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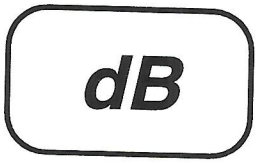
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Chapter 7

OTDR Mode Measurements

After you acquire a trace, you can make several different types of measurements with the CMA4000 using the loss modes available through the LOSS MODE hardkey.



LOSS MODE *Hardkey*

7.1 LOSS MODES

- Two Point Loss
- LSA Two Point Loss
- Loss/Distance
- LSA Loss/Distance
- Splice Loss
- Optical Return Loss (ORL)

The current loss mode and corresponding loss value are displayed in the center of the Trace Parameters region directly below the trace grid.

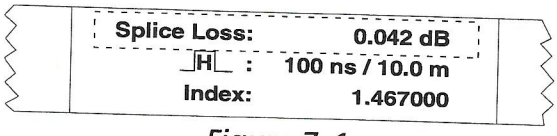


Figure 7–1
Loss Mode and Loss Value

Figure 7–2 shows examples of events on a fiber that are referred to in this chapter. Use this illustration as an aid to understanding some of the terminology used to describe measurement procedures.

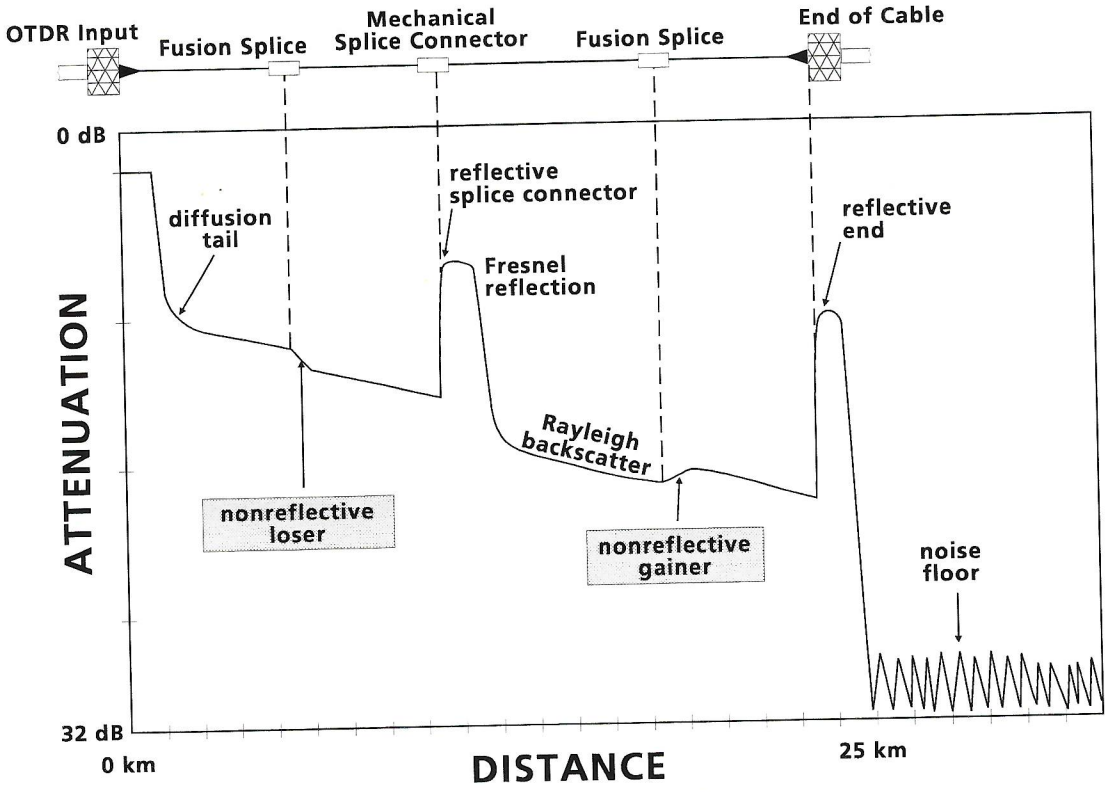


Figure 7–2 Measurement Reference Illustration

7.2 DISTANCE MEASUREMENT

When a primary trace is displayed, the fiber distance is automatically measured from the origin of the trace to each of the two cursors and between the cursors. The values are displayed in the Cursor Location window. Proper cursor placement is crucial for accurate measurements.

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

Figure 7–3 Cursor Location Window

NOTE — Improper distance readings may be reported if the Index of Refraction is set inaccurately.

The following procedures illustrate two common distance measurements; the total length of a fiber and the distance from a known point to a break in the fiber.

Fiber Length

Procedure:

1. Display From Origin.
2. Place Cursor A at the end of the launch cable (pulse suppressor), if one is used, or at 0.00 km.
3. Display from A.
4. Expand the screen vertically and horizontally around Cursor A for more accurate cursor placement.
5. Place Cursor B at the end of the fiber.
6. Display From B.
7. Expand the screen vertically and horizontally around Cursor B for more accurate cursor placement.
8. Place Cursor B at the start of the reflective or non-reflective end of the fiber (see Figure 7–4).

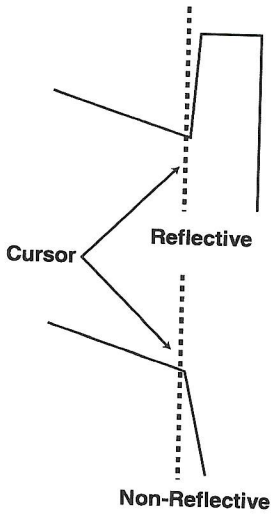


Figure 7–4 Cursor Placement For Break/End of Fiber

9. Read the **fiber length** as the A —> B distance in the Cursor Location window.

Note — If Cursor A was set at 0.00 km, then the A —> B distance will be the same as Cursor B distance.

Distance To A Break

The following procedure demonstrates a method of locating a break relative to a known point on the fiber.

Procedure:

1. Display From Origin.
2. Place Cursor B at the break in the fiber.
3. Display From B.
4. Expand the screen vertically and horizontally for more accurate cursor placement.
5. Place Cursor B at the feature indicating the break in the fiber.
6. Display From Origin.
7. Place Cursor A at a known point on the fiber.
8. Display From A.
9. Expand the screen vertically and horizontally for more accurate cursor placement.
10. Move Cursor A to the beginning of the splice.
11. Read the **distance** from the known point to the break as the A —> B distance in the Cursor Location window.

7.3 2-POINT LOSS MEASUREMENT

The 2-Point Loss Measurement uses a data point at Cursor A and a data point at Cursor B to calculate the change in dB between the two points. Normally the Cursor A (Y-Axis) data is greater than the Cursor B (Y-Axis) data and a positive loss measurement is displayed. Otherwise, the loss value is reported as a negative quantity called a "gainer."

2-Point Loss Measurement

Procedure:

1. Display From Origin.
2. Place Cursor B at the end of the fiber.
3. Display From B.
4. Expand the screen vertically and horizontally for more accurate cursor placement.
5. Place Cursor B at the beginning of the *reflective end* of the fiber and read the total fiber length from the highlighted Cursor B location in the Cursor Location window.
6. Display From Origin.
7. Place Cursor A just to the right of the *diffusion tail,* if one exists, after the beginning of the fiber.
8. Display From A.
9. Expand the screen vertically and horizontally for more accurate cursor placement.
10. Move Cursor A to the end of the diffusion tail.
11. If the Loss Mode is not properly set,

    press **dB**

    and select **2-Point Loss.**
12. Read the total loss for the fiber from the Loss window.

7.4 LSA 2-POINT LOSS MEASUREMENT

The Least Squares Approximation (LSA) 2-Point Loss Measurement uses an LSA technique to calculate the best Y-intercept values based on the current cursor positions. Intervals directly to the right of Cursor A and left of Cursor B will be used to calculate the intercept values. The length of the LSA intervals is user selectable. The default value is 408.7 meters. The intervals will be highlighted on the trace data with the ends marked by **X's.**

The LSA 2-Point Loss is the change in dB (Y-Axis) calculated between the two points. When the Cursor A, Y-Axis position is greater than the Cursor B, Y-Axis position, a positive loss measurement is displayed.

LSA (Least Squares Approximation) technique is useful when the trace is excessively noisy.

The "left interval" is associated with Cursor A and the "right interval" with Cursor B. The default location for the left interval is immediately to the right of Cursor A in Figure 7–5. The scale has been exaggerated for illustration purposes. The default location for the right interval is immediately to the left of Cursor B.

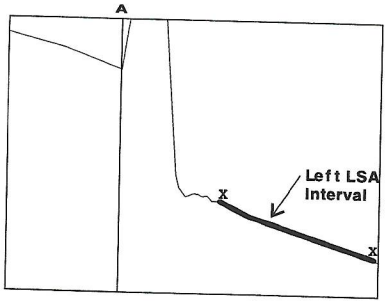


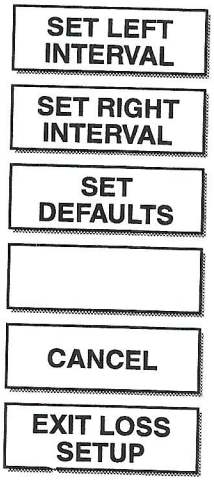
Figure 7–5 2-Point LSA Loss Difference

Procedure for 2-Point LSA end-to-end loss measurement:

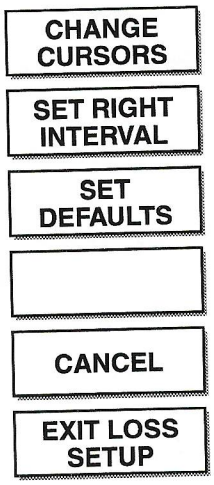
1. Place the cursors like you would for an end-to-end loss measurement.
2. Display From Origin.
3. Select **2-Point Loss LSA** from the Loss Mode menu.
4. Display from each cursor and expand as necessary.
5. Check that the LSA intervals are located on areas of straight backscatter and do not touch a splice or other feature.
6. Read the 2-Point LSA Loss from the Loss window.

If the LSA intervals require adjustment to ensure a more accurate 2-Point LSA Loss reading:

1. Press the **SET LOSS INTERVALS** softkey. The following softkeys are displayed.



2. Press the **SET LEFT INTERVAL** softkey to enter the change mode for the interval at Cursor A.
   The softkeys will change to read —



The cursor distance information in the Trace Parameters area will be temporarily replaced by the LSA interval distance measurements.

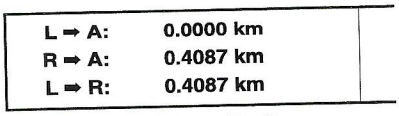
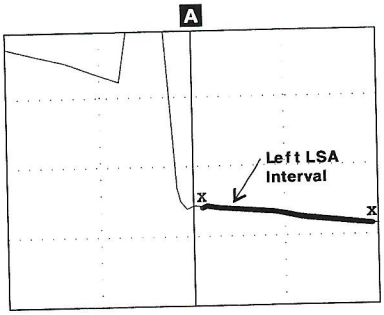


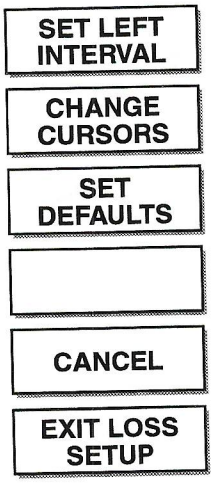
Figure 7–6
Left LSA Interval
Distance Measurements

L –> A	Distance from the left boundary to Cursor marker
R –> A	Distance from the right boundary to Cursor marker
L –> R	Distance from the left boundary to the right boundary

An example of how a section of the trace screen expanded around Cursor A would look is shown in the next illustration.



3. Rotate the Cursor Control Knob to adjust the left side of the Left Interval. The left **x** will move with the fuzzy cursor and the L –> A reading will change in the LSA Interval Distance Measurements.
4. Press the **SELECT** hardkey.
5. Rotate the Cursor Control Knob to adjust the right side of the Left Interval. The right **x** will move with the fuzzy cursor and the R –> A reading will change in the LSA Interval Distance Measurements.
6. Press the **SET RIGHT INTERVAL** softkey to enter the change mode for the interval at Cursor B.The softkeys will change to read —



The cursor distance information in the Trace Parameters area will be temporarily replaced by the LSA interval distance measurements.

L ➡ B:	- 0.4087 km
R ➡ B:	0.0000 km
L ➡ R:	0.4087 km

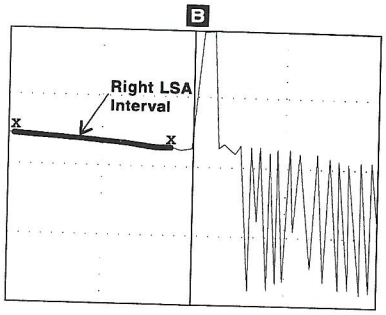
Figure 7–7
Right LSA Interval
Distance Measurements

L ➡ B — Distance from the left boundary to Cursor marker

R ➡ B — Distance from the right boundary to Cursor marker

L ➡ R — Distance from the left boundary to the right boundary

An example of how a section of the trace screen expanded around Cursor B would look is shown in the next illustration.



7. Follow the procedure in steps 3 through 5 to adjust the interval end positions.

   Note — The right **X** will be adjusted first. Press the **SELECT** hardkey to switch to the left **X**.

8. Read the 2-Point Loss LSA from the Loss window.

9. Press the **EXIT LOSS SETUP** softkey to leave Set Interval Mode.

   NOTE — The Set Defaults softkey may be pressed at any time during the Set Interval procedure for interval default settings.

