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CMA4000

Operator's Manual



GN Nettest

CMA4000
Operator's Manual

#30163 Rev. B

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Revision	Date	Software Release	Bios
–1	11–Jul–97	PRELIMINARY	
A	30–Jul–97	v 1.11c*	970731.REL02*
B	22-Sep-97	v2.0*	970819.REL01*

NOTE — * This manual covers these software and BIOS versions and versions with higher numbers.

REC 2/19/98

EC Declaration of Conformity

P.O # 1H4A000401

Manufacturer's Name: GN Nettest (New York) Inc.
Manufacturer's Address: 109 North Genesee Street
Utica, NY 13502-2596
USA

1- 315 - 797 - 4449

Declares that the product:

Product Name: Optical Time Domain Reflectometer
Model Number: CMA4000
Product Options: CM44XX Modules, 29621 Power Supply, All Internal Options, See Manual for Information Regarding Peripherals and Cabling

Conforms to the following Council of the European Communities Directives:

Directive 89/336/EEC for Electromagnetic Compatibility (EMC)
Directive 73/23/EEC for Safety (Low Voltage Directive)

Specifications under these directives to which conformity is declared:

EMC:
EMISSIONS:
EN 55022, Class A ITE, Conducted
EN 55022, Class A ITE, Radiated
IMMUNITY:
EN 50082-1:1992, Generic Immunity

SAFETY:
EN 61010-1:1993
EN 60825-1: 1994 w/Amendment 1:1996

Notes:
-Performance was verified by type testing.
-Modules are considered compliant when used with a CMA4000 bearing the CE mark.
-The GN Nettest 29621 Power Supply is considered part of the CMA4000 system.
-The signed original is on file as GN Nettest (New York) Inc document 30773.

Utica, NY, USA — Location:

07 July 1997 — Date:

James Poynter — James Poynter, President/CEO

European Contact:

GN Nettest Holding as
Kirkebjerg Alle' 90
DK-2605 Brondby
Denmark

Supplementary Information for Compliance

WARNING

The CMA4000 is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

- EMC performance was verified with the following peripherals:
  - -Serial Printer (Seiko DPU-414)
  - -Parallel Printer (Seiko DPU-411)
  - -Keyboard (Cherry ML-4100)
  - -External Monitor (Dell D1428HS)

- If these or other peripherals are used, the following guidelines should be followed in order to ensure EMC performance will be as tested:
  - -Any peripherals used should be declared and marked as compliant by their respective manufacturers.
  - -Serial cables should be shielded and no longer than five feet.
  - -Parallel cable should be shielded and no longer than six feet.
  - -Keyboard cable should have a Ferrishield SS28B2034 (or equivalent) ferrite at each end.
  - -External monitor cables should be shielded, ferrite loaded and no longer than six feet.

- Use only the power supply provided with the CMA4000. The EMC and safety performance of the system is not guaranteed when any other power supply is used.

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Laser Safety

LASER RADIATION

Infrared radiation is produced at the fiber connection port on the right side of the front panel and at the end of un-terminated optical fibers that are attached to this port. Avoid long, direct exposure to the light that comes from these sources. The OTDR/Source uses a Class I laser. The Visual Fault Locator uses a Class II laser.

Do not enable the Laser when there is no fiber attached to the fiber connection port.

Do not attempt any type of service to this instrument other than instructed in this manual. Refer servicing to GN Nettest. Failure to do so may void product warranty.

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Chapter 1

CMA4000 Overview

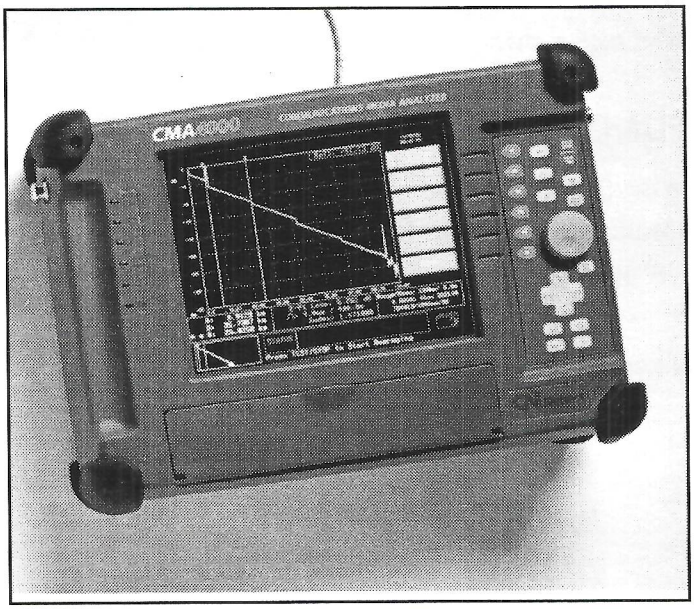


Figure 1–1 The CMA4000 OTDR

The CMA4000 is an enhanced Optical Time Domain Reflectometer for use in the building, commissioning, maintenance, restoration, and record keeping of optical fiber and cables. All the features of a mainframe OTDR are included either as standard or optional equipment in a compact, field portable unit. Technicians can perform a complete set of fiber optic tests with one button or make manual measurements.

Features include a VGA compatible full trace display, modular test plug-ins, short dead zones, internal SRAM for trace storage and a dynamic range of up to 40 dB (Singlemode). A 3.5" high density floppy disk drive and an optional hard disk are available for trace storage.

Real-time multi-tasking provides the capability to run tasks like data acquisition and fiber analysis simultaneously. This speeds up the test process and makes the CMA4000 an extremely flexible and fast test instrument. Task status is indicated on screen using icons in a dedicated STATUS area.

Although designed to be a one-button test instrument, the CMA4000 also includes fifteen hardkeys, six softkeys and a cursor control knob, all designed to simplify manual operation. The hardkeys are fixed and are used for main instrument functions. The softkeys are dynamic with key legends and functions changing as instrument modes change.

1.1 HARDKEY FUNCTIONS

Primary functions on the CMA4000 are hardkey driven. This reduces the complexity of searching through multiple menus using softkey layers.

The hardkey functions are:

Test/Stop
Real Time/Stop
Display From
Loss Mode
Wavelength
Print
Mass Storage
Help
Setup
Vertical Expand *and* Contract
Horizontal Expand *and* Contract
Range/Reso
Pulse Width
A/B Select

The **A/B SEL** button toggles between cursor A and cursor B. This button also acts as the **SELECT** button for most of the other hardkey menus and Setup menus.

1.2 SOFTKEY FUNCTIONS

The CMA4000 has six softkeys located to the right of the LCD display screen.

When softkeys are not active the text will be dimmed (different color) or the softkey will be blank. For example, the **ANALYZE TRACE** softkey will be dim when there is no trace data available to run analysis on. Once a trace has been collected, or recalled, the **ANALYZE TRACE** softkey will be displayed in bold to indicate that it is active.

Diagrams outlining softkey flow for CMA4000 functions are contained in Appendix D.

1.3 USER INTERFACE

The CMA4000 user interface is convenient and easy to use. It is designed to operate and perform tests with very little training required.

1.3.1 Mode Selection

When power-up is complete, you will see a selection screen where you can choose the mode of operation. Each available mode will be listed on a softkey. Press the key corresponding to the desired mode to begin operation of that mode.

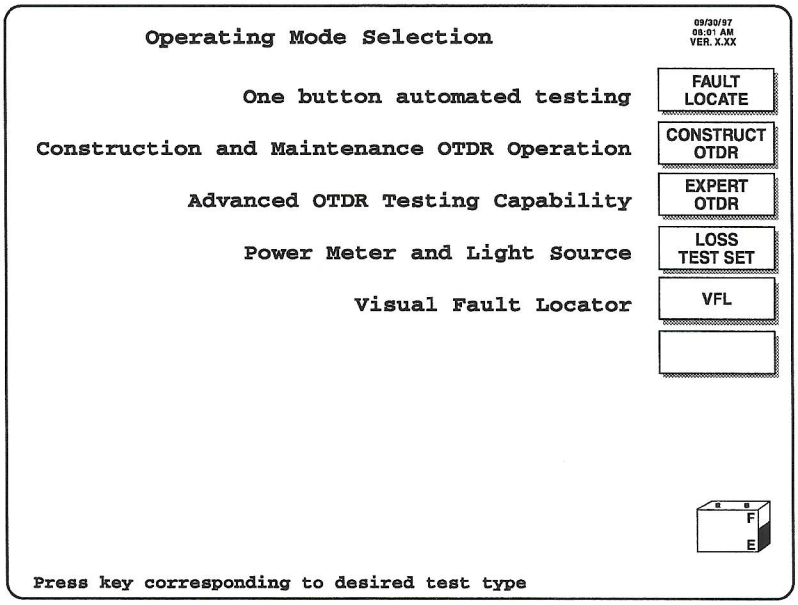


Figure 1–2 Mode Selection Screen

1.3.2 Quick Setup

If a mode requires setup prior to operation, quick setup options will be presented.

Pop-up windows are used for each item on the setup screen. Press the appropriate key to display a list of the available options with the current option value highlighted. To change the current selection move the highlight up or down the list using the cursor knob or vertical expansion/contraction keys, highlight an option and press the **A/B SELECT** hardkey.

Practice example:

1. Rotate Cursor Knob to highlight Range/Reso.

1. With Range/Reso highlighted, press the A/B SEL hardkey to access the following pop-up menu:

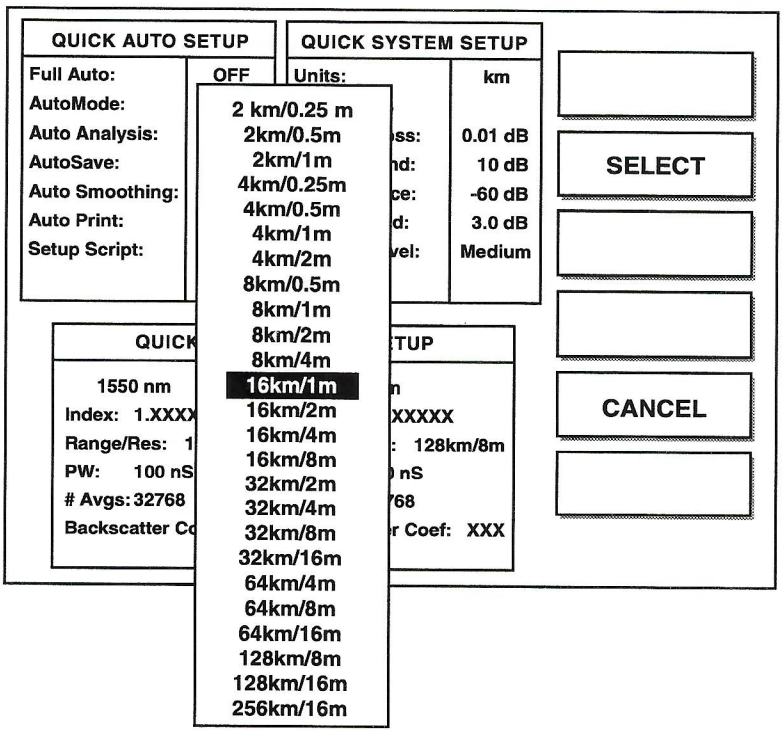


Figure 1–3 One of the Quick Setup Selection Menus

2. Rotate the cursor knob or use the vertical expand/contract keys to highlight the desired selection.

3. Press the A/B SEL hardkey or softkey #2 to select your choice or the **CANCEL** softkey to leave the original selection unchanged. Note that in many instances you can use the A/B Select key or a Softkey to make your changes.

1.4 EXTERNAL PRINTERS SUPPORTED

TD-105/405	IBM Graphics	HP Laser Jet	HP Desk Jet

1.5 OPTIONAL ACCESSORY LIST

AC Power Cord Options: (must be added as separate line item)

TD-11685	US power cord	TD-30362	Australian power cord
TD-30358	Euro power cord	TD-30359	UK power cord
TD-30361	Italian power cord	TD-30360	Swiss power cord

OTDR/Source Connector Adapter: (select one for SM and/or one for MM)

Adapters for PC and Ultra Polish

UC-130-10	Biconic	UC-130-35	SMA 905/906
UC-130-15	DIN 47256	UC-130-40	Diamond HP HMS-10
UC-130-20	D4	UC-130-45	Diamond HP HMS-0
UC-130-25	FC	UC-130-50	Diamond HP HMS-10/A
UC-130-30	ST	UC-130-55	SC

Adapters for Angle Polish

UC-130-60	FC NTT	UC-130-70	DIN/HRL-10
UC-130-60A	FC Seiko Giken	UC-130-75	ST
UC-130-65	SC	UC-130-80	Diamond E-2000

Meter Connector Adapter: (select one when ordering power meter)

AM-430-10	Biconic	AM-430-75	VFP/PFO
AM-430-15	D4	AM-430-85	DIN
AM-430-20	SMA 906	AM-430-90	SC
AM-430-25	Diamond GFS-3	AM-430-45	FC
AM-430-50	ST	AM-430-100	FDDI

CMA4000 Optional Accessories:

TD-400	Hard transit case	TD-459US	US style keyboard
TD-410	Deluxe Soft case	TD-459GE	German CE style keyboard
TD-415	Soft Case	TD-459FR	French CE style keyboard
TD-405	Printer w/cable	TD-459SP	Spanish CE style keyboard
TD-309	Printer paper (5 rolls/pack)	TD-459IT	Italian CE style keyboard
TD-409	Case of paper (5 packs/case)	TD-30163	Additional User's Manual
TD-453	12 v lead acid battery	TD-30162	Additional Training Manual
TD-30710	Serial Null Modem Cable	TD-30711	Parallel Laplink Cable
TD-30712	Serial Printer Cable - 5 ft.	TD-30713	Parallel Printer Cable - 6 ft.

