2		KEYBOARD,DATA ENTRY		
		(51275) 14970	EA	1
3		INVERTER, POWER, STATIC		
		(51275) 22348	EA	1
4		FUSE, CARTRIDGE, 1.5 AMP 250V, SLO-BLO, 5x20mm.		
		(51275) 22582	EA	2
5		CIRCUIT CARD ASSEMBLY, PROGRAMMED ROMCARD		
		(51275) 21174	EA	1
6		BAG, TEXTILE		
		(51275) 21188	EA	1
7		CABLE ASSEMBLY, POWER, ELECTRICAL		
		(51275) 22939	EA	1
8		CABLE ASSEMBLY, POWER, ELECTRICAL, AC LINE		
		(51275) 12731	EA	1
9		LIGHT SIGNAL RECEIVER-TRANSMITTER SUBASSEMBLY, TD-260C		
		(51275) 21305	EA	1
10		LIGHT SIGNAL RECEIVER-TRANSMITTER SUBASSEMBLY, TD-261C		
		(51275) 21332	EA	1
11		LIGHT SIGNAL RECEIVER-TRANSMITTER SUBASSEMBLY, TD-285C		
		(51275) 22548	EA	1

Section II. COMPONENTS OF END ITEM



Illus Number	National Stock Number	Description CAGEC and Part Number	U/I	Qty Rqr
12		CASE, TEST SET		
		(51275) 21189	EA	1
13		CABLE ASSEMBLY, FIBER OPTIC, ST/PC MULTIMODE 62.5/125		
		(51275) 22711-22365	EA	1
14		CABLE ASSEMBLY, FIBER OPTIC, ST/PC MULTIMODE 50/125		
		(51275) 22711-22366	EA	1
15		CABLE ASSEMBLY, FIBER OPTIC, ST/PC SINGLEMODE 9/125		
		(51275) 22711-22367	EA	1
16		CABLE ASSEMBLY, FIBER OPTIC, ST/PC - FC MULTIMODE		
		51275 22711-22364	EA	1
17		CABLE ASSEMBLY, FIBER OPTIC, ST/PC - ATT BIC SINGLEMODE		
		(51275) 22711-22358	EA	1
18		CABLE ASSEMBLY, FIBER OPTIC, ST/PC - ST SINGLEMODE		
		(51275) 22711-22359	EA	1
19		CABLE ASSEMBLY, FIBER OPTIC, ST/PC - FC SINGLEMODE		
		(51275) 22711-22360	EA	1
20		CABLE ASSEMBLY, FIBER OPTIC, ST/PC - ATT BIC MULTIMODE		
		(51275) 22711-22361	EA	1
21		CABLE ASSEMBLY, FIBER OPTIC, ST/PC - ST MULTIMODE		
		(51275) 22711-22362	EA	1
22		CABLE ASSEMBLY, FIBER OPTIC, ST/PC - SMA 906 MULTIMODE		
		(51275) 22711-22363	EA	1

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE.

This appendix lists expendable supplies needed for maintenance on TS-4320(P)/G. These items are authorized by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. 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 item (e.g. "Use cleaning compound, item 5, Appendix D").

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

C - Operator/Crew.

O - Organizational Maintenance.

c. Column 3. National Stock Number. This column indicates the national stock number assigned to the item and will be used for requisitioning purposes.

d. Column 4. Description. This column indicates the federal item name and if required a minimum description to identify the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

e. Column 5. Unit of Measure (U/M). This column 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 SUPPLIES AND MATERIAL LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	C	6810-00-753-4993	Alcohol, Isopropyl, 8 OZ Can, MIL-A-10428, Grade A (81349)	CN
2	C	8305-00-267-3015	Cloth, Cheesecloth, Cotton, Lintless, CCC-C-440, Type II, Class 2 (81349)	YD
3	C	7930-00-068-1669	Detergent, Mild, Liquid	OZ
4	C	RAMCARD, 128K x 8	SRAM, Fujitsu (61271) MB98A9070-25	EA

APPENDIX E

REMOTE OPERATION

E-1. SCOPE.