The other two softkeys in the Set Loss Intervals mode are **CHANGE CURSORS** and **CANCEL.**

CHANGE CURSORS — Acts like the **A/B SELECT** hardkey during Set Loss Intervals Mode because the **A/B SELECT** key function is changed to switch between interval ends.

CANCEL — Press this key to exit Set Loss Intervals mode without saving any changes that have been made to the intervals.

7.5 LOSS/DISTANCE MEASUREMENT

The Loss/Distance Measurement uses a data point at Cursor A and a data point at Cursor B to calculate the change in dB (Y-Axis) between the two points. This is divided by the distance between the two Cursors to calculate the Loss/Distance measurement. When the Cursor A (Y-Axis) data is greater than Cursor B (Y-Axis) data, a positive loss measurement is displayed.

$$\text{Loss/Distance} = \frac{\text{2-Point Loss}}{\text{Distance Between Cursor A and Cursor B}}$$

Loss/Distance will be expressed in the following three forms depending on the units chosen in setup:

Loss/Distance	Current Unit of Measurement
dB/Km	M, Km
dB/Kft	Ft, KFt
dB/Mi	Mi

7.6 LSA LOSS/DISTANCE MEASUREMENT

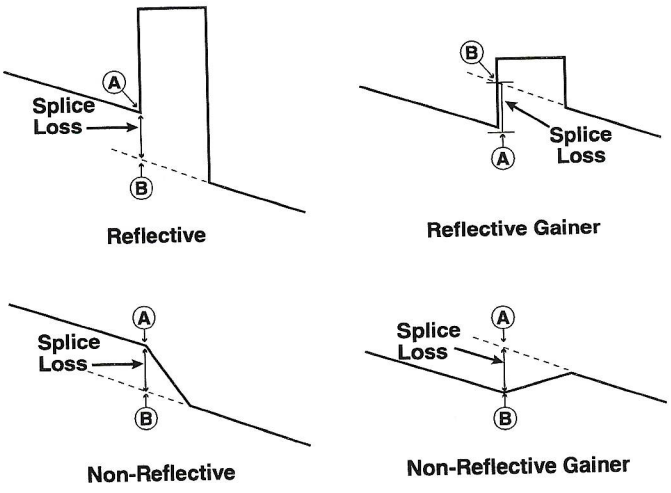
LSA Loss/Distance finds the LSA 2-Point Loss and divides it by the distance between the two cursors.

$$\text{dB/Distance} = \frac{\text{LSA 2-Point Loss}}{\text{Distance Between Cursor A and Cursor B}}$$

LSA Loss/Distance will be expressed in the three forms shown in the Loss/Distance measurement chart depending on the units chosen in the setups.

7.7 SPLICE LOSS

Splice Loss is used to measure the optical power loss caused by connectors, splices and couplers on a fiber optic cable. The following figure depicts the technique used to measure splice loss:



Ⓐ = Start of Splice

Ⓑ = Y-Intercept

Splice Loss = Ⓐ Y-Axis Position — Ⓑ Y-Axis Position

Figure 7–8 Splice Loss Measurement

Cursor A will be placed at the start of the splice. The Y-axis position (Ⓐ) at the start of the splice will be determined by an LSA calculation using the interval set up to the left of Cursor A. The Y-intercept point (Ⓑ) is determined by an LSA calculation using the current data interval setup to the right of Cursor A, and calculating the intercept back to Cursor A.

1. Display From Origin.
2. Place Cursor A near the beginning of the splice where loss is to be measured.
3. Display From A.
4. Expand the screen vertically and horizontally for more accurate cursor placement and place Cursor A at the beginning of the splice to be measured.

5. Select Splice Loss from the Loss Mode menu.
6. If the LSA intervals are set properly, go to Step 9.
7. Press the **SET LOSS INTERVALS** softkey.
8. Adjust the LSA intervals so that they are on straight backscatter.
9. Read the Splice Loss from the Loss window.

The data intervals used for Splice Loss may be modified by the user via the **SET LOSS INTERVALS** softkey. Refer to Section 7.4 for information on how to change intervals.

7.8 OPTICAL RETURN LOSS (ORL)

The CMA4000 provides the ability to calculate Optical Return Loss (ORL), the ratio of reflected energy to input energy for a fiber optic link.

When the Loss Mode tag reads ORL, a **CALCULATE ORL** softkey will be displayed. You will use Cursor A to mark the start of the ORL interval, and Cursor B to mark the end of the interval. Press **CALCULATE ORL** to initiate an ORL calculation. While in progress, an icon (ORL) will be displayed in the Status window indicating that ORL calculation is in progress. When the ORL calculation is complete, the value will be displayed in the Loss Information area of the Trace Parameters section.

If ORL can not be completed, a tone will sound.

A "<" displayed in front of the ORL value, along with an "S" following the value, indicates that saturation was encountered in the marked area of the trace. This implies that the actual ORL is, at most, the displayed value but probably less.

A "<" displayed without an "S" indicates that there were insufficient points per pulsewidth to perform an accurate ORL value.

7.9 REFLECTANCE

A reflectance value for reflective events is displayed in a box in the upper right hand corner of the trace grid. This value will only be displayed if the Reflectance Box value in the User Preferences setup window is set to YES. This reflectance measurement is made relative to the A Cursor.

Reflectance is the ratio of reflected power to incident power displayed in dB. It is affected by the Pulse Width and the Backscatter Coefficient, both adjustable in Setups.

Default Backscatter Coefficient Table

Wavelength	Mode	Coefficient
850nm	MM	67.0
1300nm	MM	74.0
1310nm	SM	80.0
1550nm	SM	83.0

To take a reflectance measurement:

Position Cursor A at the approximate start of a reflective splice.

The Reflectance measurement will always be displayed as a negative value between -20 and -80 dB with the following exceptions:

- If the measurement is less than the threshold set in the FAS Setup Mode –

  "N/A" will be displayed.

- If greater than -20 dB (-19 to -14 dB) –

  ">-20 dB" will be displayed.

- If the splice under measurement is saturated –

  the measurement will be displayed, but will be preceded by a ">" sign and followed by an "S." This means that the reflectance is at least as great as the displayed value, but may be even greater than that value.

- If the event being measured contains less than the minimum number of points per pulsewidth (8 points)

  a ">" sign will always be displayed for that event.

- Reflectance measurements made on traces recorded on instruments that use clamping circuitry in the optical module will always display a ">."

Note — Invalid Reflectance may be reported if two reflective artifacts are within 2 pulse widths of each other.

Chapter 8

OTDR Analysis Software

CMA4000 has Analysis software designed to locate, classify and measure features of interest on an OTDR trace. The Results Table will be superimposed on the trace when Analysis is complete. Each feature is identified with a special icon. The table shows the distance from the origin to each feature, the event-to-event loss, the loss caused by the feature and, if applicable, its reflectance. A fiber Summary is attached to the Results Table.

Analysis can be set to operate automatically each time a fiber is scanned or can be started manually with a softkey.

- Auto Analysis is set to "ON" in the Quick Auto Setup window — Trace Analysis will execute when the data collection is complete.
- Auto Analysis is set to "OFF" — Trace Analysis will run when you press the softkey.

While fiber analysis is in progress, the Analysis In Progress icon will be displayed in the Status Window with the percentage complete displayed next to it.

When Analysis is complete an Event Table is automatically displayed and the [ET] icon appears in the STATUS area to show that Analysis has been run on the trace.

Note — Primary trace analysis results will be saved until a new data collection is started. To preserve trace information permanently, save the trace to the hard drive, floppy disk, or to the internal RAM drive (D:). See Chapter 9 for Save Trace information.

8.1 EVENT TABLE

A screen will be displayed that reports all events detected by Analysis. A summary window is attached. Figure 8–1 is an example of such a screen. This is ***not*** an actual Event Table but a facsimile showing every type of event that can be reported on the CMA4000.

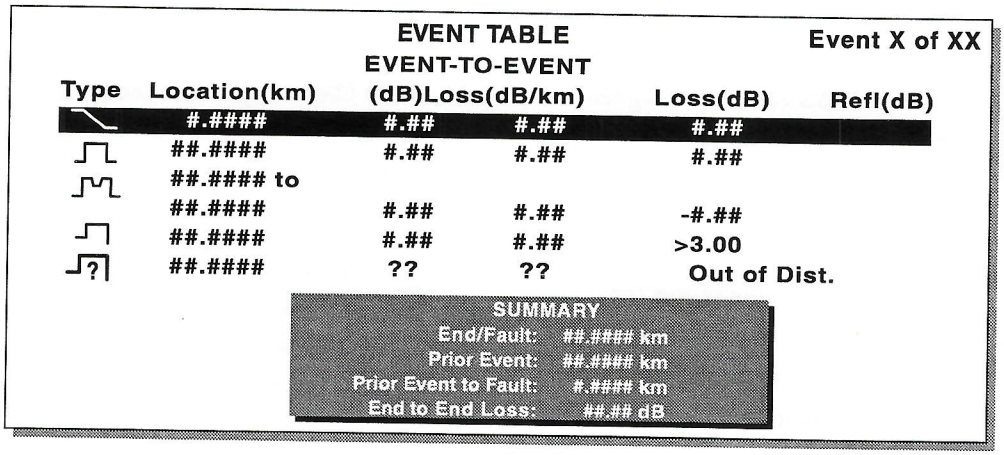


Figure 8–1 CMA4000 Sample Event Table

This is a tabular view of the trace. It becomes part of the trace file when you save a trace and can be printed as part of a trace file if you want.

8.1.2 Types of Events Reported

OTDR Analysis will report four types of events – reflective, non-reflective, grouped and end/fault. It will also report an out-of-range or out-of-distance event.

Reflective Event —

- All reflective artifacts found on the fiber, such as mechanical splices and connectors will be reported.
- Any reflective event with a loss greater than the set Splice Loss Threshold will be reported.
- Any event with a reflectance greater than the set Reflectance Threshold will be reported. If the event has a reflectance greater than the Reflectance Threshold but meets the event loss criteria, it is still reported.

The distance location, splice loss, and reflectance will be reported for a reflective event.

The letter "R" will be displayed on the print out of the Event Table after the event number for a reflective event.

Non-Reflective Event —

- All non-reflective events, such as fusion splices, with a loss greater than the set Splice Loss Threshold will be reported.

The distance location and splice loss will be reported for a non-reflective event.

The letter "N" will be displayed on the print out of the Event Table after the event number for non-reflective events.

Grouped Event —⎍⎍⎍

- Events spaced too close to each other for Analysis to distinguish them as separate events will be reported as Grouped Events.

The start distance location, end distance location, two point loss, and reflectance will be reported for a grouped event.

A "G" will be displayed on the print out of the Event Table after the event number for grouped events.

End/Fault Event —⎍⎍

- Any event with a loss greater than the Break/End Threshold will be reported as the End/Fault Event.

The distance location and reflectance will be reported for an End/Fault event.

The letter "E" will be displayed on the print out of the Event Table after the event number for the end event.

Out of Range Event —⎍?⎍

Out of range may indicate out of dynamic range or out of distance range.

- Out of Dynamic Range – The point where the CMA4000 ran out of dynamic range will be reported if the end of the fiber is not found and the noise floor is encountered.
- Out of Distance – The point where the CMA4000 ran out of distance range will be reported if the end of the fiber is not found and the end of trace data is encountered.

The loss field will indicate Out of Distance or Out of Range.

8.1.2 Event Location

The Location field on the Event Table represents the distance from the start of the trace to the start of the feature. This value is reported in the distance units set in the Quick System Setup window, for example "km." Grouped events take up two lines of text on the event table, the top line displaying the start distance of the grouped event and the second line displaying the end of the grouped event.

8.1.3 Event to Event Loss

The Event Table screen has a column named "Event to Event Loss" that displays the dB/km loss between the selected event and the prior event, less the actual splice loss.

If the end event is *Out of Distance* or *Out of Range,* the Event to Event Loss column will display "??.??." Otherwise, the end event will display an Event to Event Loss value.

8.1.4 Loss

The Loss calculated for the event is displayed in decibels (dB). In the case of a reflective or non-reflective event, this loss is the result of a splice loss calculation. For grouped events a two-point loss calculation is made. The loss displayed for the end/fault event is the Fiber Break threshold value.

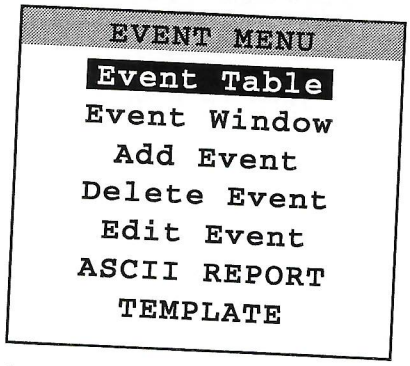
8.1.5 Reflectance

A reflectance value is displayed for all reflective events. No value will be displayed in the Reflectance Field for non-reflective events.

-- EVENT MENU

The CMA4000 enables you to display the Event Table or individual table events on the trace grid, to insert, delete and edit Event Table items, and to save and print the Event Table information as ASCII text.

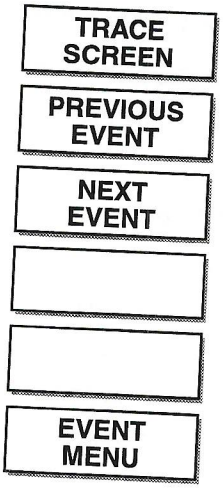
Press the **EVENT MENU** softkey to display the EVENT MENU pop-up.



The first item on the menu, Event Table, will be highlighted the first time you display the EVENT MENU. Use the cursor knob or vertical expansion/contraction keys to highlight any option you want. Press the **A/B SELECT** hardkey to execute the highlighted function. Press **EXIT** to return to the previous softkey layer.