Chapter 2

Instrument Layout and Controls

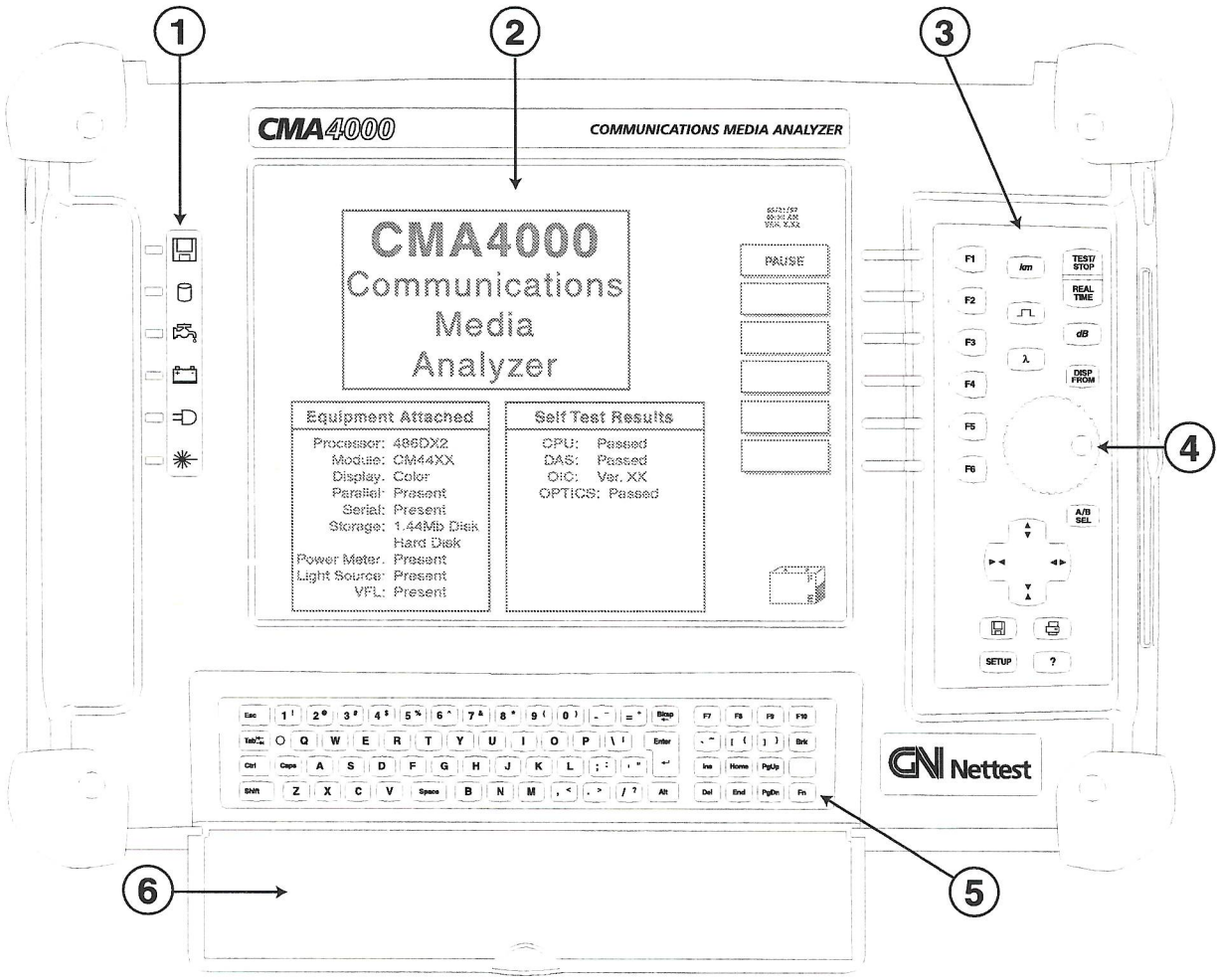


Figure 2–1 CMA4000 Front View

Item #	Description
1	Function Indicator Lights – Each light signals an active function on the CMA4000
2	Display Screen – All instructions and instrument data are displayed on this screen. Softkey labels are displayed on the right side of the screen.
3	Front Panel Controls – This section contains all the hardkeys and softkeys.
4	Cursor Control Knob – Controls cursor movement. Also used to navigate through menu screens.
5	Built In Keyboard – Keyboard used to enter data when no external keyboard is connected.
6	Keyboard Cover – Hinged panel that covers the keyboard when not in use.

2.1 FUNCTION INDICATOR LIGHTS AND ICONS

The Function Indicator LEDs are located to the left of the display screen. When a CMA4000 function is active the corresponding LED will light.

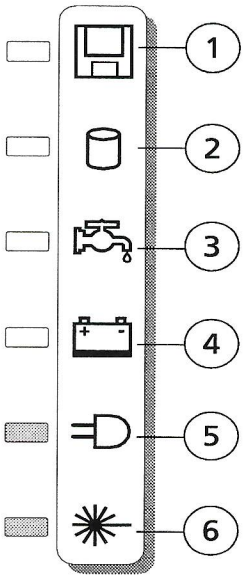


Figure 2–2 Function Indicator Lights and Icons

Item #	Indication
1	When a floppy disk is inserted to the drive; writing to a floppy disk; recalling data from a floppy disk.
2	If a hard disk is installed, when writing to or recalling data from the hard disk.
3	Power Save is active. The CMA4000 will enter Power Save mode if the unit is inactive for more than five minutes. This maximizes battery life by shutting down non-essential devices.
4	Power is being supplied by the internal battery or when battery is charging.
5	Power is being supplied by an external AC source.
6	The laser is firing.

FRONT PANEL CONTROLS

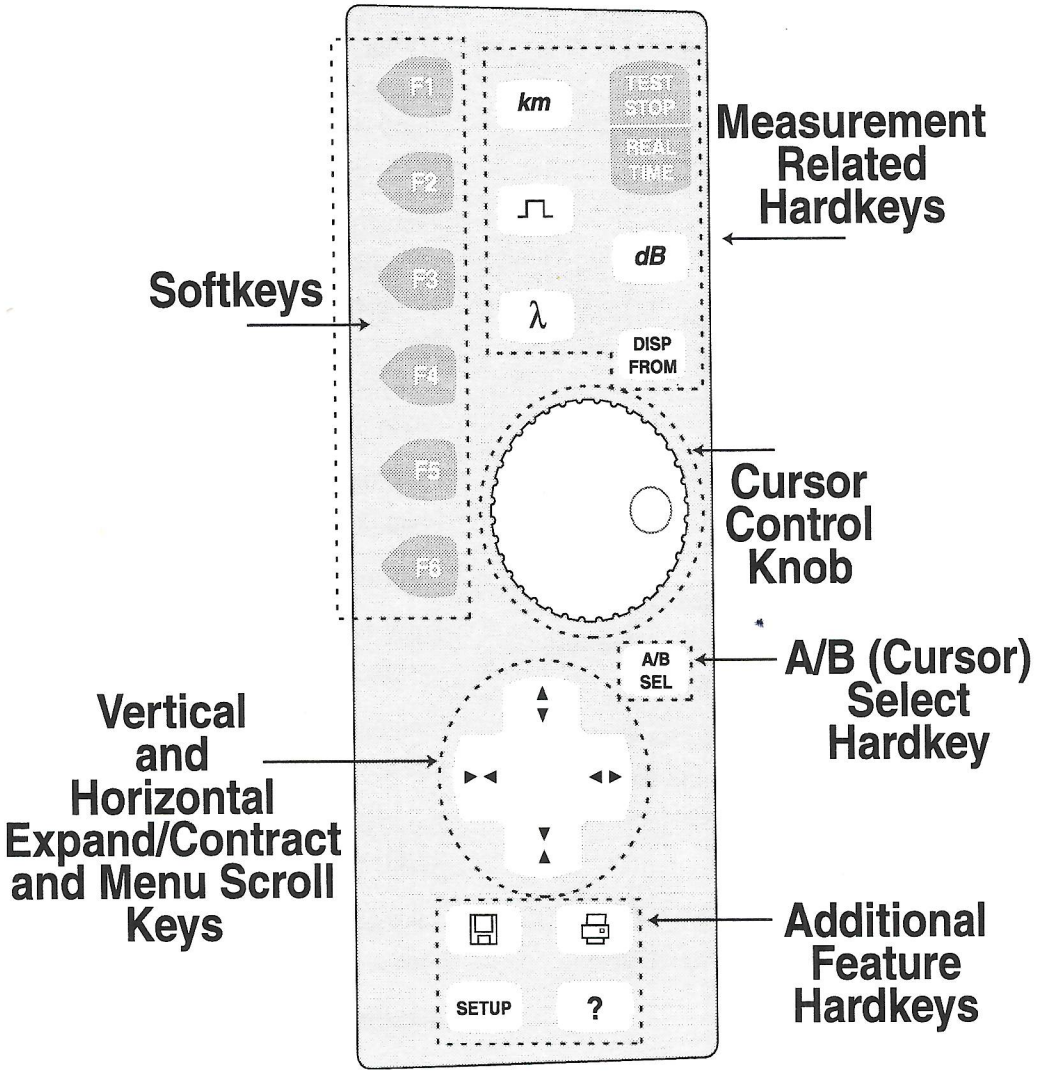


Figure 2–3 Control Panel Section

2.2 HARDKEYS

The CMA4000 has fifteen hardkeys: fixed, labelled keys that control one of the instrument's main functions. The specific purpose and operation of each hardkey is described in the following sections.

A/B Select



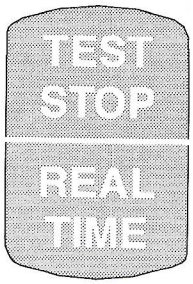
This important hardkey has two essential functions depending on the state of the instrument.

OTDR mode — Press to toggle between cursors. The active cursor will be indicated with a highlighted letter above a cursor line.

If cursor A is active, turning the cursor knob will move only that cursor. Press the **A/B SELECT** key to make cursor B active (and vice versa).

Pop-up menu mode — Press the **A/B SELECT** key to choose the highlighted menu option.

Test/Stop and Real Time



ONE BUTTON TEST!

This dual function hardkey has a red background. It is located in the upper right corner of the control panel.

Test/Stop

Press this key to begin an averaging test cycle. All features that are set to run automatically during a test (AutoMode, analysis, smoothing, print) will run in the appropriate sequence when the **TEST/STOP** key is pressed.

Press the **TEST/STOP** key while the CMA4000 is averaging and the data collect is terminated. However, all of the automatic features that are enabled in Setups (Auto Analysis, Auto Smoothing, Auto Save) will still run in the normal sequence.

Press the **TEST/STOP** key while in real time to initiate averaging.

Real Time

Press this key to begin real time testing (unless it is already running).

If AutoMode is turned on it will run before the real time cycle begins.

The real time test is terminated by pressing the **REAL TIME** key again.

If the **TEST/STOP** key is pressed while in real time, an averaging test cycle will begin.

Range/Reso



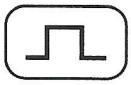
Press the **RANGE/RESO** key to select a distance range and resolution value for the next test cycle. The window displaying the available range/resolution settings (depending on the installed test module) is displayed with the current setting highlighted. A list of modules and range options is provided in a chart in Appendix A.

The range/reso may be changed **ON THE FLY** while a real time or averaging cycle is running. There are two possible options when the **RANGE/RESO** key is pressed:

- The Range/Reso pop-up menu appears. The new range is selected. When you exit the range pop-up menu, the scan will automatically restart using the new range.
- The Range/Reso pop-up menu appears. If you press **CANCEL,** the range will not be changed and the scan that is in progress will continue.

Note - Automode must be OFF in the Quick Auto Setups in order to change Range/Reso, Pulsewidth and Average Mode values on the fly.

Pulse Width



Press this key to select a pulse width for the next test cycle. The window displaying the available pulse widths (depending on the installed test module) is displayed with the current setting highlighted. A list of modules and the associated range of pulse widths is provided in a chart in Appendix A.

NOTE — The available pulsewidth selections may be limited according to the present Range selection. For example, a longer Range selection will enable selection of the longer pulsewidths.

The pulse width may be changed **ON THE FLY** while a real time or averaging cycle is running. There are two possible options when the **PULSE WIDTH** key is pressed:

- The current scan is stopped. The new pulse width is selected. When you exit the pulse width pop-up menu, the scan will be automatically restarted using the new pulse width.
- If you press **CANCEL,** the pulse width will not be changed and the scan that was in progress will continue where it left off.

Wavelength



The Wavelength hardkey will only be active if the test module installed has more than one wavelength. You can switch from a shorter wavelength to a longer wavelength to a dual wavelength or quad wavelength test mode depending on the type of test module used.

If a single wavelength module is installed and you press this key, an error tone will sound and a message will appear on the instruction line.

Loss Mode



Press this key to select the type of loss that is calculated and displayed on the CMA4000.

Options are:

Splice Loss
Two-point
LSA Two-point
dB/distance
LSA dB/distance
ORL

Display From

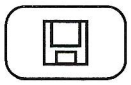


Press this key to toggle through the grid display reference point.

Options are:

Display from Origin
Display from Cursor A
Display from Cursor B

Mass Storage



Press the **MASS STORAGE** hardkey to access the Mass Storage pop-up menu.

This menu contains the following options:

Save Trace
Load Trace
Delete File(s)
Copy File(s)
Disk Summary
Rename File(s)
Make Directory
Delete Directory
Format Diskette
Display Header

Setup



Press the SETUP hardkey to access the Quick Setup and Instrument Setup menus. The options available will be dependent on the current mode that the CMA4000 is in and the type of test module that is plugged into the instrument. To jump from menu to menu you can use the **Tab** key on the keyboard.

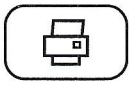
Options for Construct or Expert OTDR mode:

Quick Setup
    Quick Auto Setup
    Quick System Setup
    Quick Measurement Setup
Instrument Setup
(Additional Setup softkey)
    System Setup
    Printer Setup
    User Preferences

Options for Loss Test Set mode are:

    System Setup
    Power Meter Setup
    Printer Setup
    User Preferences

Print



Press the PRINT hardkey to print-

- current screen display,
- primary event table,
- overlay event table,
- primary trace header,
- overlay trace header

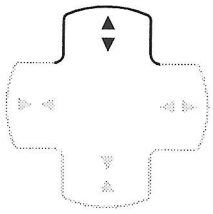
– to the active printer specified in Printer Setup.

Help



Press the **HELP** hardkey to obtain an index to information and instructions about CMA4000 modes, controls and functions.

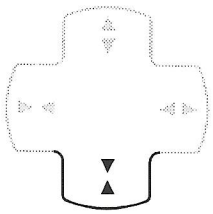
Vertical Expand



Press the **VERTICAL EXPAND** hardkey for closer examination of a portion of a trace. Each press will decrease the dB/division value on the vertical grid scale by a factor of two.