This Appendix describes Optical Fiber Test Set TS-4320(P)/G remote operation (GPIB) procedures using an external controller. GPIB conforms to IEEE Standard 488-1978.

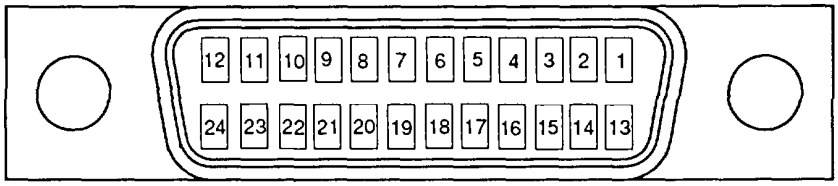
E-2. GENERAL

The GPIB interface provides two modes of operation. If connected to an external GPIB controller and operating in Remote Mode, it acts as a fully programmable talker/listener device. In Talk-Only Mode, it can produce screen image, hard-copy output on an external plotter or printer operating in Listen-Only mode. The rear panel GPIB connector input and output information is supplied below.

Logic Levels

True = 1 = Low = <=+0.4V

False = 0 = High = >=+2.5V



PIN	ASSIGNMENT	NOMENCLATURE	DESCRIPTION
1	DIO 1	Data In/Out Bit 1	Data Line'
2	DIO 2	Data In/Out Bit 2	Data Line'
3	DIO 3	Data In/Out Bit 3	Data Line'
4	DIO 4	Data In/Out Bit 4	Data Line'
5	EOI	End or Identify	Interface Line'''
6	DAV	Data Valid	Handshake Line''
7	NRFD	Not Ready for Data	Handshake Line'''
8	NDAC	Not Data Accepted	Handshake Line''
9	IFC	Interface Clear	Interface Line'''
10	SRQ	Service Request	Interface Line'''
11	ATN	Attention	Interface Line***
12	SHIELD		Connector GND
13	DIO 5	Data In/Out Bit 5	Data Line'
14	DIO 6	Data In/Out Bit 6	Data Line*
15	DIO 7	Data In/Out Bit 7	Data Line'
16	DIO 8	Data In/Out Bit 8	Data Line'
17	REN	Remote Enable	Interface Line.'.
18	TW PR with 6		GND at TERM
19	TW PR with 7		GND at TERM
20	TW PR with 8		GND at TERM
21	TW PR with 9		GND at TERM
22	TW PR with 10		GND at TERM
23	TW PR with 11		GND at TERM
24	Signal Ground		

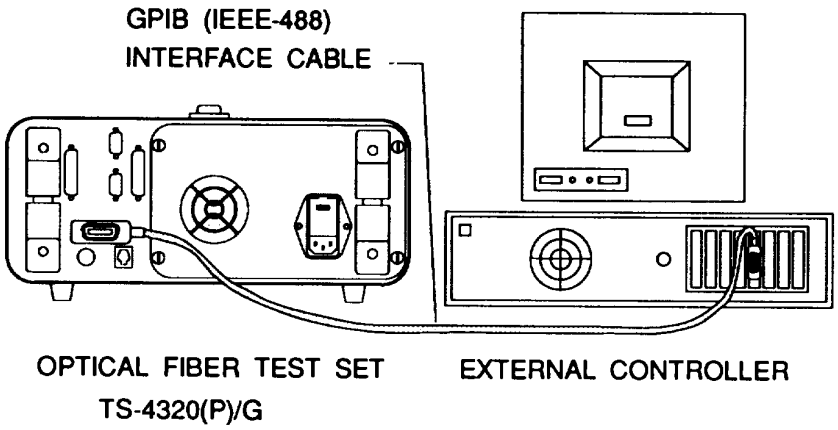
* Data lines are used to transfer data from one instrument to another.
** Handshake lines operate in a proper time sequence for complete communication between instruments.
*** Interface lines are used to provide an orderly flow of information between units.