8.2.1 Event Table

If you select this item from the menu an Event Table similar to the one shown in Figure 8–1 will be displayed. These softkeys help you navigate the Event Table or return to either the Trace Screen or the EVENT MENU.



8.2.2 Event Window

Select this menu item to bring up a display of the primary trace with an Event Window; see Figure 8–2.

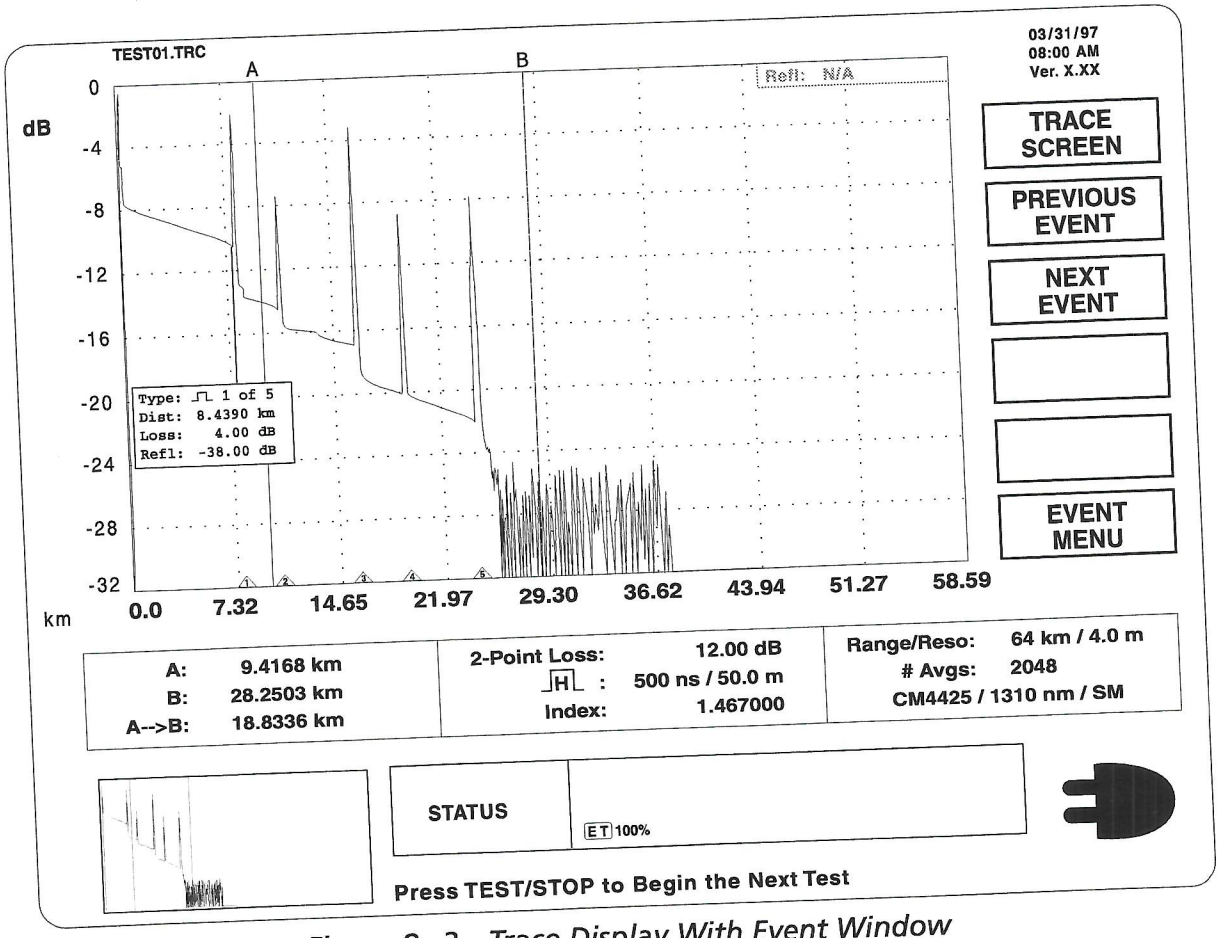
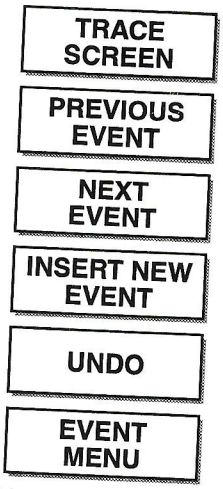


Figure 8– 2 Trace Display With Event Window

Each event window contains data relating to an item on the Event Table. A line extends from the window and points to the position of the event on the trace. OTDR functions such as cursor movement and expansion/contraction are still valid. Only the **DISPLAY FROM, PRINT,** and **A/B SELECT** hardkeys will be functional in this mode.

8.2.3 Inserting Events

When you select the **ADD EVENT** option from the EVENT MENU, a new event can be placed into the event table. The softkeys will change to read:



The trace grid screen will be displayed with the Event Window presented for a highlighted event on the trace – usually the first event.

CAUTION

Be sure to place Cursor A at the point on the trace where you want the new event to be inserted.

Press the **INSERT NEW EVENT** softkey to create a new event located at Cursor A. The Default Event Type is selected by the CMA4000 from the Icon menu. The currently displayed Distance, Loss and Reflectance (if applicable) are automatically inserted. Any of these fields can then be edited with the Edit Function.

The **UNDO** softkey will exit the Add Event mode without saving any changes made.

The **EVENT MENU** softkey brings the EVENT MENU pop-up back on screen. The changes will remain in place.

NOTE — For any changes to become a permanent part of the trace file, you must save the trace (see Mass Storage).

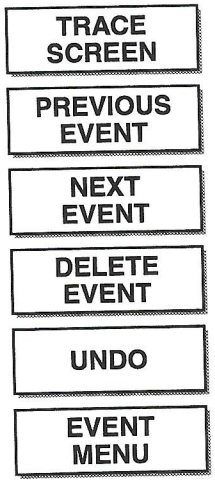
PREVIOUS EVENT and **NEXT EVENT** softkeys help you navigate the trace quickly.

The **TRACE SCREEN** softkey will return you to a trace grid with the primary trace and no changes saved.

NOTE — If you press the **TRACE SCREEN** softkey and try to add an event previously inserted events will be restored. The **UNDO** softkey will not eliminate inserted events from a prior Add Event session.

8.2.4 Deleting Events

Select the **DELETE EVENT** option from the EVENT MENU to select events and delete them from the Event Table. The softkeys will change to read:



The trace grid screen will be displayed with the Event Window presented for whatever event on the trace was highlighted – usually the first event.

PREVIOUS EVENT and **NEXT EVENT** softkeys help you navigate the trace quickly.

After you select the event you want to delete from the trace, press the **DELETE EVENT** softkey. The event will be removed and all subsequent events will be renumbered.

The end event cannot be deleted. The error message

```
Error! – Cannot delete "end" event.
```

will be displayed for about five seconds. You may edit the End Event distance, however. (See section 8.2.5, Editing Events.)

Whether you deleted one or more events, the **UNDO** softkey will exit the Delete Event mode without saving any changes you made.

The **EVENT MENU** softkey brings the EVENT MENU pop-up back on screen. The changes will remain in place.

NOTE — For any changes to become a permanent part of the trace file, you must save the trace (see Mass Storage).

CAUTION

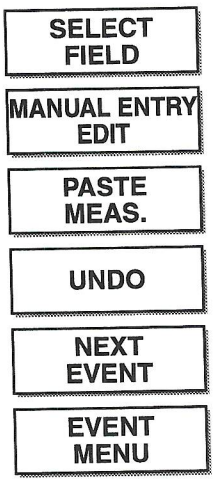
Once a trace has been saved, no deleted events can be recovered.

The **TRACE SCREEN** softkey will return you to a trace grid.

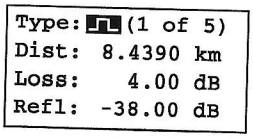
NOTE — If events are deleted and you press the **TRACE SCREEN** softkey and then reenter Delete Event mode, previously deleted events will not be displayed.

8.2.5 Editing Events

Feature information for any event in the Event Table can be changed. Select the **EDIT EVENT** option from the EVENT MENU to access the event currently displayed on the Analysis/Trace display or highlighted in the Event Table. The softkeys will change to read:



The Event Window will be displayed and the event icon will be highlighted (see the following illustration).



The **SELECT FIELD** softkey moves the highlight through the changeable fields including the Event Comments field.

If you want to move to another event you do not have to leave Edit Event mode. Just use the **NEXT EVENT** softkey to travel through an entire sequence of the event list.

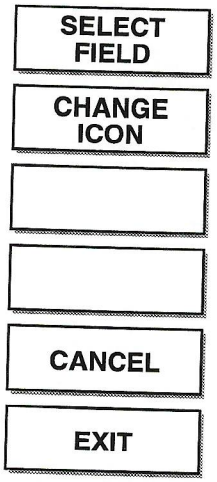
There are two ways to edit events – Manual Edit or Paste Measurement.

8.2.6 Manual Edit

Using the **MANUAL ENTRY EDIT** softkey you can enter specific values for fields such as Loss, Distance and Reflectance.

Manual entry procedure for icons:

1. Press the **SELECT FIELD** softkey until the event icon is highlighted.
2. Press the **MANUAL ENTRY EDIT** softkey. The softkeys will change to read:



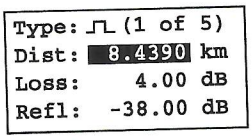
3. Press the **CHANGE ICON** softkey until the one you want appears in the highlighted area.

Note — Reflective, non-reflective and grouped event icons will be available for events except the end event. Only end event and out of range icons will be available for the end event.

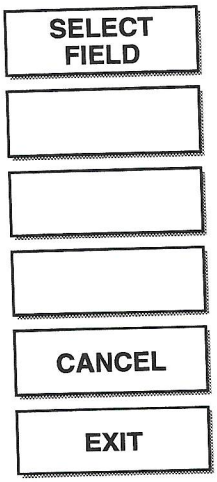
4. Depending on whether you want to keep the change or discard it –
   - Press the **EXIT** softkey to save the change.
   - Press the **CANCEL** softkey to exit Manual Entry Edit mode with no change saved.

Manual entry procedure for Distance, Loss and Reflectance fields:

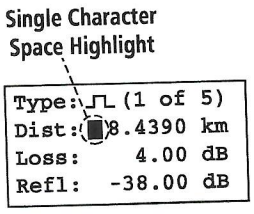
1. Press the **SELECT FIELD** softkey until the `DIST, LOSS` or `REFL` field is highlighted.



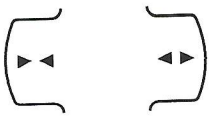
2. Press the **MANUAL ENTRY EDIT** softkey. The softkeys will change to read:



3. The highlight will change to a single character space.



4. You can move this highlight to the character(s) you want to change by using the horizontal movement hardkeys.



5. Enter the number you want to put in the selected field using the onboard keypad or optional external keyboard.
   The only character other than a number 0 through 9 that is acceptable is the decimal point.

You will get error messages for the following entries:

- An "alpha" character entry.

`Error! – Invalid number.`

- A distance entry lower than the previous event.

`Error! – Specified distance is before the previous event.`

- A distance entry higher than the next event.

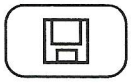
`Error! – Specified distance is after the next event.`

6. Depending on whether you want to keep the change or discard it –
   - Press the **EXIT** or **SELECT FIELD** softkey to save the change.
   - Press the **CANCEL** softkey to exit Manual Entry Edit mode with no change saved.

Chapter 9

MASS STORAGE

9.1 MAIN MENU

When you press the Mass Storage hardkey  the Mass Storage menu for the CMA4000 will pop up with the following options:

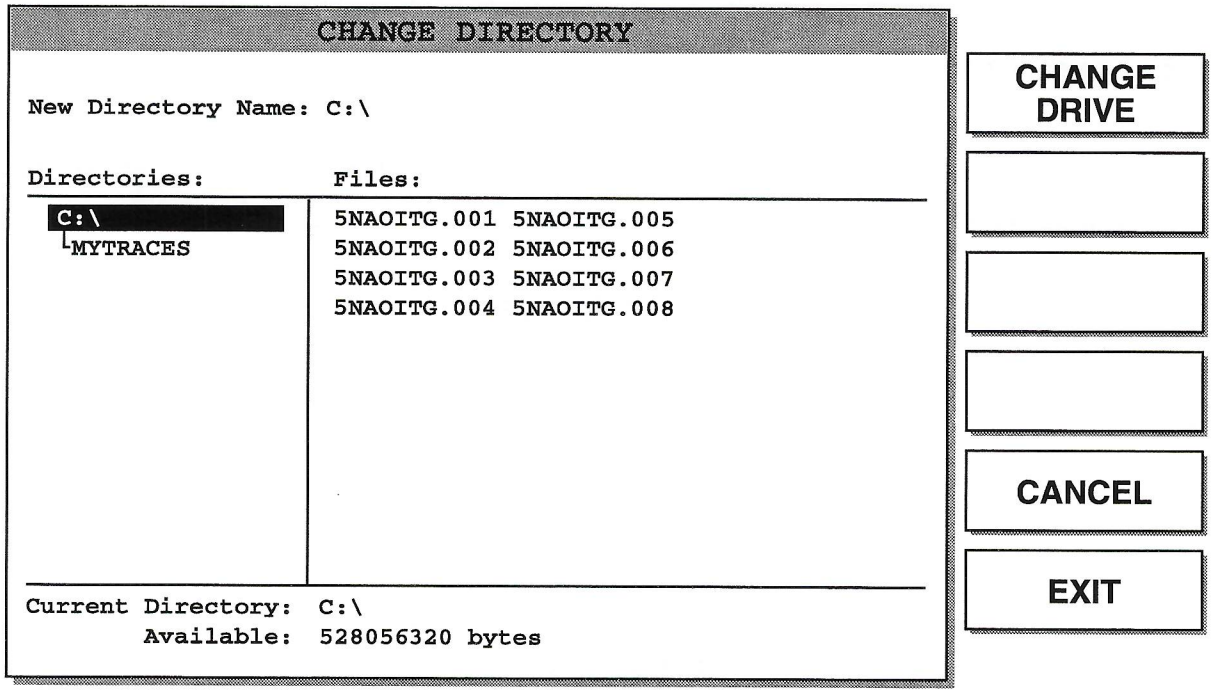


Rotate the cursor knob or press the vertical expand/contract keys to move through the menu selections. The highlighted option is selected by pressing the **A/B SELECT** hardkey. A highlighted arrow will appear to the left of your selection as confirmation.