Also, you can use this key instead of rotating the cursor control knob to move the highlight bar **up** in a pop-up menu.

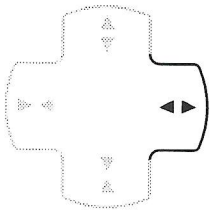
Vertical Contract



Press the **VERTICAL CONTRACT** hardkey for examination of a wider portion of a trace. Each press will increase the dB/division value on the vertical grid scale by a factor of two.

Also, you can use this key instead of rotating the cursor control knob to move the highlight bar **down** in a pop-up menu.

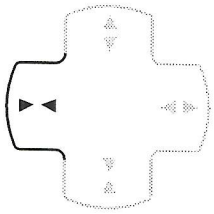
Horizontal Expand



Press the **HORIZONTAL EXPAND** hardkey for closer examination of a portion of a trace. Each press will decrease the distance/division value on the horizontal grid scale by a factor of two.

This key moves a highlight bar to the right.

Horizontal Contract

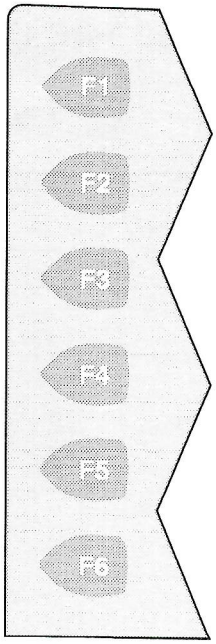


Press the **HORIZONTAL CONTRACT** hardkey for examination of a wider portion of a trace. Each press will increase the distance/division value on the horizontal grid scale by a factor of two.

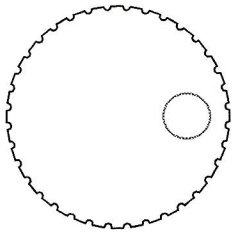
This key moves a highlight bar to the left.

2.3 SOFTKEYS

The CMA4000 has six "softkeys" located on the left side of the control panel section, to the right of the display area. The key functions are dynamic, that is they change with the state of the instrument. Softkey legends are displayed on screen in boxes to the left of the corresponding key.



2.4 CURSOR CONTROL KNOB



The cursor control knob is used for cursor control and menu selection.

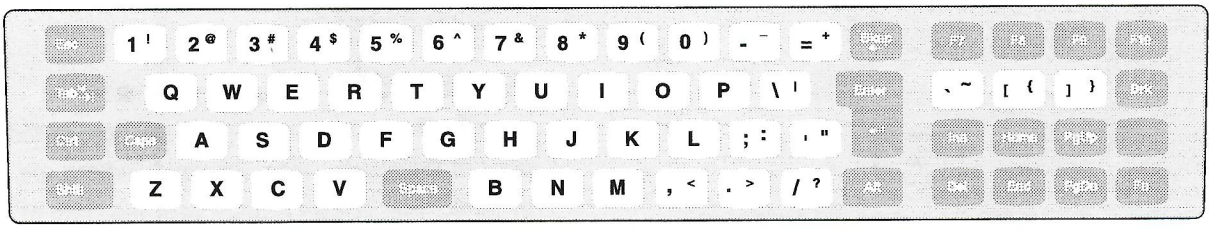
You can move the active cursor right or left on the display by rotating this knob clockwise or counterclockwise respectively.

Press the A/B SEL hardkey to make the other cursor active and be able to move it in the same way.

When a pop-up menu is displayed, select an option from the menu by rotating the cursor control knob to move the highlight bar up or down through the options.

Then press the A/B SEL hardkey to activate the option.

2.5 KEYBOARD



The CMA4000 has a built-in keyboard located below the display screen. The keyboard has a set of number keys so you can enter both text and numeric data.

2.6 CMA4000 TOP CONNECTORS

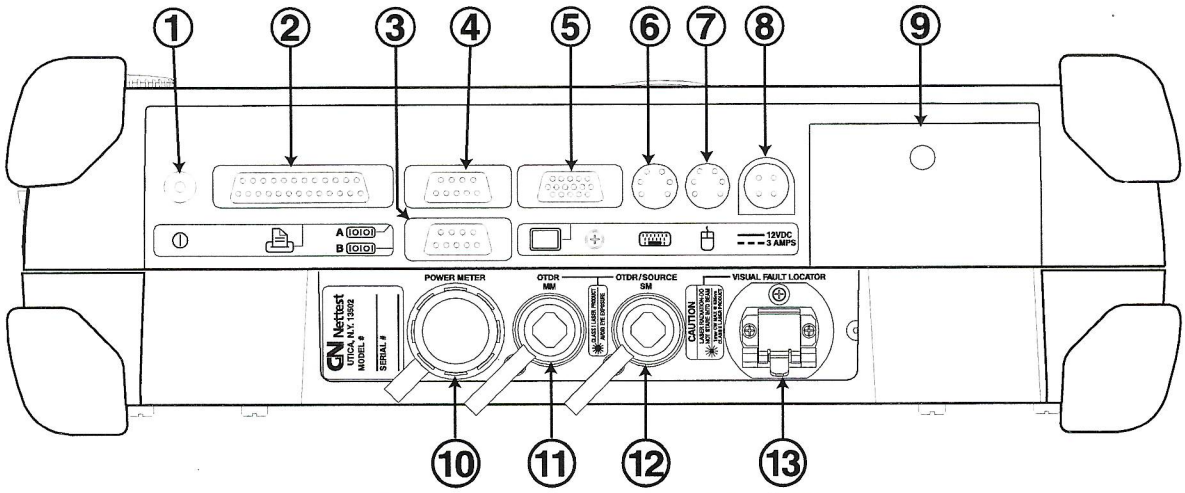


Figure 2–4 CMA4000 Top View

Chart 2–1 Top Connector Descriptions

ITEM#	NAME	DESCRIPTION
1	Power Switch	A mechanical button to turn CMA4000 power on or off. Push to switch ON or OFF.
2	Parallel Interface Port	The parallel interface port is provided for printer support or remote control using GN Nettest NetWorks-TestNet software.
3	Serial Interface Port	The 9-pin female serial interface port on the CMA4000 is provided for data transfer, mouse support and printer support. This port is designated as COM B.
4	Modem Interface Port	The 9-pin female modem interface port is designated as COM A.
5	External VGA	An external VGA monitor can be connected to the CMA4000 to view the display screen; excellent for training.
6	External Keyboard	An optional external keyboard is available. If attached to this PS2-style (6-pin mini-din) connector, the keyboard can be used to enter data and simulate front panel keys like the function keys (F1–F6) for softkey operation. Refer to Chart 2–2 for additional information on the external keyboard.
7	Mouse Port	PS2 style (6-pin mini-din) connector for a mouse. This is a possible future enhancement.
8	External Power	AC power connection. Only use a GN Nettest charger/adapter. See Chapter 1 for part numbers.
9	Battery Compartment Cover	This is the compartment where the lead acid battery is housed. The cover is held on with a thumb screw.
10	Power Meter	The optional power meter connection.
11	Multimode/Singlemode OTDR	Multimode or singlemode OTDR connection.
12	Singlemode OTDR and Light Source	Singlemode OTDR and light source connection.
13	Visual Fault Locator	The optional visual fault locator connection or multimode source.

2.7 EXTERNAL KEYBOARD

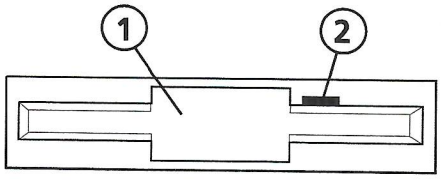
An optional external keyboard is available for the CMA4000. See § 1.5, *CMA4000 Optional Accessories,* for part numbers.

A port is provided on the top of the instrument to connect the keyboard (see Figure 2–4 and Chart 2–1). When connected, the keyboard may be used to enter alphanumeric data or to emulate the CMA4000 front panel keys. Chart 2–2 lists the external keyboard equivalent to CMA4000 hardkey and softkey functions.

Chart 2–2 External Keyboard Equivalents

External Keyboard Key	CMA4000 Function
F1 through F6	Softkeys 1 through 6
ALT F2	Mono Contrast DOWN
ALT F3	Mono Contrast UP
ALT F4	Mono Contrast MID
ALT F5	LCD Backlight Intensity MAX
ALT F6	LCD Backlight Intensity MIN
CTRL LEFT	LCD Backlight Intensity DOWN
CTRL RIGHT	LCD Backlight Intensity UP
CTRL END	LCD Backlight Intensity MID
F9, RETURN	Select
A	Display From
C	Real Time/Stop
D	Mass Storage
L	Loss Mode
P	Print
Q	Wavelength
R	Range Select
S	Setup
T	Test/Stop
W	Pulse Width Select
↑	Scroll Up Menu, Vertical Expand
↓	Scroll Down Menu, Vertical Contract
←	Horizontal Contract
→	Horizontal Expand
TAB	Go to Next Menu Window
SHIFT TAB	Go to Previous Menu Window
END	Move Cursor Right
HOME	Move Cursor Left

2.8 FLOPPY DISK DRIVE



The 3.5" floppy disk drive supports 1.44 MB and 720 KB diskettes. The default disk type is 1.44MB.

The drive will be designated as Drive A and will be used for trace storage and software upgrade capabilities.

Item #	Description
1	Disk drive – insert disks here.
2	Disk eject button.

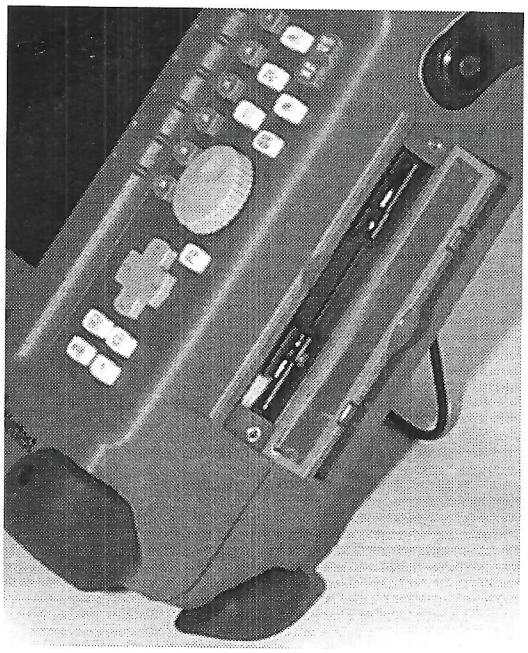


Figure 2–5 CMA4000 Side View

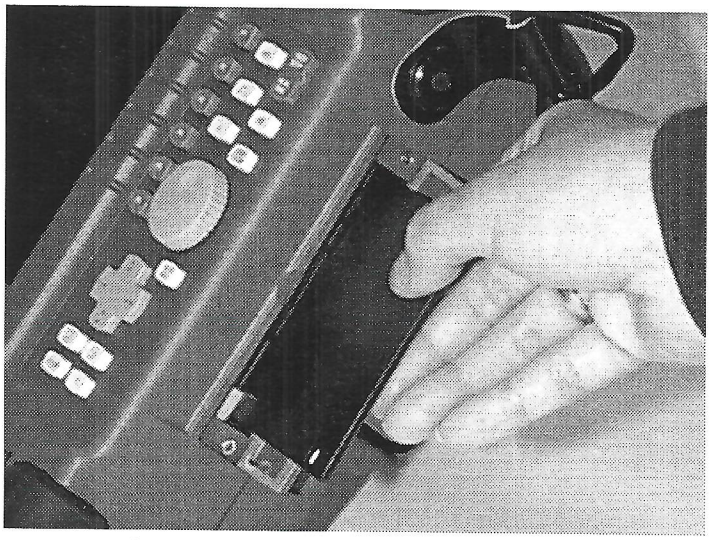


Figure 2–6 Inserting a Floppy Disk

2.9 HARD DISK OPTION

An internal hard disk is an option for the CMA4000. If installed, this drive will be designated on Mass Storage menus as Drive C.

Chapter 3

Instrument Power Up

Refer to Figure 2–4 for the location of the power switch, battery compartment, and external power connection port. Be sure you have the battery installed properly or that you have the correct power cord properly connected. Then press the power switch firmly to start the CMA4000.

3.1 BATTERY INSTALLATION

The following illustration shows the proper way to install a battery in the CMA4000. See Figure 2–4, Item #9 for the location of the battery port cover on the top of the unit.

To install the battery, remove battery door by loosening the thumb screw and sliding off the cover towards the front of the instrument. Pull cover off. To replace cover, slide toward bottom of unit and tighten thumb screw.

NOTE — Only use GN Nettest 12 volt sealed lead acid battery pack, part number TD-453.

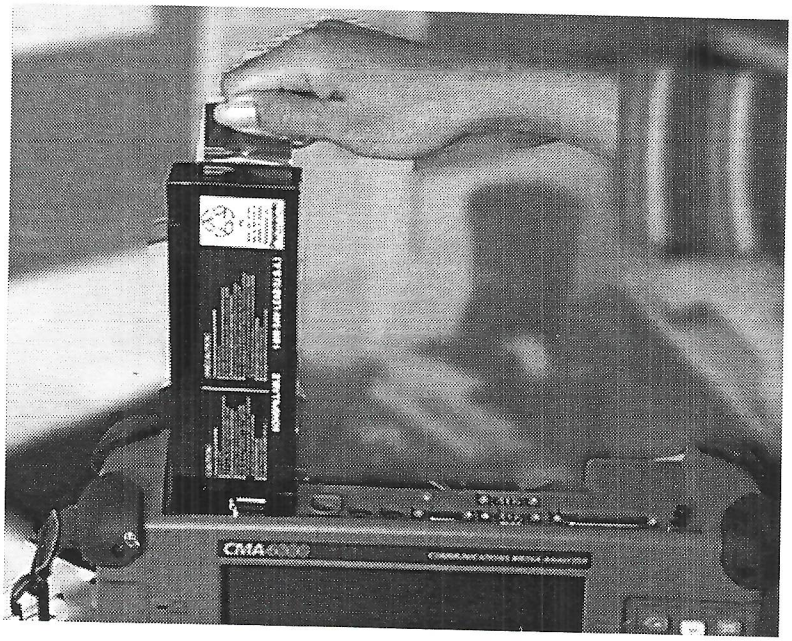


Figure 3–1 Proper Battery Installation

NOTE — The CMA4000 has a "stop" built in to the battery compartment so you are not able to fully insert the battery the wrong way. When the battery is charging the battery LED indicator light will glow orange.