E-3. OPERATING PROCEDURES

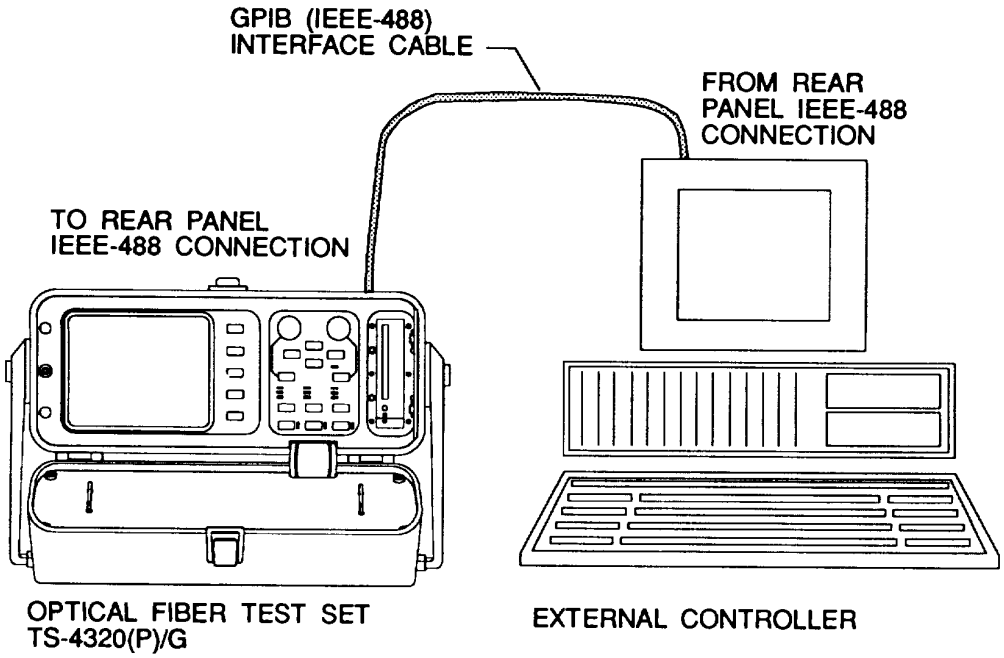
Perform the following steps for remote operation of Optical Fiber Test Set TS-4320(P)/G.

1. Connect the equipment as shown below.

NOTE
Keep GPIB interface cable length below 6 feet (1.8 m)