Press the **EXIT MASS STORAGE** softkey to return the CMA4000 to the previous state.

9.2 CHANGE DIRECTORY

Most of the Mass Storage functions contain a **CHANGE DIRECTORY** softkey so you can change to a directory other than the default or currently selected directory. When you press the **CHANGE DIRECTORY** softkey, the following window is displayed:



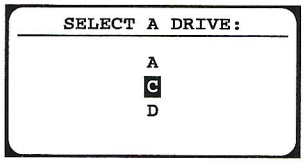
You can scroll through the list of directories using the cursor knob, expansion/contraction keys or keyboard arrow keys. The highlighted directory name appears in the `New Directory Name` field and the files listed in that directory are listed to the right. Once the desired directory is highlighted, press the **A/B SELECT** hardkey to confirm your selection or the **EXIT** softkey to return to the previous Mass Storage option display.

Press the **CANCEL** softkey at any time to return to the previous Mass Storage option display without executing a directory change.

Press the **CHANGE DRIVE** softkey to select a different storage device.

9.3 CHANGE DRIVE

When you press this key a pop-up window containing all of the available drives is presented.



Use the cursor knob, expansion/contraction hardkeys or keyboard arrow keys to highlight the desired drive. Press the **A/B SELECT** hardkey to confirm your selection and return to the Change Directory window. The directories available on the newly specified storage device are displayed.

Press **CANCEL** to return to the Change Directory window without changing the drive.

9.4 SAVE TRACE

You can store trace data recorded by the CMA4000 OTDR to the floppy disk, hard disk or nonvolatile internal storage using the Save Trace function. Trace files will be stored in the format specified in the Save File field in Additional System Setups (§ 4.3.1).

When you select the **SAVE TRACE** option, you are presented with the following screen

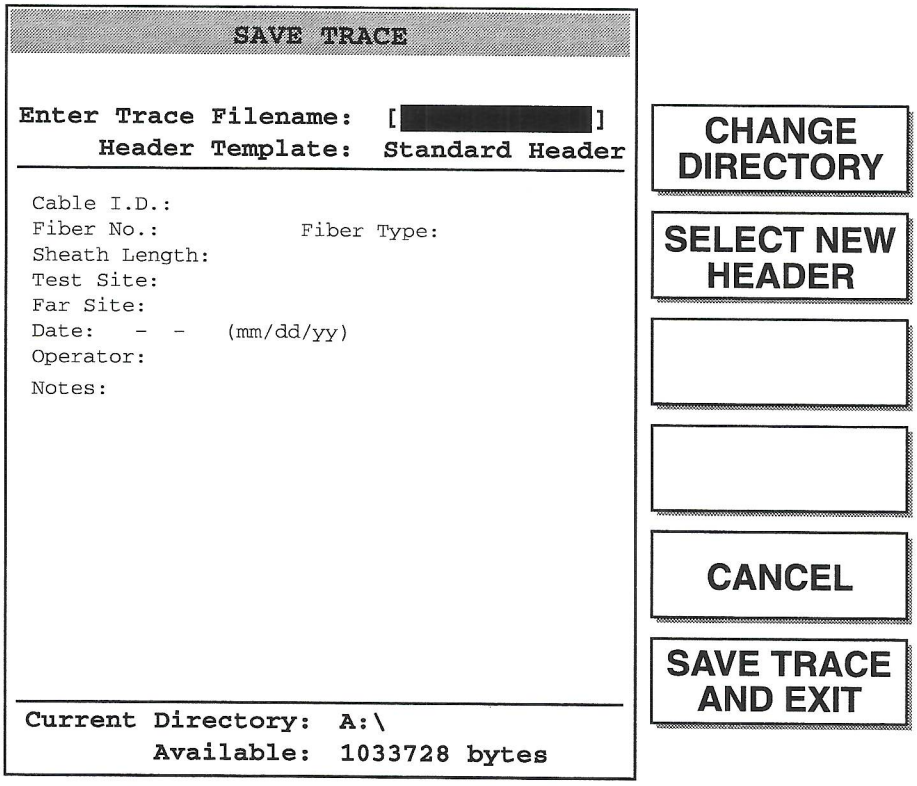


Figure 9–1 The Save Trace Screen

Note— If Auto Save is set to **"Stand."** in the Quick Auto Setup menu, the Auto Save screen will be displayed after trace acquisition (following Analysis, if enabled). See the *Auto Save/Autofilename Feature* section (§ 9.5).

The filename field will be highlighted as a prompt to enter a trace file name for the primary trace. File names must be in MS-DOS compatible format – a maximum of an eight character name, a period and an optional three character extension, for example, **ABCDEFGH.TRC**. The first character must be a letter or a number.

The fields in the currently loaded trace header will be in the center area of the Save Trace screen. The built-in keyboard or optional external keyboard may be used for filename and header data input. Use the "tab" or "enter" key to move to the next field.

Header format is determined by the Save File format selected (see Additional Setups, System Setup) or by a custom header file. A custom header may be selected by using the **SELECT NEW HEADER** softkey.

See Appendix B for information on how to create a custom header.

When the desired filename and header information have been entered, you can continue with the Save Trace process by pressing the **SAVE TRACE AND EXIT** softkey.

Press the **CANCEL** softkey to return to the Mass Storage menu without saving the trace file.

Note — If you were saving a trace file that already had a name, any information that was in the filename and header fields will be restored.

When you press the **SAVE TRACE AND EXIT** softkey, an icon is displayed in the Status Window to indicate a trace save is in progress.

9.5 AUTOSAVE/ AUTOFILENAME FEATURE

If the AutoSave feature is enabled (see Quick Setups, Quick Auto Setup), the Auto Save window will be displayed as soon as a data collect is complete so you do not have to enter Mass Storage using the hardkey. If Auto Analysis is set to ON in the Quick Auto Setup menu, Analysis will execute on completion of the data collect before the Auto Save window is displayed.

9.5.1 Automatic Filename Generation

The Autofilename feature requires you to enter a base filename that is used to generate sequentially numbered filenames. This screen will only be displayed if the AutoSave option is set to "Stand." (Standard) in Quick Auto Setups.

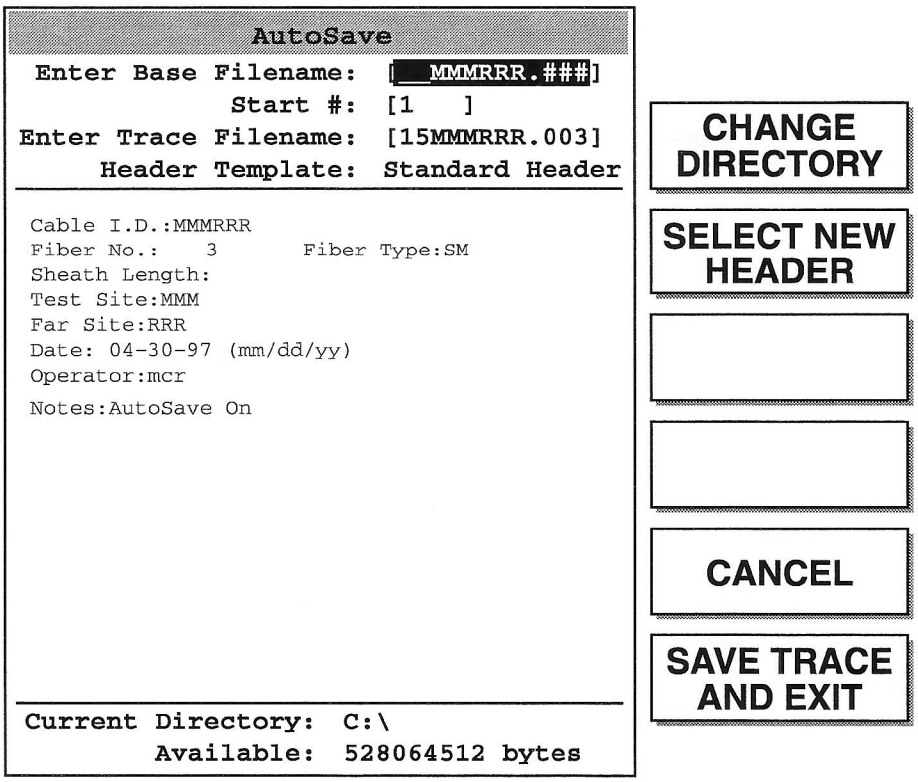


Figure 9–2 The Auto Save Screen

The base filename will consist of up to 8 characters and an optional three character extension, MS-DOS format. Enter the base characters for the filename and the character "#" to signify placement of the digits that will automatically increment.

Practice example:

1. Power up a CMA4000 with a 1310/1550 nm singlemode optical module.
2. Set the AutoSave option in Quick Auto Setups to "Stand."
3. Perform the first data collect at 1550 nm.
4. When the Auto Save screen is presented, specify a filename template similar to the following:

   XXXYYY__.###

   where:

XXX	represents Near Site
YYY	represents Far Site
__	specifies wavelength ID
.	standard DOS extension prefix
###	specifies auto-increment field

5. Enter the number "1" in the Start #: field.
6. Press **SAVE TRACE.**

The first filename will be:

XXXYYY15.001

7. Collect the next trace at the 1310 nm wavelength.

The next filename will be:

XXXYYY31.001

8. Collect the next trace at the 1550 nm wavelength,

That filename will be:

XXXYYY15.002

This allows you to document fiber tests in a more meaningful manner.

CAUTION

If no wavelength ID characters are specified, filenames will be automatically incremented by one each time a new save is initiated regardless of the wavelength.

The following are optional methods of entering trace file names for the AutoFilename feature.

For example:

TEST####.TRC

This base would result in filenames starting with TEST0001.TRC (if you enter the number "1" as the Start #), and continuing sequentially to TEST9999.TRC.

The Start # field allows you to select the first number used in the autofilename sequence. The possible values for this field range from 1-9999. The default value is 1. If you are using a dual wavelength module, changing this value will cause the autofilename numbers for both wavelengths to begin with the selected value.

Another example would be:

DENVER.###

In this case filenames would range from DENVER.001 (assuming that Start # is 1) to DENVER.999.

If there is more than one set of "#" characters detected in a base filename, the ***right most*** group is read by the CMA4000 as the place markers for the auto filename number. For example:

FILE##13.###

will result in the first filename being FILE##13.001.

The three character extension is treated as a separate group of characters so that the base name

########.###

will result in the filename ########.001.

Note — It is recommended that you not use "#" in filenames for anything other than place holders for the auto-sequencing number in the base.

You can embed the wavelength into the filename by using the "_" (underscore) character as a placeholder in the base filename. Place one or two underscore characters into the filename and the CMA4000 will replace them with the wavelength used to obtain the trace.

If you place a single underscore character into the filename, the CMA4000 will replace it with the following character:

Wavelength	Replacement Character
850 nm	8
1300 nm	3
1310 nm	3
1550 nm	5

If you place two consecutive underscore characters anywhere in the filename:

Wavelength	Replacement Character
850 nm	85
1300 nm	30
1310 nm	31
1550 nm	15

If more than two consecutive underscores are placed into the filename, all underscore characters after the second will remain unchanged in the final filename.

You can test a fiber at both wavelengths with a dual wavelength module. The number in the "#" placeholder field in the filename will advance only when the wavelength matches that of a previous filename.

The base filename and current filename numbers (for both wavelengths if dual module) are saved in nonvolatile RAM each time the **SAVE TRACE** softkey is pressed. When the CMA4000 is powered down this information is retained. When it is powered up again, the auto-filename sequence will begin where it left off. However, if the base name or the Start # field is changed, the numbering sequence will be reset.

9.6 LOAD TRACE

All types of GN Nettest and Laser Precision trace file formats stored on disk can be recalled and displayed. Besides files saved in the native CMA format, the CMA4000 is able to recall:

- TD-9950 format
- TD-9960 format
- FF-1000, FF-1200, FF-1300 format
- FL-550 format
- TD-1000 format
- FiberWizard format
- TD-2000 format
- TD-3000, TD-3486 format
- GR-196 – Bellcore defined universal trace formats

To recall a trace file:

1. Select the Load Trace option from the Mass Storage Main Menu.

   A directory list of all the files stored on the current selected storage device is displayed.
2. Press **CHANGE DIRECTORY** to obtain a list of available directories on the selected drive if the directory shown is not the one desired.
3. Press **CHANGE DRIVE** to select a new default drive from a list of the available drives.
4. If the Directory or Drive is changed, press the EXIT softkey to gain access to the files in the selected Drive/Directory.
5. Scroll through the list of names using the cursor knob, expansion/contraction hardkeys or arrow keys on the optional keyboard (if attached).
6. Press **VIEW TRACE(S)** to load the file you want as the primary trace.

The CMA4000 will return to the main grid screen.