3.2 CONNECTING THE POWER CORD

Figure 2–4, Item #8 shows the location of the external power connector port. Note that the shape of the port is designed for error free installation of the power cord.

3.3 STARTUP SCREEN

The first screen to appear when the CMA4000 is powered on is the GN Nettest logo with current software version and its release date.

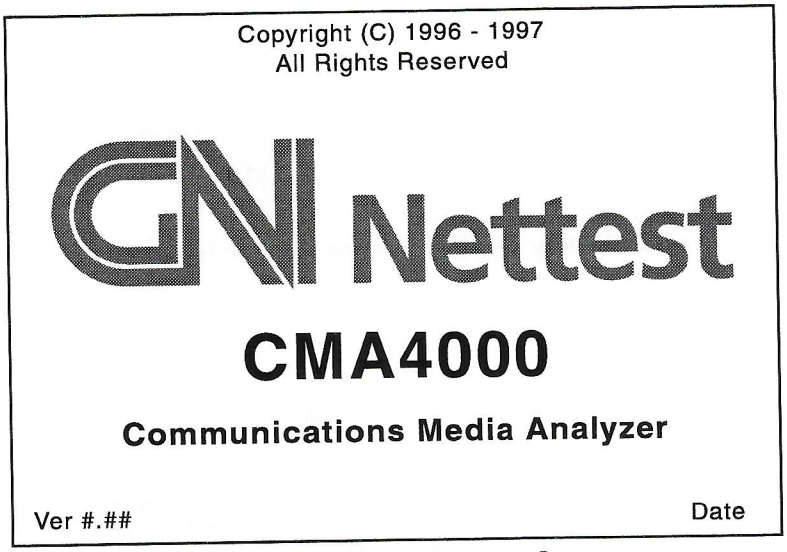


Figure 3–2 Logo Startup Screen

3.4 POWER ON SELF TESTS

After the logo, the screen displays a list of the optional equipment that is installed.

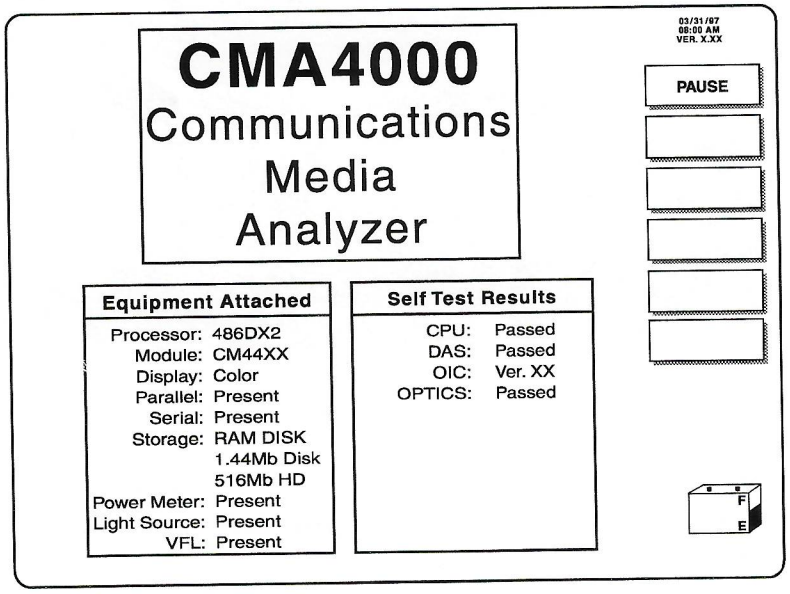


Figure 3–3 CMA4000 Power-Up Screen

Available equipment includes: Floppy disk drive, CM44XX Test Module, hard disk drive, keyboard, Power Meter, Light Source, Visual Fault Locator, serial printer port, and parallel printer port.

Next to the attachment list is a list with the status of each of the self diagnostic routines. The self test consists of the following component tests: CPU, Data Collect, and Optics Module.

Press the **PAUSE** softkey so you can read all of the information contained on this screen. The softkey legend will change from **PAUSE** to **CONTINUE**. Press **CONTINUE** to resume CMA4000 operation.

If you do not press the **PAUSE** key, the CMA4000 proceeds to the Operating Mode Selection screen.

If an error is detected in Self Test mode the power-up cycle will halt.

3.5 OPERATING MODE SELECTION

When all the CMA4000 self tests are complete, the following display is presented:

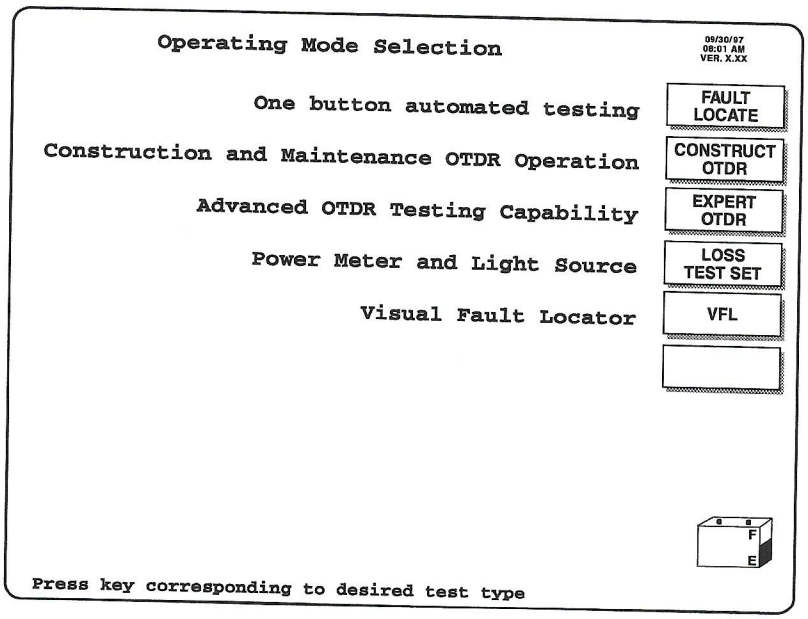


Figure 3–4 Operating Mode Selection Screen

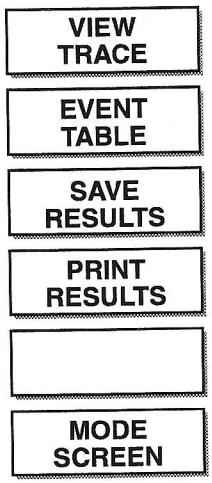
At this point the power-up cycle is complete and you can enter the various modes available on the CMA4000.

3.5.1 Fault Locate Mode

Press the **FAULT LOCATE** softkey to start a Connection Check that will tell you if you have a Bad, Fair, or Good connection. The results are based on the user defined backscatter coefficient set in the Quick Setup menu.

If the connection is Bad, a message is displayed suggesting that you check the connection or clean the connector. If the connection is Fair to Good, the instrument proceeds to AutoMode after 10 seconds. You will have the option to pause and clean the connectors if a "Fair" connection is inadequate.

When the test is complete, the end/fault location is displayed. These softkeys will be displayed:



Softkey	Result
VIEW TRACE	Displays the trace grid on the screen.
EVENT TABLE	Displays the entire Event Table for the trace.
SAVE RESULTS	Opens the Save Trace screen from Mass Storage.
PRINT RESULTS	Opens the Print Selections pop-up menu. You can print the trace screen, the event table and the trace header.
MODE SCREEN	Returns to the screen in Figure 3–4.

3.5.2 Construct OTDR Mode

Press the **CONSTRUCT OTDR** softkey to enter Construction mode designed for a user who has many fibers to test. The CMA4000 will display a quick setup screen where you can set automatic features and measurement parameters (see Figure 4–1).

Press the **CONTINUE** softkey to advance to a form input screen where you enter pertinent test information. Start the test cycle by pressing the **CONTINUE** softkey.

A dialog box will instruct you to connect the first test fiber. When the fiber is connected press the **GO** softkey to begin the test cycle for the first fiber.

When testing on a fiber for all of the selected wavelengths is complete, the prompt window will be displayed again. This cycle is repeated until all of the fibers have been tested.

3.5.3 Expert OTDR Mode

Press the **EXPERT OTDR** softkey to put the CMA4000 into Expert OTDR mode. The unit will display a Quick Auto Setup screen. Press **GO** to display the grid screen. The current instrument setups determine which operations are performed automatically. With Full Auto set to *On*, all operations are performed automatically. When Full Auto is set to *Off*, you must select which functions will run automatically.

3.5.4 Loss Test Set Mode

The **LOSS TEST SET** softkey will only be active if the test module installed in the CMA4000 has the Power Meter/Light Source option. If these options are not available, the text on this key will be dimmed and the key will not be active.

If the options are available, press this key to display the Power Meter/Light Source display screen. The **MODE SCREEN** softkey is provided so you can return to the Operating Mode Selection screen to select another operating mode.

3.5.5 VFL (Visual Fault Locate) Mode

Whether the **VFL** softkey is displayed or not also depends on the current test module installed in the CMA4000. If a visual fault locator is not available on the test module, the **VFL** softkey will not be active.

When a visual fault locator is available on the instrument, press this softkey to display the VFL control screen. The **MODE SCREEN** softkey is provided so you can return to the Operating Mode Selection screen to select another operating mode.

Chapter 4

OTDR Instrument Setup

This chapter covers the Setup menus for the Construct OTDR and Expert OTDR modes on the CMA4000. You enter these modes from the Operating Mode Selection screen (see *Figure 3–4*).

The Quick Setup screen for these modes will look like the following:

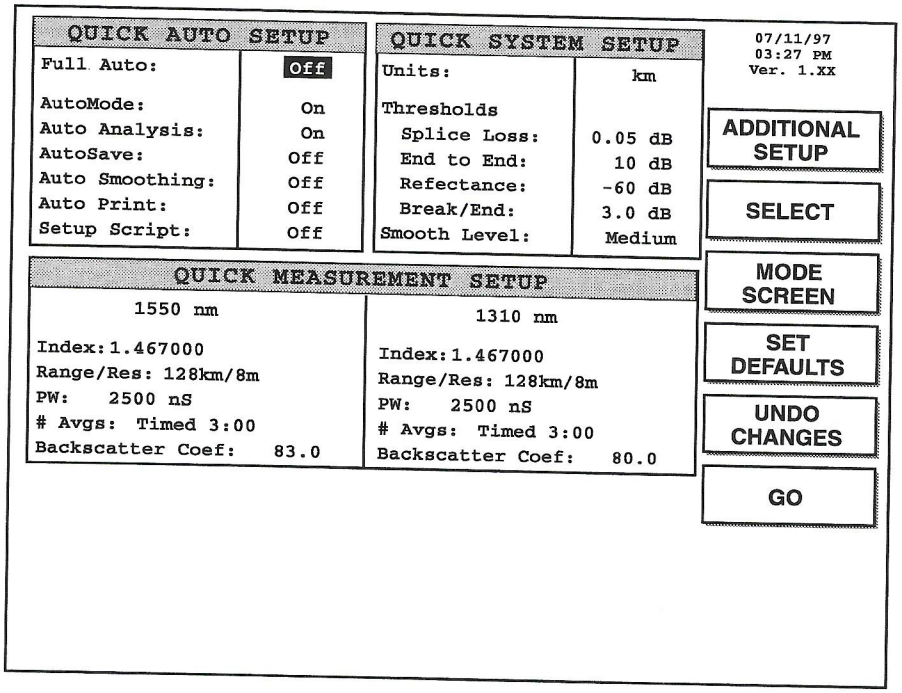


Figure 4–1 Quick Setup Screen

HINT — Use the TAB key on the attached (or external) keyboard to jump between boxes on the setup screens.

The setup screen displayed when the **ADDITIONAL SETUP** *softkey is pressed is shown in the following diagram:*

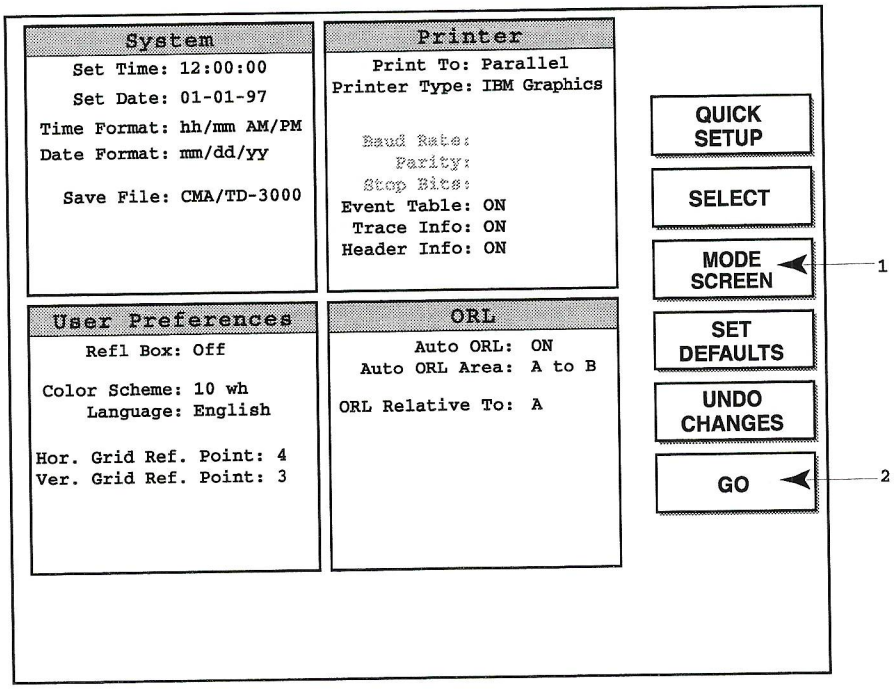


Figure 4–2 Additional Setup Screen

4.1 SETUP MODE

4.1.1 Main Menu

You can enter SETUP either from the Mode Select Screen or by pressing the **SETUP** hardkey. Setup screens for the OTDR modes, Construct OTDR and Expert OTDR, will have the same appearance.