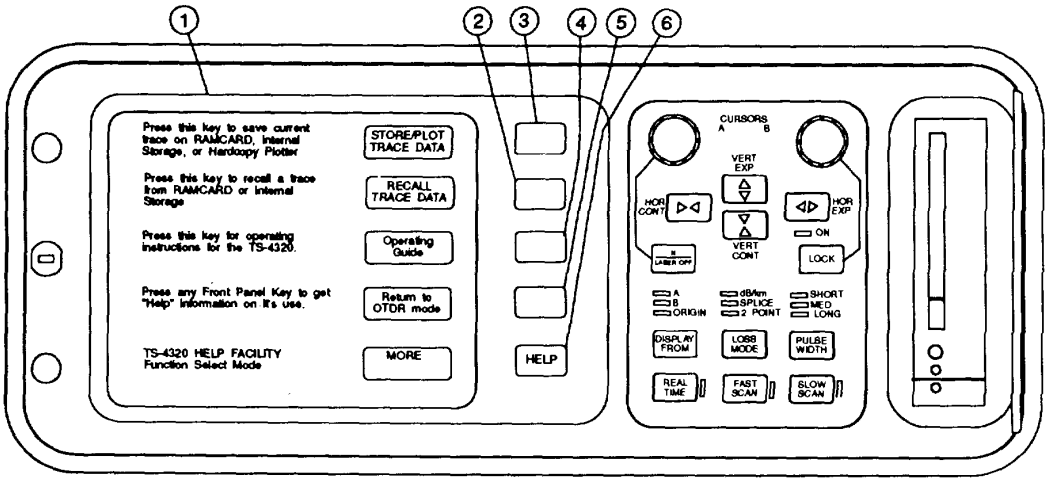
REAR VIEW



FRONT VIEW

2. Perform turn-on procedure (para 2-7).

3. Obtain HELP Facility Function Select Mode screen (1), (para 2-20).



4. Press the MORE key (6).

   - The text opposite key (2) reads:

     Set Initial values for TS-4320 Operation.

     INSTRUMENT] SETUP

5. Press key (2).

   - The text opposite key (2) reads:

     Press this key to change Display Units, Fiber Length & Resolution, GPIB Address & Mode.

     OTDR SETUP

6. Press key (2).

   - The text opposite key (4) reads:

     Press to adjust GPIB Address, and Mode.

     GPIB ADDR/MODE

7. Press key (4).

   - The text opposite key (2) reads:

     Press to set General Purpose Interface Bus Mode to Enabled, Disabled, Talk-Only.

     SET GPIB MODE

8. Press key (2).

   •The text opposite Key (3), Key (2) and Key (4) changes to read:

Press to set GPIB "ENABLED".	SET GPIB ENABLED
Press to set GPIB "DISABLED"	DSET GPIB DISABLED
Press to set GPIB “TALK ONLY”	SET GPIB

9. Press either the SET GPIB ENABLED Key (3), the SET GPIB DISABLED Key (2), or the SET GPIB TALK ONLY Key (4) to select the desired GPIB mode.

   - The text opposite Key (5) will temporarily display:

     Setting Mode - PLEASE WAIT

   - Then the display will return to the instrument setup screen.

10. If GPIB Mode was set to ENABLED, perform steps 11 through 15. Otherwise proceed to step 16.

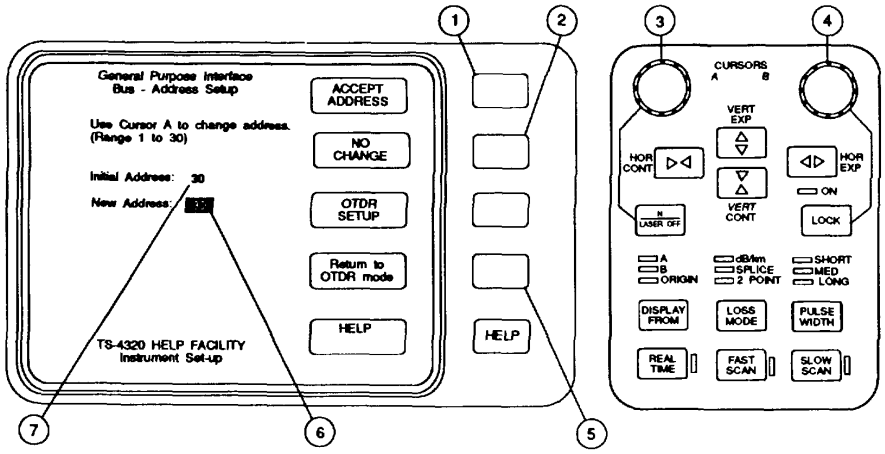
11. Press key (4) . GPIB ADDR/MODE

    - The text opposite Key (3) reads:

Press to set General Purpose Interface Bus Address (range 1 - 30).	SET GPIB) ADDRESS

12. Press key (3)

    - The following screen is displayed:



13. If the Initial Address (7) is correct, press NO CHANGE (2) and skip to step 16.

14. Rotate Cursor A (3) until the desired GPIB Address is displayed at the New Address indicator (6).

15. Press ACCEPT ADDRESS (1).

16. If key (5) icon reads "Return to OTDR Mode", press key (5). Otherwise, rotate the cursor B knob (4) until the icon reads "Return to OTDR Mode" and then press key (5).