An overlay trace can be recalled from the Load Trace option, also. The procedure is explained in Chapter 11, under the title *OTDR Mode Trace Overlay.*

If you press the **OVERLAY WITH SETUPS** softkey, the CMA4000 trace parameters will change to match those saved with the selected trace file. The instrument will immediately exit from Mass Storage mode and return to the trace grid screen. When you press the **TEST/STOP** key, the new primary trace will be collected using the overlay trace parameters.

9.7 DELETE FILE(S)

You can select files for deletion from a directory list of all the files stored on the current selected storage device.

To delete a trace file:

1. Select the Delete File option from the Mass Storage Main Menu to display a directory list of all the files stored on the selected storage device. The first file in the list is highlighted.

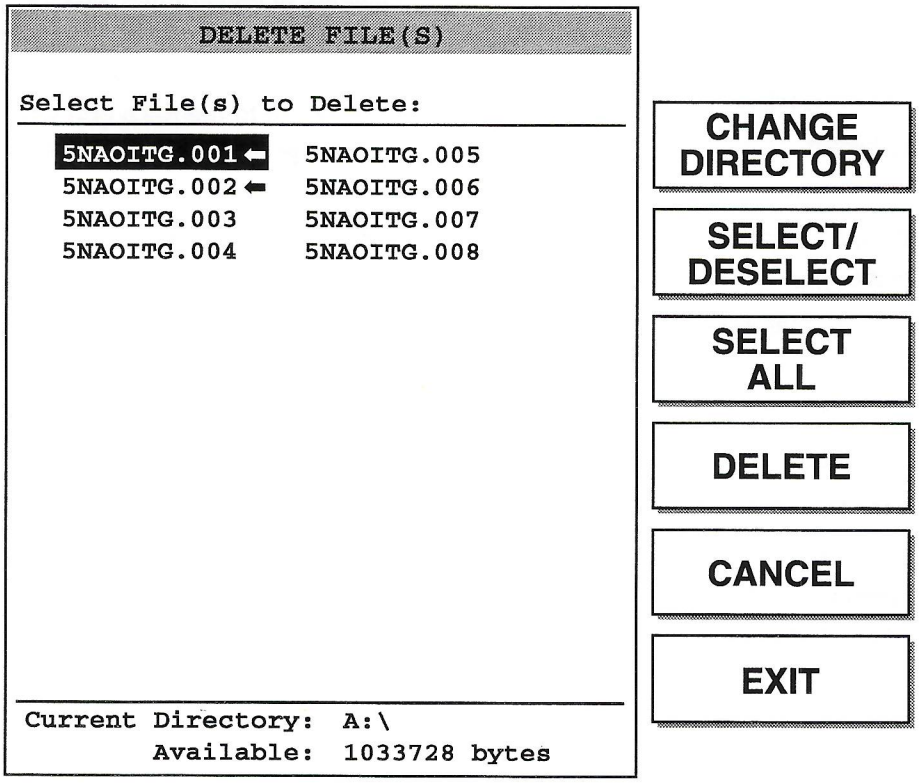


Figure 9-2 Delete File(s) Screen

2. Press **CHANGE DIRECTORY** to obtain a list of available directories on the selected drive if the directory shown is not the one desired.
3. Press **CHANGE DRIVE** to select a new default drive from a list of the available drives.
4. If the Directory or Drive is changed, press the EXIT softkey to gain access to the files in the selected Drive/Directory.
5. Scroll through the list of names using the cursor knob, expansion/contraction hardkeys or arrow keys on the optional keyboard (if attached).
6. Press the **SELECT/DESELECT** softkey to tag the highlighted file with an arrow on the right to signify that this file has been selected for deletion.
   - Multiple files may be tagged.
   - Press the **SELECT/DESELECT** softkey when a file that has already been selected is highlighted to deselect it.
   - Press the **SELECT ALL** softkey to tag all of the displayed files for deletion. After you press this key the softkey label changes to read **DESELECT ALL** so that all files may be un-tagged.
7. Press the **DELETE** softkey to initiate the deletion process. To exit without deleting any files press **CANCEL**.

9.8 COPY FILE(S)

You can use the Copy File(s) option to copy one or more files from a designated source directory to a specific destination directory.

To copy files on the CMA4000:

1. Select the Copy File(s) option from the Mass Storage Main Menu.
   The following window (Figure 9–3) is displayed with a list of files on the current directory. This will be listed in the `Source Directory` field in the bottom section of the screen.

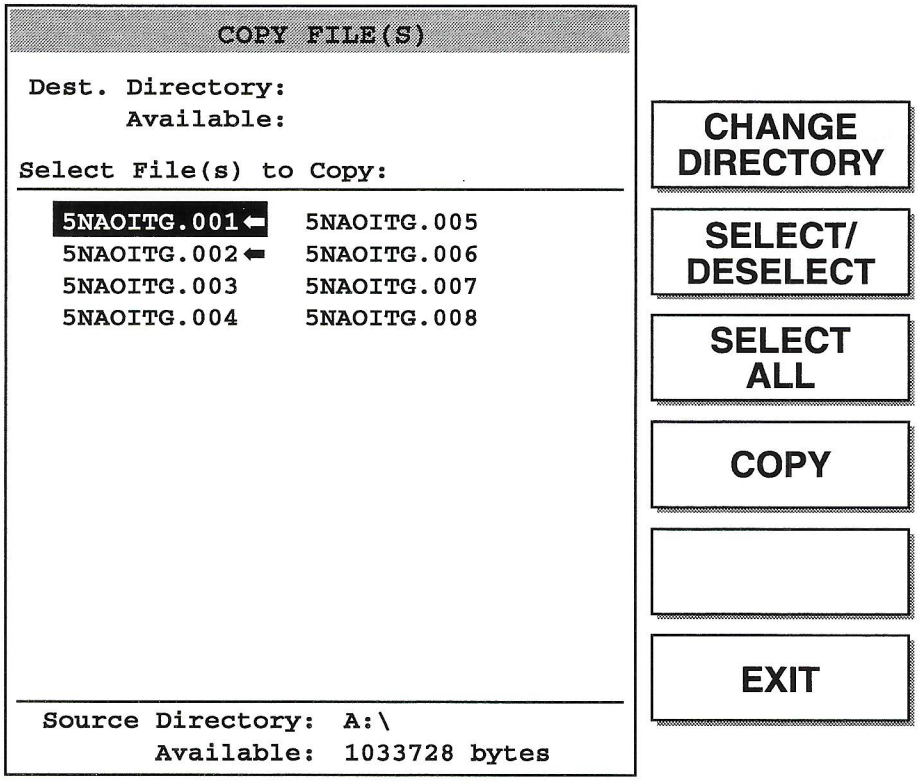
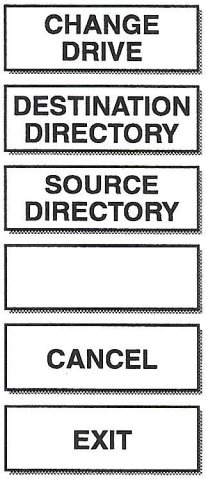


Figure 9–3 Copy File(s) Screen

2. Select a source and destination directory. You can change the `Source Directory` from the current selected storage device. A `Destination Directory` must be selected for the Copy File(s) procedure to work.

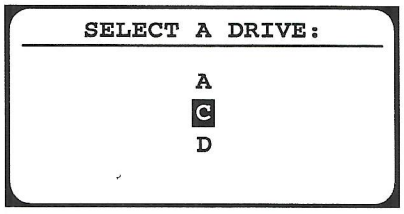
   A. Press the **CHANGE DIRECTORY** softkey. The softkey labels will change to the following:

   B. Press **SOURCE DIRECTORY** to scroll through the available directories on the current storage device.

   C. Select the directory to copy the file(s) from.

   To change the storage device option, press the **CHANGE DRIVE** softkey. The following pop-up menu will appear with the currently selected drive highlighted.

   When the desired drive is highlighted, press the **A/B SELECT** hardkey to lock it in.

   D. Press the **DESTINATION DIRECTORY** softkey.

   E. Select the directory to copy the file(s) to.

   The directory selection process is the same as described in Step C above.

   F. Press **EXIT** to return to the Copy File(s) window with the source directory list displayed.

   Press **CANCEL** if you do not want to save any of the selections made.

3. To select specific files to copy from the source to the destination directory, scroll through the list by rotating the cursor control knob, pressing the expansion and contraction hardkeys or the arrow keys on the optional external keyboard. Press **SELECT/DESELECT** to tag the highlighted file with an arrow to the right of the filename indicating that this file is to be copied to the destination directory. Press **SELECT/DESELECT** again to remove the arrow and un-tag the file. You can select any number of files to copy.

4. Press the **COPY** softkey to start the process.

   To exit without performing the copy, press **CANCEL.**

9.9 DISK SUMMARY

The Disk Summary option on the Mass Storage Main Menu will run an error check on all of the trace files in the selected directory. On completion, a summary of those files with checksum errors, if any, will be presented. The wavelength, pulse width and range for each trace file will also be displayed.

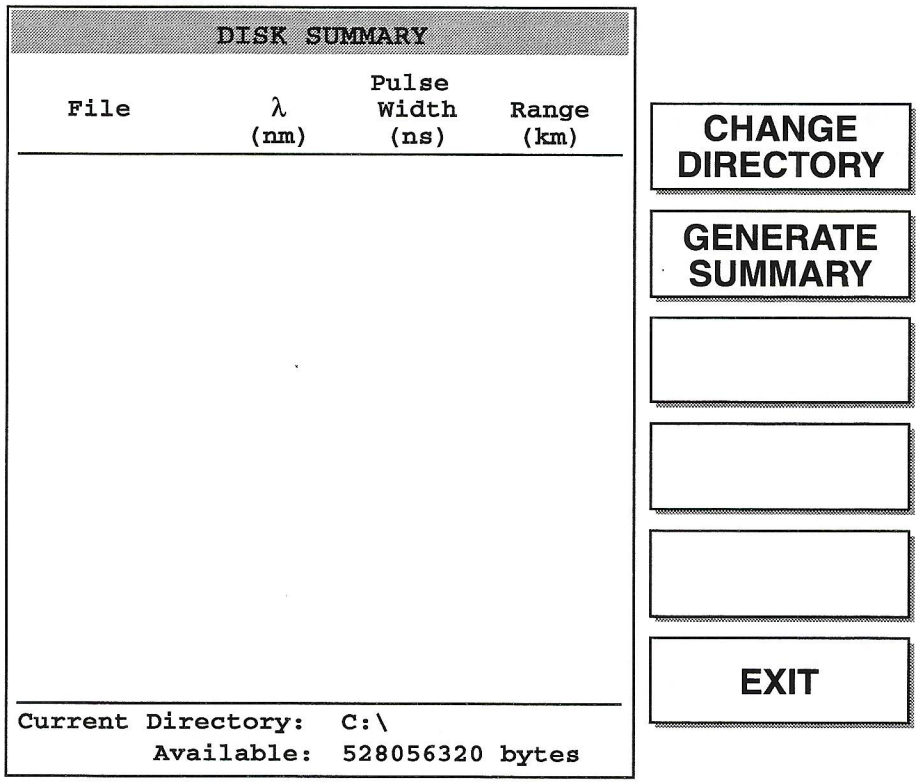


Figure 9–5 The Disk Summary Screen

Press the **CHANGE DIRECTORY** softkey to select and display a different directory or drive.

Press the **GENERATE SUMMARY** softkey when the directory you want to run a summary on is displayed in the `Current Directory:` field.

If the summary information does not fit in one window, the **NEXT PAGE** and **PREVIOUS PAGE** softkeys will be available to scroll through the list.

9.10 RENAME FILE

You can rename a file on any available directory on the CMA4000. Select the Rename File option from the Mass Storage Menu to display the following screen.

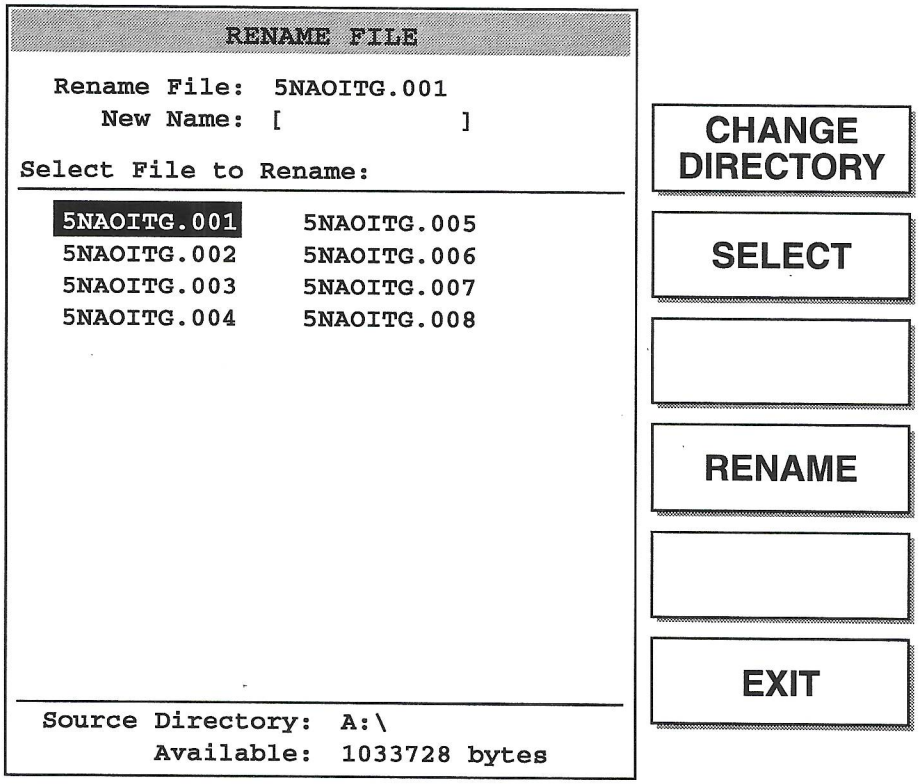


Figure 9–6 The Rename File Screen

To rename a file:

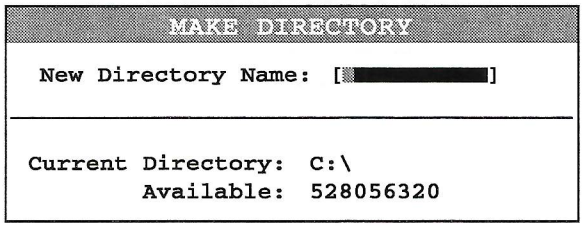
1. Select the Rename File option from the Mass Storage Main menu.
2. Select the file to be renamed. Scroll through the directory using the cursor knob, expansion/contraction hardkeys or arrow keys on the optional keyboard.
3. Press the **SELECT** softkey or the **A/B SELECT** hardkey. The `New Name:` field will be highlighted. The first character space will have a different shade (or color) prompting you to input the new name.

```
Rename File: 5NAOITG.001
   New Name: [                ]
```

4. Input the new filename using the onboard keypad or the optional external keyboard.
5. When the new filename is entered, press the **RENAME** softkey to rename the file. Press **CANCEL** to exit without executing the rename function.