When you press the **SETUP** hardkey, *the Quick Setup windows will be displayed:*

Quick Setup

- Auto Setup
- System Setup
- Measurement Setup

From the Quick Setup screen press the **ADDITIONAL SETUP** *softkey for the following menus:*

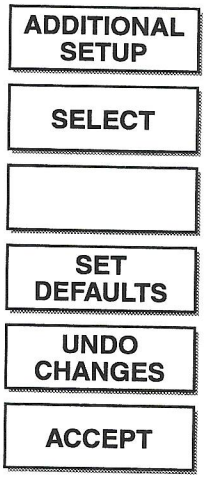
Additional Setup

- System Setup
- Printer Setup
- User Preferences
- ORL

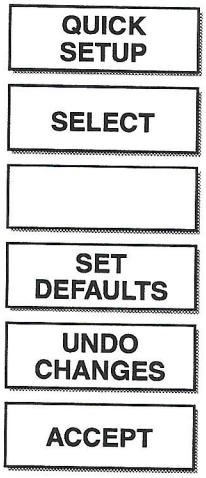
1. *The* ***MODE SCREEN*** *softkey will be blank when you enter setups from a trace grid screen.*
2. *The* ***GO*** *softkey will read* ***ACCEPT*** *when you enter setups from a trace grid screen.*

4.1.2 Selecting and Changing Parameters

When you enter setup mode by pressing the SETUP hardkey, the softkeys read:



Press the **ADDITIONAL SETUP** softkey to bring up the set of windows (see Figure 4–2) enabling you to change System, Printer and User Preference selections. This softkey changes to read **QUICK SETUP** so you can toggle back and forth between the two setup levels.



The **SET DEFAULTS** softkey sets all of the parameters in the currently displayed windows to their factory default values.

The **UNDO CHANGES** softkey returns the CMA4000 to the mode it was in prior to entering Setups. **No** changes are saved.

The **ACCEPT** softkey makes any changes and returns to the mode the CMA4000 was in prior to entering Setups.

You can move from one parameter to the next by using the cursor knob, or using the vertical or horizontal expand/contract keys.

When the desired parameter is highlighted, press the A/B SEL hardkey or the **SELECT** softkey to display a list of options for that parameter in a pop-up window with the current setting highlighted. The softkeys will change depending on which parameter is selected.

4.1.3 Menu Parameters

To change parameters in the Quick Auto Setup menu, the Units and Smooth Level selections in the Quick System Setup menu, the Range/Res, PW (Pulse Width), and # Avgs selections in the Quick Measurement Setup menu, follow this procedure:

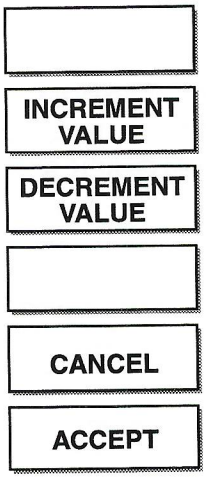
1. Rotate the cursor control knob or press the vertical or horizontal expand/contract hardkeys to highlight the parameter.
2. Press the **A/B SELECT** hardkey or the **SELECT** softkey.
3. Rotate the cursor control knob or press the vertical expand/contract hardkeys to move to the new setting.
4. Press the **A/B SELECT** hardkey or the **SELECT** softkey to lock in the new setting and return to the setup window
   OR
   press the **CANCEL** softkey to return to the active setup window without saving any changes made to the selected parameter.
5. Press the **F6** softkey labelled either **"GO"** or **"ACCEPT."**

4.1.4 Incremental Parameters

For the Threshold parameters (Splice Loss, End to End, Reflectance, and Break/End) in the Quick System Setup menu, the Index of Refraction setting(s) and the Backscatter Coefficient setting(s) in the Quick Measurement Setup menu, follow this procedure:

1. Rotate the cursor control knob or press the vertical or horizontal expand/contract hardkeys to make the selection.
2. Press the **SELECT** softkey to enable the change.

   The following softkeys will be displayed for the Incremental Parameters.



3. Press the **INCREMENT VALUE** softkey to increase the parameter value or the **DECREMENT VALUE** softkey to decrease the parameter value. You may also use the Cursor Control Knob to increase or decrease values.

HINT — A combination of both Cursor Control Knob and **INCREMENT VALUE** and **DECREMENT VALUE** softkeys is often the best way to obtain a setting. Experiment with both to find the fastest and most accurate method for your setting. Remember – you have the **CANCEL** softkey to undo any changes.

4. If you make a change you do not want to keep, press the **CANCEL** softkey to return to the Setup menu with the original parameter value intact.
5. If you change the value and want to keep the change, press the **ACCEPT** softkey to return to the Setup menu with the new parameter value.

4.2 QUICK SETUP

Following are the Setup Parameters for OTDR Modes (Construct OTDR and Expert OTDR).

4.2.1 Quick Auto Setup

The parameters you set on this screen affect the automatic operation of all the major functions of the CMA4000. Whether a function runs automatically, is started by a softkey press, or does not run at all is controlled through this window.

Quick Auto Setup Window

QUICK AUTO SETUP	
Full Auto:	Off
AutoMode:	On
Auto Analysis:	On
AutoSave:	Off
Auto Smoothing:	Off
Auto Print:	Off
Setup Script:	Off

Full Auto

Options: On, Off
Default: Off
When Full Auto is set to ON, all of the automatic features, Auto Analysis, Auto Print, AutoMode, AutoSave, and Auto Smoothing, are set to ON. When the Full Auto setting is OFF, each of these must be set individually.

AutoMode

Options: On, Off
Default: On
When AutoMode is ON, the CMA4000 will select range, resolution and pulse width values plus the averaging mode (slow, medium, or fast) for a data collection.
When the AutoMode value is set to **OFF**, the operator must select the range, resolution, and pulse width values and mode of averaging.

Auto Analysis

Options: On, Off
Default: On
Set ON, analysis is performed on trace data immediately after a scan is completed with an event table displayed at the finish.
With Auto Analysis set OFF, fiber analysis will only run when you press the **ANALYZE TRACE** softkey.

AutoSave

Options: Off, Stand.
Default: Off
With AutoSave set to Stand., the Save Trace window will be displayed as soon as the data collection is complete or halted.
If this parameter is set to OFF, you can enter the Save Trace screen by using the Mass Storage hardkey.

Auto Smoothing

Options: On, Off
Default: Off
If Auto Smoothing is set to ON, smoothing, a process applied to the OTDR trace to reduce noise, will run automatically on the trace data when a scan cycle is completed or halted.
If this option is set to OFF, smoothing can be accomplished by pressing the **SMOOTH TRACE** softkey.

Auto Print

Options: On, Off
Default: Off
When the Auto Print option is ON a hard copy of the trace will be printed out on the attached, selected printer automatically after data collection and analysis.

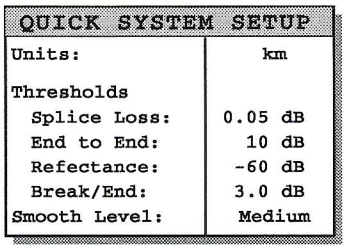
Setup Script

Possible future enhancement.

4.2.2 Quick System Setup

The CMA4000 parameters you set on this screen are linked to the performance of and reports from Auto Analysis and Auto Smoothing.

Quick System Setup Window



Units

Options: m (meters), km (kilometers), ft (feet), kft (kilofeet), mi (miles)
Default: km
Specifies the unit of measure used to display distance on the horizontal axis of the trace grid. This in turn affects Range and Resolution readings and analysis events incorporating distance.

Thresholds —

The four threshold settings define the parameters for Trace Analysis.

Splice Loss Threshold

Options: 0.00 to 5.00 dB in 0.01 dB increments
Default: 0.05 dB
Determines the dB value below which Analysis will not report events.

End to End Loss Threshold

Options: 1 dB to 99 dB in 1 dB increments
Default: 10 dB
Determines the highest End to End Loss value that will be reported by the Analysis software.

Event Reflectance Threshold

Options: -10 dB to -70 dB
in 1 dB increments.
Default: -60.0 dB
Determines the lowest reflectance value that will be reported by Analysis.
Any event that has a reflectance greater than the value in this parameter will be reported.
Events with reflectance values lower than this will not be reported.
For example, -70.00 dB is lower than -60.00 dB and will not be reported if the Event Reflectance Threshold is set to -60.00 dB.

Break/End Threshold

Options: 0.2 dB to 5.0 dB
in 0.2 dB increments
Default: 3.0 dB
Determines the amount of loss that will classify an event as a break in the fiber.
Any event with a loss greater than this value will be identified as the end of the fiber.

Smoothing Level

Options: Light, Medium, Heavy
Default: Medium
Determines the degree of digital filtering that is performed.

Light — The least amount of distortion and least amount of noise reduction is introduced by the setting.

Medium — Displays the best compromise between noise reduction and distortion.

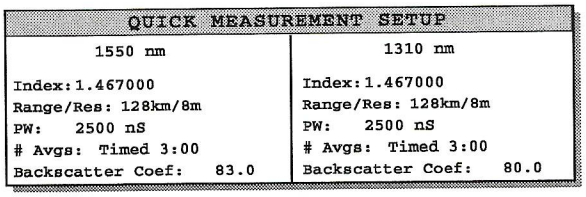
Heavy — Produces the most noise reduction with the most amount of distortion.

4.2.3 Quick Measurement Setup

Each wavelength in the optical module installed in the CMA4000 has setup parameters for Index of Refraction, Range/Reso, Pulse Width, Number of Averages, and Backscatter Coefficient.

A quick measurement screen for a dual-wavelength test module is shown in the next figure.

Quick Measurement Setup Window



The wavelengths displayed on this screen depend on the test module installed in the CMA4000.

Index of Refraction

Options: 1.400000 to 1.699999
Default: 1.467000 (1310 nm, 1550 nm SM), 1.470000 (1300 nm MM), 1.475000 (850 nm MM)

Represents the index of refraction value of the fiber being tested to six decimal places. This value is used to calculate distance measurements.

IOR values can be obtained from the fiber manufacturer.

Range and Resolution

Options: 2 km/0 25m to 256 km/16m (Selections dependent on test module)
Default: Depends on current test module plug-in.

The **range** value determines the distance range of the fiber to be tested.

The **resolution** value specifies the distance between data sampling points.

These values are read from the optical module.

Pulse Width

Options: 10 nS to 20 µS (Selections dependent on test module)
Default: Depends on test module.

Specifies the width of the light pulse that is sent down the fiber under test.

Number of Averages

Options: Fast (2048), Medium (32768), Slow (262144), Timed (00:05 to 99:55 minutes:seconds)
Default: Timed 3:00

Specifies the number of averages used when a data collect is performed.

The larger the number of averages, the longer the scan will take. Also, more noise is averaged out of the trace.

The timed scan option enables the user to select the length of time that averaging takes place.

Backscatter Coefficient

Options: -60.0 to -90.0
Default: -83.0 (1550 SM), -80.0 (1310 SM), -74.0 (1300 MM), -67.0 (850 MM)

Determines the backscatter coefficient that is used to calculate a reflectance value. Individual backscatter coefficeint values may be saved for each wavelength on the current test module.

Backscatter coefficient values can be obtained from the fiber manufacturer.

Backscatter coefficient is entered either from SETUP or from the **SET PARAMETER** softkey.

GN Nettest uses the industry standard backscatter coefficient the **1 ns standard,** defined as "the dB magnitude of backscatter for a 1 ns pulse."

A fiber manufacturer may use a coefficient relative to a 1 µs pulse, so their fiber coefficient will be published as -49 dB. But the value to be entered on the CMA4000 backscatter coefficient would be -79 dB.

If you come across this discrepancy the formula is:

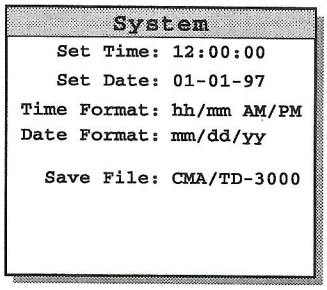
1 ns backscatter coefficient = 1 µs backscatter coefficient - 30 dB.

4.3 ADDITIONAL SETUP

Setup options that need to be accessed infrequently will be contained on the Additional Setup mode screen.

4.3.1 System Setup

System Setup Window



Set Time

Options: 0-23 hours, 0 - 59 minutes, 0 - 59 seconds
Default: Read from real time clock

You can set the time stored in the real time clock in this field.

Set Date

Options: 1 - 31 days, JAN - DEC month, 1995 - 2099 years
Default: Read from real time clock

You can set the date stored in the real time clock in this field.

Time Format

Options: hh:mm AM/PM, hh:mm:ss AM/PM, hh:mm, hh:mm:ss
Default: hh:mm AM/PM

The time format display on the CMA4000 screen is selectable in this field.

Date Format

Options: mm/dd/yy, dd-mmm-yy, dd-mmm, mmm-yy
Default: mm/dd/yy

The date format display on the CMA4000 screen is selectable in this field.

Save File

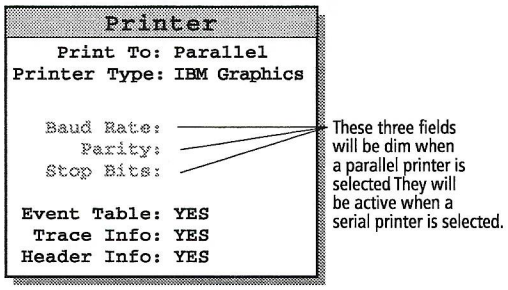
Options: TD-1000/TD-2000, CMA/TD-3000, GR-196-ILR
Default: CMA/TD-3000
Determines the format used to save the current trace data.

Selection	*Trace File Format*
TD-1000/TD-2000	T4C
CMA/TD-3000	T5
Original	Preserves the "original" trace file format. For example, whatever format the trace comes in to the CMA4000 as, is the format it will be saved as.
GR-196	Industry standard format defined by Bellcore (possible future enhancement)

4.3.2 Printer Setup

The following are setup parameters for output to a printer.

Printer Setup Window



Print To

Options: None, Parallel, Serial
Default: Parallel
This determines the printer port where output is sent to when the **PRINT** hardkey is pressed.

Parallel	Printer output is directed to the CMA4000 external parallel port
Serial	Printer output is directed to the CMA4000 external serial port
None	Printer is not attached

Printer Type

Options: TD-105/405, IBM Graphics, HP Laserjet, HP Deskjet
Default: IBM Graphics
Determines what type of printer is attached to the port selected in the "Print To" selection. The printer output driver is selected based on this setting.

Baud Rate (serial printers only)

Options: 2400, 4800, 9600
Default: 9600
Sets the baud rate for printer data sent to the Serial Port.
This option will only be available if the "Print To" option is set to SERIAL.