GLOSSARY

Section I. ABBREVIATIONS

dB ..... Decibel.

dBm..... Decibel referenced to a milliwatt.

Dbμ ..... Decibel referenced to a microwatt.

EMI ..... Electromagnetic interference.

IEEE-488 ..... A type of communications interface.

LSA ..... Least Squares Approximation.

MM ..... Multimode.

MSPS ..... Mega-Samples Per Second, used in reference to the Flash Converter.

NA ..... Numerical Aperture.

OTDR ..... Optical Time Domain Reflectometer.

RAM ..... Random Access Memory. The TS-4320(P)/G's temporary memory.

ROM ..... Read Only Memory. The TS-4320(P)/G's permanent memory.

RS-232C ..... A type of standardized serial communications interface.

SM ..... Single Mode.

SECTION II. DEFINITION OF UNUSUAL TERMS

Backscattering - The return of a portion of scattered light to the input end of a fiber; the scattering of light in the direction opposite to its original propagation.

DEFINITION OF UNUSUAL TERMS - Continued.

Bend loss - A form of increased attenuation in a fiber that results from bending a fiber around a restrictive curvature (a macrobend) or from minute distortions in the fiber (microbends).

Buffer - A protective layer over the fiber, such as a coating, an inner jacket, or a hard tube.

Buffer coating - A protective layer, such as an acrylic polymer, applied over the fiber cladding for protective purposes.

Buffer tube - A hard plastic tube, having an inside diameter several times that of a fiber, that holds one or more fibers.

Calibration - The act of setting the instrument's accuracy to set standards.

Cladding - The outer concentric layer that surrounds the fiber core and has a lower index of refraction.

Cladding mode - A mode confined to the cladding; a light ray that propagates in the cladding.

Core - The central, light-carrying part of an optical fiber; it has an index of refraction higher than that of the surrounding cladding.

Coupler - A multiport device used to distribute optical power.

Data rate - The number of bits of information in a transmission system, expressed in bits per second (bps), and which may or may not be equal to the signal or baud rate.

*Decibe*l - A standard logarithmic unit for the ratio of two powers, voltages, or currents. In fiber optics, the ratio is power. dB = 10Logio(Power Out/Power In)

Detector - An optoelectronic transducer used in fiber optics for converting optical power to electric current, in fiber optics, usually a photodiode.

Electromagnetic interference (EMI) - Any electrical or electromagnetic interference that causes undesirable response, degradation, or failure in electronic equipment. Optical fibers neither emit nor receive EMI.

Extrinsic loss - In a fiber interconnection, that portion of loss that is not intrinsic to the fiber but is related to imperfect joining, which may be caused by the connector or splice.

DEFINITION OF UNUSUAL TERMS - Continued.

Fall time - The time required for the trailing edge of a pulse to fall from 90% to 10% of its amplitude; the time required for a component to produce such a result. "Turnoff time." Sometimes measured between the 80% and 20% points.

Fresnel reflection - The reflection that occurs at the planar junction of two materials having different refractive indices; Fresnel reflection is not a function of the angle of incidence.

Fresnel reflection loss - Loss of optical power due to Fresnel reflections.

Gap loss - Loss resulting from the end separation of two axially aligned fibers.

Graded-index fiber - An optical fiber whose core has a nonuniform index of refraction. The core is composed of concentric rings of glass whose refractive indices decrease from the center axis. The purpose is to reduce modal dispersion and thereby increase fiber bandwidth.

Homogeneous - The condition of uniform composition throughout a material.

Inhomogeneity - The lack of homogeneity. That which is not homogeneous.

Index of refraction - The ratio of the velocity of light in a vacuum to the velocity of light in a given material. Symbolized by n.