9.11 MAKE DIRECTORY

You can create a subdirectory under the current selected directory using this option from the Mass Storage Menu. When this option is selected, a window displaying the current directory and a field to enter a subdirectory name appears.



Enter a directory name using the built-in keypad or the optional external keyboard. Directory names follow the same conventions as MS-DOS filenames, a maximum of 8 characters, plus an optional 3 character extension.

The **CHANGE DIRECTORY** and **CHANGE DRIVE** softkeys are available if you want to change the selected directory.

Press **MAKE DIRECTORY** to create the new subdirectory under the current selected directory. Press **EXIT** to return to the Mass Storage Main Menu without creating a directory.

9.12 DELETE DIRECTORY

Select the Delete Directory option to delete subdirectories under the current directory.

NOTE — A directory or subdirectory must be empty before you can delete it.

To delete a directory:

1. Select the Delete Directory option from the Mass Storage Main Menu.
   A list of the subdirectories under the current directory is displayed with the first directory highlighted.
2. Select subdirectories to be deleted by scrolling through the list using the cursor knob, expansion/contraction keys or arrow keys on an optional keyboard.
3. Press the **SELECT/DESELECT** softkey to mark the highlighted directory with an arrow to the right. This signifies that this subdirectory has been selected for deletion.
4. Continue to select subdirectories until all the directories you want to delete have been tagged.

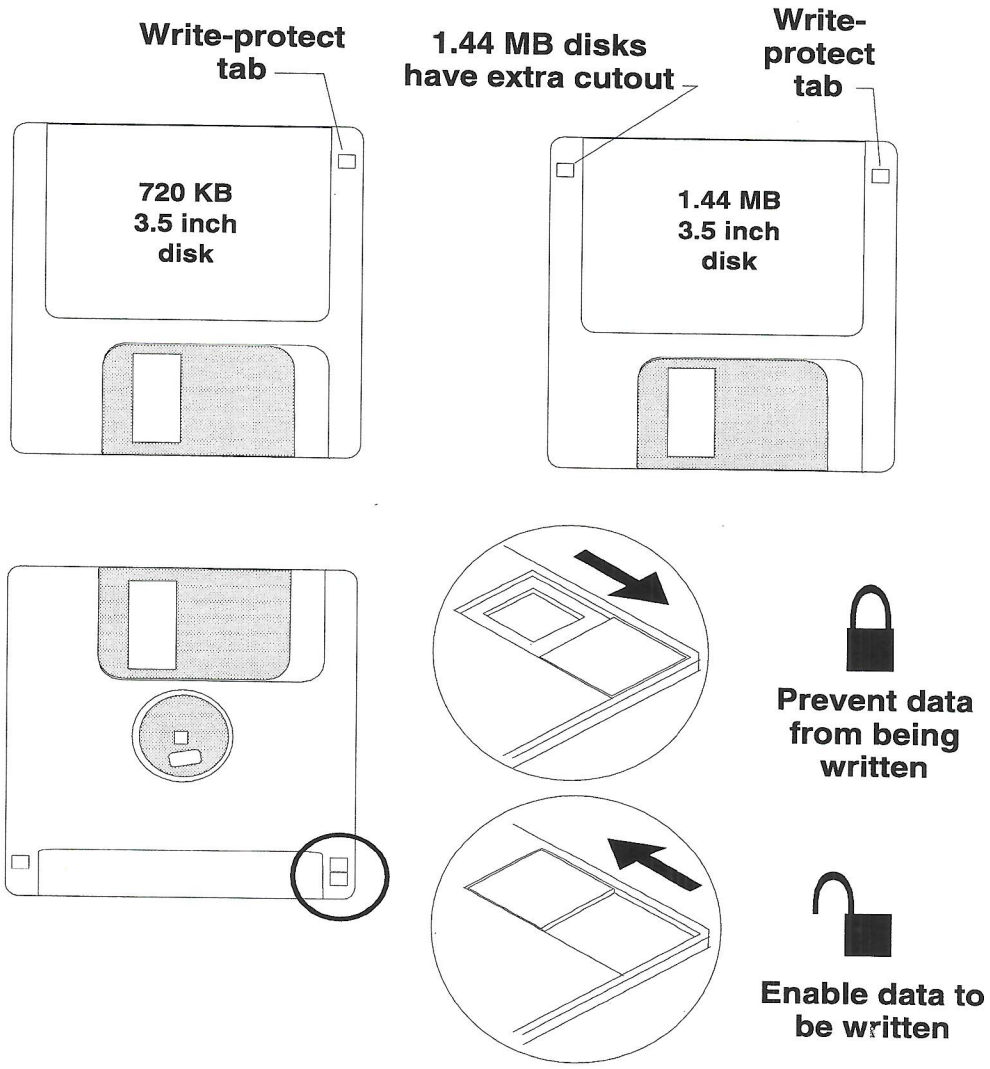
   Note — Press the **SELECT/DESELECT** softkey to deselect a highlighted subdirectory that has already been selected. The arrow will be removed.
5. Press the **DELETE** softkey to initiate the deletion process.
   Press **CANCEL** to exit without deleting any directories.

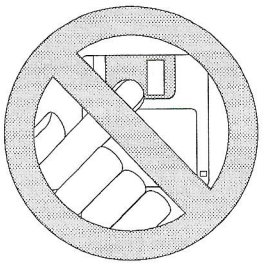
9.13 FORMAT DISK

9.13.1 Handling Storage Media

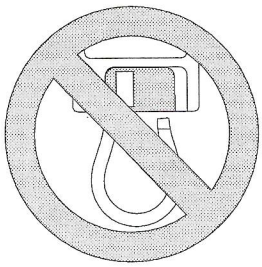
The CMA4000 has a 3.5" Floppy Disk Drive that accommodates both 1.44M or 720K formatted diskettes. Any reliable brand of diskettes can be used.

Use the following precautions when handling the storage media:

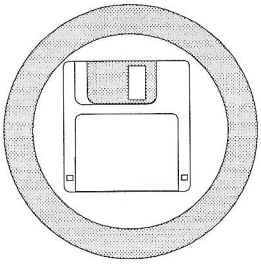




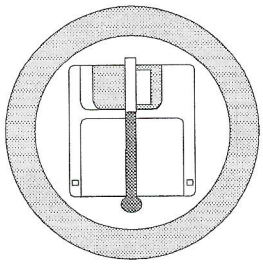
Never Contact Disk Surface



Never Expose to Magnetic Field



Always Protect Disk Surface



Storage Temperature
50-140°F (10-60°C)

9.13.2 Formatting a Floppy Disk with the CMA4000

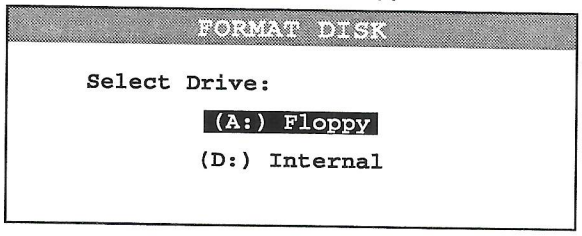
Floppy diskettes need to be formatted before files can be saved to them. You can use pre-formatted DOS floppy disks or format blank disks in the CMA4000 using the following procedure.

CAUTION

Any information stored on a floppy disk
will be erased by this process.

To format a floppy disk in the CMA4000:

1. Insert the disk into the floppy disk drive on the CMA4000.
2. Select the Format Disk option from the Mass Storage Main Menu.
   The following window appears:



3. Select (A:) Floppy. Use the cursor knob, expansion/contraction keys or arrow keys on the optional external keyboard to make your selection and press the **A/B SELECT** hardkey.

   Note — Floppy diskettes used in the CMA4000 may be formatted to store 720K or 1.44 Mbytes of data.

4. Press the **FORMAT** softkey to initiate the process. An icon ( ) is displayed in the Status Window to indicate formatting in progress.

The CMA4000 will inform you when the formatting process is complete.

Chapter 10

Loss Test Set Mode Operation

Not only is the CMA4000 a full-function OTDR, it includes a measurement mode that enables you to utilize the instrument as a Loss Test Set. This mode is available when a test module containing power meter and light source capability is installed. All singlemode versions of the CMA4000 series have an available light source. This makes the CMA4000 an extremely flexible unit for testing optical transmitters and components.

See Appenix B in this manual for the procedure to attach a fiber optic cable to the POWER METER port before attempting any of the following procedures.

Enter Loss Test Set Mode by selecting the **LOSS TEST SET** softkey from the Operating Mode Selection screen. The message,

```
Calibrating Power Meter

... Please Wait ...
```

will appear in a box in the center of the screen.

The optical power meter port measures light power at the 850 nm, 1310 nm and 1550 nm wavelengths. The instrument will be able to measure optical power in the -55 dBm to +5 dBm range. Measurements up to +20 dBm are possible using a selectable offset value in conjunction with an attenuation device such as the GN Nettest AM-460, 10 dB filter.

The power meter unit of measure is presented in both watts and dBm. Power measurements can be compared using the "store reference" function. In this mode, relative power readings are displayed in dB.

10.1 MANUAL LOSS TEST SET

When the CMA4000 is in Manual Loss Test Set Mode the following screen will be displayed if a reference power has not been entered:

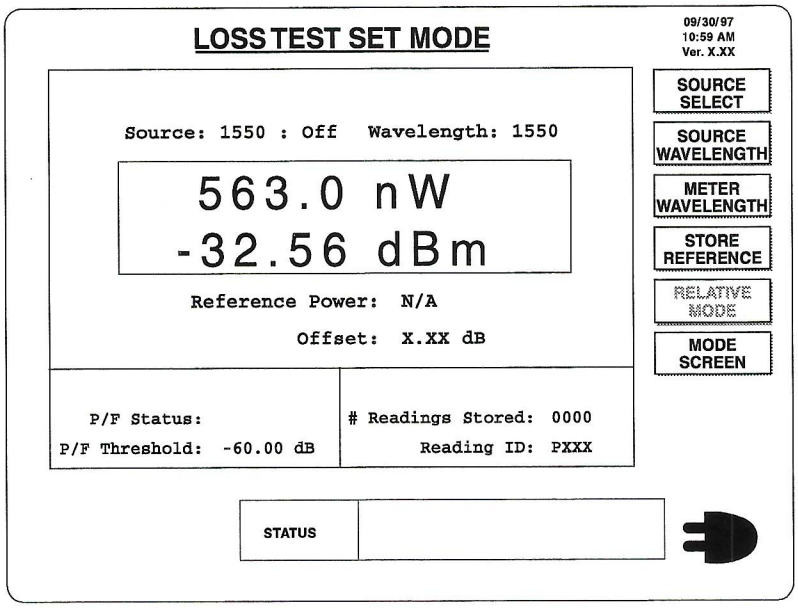


Figure 10–1 Loss Test Set Mode Screen

The center region of this display contains the wavelength and an indication that no reference value has been stored. The user-selected offset value, a number that is added to the actual power meter reading, is also displayed.

When a light source is installed on the CMA4000, the source modulation is displayed in the upper left hand corner of the power meter window. Light sources are available for 1310 and 1550 nm wavelengths. The light source modulation may be set for CW (continuous wave), 1 kilohertz or 2 kilohertz, or the light source may be set to OFF. If no light source is available in the current test module, N/A is displayed in this field.

The Pass/Fail status and Pass/Fail threshold set for the selected wavelength are displayed in the lower left portion of the display.

- When the absolute power meter reading is greater than the Pass/Fail threshold, "**PASS**" will be displayed in the status field.
- When the meter reading value is less than the set threshold, "**FAIL**" is displayed.

The range status of the current power meter reading is displayed in the screen area to the right of the Pass/Fail information.

- If the measured power is greater than +5 dBm (+ offset), the instrument reports >(5 + offset) dBm and "**OVER RANGE**" is displayed.
- If the measured power is less than -70 dBm (+ offset), <(-70 + offset) dBm is reported and "**UNDER RANGE**" is displayed on the screen.

The following feature is a possible future enhancement.
Also displayed in this area of the screen, beneath the range status information, is the number of power meter readings stored and the identification field text for the current reading.