Possible future enhancement.

Parity (serial printers only)

Options: None, Even, Odd
Default: None
Sets the parity for printer data sent to the Serial Port. This option will only be available if the "Print To" option is set to SERIAL.

Possible future enhancement.

Stop Bits (serial printers only)

Options: 1, 2
Default: 1
Sets the number of stop bits used for printer data sent to the Serial Port. This option will only be available if the "Print To" option is set to SERIAL.

Event Table

Options: On, Off
Default: On
When set to "On," the Event Table will automatically be printed after the current screen display.
If set to "Off," the Event Table will not be printed.

Trace Information

Options: On, Off
Default: On
If set to "On," the trace name, trace source, and trace date and time will automatically be printed when a screen print is executed.
If set to "Off," this information will not be printed.

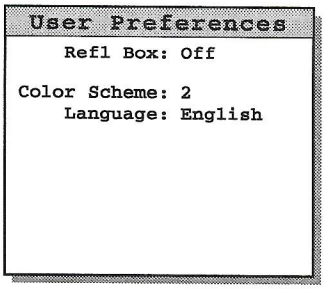
Header Information

Options: On, Off
Default: On
If set to "On," header information (if available) is printed after the current screen display. If no header information is available, a statement to this effect is displayed.
If this option is set to "Off," the header is not printed.

4.3.3 User Preferences Setup

These preferences allow you to customize the CMA4000 screen appearance. Some of the settings are aesthetic and some add useful information to the display.

User Preferences Setup Window



Reflectance Box

Options: On, Off
Default: Off
If this option is set to "On," the box reporting the reflectance measurement will be displayed in the upper right hand corner of the trace grid screen.
If the option is set to "Off," reflectance values will not be reported on the trace grid screen.

Color Scheme

Options: 1 - 16
Default: 2
The CMA4000 has sixteen predefined color schemes Select this option to display a pop-up window with the numbers 1 through 16 and the corresponding list of colors for the major portions of the screen.

Language Description

Options: English, Chinese, French, German, Italian, Mexican, Portuguese, Spanish, Russian
Default: Currently installed language.
Contact GN Nettest for the availability of other languages.

Horizontal Grid Reference Point

Possible future enhancement.

Vertical Grid Reference Point

Possible future enhancement.

4.3.4 ORL Setup

These settings let you customize the way Optical Return Loss is reported on the CMA4000. ORL, Optical Return Loss, is the total amount of light returned to the OTDR including backscatter and all reflections. GN Nettest has several application notes on this subject. Contact customer service or our web site, www.gnlp.com.

Auto ORL

Options: ON, Off
Default: ON
When set to ON, the Analysis function of the CMA4000 will automatically calculate ORL and report the results on the last line in the Analysis Summary window (see Figure 8–1). If set to Off, then ORL calculations will not be performed.

Auto ORL Area

Options: A to B, Full Trace
Default: A to B
This parameter determines the start and stop distances for ORL calculation.
If set as A to B, only the area between the A and B cursors will be used for ORL calculation.
If set as Full Trace, ORL will be calculated on the area from the origin of the trace to the end of the trace.

ORL Relative To

Options: A, Origin
Default: A
The ORL Relative to A setting yields the ORL that would be observed by an ORL meter attached to the fiber at cursor A.
The ORL Relative to Origin setting yields the contribution to the ORL seen at the origin from the fiber segment between A and B.

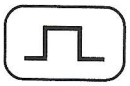
4.4 HARDKEY SETUP SELECTIONS

Some commonly used parameter settings can be changed without reentering SETUP. When you use one of the hardkeys in the control panel section of the CMA4000, a single parameter can be changed for the next data collection or series of data collections. This change will remain in effect until you press the hardkey and make a new selection or if you make a change through Setups.

The following sections describe these settings and the procedures to make the changes.

4.4.1 Setting Pulse Width

The ***PULSE WIDTH*** hardkey



on the CMA4000 can change the pulse width used to collect trace data at any time. When you press the **PULSE WIDTH** key, a pop-up window is displayed with the pulse widths available for the attached optical module. The selected pulse width is highlighted.

To select a new pulse width:

1. Press the **PULSE WIDTH** hardkey.
2. Rotate the cursor knob or use the vertical expand/contract key to step through the list of pulse widths.
3. When the desired pulse width is highlighted, press the **SELECT** hardkey to lock it in.

The pop-up window will disappear.

Press the **CANCEL** softkey if you want to exit without changing the pulse width.

To change the pulse width during a real time or averaging scan cycle:

1. Press the **PULSE WIDTH** key during data collection. The pulse width pop-up menu will be displayed.
2. Select a new pulse width. The trace display will return and a new scan set will be initiated using the new pulse width.

Press **CANCEL** to exit without changing the pulse width. The instrument will return to the scan that was in progress before the **PULSE WIDTH** key was pressed.

Pulse widths are optical module dependent.

4.4.2 Setting Range/Reso

The **RANGE/RESO** hardkey



on the CMA4000 can change the distance range and resolution used to collect trace data at any time. When you press the **RANGE/ RESO** key, a pop-up window is displayed with the range and resolution selection available for the attached optical module. The selected range/reso is highlighted.

To select a new range:

1. Press the **RANGE/RESO** hardkey.
2. Rotate the cursor knob or use the vertical expand/contract key to step through the range list.
3. Highlight the desired range/reso.
4. Press the **A/B SELECT** hardkey to lock it in.

The pop-up window will disappear.

Press the **CANCEL** softkey if you want to exit without changing the range.

To change the range/reso during a real time or averaging scan cycle;

1. Press the **RANGE/RESO** key during data collection. The range/reso pop-up menu will be displayed.
2. Select a new range/reso. The trace display will return and a new scan set will be initiated using the new range/reso.

Press **CANCEL** to exit without changing the range/reso. The instrument will return to the scan that was in progress before the **RANGE/RESO** key was pressed.

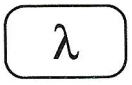
Range/Resolution settings are optical module dependent.

4.4.3 Selecting Wavelength

You can change the wavelength on test modules containing more than one laser using the **WAVELENGTH (λ)** hardkey.

To change the wavelength on a unit containing a multi-wavelength test module:

Press the **WAVELENGTH**



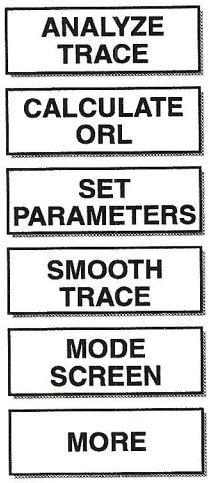
hardkey. The value displayed in the wavelength field in the trace parameters section of the display screen will cycle to the next available wavelength.

Note — If dual wavelength test mode is selected, both wavelengths are displayed with the currently active wavelength highlighted.

If only one wavelength is available on the attached test module an error tone will sound and an error message will appear when you press the **WAVELENGTH (λ)** hardkey.

4.5 OTHER SETUPS

The Index of Refraction and Backscatter Coefficient can be set without returning to the Setups screen. The **SET PARAMETERS** softkey appears in the set shown in the following figure.



When you press this softkey, a box appears in the Trace Parameters area of the screen (see Figure 5–1 for the full view of a Standard Trace Display). Figure 4–3 shows the Index of Refraction and Backscatter Coefficient box.

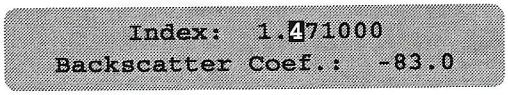
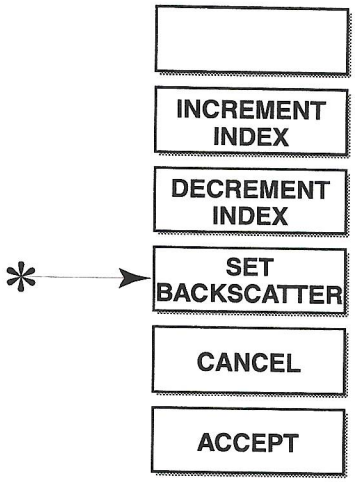


Figure 4–3 Index of Refraction and Backscatter Coefficient Settings Box

4.5.1 Setting Index Of Refraction

The Index of Refraction for optical test module plug-ins will be selected for change when you enter Set Parameters mode. The following set of softkeys is displayed.



NOTE — If you want to change the Backscatter Coefficient, press the **SET BACKSCATTER** softkey. The F4 softkey text will change to **SET INDEX**. You can return to the Index of Refraction setting by pressing that softkey.

The present IOR (Index of Refraction) value can be changed by rotating the **CURSOR KNOB** or pressing the **INCREMENT VALUE** and **DECREMENT VALUE** softkeys. Each digit in the IOR can be changed independent of the others. In Figure 4–3, notice that the first digit to the right of the decimal, the number **4**, is highlighted. You can switch to any of the other five digits to the right of the decimal using the left or right arrow keys. The number **1** to the left of the decimal can not be changed. The trace display is updated as you change the value.

Index of refraction values may be in the range of 1.400000 to 1.699999.

Press the **ACCEPT** key to lock in the new value and return to the trace display screen.

Press the **CANCEL** softkey to return to the trace display mode and restore the value in use before the pop-up window was invoked.

4.5.2 Setting the Backscatter Coefficient

See page 4-9, § 4.2.3, Quick Measurement Setup, Backscatter Coefficient, for information on Backscatter Coefficient.

See the **NOTE** in § 4.5.1 about switching between the two settings in Set Parameters mode.

The present Backscatter Coefficient value can be changed by rotating the **CURSOR KNOB** or pressing the **INCREMENT VALUE** and **DECREMENT VALUE** softkeys. The Cursor Knob only changes the tens digit value (60, 70, 80, 90). To fine tune the Backscatter Coefficient value use the softkeys.

Chapter 5

OTDR Mode

5.1 TRACE DISPLAY

When the CMA4000 is in OTDR mode, fiber trace data can be displayed on a grid screen. This display is divided into regions named Trace Grid, Trace Parameters, Horizontal/Vertical Offset Window, Reflectance Box, Status Window, Full Trace View Window, Icon Row, Time/Date Display, Battery Gauge (or Plug Icon) and User Instruction Row.

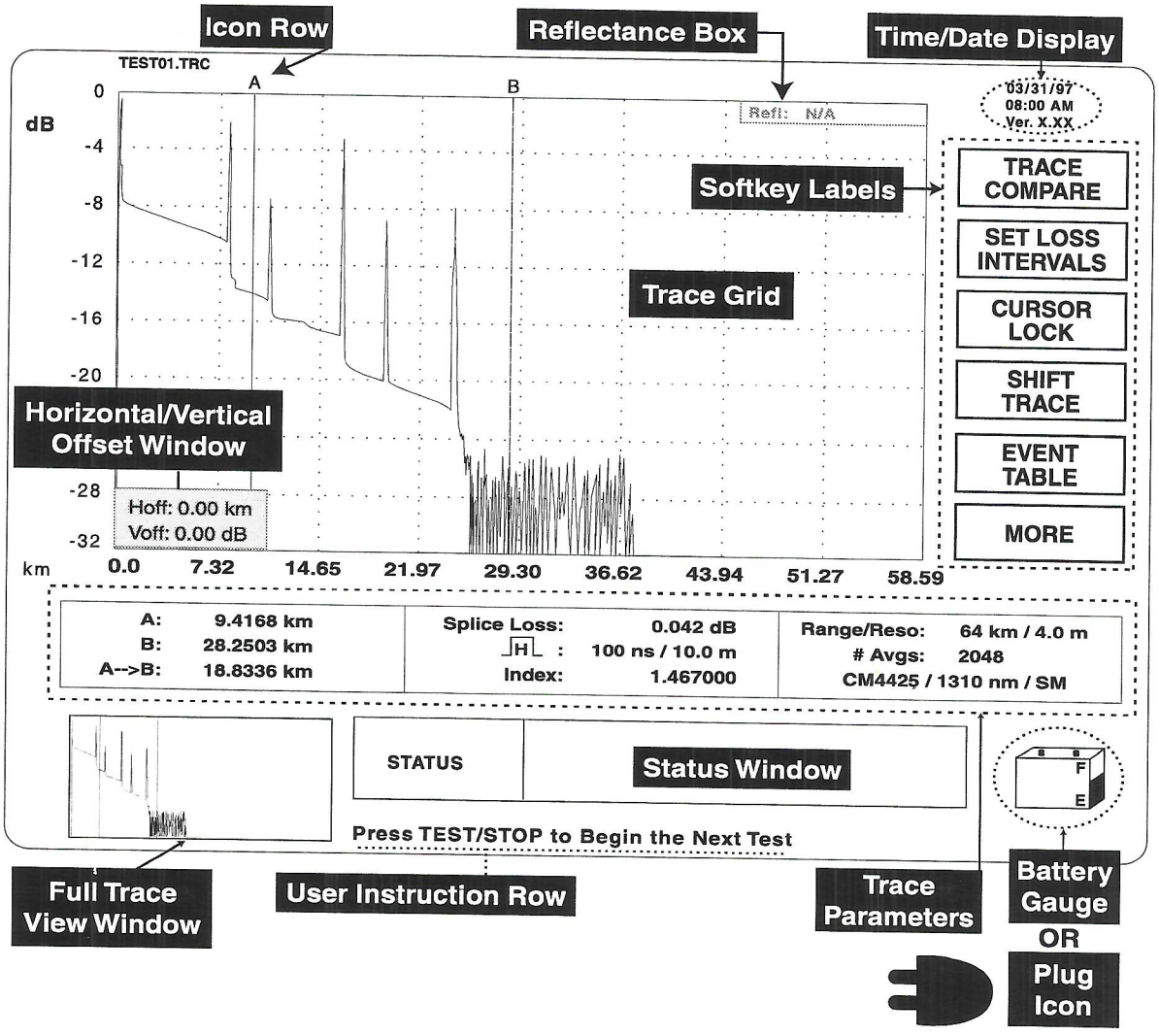


Figure 5–1 Standard Trace Display

5.1.1 Trace Grid

CMA4000 trace data is displayed on a grid that can consist of as many as eight vertical and eight horizontal divisions.

The vertical grid is in units of decibels (dB) with the top left corner representing 0 dB. The grid markers are labelled with negative decibel values representing the number of dB down from the zero reference point. The dB per division depends on the vertical expansion state and the maximum dynamic range of the module.