Insertion loss - The loss of power that results from inserting a component, such as a connector or splice, into a previously continuous path.

Laser - A light source producing, through stimulated emission, coherent, near monochromatic light. Lasers in fiber optics are usually solid-state semiconductor types.

Least Squares Approximation - A mathematical method to find the best fit line through a sample of data points.

Memory Card - See TS-4320(P)/G System Boot Card.

Misalignment loss - The loss of power resulting from angular misalignment, lateral displacement, and end separation.

Mode Field Diameter-mismatch loss - The loss of power at a joint that occurs when the transmitting half has a diameter greater than the diameter of the receiving half. The loss occurs when coupling light from a source to fiber, from fiber to fiber, or from fiber to detector.

Multimode fiber - A type of optical fiber that supports more than one propagating mode.

DEFINITION OF UNUSUAL TERMS - Continued.

Numerical Aperture (NA) - The "light-gathering ability" of a fiber, defining the maximum angle to the fiber axis at which light will be accepted and propagated through the fiber. NA = sin B, where B is the acceptance angle. NA is also used to describe the angular spread of light from a central axis, as in exiting a fiber, emitting from a source, or entering a detector.

Optical time domain reflectometry - A method of evaluating optical fibers based on detecting backscattered (reflected) light. Used to measure fiber attenuation, evaluate splice and connector joints, and locate faults.

Pigtail - A short length of fiber permanently attached to a component, such as source, detector, coupler, or connector.

RAMCARD - Random Access Memory contained in a removable card, for the TS4320(P)/G, used to store trace images.

Rayleigh scattering - The scattering of light that results from small inhomogeneities in material density or composition.

Reflectance - The ratio of reflected power to incident power expressed in decibels.

ROMCARD - Read Only Memory contained in a removable card, for the TS-4320(P)/G, which contains the system software.

Screen - Saver An operating state of the TS-4320 that causes the display to go blank. This state is entered if there is no operator activity for a period of 10 minutes. Depressing the HELP key re-displays screen.

Single - mode fiber An optical fiber that supports only one mode of light propagation above the cutoff wavelength.

Splice - An interconnection method for joining the ends of two optical fibers in a permanent or semipermanent fashion.

TS-4320(P)/G System Boot Code - System Software contained on a ROM CARD (Memory Card). Is used to reload system software in the event that system software has been corrupted.

Wavelength - The distance between the same two points on adjacent waves; the time required for a wave to complete a single cycle.

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By Order of the Secretary of the Army:

GORDON R. SULLIVAN
General, United States Army
Chief of Staff

Official:

MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
0548

DISTRIBUTION:

To be distributed in accordance with DA Form 12-36-E, block 9327, requirements for TM 11-6625-3271-12.

*U.S. GOVERNMENT PRINTING OFFICE: 1993 - 710-084/80310

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@wherever.army.mil>
To: 2028@redstone.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19−OCT−93
8. ***Pub no:*** 55−2840−229−23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04−JUL−85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123−123−1234
17. ***Problem:*** **1**
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21. *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
24. *Table:* 8
25. *Item:* 9
26. *Total:* 123
27. ***Text:***

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25–30; the proponent agency is ODISC4.	Use Part II (*reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE 8/30/02
TO: (*Forward to proponent of publication or form)(Include ZIP Code)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM–MMC–MA–NP Redstone Arsenal, AL 35898	FROM: (*Activity and location)(Include ZIP Code)* MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	

PART 1 – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 9–1005–433–24	16 Sep 2002	Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System

ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788–1234	

TO: (*Forward direct to addressee listed in publication)*	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**
Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM–MMC–MA–NP Redstone Arsenal, AL 35898	MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	8/30/02

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788–1234	

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25–30; the proponent agency is ODISC4.	Use Part II (*reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE
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PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

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TO: (*Forward direct to addressee listed in publication)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**

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TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 071649-000