Press the **SOURCE SELECT** softkey. When the readings stabilize press the **STORE REFERENCE** softkey to store a reference value and the Loss Test Set Mode screen will look something like the following:

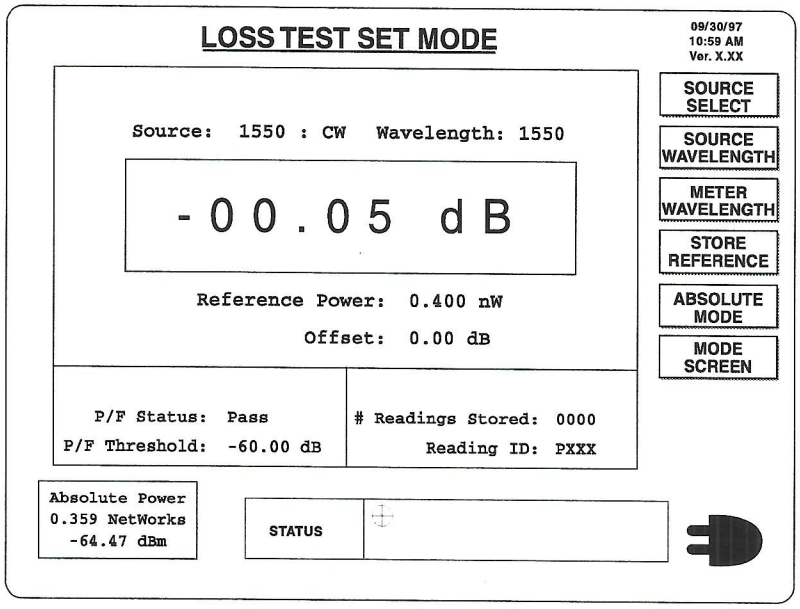


Figure 10–2 Loss Test Set Screen After Storing a Reference Value

The power value in dB is displayed in the box in the center of the screen.

Notice the laser icon in the STATUS window toward the bottom of the screen indicating that the light source is present.

Press the **ABSOLUTE MODE** softkey and the screen changes to look something like the following:

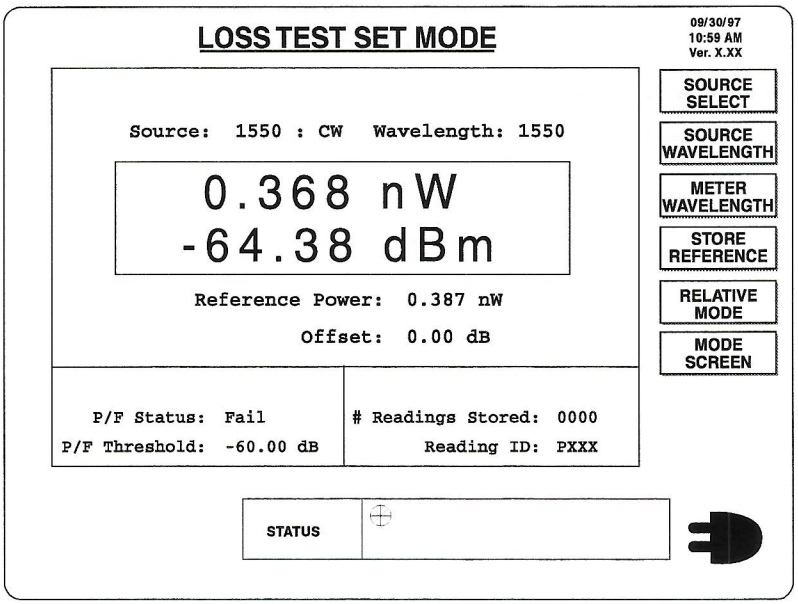


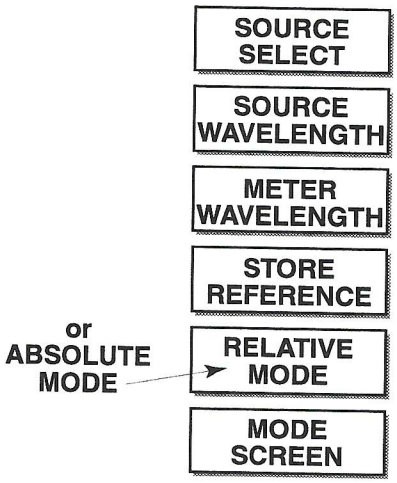
Figure 10–3 Absolute Mode Screen

The absolute power value is displayed in units of dBm and watts in the large box in the center of the screen.

The Pass/Fail status and Pass/Fail threshold set for the current wavelength are displayed in the lower left portion of the display.

10.2 LOSS TEST SET SOFTKEYS

The softkeys displayed in Loss Test Set Mode are:



SOURCE SELECT softkey —

The type of light source modulation is selected. Values are OFF, CW, 1 kHz, or 2 kHz.

If a light source is not available on the current test module plug-in, the text on this softkey will be dim.

SOURCE WAVELENGTH softkey —

Selects the singlemode source wavelength when more than one is available; otherwise dim and non-functional.

When Source Wavelength is changed, the Meter Wavelength will automatically change to match it.

Note — The Meter Wavelength can be changed independently of the Source Wavelength.

METER WAVELENGTH softkey —

Press this key to switch between the three primary wavelengths – 850 nm , 1310 nm, and 1550 nm.

STORE REFERENCE softkey —

The current power meter reading value is stored in the CMA4000 nonvolatile (battery-backed) RAM and the Reference Power field on the screen is updated to dB mode (0.00 dB).

RELATIVE MODE/ABSOLUTE MODE softkey —

This softkey will toggle from Absolute Mode to Relative Mode on the CMA4000. Figure 10–2 depicts a typical Relative Mode screen and Figure 10–3 depicts a typical Absolute Mode screen.

Absolute Mode —

This label will appear when the **STORE REFERENCE** softkey is pressed or if the CMA4000 is in dB Mode.

Relative Mode —

This label will appear only if the CMA4000 display is in dBm/watts mode and if a Store Reference value exists for the current meter wavelength.

MODE SCREEN softkey —

Press this softkey to return to the Operating Mode Selection screen.

10.4 LOSS TEST SET HARDKEY INTERFACE

The CMA4000 hardkeys that are active in Loss Test Set Mode include: λ (wavelength) and **SETUP**. **MASS STORAGE** and **PRINT** are possible future enhancements.

The λ key can be used instead of the **SOURCE WAVELENGTH** softkey to switch the test wavelength.

The **SETUP** hardkey operates the same way it does in other modes. The selections available on the Power Meter Setup Main Menu are Power Meter, Printer, User Preferences and System.

MASS STORAGE – Possible future enhancement.

PRINT – Possible future enhancement.

10.5 POWER METER SETUP

Power Meter Setup can be accessed by pressing the **SETUP** hardkey when the CMA4000 is in Power Meter mode.

With PASS/FAIL enabled, the CMA4000 will automatically check the in-progress power reading against a threshold set for a specific wavelength. If the in-progress power is less than the set threshold, the unit will beep and display a "**FAIL**" message.

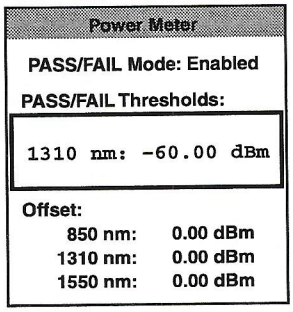
If PASS/FAIL is disabled, no **PASS** or **FAIL** message will appear.

10.5.1 Setting Thresholds

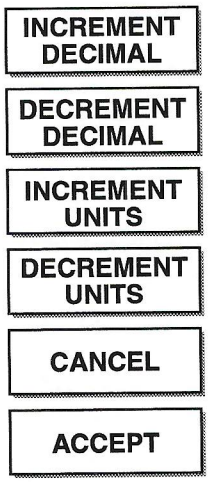
You can set a PASS/FAIL threshold for each wavelength in Power Meter Setup.

To set a PASS/FAIL threshold:

1. Use the up or down arrow key or rotate the cursor control knob to highlight the wavelength you want to set the threshold for.
2. Press **A/B SELECT** or the **SELECT** softkey. A box with the selected wavelength and the threshold for that wavelength appears in the middle of the Power Meter Setup box.



The softkeys change to:



3. Press **INCREMENT DECIMAL** or **DECREMENT DECIMAL** and **INCREMENT UNITS** or **DECREMENT UNITS** softkeys or rotate the cursor control knob to change the threshold value.
4. Press the **ACCEPT** softkey to keep the change or the **CANCEL** softkey to exit the change threshold mode without keeping any changes.
5. Repeat for each wavelength you want to change.

Values for these fields should range between -65 and +20 dB. You will not be able to enter out of range values.

Exit Power Meter Setup by pressing:

EXIT – To keep the changes.
or

CANCEL – To discard the changes you just made. The Loss Test Set Mode screen will be displayed.

10.5.2 Store Reference

The **STORE REFERENCE** softkey provides a means for storing a reference power level when you are using the CMA4000 to make power measurements. The stored value will be subtracted from the power meter reading and the result will be "relative power."

Procedure A –

1. Enter Loss Test Set Mode.
2. Connect a patch cord from the light source (OTDR port) to the power meter (METER port). See *Figure 10–4, CMA4000 Used as Power Meter and Light Source,* for the suggested Store Reference and Test connections, either Single OTDR or Dual OTDR method.
3. Press the **SOURCE SELECT** softkey to fire the laser (one press = CW, two = 1 kHz, three = 2 kHz, four = OFF).
4. Press the **STORE REFERENCE** softkey.
5. Press the λ hardkey or the **SOURCE WAVELENGTH** softkey to change wavelength (if desired).
6. Repeat steps 3 and 4.

NOTE — No 850 nm light source is available on the CMA4000.

Single OTDR Method

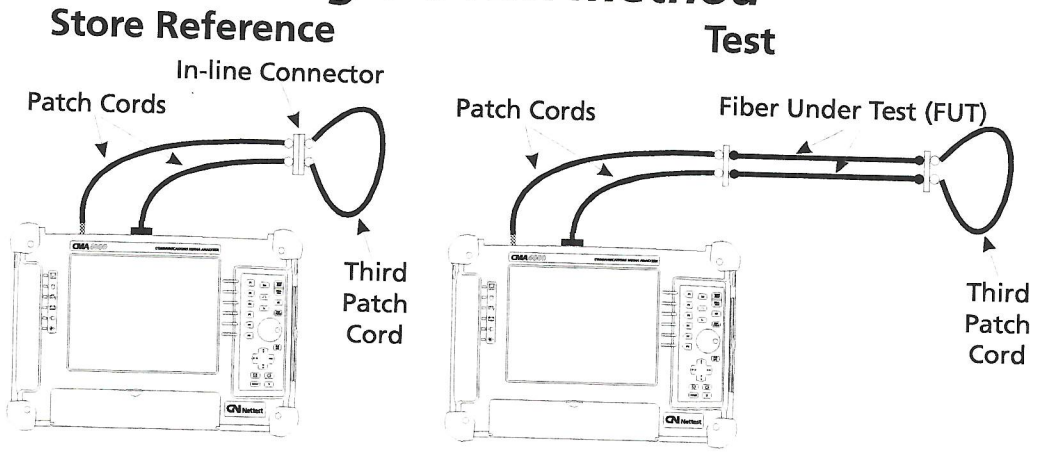


Figure 1

Dual OTDR Method

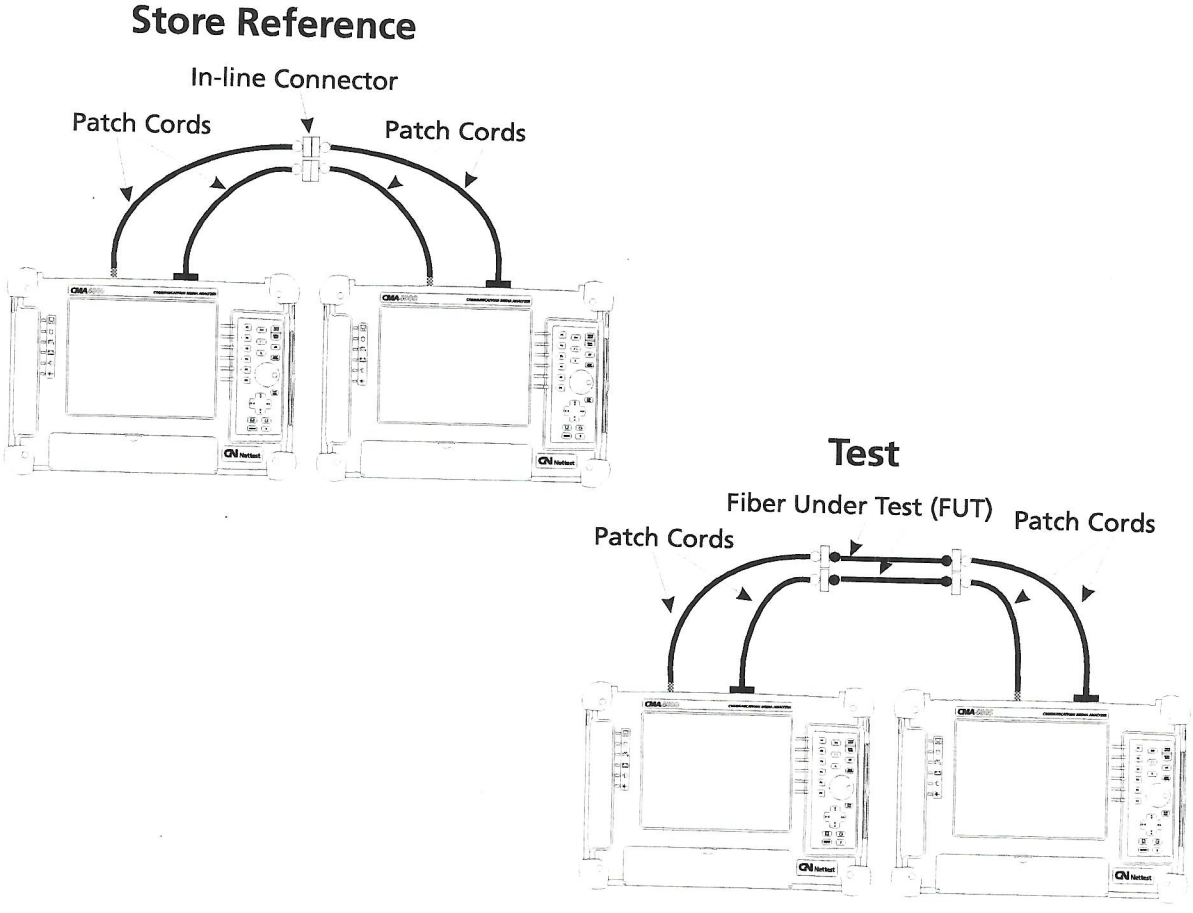


Figure 2

Figure 10–4 CMA4000 Used as Power Meter and Light Source

Procedure B –

1. Enter Loss Test Set Mode.
2. Connect a patch cord from the light source to the power meter (METER port). See *Figure 10–5, CMA4000 With Outside Light Source,* for the suggested Store Reference and Test connections.
3. Be sure the wavelength of the light source and the CMA4000 are the same.
4. Activate the light source.
5. Press the **STORE REFERENCE** softkey.
6. Press the λ hardkey or the **SOURCE WAVELENGTH** softkey to change wavelength (if desired).
7. Repeat steps 3 and 4.