The horizontal grid is in units of distance that depend on the System setup *Units* setting. The number of distance units/division depends on the current horizontal expansion state and the distance range setting that varies depending on the module.

The trace grid also includes two cursors, labelled A and B, used for distance and loss measurement.

5.1.2 Trace Parameters

The Trace Parameters region of the screen is located directly below the trace grid and contains three sections.

- The left most section contains cursor distance information. This includes the Cursor A distance, Cursor B distance and the distance from Cursor A to Cursor B.
- The center section contains loss measurement information including the type of loss being reported, the loss value, the pulse width setting and the index of refraction.
- The right section of the Trace Parameters region contains the parameters used to collect the trace data currently displayed. This includes the range setting, number of averages taken, wavelength and optical module information.

5.1.3 Horizontal/Vertical Offset Window

You can shift trace data horizontally or vertically when you are in *Display From Origin* mode. The distance offset (horizontal) and the decibel offset (vertical) are displayed in the lower left hand portion of the grid.

These values will only be displayed when some type of offset is in use.

5.1.4 Full Trace View Window

The Full Trace View window, located in the lower left hand corner of the trace display, shows the full view of the current trace when the main view has been expanded either horizontally, vertically or in both directions.

5.1.5 Status Window

CMA4000 uses a true multi-task operating system so it is possible to run certain tasks as background tasks yet continue instrument operation. The Status window indicates the tasks that are currently running and those that have been completed by using icons to indicate task status and a digital clock or percentage value next to the icon to signify the time remaining until the task is complete.

The following icons are used to indicate task status:

Data Collect in Progress — 03:00

Data Collect Completed — 00:00

Analysis in Progress — ET 50%

Analysis Completed — ET 100%

Smoothing in Progress — SMT

Print in Progress —

Print Complete —

Trace Save in Progress —

Disk Format in Progress —

ORL Calculation in Progress — ORL

Trace Align On —

5.1.6 Icon Row

The Icon Row, located above the trace grid, displays information about both the primary and the overlay traces. This includes whether the trace has been filtered, attenuated, had analysis run on it, or was recorded after an incomplete scan cycle. The filename and related icons for the primary trace are displayed on the left side of the screen and the overlay filename and related icons (if applicable) are displayed on the right side of the screen above the grid.

Icon row icons:

Event Table available — ET

Smoothing has been run on the data — SMT

Incomplete Data Collect —

Delta Compare —

Cursor Lock (Displayed Next to Cursor A and B Distances) —

5.1.7 Time/Date Display

The Time and Date from the real-time clock are displayed in the upper right hand corner of the display. Time is updated every second.

5.1.8 Battery Gauge or Plug Icon

The Battery Gauge or Plug Icon is located in the lower right hand corner of the display.

- The gauge on the side of the battery icon shows the proportion of battery life remaining. When the gauge gets down to one-half hour, a battery low warning message will be displayed.
- The Plug Icon indicates that the CMA4000 is connected to an external power source.

5.1.9 User Instruction Row

Below the Status box is a User Instruction Row containing text to guide you in instrument operation.

5.2 TRACE CONTROL

Three *Display From* modes are provided on the CMA4000.

Cursor placement is controlled with one cursor control knob.

The **A/B SELECT** hardkey is used to switch between Cursor A and Cursor B.

A softkey cursor lock function is provided.

Vertical and horizontal expansion/contraction of the trace is accomplished using four hardkeys.

5.2.1 Display From

Allows you to select one of three different Trace Display modes:

1. Display from Origin –
   Displays the beginning of the fiber at the left edge of the grid.
2. Display from Cursor A –
   Defaults to Cursor A as the active cursor and places Cursor A at the grid reference point specified in the User Preferences setup window.

   If you move the cursor knob, the trace will move instead of the cursor.

   When the trace is expanded or contracted, it is centered on the point specified in the User Preferences setup window. The default value is the center of the grid.
3. Display from Cursor B –
   Defaults to Cursor B as the active cursor and places Cursor B at the grid reference point specified in the User Preferences setup window.

   If you move the cursor knob, the trace will move instead of the cursor.

   When the trace is expanded or contracted, it is centered on the point specified in the User Preferences setup window. The default value is the center of the grid.

The Display From mode is signified by an inverse video bar.

In Display from A mode the cursor A distance field tag is shown in inverse video.

A:	9.4168 km
B:	28.2503 km
A-->B:	18.8336 km

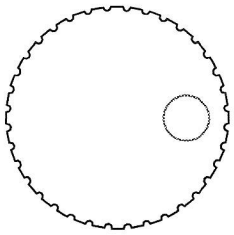
In Display from B mode the cursor B distance field tag is shown in inverse video.

A:	9.4168 km
B:	28.2503 km
A-->B:	18.8336 km

Display from Origin is indicated when neither distance field tag is inverted.

A:	9.4168 km
B:	28.2503 km
A-->B:	18.8336 km

5.2.2 Cursor Control



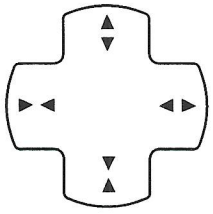
You can place Cursor A or Cursor B or both cursors at a distance location of your choice. A control knob is provided on the front panel to adjust cursor placement.

- Rotate the knob clockwise to move the cursor to the right.
- Rotate the knob counterclockwise to move the cursor to the left.
- Switch between Cursor A and Cursor B by pressing the **A/B SELECT** hardkey. The A or B tag at the top of the grid will be highlighted to indicate the active cursor.
- Use the **CURSOR LOCK** softkey to fix the distance between Cursor A and Cursor B. Press the softkey and a padlock icon is displayed next to the Cursor B value in the distance section of the trace parameters window indicating that Cursor Lock is active. Move Cursor B and Cursor A will move with it at a fixed distance.

NOTE — Moving Cursor A will change the distance between the two cursors. That is, Cursor A movement remains independent of Cursor B.

Press the **CURSOR LOCK** softkey again to unlock the cursors. The padlock icon will disappear.

5.2.3 Vertical/Horizontal Contraction/Expansion



Two hardkeys are used to vertically expand or contract the display.

Press the vertical expand hardkey to halve the value of the dB/divisions on the display.

Press the vertical contract hardkey to double the value of the dB/divisions on the display.

The vertical expansion limits are –
.125 to 8 dB/div.

If you attempt to exceed the limit of vertical expansion or contraction an error beep will sound.

Two hardkeys are used to horizontally expand or contract the display.

Press the horizontal expand hardkey to expand the horizontal scale of the display grid by a factor of 2.

Press the horizontal contract hardkey to contract the horizontal scale of the display grid by a factor of 2.

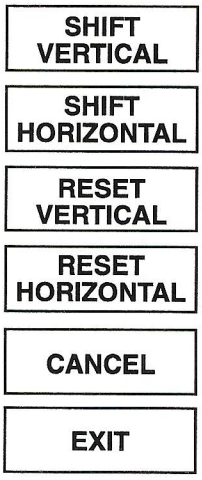
The horizontal expansion limits are –
1 m/div to 37.64 km/div.

If you attempt to exceed the limit of horizontal expansion or contraction an error beep will sound.

5.2.4 Vertical/Horizontal Shifting

Trace data may be shifted horizontally or vertically or in both directions on the trace grid when in Display From Origin mode.

Press the **SHIFT TRACE** softkey to change the instrument state to Shift Mode and the softkey display to **SHIFT VERTICAL, SHIFT HORIZONTAL, RESET VERTICAL, RESET HORIZONTAL, CANCEL** and **EXIT.**



SHIFT VERTICAL - Press to enable a vertical shift to the trace. Then rotate the cursor knob or press the **VERTICAL EXPAND** and **VERTICAL CONTRACT** hardkeys to shift the trace.

- Clockwise rotation of the knob or **VERTICAL EXPAND** shifts the trace upward
- Counterclockwise rotation of the knob or **VERTICAL CONTRACT** shifts the trace downward.

The amount in dB that the trace has been shifted is displayed in the "VOFF" field of the Horizontal/Vertical Offset Window.

SHIFT HORIZONTAL – Press to enable a horizontal shift to the trace. Then rotate the cursor knob or press the **HORIZONTAL EXPAND** and **HORIZONTAL CONTRACT** hardkeys to shift the trace.

- Clockwise rotation of the knob or **HORIZONTAL EXPAND** shifts the trace to the right.
- Counterclockwise rotation of the knob or **HORIZONTAL CONTRACT** shifts the trace to the left.

The amount in distance units that the trace has been shifted is displayed in the "HOFF" field of the Horizontal/Vertical Offset Window.

RESET VERTICAL – Moves the trace back to the origin with 0.00 dB offset.

RESET HORIZONTAL – Moves the trace back to the origin with 0.00 distance units offset.

CANCEL – Returns to the trace grid without recording any of the changes made while in Shift Mode.

EXIT – Returns to trace grid with the shift changes you entered intact.

Note — The Horizontal/Vertical Offset Window will only be visible on screen if a horizontal or vertical offset or both have been entered.

5.2.5 Reflectance Box

The reflectance measured at the Cursor A position is displayed in the box in the upper right hand corner of the trace grid.

This box may be turned on or off in the User Preferences setup window that is available when you press the **ADDITIONAL SETUPS** softkey.

Chapter 6

OTDR Data Acquisition

This chapter covers the three OTDR modes, Fault Locate, Construct OTDR, and Expert OTDR and the methods for acquiring trace data for each mode.

6.1 FAULT LOCATE TEST SEQUENCE

When you select the Fault Locate option on the Operating Mode Selection screen, the CMA4000 will enter the Fault Locate mode. The first screen you see will depend on the type of optical module installed. The initial screen may be a Port Selection screen (see Figure 6–1).

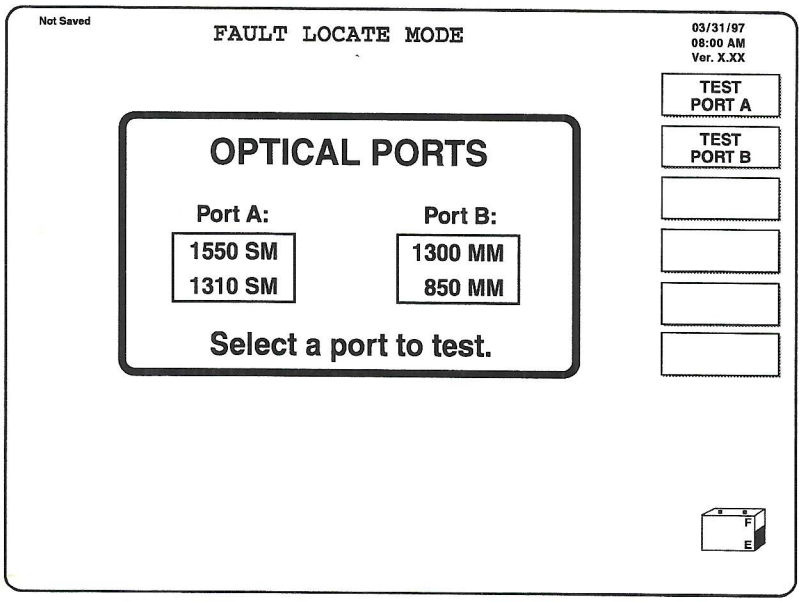


Figure 6–1 Port Selection Screen (Fault Locate Mode)

You can select the wavelength (Port) for the test you want to run by pressing the applicable softkey.

NOTE — This screen will only appear if an optical module with two or more ports is installed. If the optical module has a single port, the Port Selection screen is bypassed and the Connection Check screen shown in Figure 6–2 will appear.

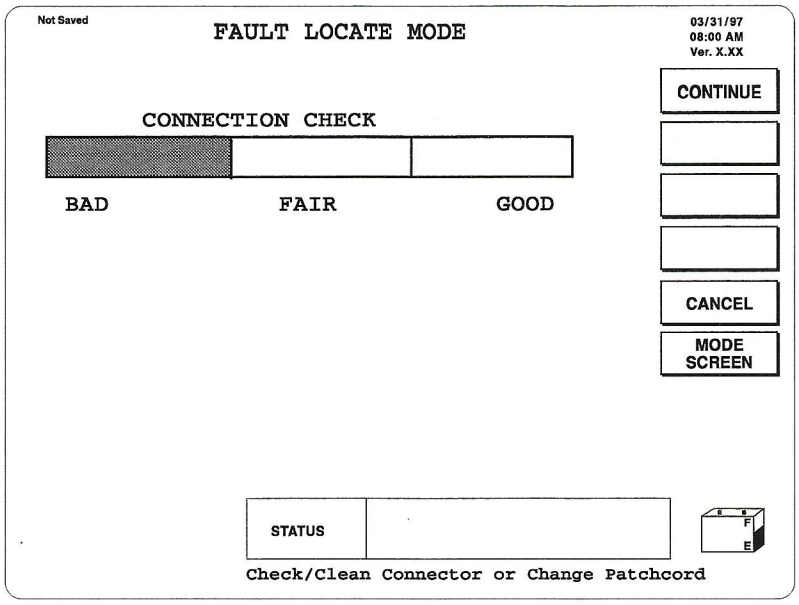


Figure 6–2 Connection Check Screen (Fault Locate Mode)

The previous screen will be displayed if a Bad to Fair connection is detected:

- If the connection is Bad, a message is displayed suggesting that you check the connection or clean the connector. You have the option to continue by pressing the **CONTINUE** softkey or the **TEST/STOP** hardkey.
- If the connection is Fair or Good, the instrument proceeds to AutoMode after a few seconds. AutoMode selects the appropriate range, resolution and pulse width for the test. This is indicated in the text area beneath the Status Box — "Determining Range/Reso/Pulsewidth."

  NOTE — Fault Locate AutoMode uses the longest wavelength, typically 1550 nm for singlemode and 1300 nm for multimode, to determine the best parameters for data collection to locate the End/Fault of the fiber under test.
- While data is being collected the number of averages completed is counted up on the display screen.

Averages Completed

1024

You have several options during the start of a Fault Locate Test:

- Allow the test to run to completion.
- Cancel the test by pressing the **CANCEL** softkey. The Connection Check mode screen will reappear.
- Cancel the test by pressing the **MODE SCREEN** softkey. The Operating Mode Selection screen will appear.

If you do not cancel a test, the CMA4000 will run Analysis in the background while data averaging is running. This is a multi-tasking function of the instrument that helps find the End/Fault much faster.

After the test is complete the end/fault location and prior event will be displayed.

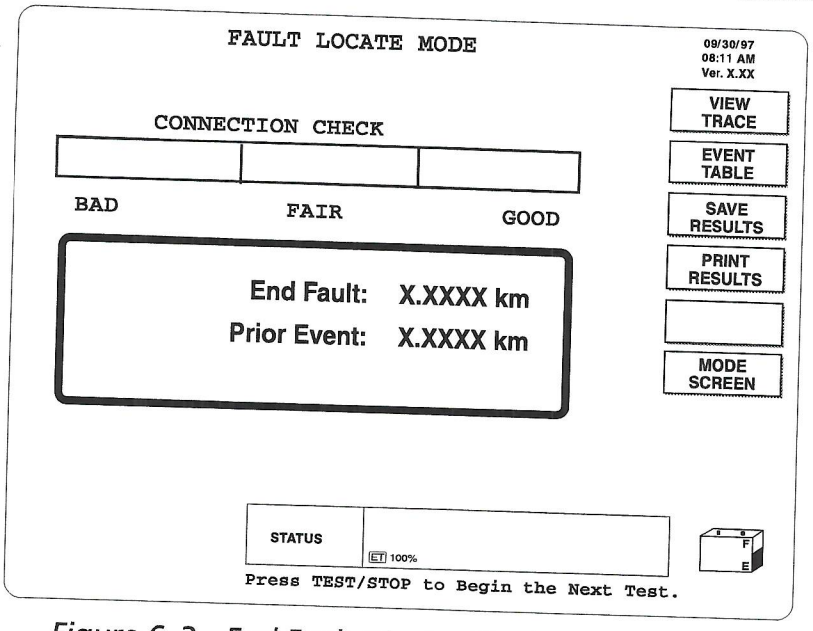


Figure 6–3 End Fault Display (Fault Locate Mode)

Press the **EVENT TABLE** softkey to view the entire event table display.

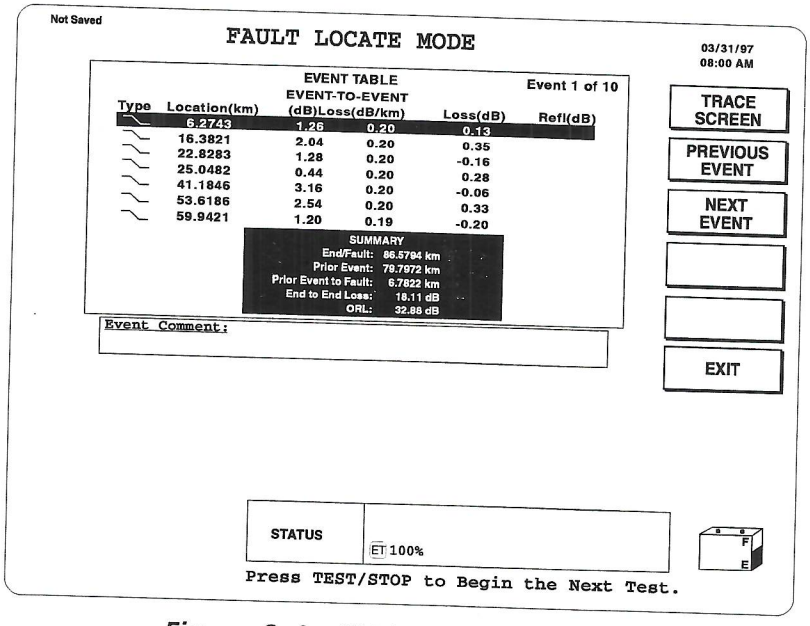


Figure 6–4 CMA4000 Event Table

Press the **VIEW TRACE** softkey to display the corresponding trace data grid.

Press the **MODE SCREEN** softkey to return to the Operating Mode Selection screen.

The test data can be saved to disk using the **SAVE RESULTS** softkey or **MASS STORAGE** hardkey.

Press the **PRINT RESULTS** softkey or the **PRINT** hardkey for a hard copy of the test results.

The next test is started by pressing the **TEST/STOP** hardkey.

6.2 CONSTRUCT OTDR MODE TEST SEQUENCE

The Construct OTDR mode is designed to simplify and automate tests that are required when fiber is being installed. Construction mode is designed for a user who has many fibers to test.

Press the **CONSTRUCT OTDR** softkey from the Operating Mode Selection screen to enter Quick Setup Mode where you can set automatic features and measurement parameters before initiating a test. See § 4.2 and § 4.3 for information on Quick Setup and Additional Setup.

GO – Press the **GO** softkey to display an input form screen (Figure 6–5) where you can enter information to describe the new test.

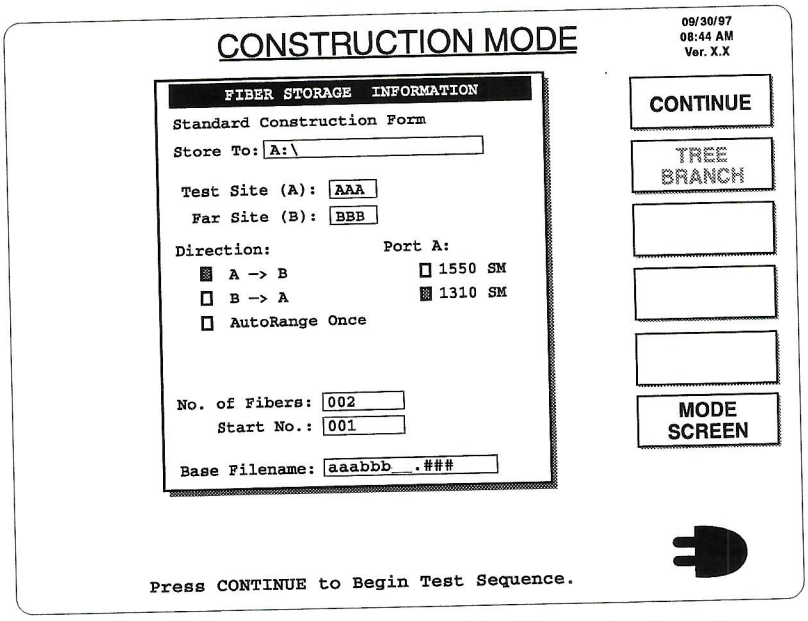


Figure 6–5 Construction OTDR Header Input

The information entered on this screen will be used as header information for the trace files that are saved during the test cycle. It will also be used to create the base filename for the saved traces.

Description of fields —

Store To — Specifies the directory path for trace data files created during a test.

See Chapter 9 for directory path information that will make using this feature easier.

Test Site(A) — Enter text that describes the location of the CMA4000 connected to the fiber under test.

Far Site(B) — Enter text that describes the opposite end of the fiber under test.

A to B (Test to Far) or B to A (Far to Test) — Select one of these to specify the direction in which a test is being performed.

AutoRange Once — If this box is checked, AutoMode will run before the data collect cycle of the first fiber test only. It will not be run for the rest of the test sequence. If this box is unchecked, AutoMode will be performed for each individual fiber test.

Wavelengths — A list of wavelengths is located on the right side of the Fiber Storage Information window. The wavelengths available on the current test plug-in will be displayed in bold and all other wavelengths will be dim. You can select the wavelengths you need for testing. Select the "All" box to run tests on all wavelengths available on the current test module.

NOTE — You will not be able to mix singlemode and multimode wavelengths on a test setup. When a wavelength is selected the CMA4000 will deselect any wavelengths that do not match that type.

- Typically, Port A is assigned as the singlemode fiber test port and Port B as the multimode fiber test port.
- On quad-wavelength modules, multimode wavelengths will be listed under Port B to indicate the different physical location from the singlemode connector.

No. of Fibers — The number of fibers that you want to test.

Note — If zero is entered in this field, the test cycle will continue until cancelled using a softkey or until the CMA4000 is turned off.

If a number is entered in this field, the CMA4000 will flash a warning screen when the maximum number of fibers has been tested.

Attention:
A file already exists with this name. Strike the Continue key to overwrite the existing file or Strike the Cancel key to terminate this operation.

A quick note on how to check a checkbox:

1. Use the up and down arrow keys or the Cursor Control Knob to scroll to the item you want to check. A ">" mark will appear to the left of the box.



2. Press the A/B SELECT hardkey.

The "checked" box will appear as an "open" box, not a "filled" box.



Start No. — Enter the number of the first fiber of a test sequence.

Base Filename — The base name for tests.

From A to B the Base Filename will be created in the following manner:

AAABBB__.###

where:

AAA = First three characters of the *Test Site* entry

BBB = First three characters of the *Far Site* entry

__ = Two digits indicating wavelength (85 = 850, 30 = 1300, 31 = 1310, 15 = 1550).

= Fiber number

If the test is taken in the B to A direction, the base filename will be:

BBBAAA__.###

The base name will be displayed in the Fiber Storage Information window and you will be able to edit the assigned name.

HINT — Use lower case letters in the base filename. This will let you modify file names saved to Mass Storage media. You will be able to override the saved filename without affecting the Test Site and Far Site fields.

TREE BRANCH – A possible future enhancement for base filename creation.

After all of the necessary Fiber Storage Information has been entered, press either the **CONTINUE** softkey or the **TEST/STOP** hardkey to begin the test sequence.

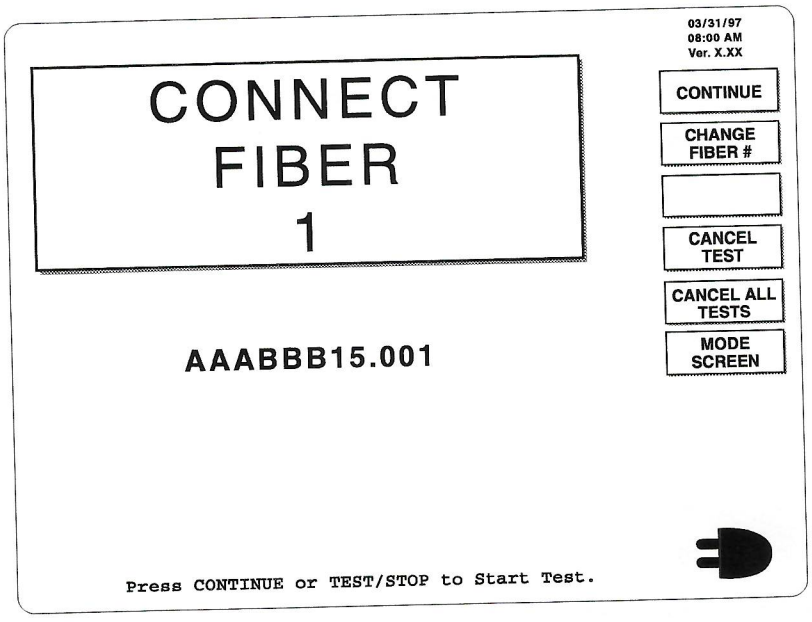


Figure 6–6 Begin Test Sequence Screen

This screen is intended to prompt the operator to connect the fiber to be tested. It also provides verification of the file names that will be used.

Press the **CONTINUE** softkey or **TEST/STOP** hardkey to begin testing. CMA4000 will run a fiber connection check and the results will be displayed briefly if the connection is good.

If the connection is bad to fair, the user will be instructed to check or clean the connector and then press **CONTINUE** to proceed.

After a good connection has been established–

- All enabled automatic functions will run. These include AutoMode, Auto Analysis, AutoSave, Auto Smoothing and any others that were turned on in the Quick Setup windows.
- Automatic testing will be performed at the wavelength(s) selected on the Fiber Storage Information screen.
- The display will indicate the function being performed and its progress.
- When a data collect is in progress the trace data on the grid will be updated.

When testing on the selected wavelength(s) is complete the CMA4000 will return to the screen in *Figure 6–6* and the prompt will be updated to read "Connect Fiber 2." This cycle will be repeated for the number of fibers entered on the Fiber Storage Information screen. If a number was not entered, this cycle will continue until the **CANCEL ALL TESTS** softkey is selected or until you press the **MODE SCREEN** softkey to return to that screen.

Press the **CANCEL TEST** softkey to return to the Fiber Storage Information screen (Figure 6–5).

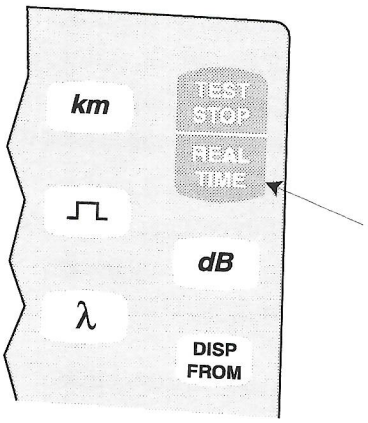
6.3 EXPERT OTDR TEST SEQUENCE

The Expert OTDR mode is designed for the OTDR user who wants to utilize the advanced capabilities of the CMA4000.

Press the **EXPERT OTDR** softkey from the Operating Mode Selection screen to enter Quick Setup Mode. You can set up all necessary parameters before beginning a test.

Press **GO** from this level to display the trace grid screen.

Press the **REAL TIME** hardkey to run a real time scan.



Press the **REAL TIME** hardkey **again** to terminate the real time scan without starting an average.

Press the **TEST/STOP** hardkey to begin testing.

- Functions set for automatic operation will run in the appropriate sequence.
- Functions **not** set for automatic operation can be executed manually using softkeys after the test cycle is complete.
- If AutoMode is set in the Quick Auto Setup window it will run immediately. Otherwise, the currently selected range, resolution and pulse width values will be used.
- On completion of a scan, smoothing will be performed if Auto Smoothing is turned on.
- Fiber analysis will run next if Auto Analysis is set to automatic. The Event Table will then be displayed. On exit from the Event Table display, the Save Trace window will be displayed if AutoSave is enabled.

Full OTDR functionality is available in Expert OTDR mode. This includes features such as Mass Storage, Trace Compare, Loss Mode Setup, Trace Shifting, Printing, etc.

Number of Averages

The number of averages performed during a complete scan cycle is determined by the number set in the Quick Measurement Setup window (see § 4.2). This option is available in Construction or Expert OTDR mode. A different value may be set for each wavelength.

In Fault Locate mode the CMA4000 will calculate the maximum number of averages based on the current range and pulse width settings and will continue averaging until this number is reached or until the user terminates the scan by pressing the **TEST/STOP** hardkey.

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