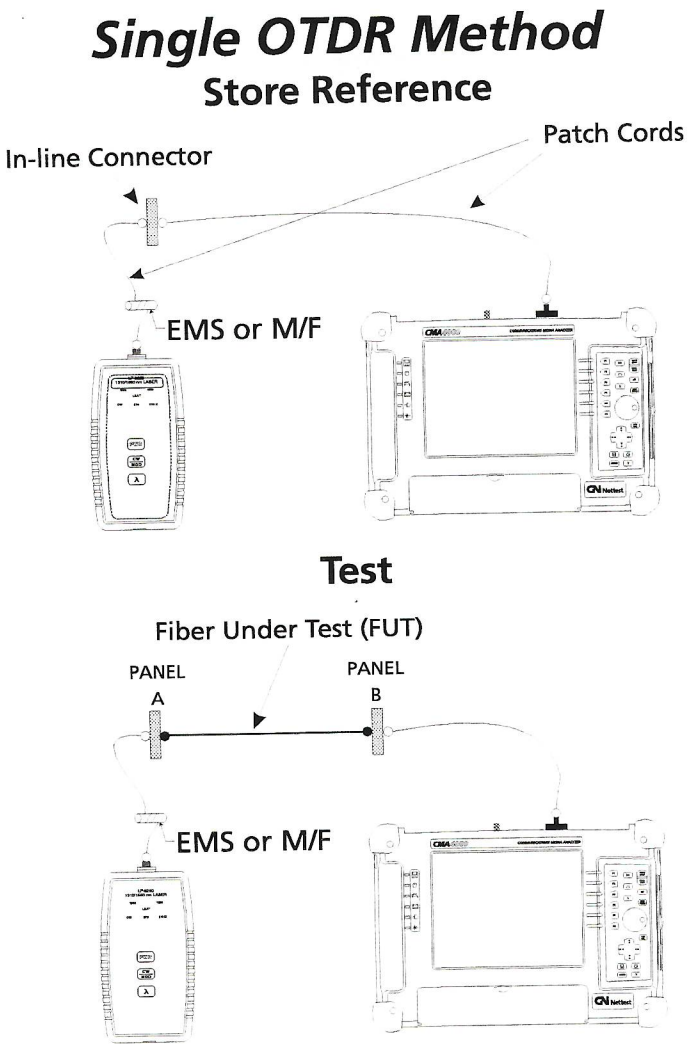


Figure 10–5 CMA4000 With Outside Light Source

Chapter 11

Advanced Features

11.1 OTDR MODE TRACE OVERLAY

Two OTDR traces can be displayed simultaneously on the CMA4000. The foreground trace (primary) is represented by a high intensity line, and the background trace (overlay or secondary) is represented by a low intensity line. On a color monitor the trace lines will be different colors. All parameters displayed on screen during Overlay Trace mode refer to the primary trace.

There are actually three trace buffers on the CMA4000 referred to as the **primary, overlay** and **resultant.**

- A trace produced by the data collect system will be placed in the **primary** buffer. The primary buffer can also be loaded through a Mass Storage Load Trace function or the **SWAP** function (accessed from **TRACE COMPARE** softkey).
- The **overlay** buffer can only be loaded using a Mass Storage function or the **SWAP** function.
- The **resultant** buffer is created from data from a mathematical operation (Delta Compare) in Trace Compare Mode.

11.1.1 Overlay modes

Two types of trace overlay are supported. These are Standard Overlay and Real-time Overlay.

Standard Overlay

In Standard Overlay mode both traces are recalled from disk.

Procedure for Standard Overlay:

1. Press the **MASS STORAGE** hardkey.
2. Select the Load Trace option from the menu. The Load Trace directory is displayed (Figure 11–1).

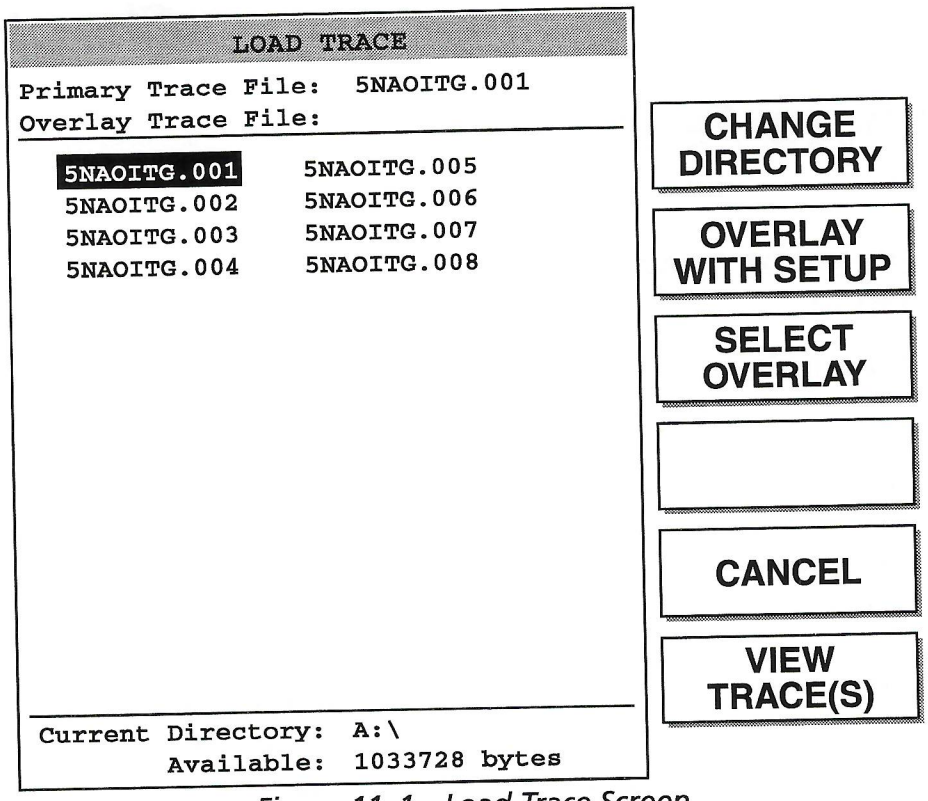


Figure 11–1 Load Trace Screen

Note — The first trace filename on the list will be highlighted and placed in the `Primary Trace File:` field. As you move through the filenames using the Cursor Control Knob or vertical and horizontal arrow keys, the information in the field changes to read the selected filename.

3. Highlight a trace filename and press the **SELECT OVERLAY** softkey. The selected filename is displayed in the `Overlay Filename` field and the overlay buffer is loaded with the selected trace file data.
4. Press the **SELECT PRIMARY** softkey and highlight a second trace filename. This filename is placed in the `Primary Filename` field, and the primary buffer is loaded with the selected trace file data.
5. Press the **VIEW TRACE(S)** softkey. The main grid screen is displayed with both traces displayed.

If you press the **OVERLAY WITH SETUPS** softkey, several things happen.

- The selected trace is loaded as an overlay trace.
- The CMA4000 trace parameters will change to match those saved with the selected trace file.
- The instrument will immediately exit from Mass Storage mode and return to the trace grid screen.
- When you press the TEST/STOP key, the new primary trace will be collected using the overlay trace parameters.

Real Time Overlay

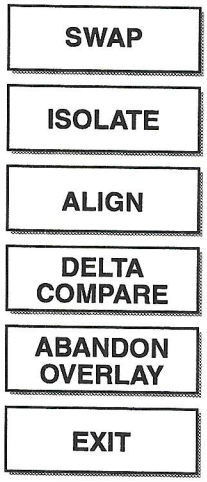
In Real-Time Overlay a trace is recalled from disk into the overlay buffer and a Data collect (with real-time display updates) is performed to load a trace into the primary buffer.

Procedure for Real Time Overlay:

1. Press the **MASS STORAGE** hardkey.
2. Select the Load Trace option from the menu.
3. Highlight a trace filename and press **SELECT OVERLAY**. The selected filename is displayed in the Overlay Filename field and the overlay buffer is loaded with the selected trace file data.
4. Press the **VIEW TRACE(S)** softkey to return to the main grid screen. Notice the trace is dimmed to indicate that it is the overlay (secondary) trace
5. Press the **REAL TIME** or **TEST/STOP** key to initiate a Data Collect. The Data Collect update is loaded into the primary buffer on top of the background trace.

11.1.2 Overlay Functions

When an overlay trace is present, the following functions may be performed by pressing the corresponding softkey: **SWAP, ISOLATE, ALIGN, DELTA COMPARE,** and **ABANDON OVERLAY.**



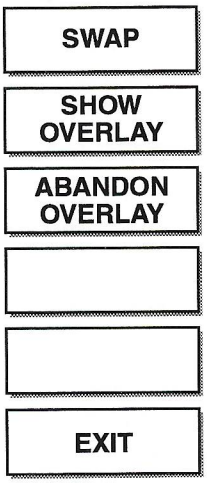
Swap

Press the **SWAP** softkey to exchange the primary and overlay trace buffers. The data and display of the primary and overlay buffers, filenames and icons displayed in the icon row (located just above the trace grid) will all be effected.

Note — Swapping traces with different ranges and lengths or both may also modify the horizontal or vertical expansion values displayed on screen or both.

Isolate

The **ISOLATE** softkey hides the overlay trace leaving only the primary trace displayed. The softkeys will change to



and the overlay trace filename will be replaced with ISOLATED in the upper right of the screen above the trace grid.

- Press the **SHOW OVERLAY** softkey to restore the overlay trace to the display along with the primary.
- Press the **ABANDON OVERLAY** softkey to remove the overlay trace from the background and leave only the primary trace on the screen.

  Note — After this softkey has been pressed, the only way to bring the overlay trace back is to go into Mass Storage and reload the overlay trace from disk.

Align

Press the **ALIGN ON** softkey to automatically line up the primary trace data with the overlay trace data. The overlay trace will be shifted vertically by the difference between the data point value of the primary trace at Cursor A and the data point value of the overlay trace at Cursor A. The traces will not be aligned if you are in Display From Origin mode.

Press the **ALIGN OFF** softkey a second time and the traces will no longer be aligned.

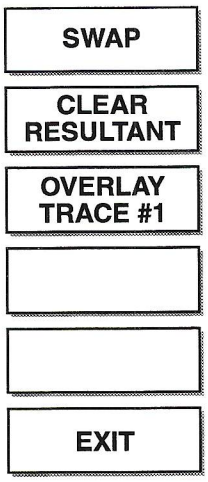
Delta Compare

The Delta Compare function is used to detect any changes in a fiber over a period of time. You begin with the two traces to be compared displayed in Trace Compare Mode – one as the primary trace and the other as the overlay trace. A new resultant trace is created when you press the **DELTA COMPARE** softkey. A Delta Compare icon is displayed in the icon row above the grid to signify that the trace is a resultant trace.

Note — A fiber that has not changed will display a straight line across the middle of the screen.

The Delta Compare feature will only operate on traces with the same range and resolution. If a different range and resolution are present, you will hear a beep when you press the **DELTA COMPARE** softkey and no action will be taken.

The softkeys will change to:



- Press the **SWAP** softkey to switch between the primary and resultant trace.
- Press the **CLEAR RESULTANT** softkey to delete the Delta Compare resultant trace file.
- Press the **OVERLAY TRACE #1** softkey to overlay the primary trace. The softkey name changes to **OVERLAY TRACE #2.** Press this softkey to overlay the secondary trace, that is, the trace originally loaded as the overlay. The softkey name changes to **ISOLATE.** Press this softkey to display only the resultant trace.

11.2 OTDR MODE SMOOTHING

The CMA4000 provides a smoothing filter that is used to remove high-frequency noise from an OTDR trace thereby expanding the dynamic range of the instrument.

The Smooth function filters the trace data between reflections (see Figure 11–2).

You can select a Light, Medium or Heavy filter level in the Quick System Setup window.

Light — Least noise reduction and least distortion.

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

Heavy — Most noise reduction with the most distortion.

Smoothing can be set for automatic execution in the Quick Auto Setup window by setting the Auto Smoothing option to "ON." Smoothing will be run on the trace data as soon as the data collection is complete.

If the Auto Smoothing option is set to "OFF" in the Quick Auto Setups window, the **SMOOTH TRACE** softkey must be pressed to run Smoothing on the current primary trace data.

The Smoothing In Progress icon will be displayed in the Status Window (SMT) while Smoothing is running.

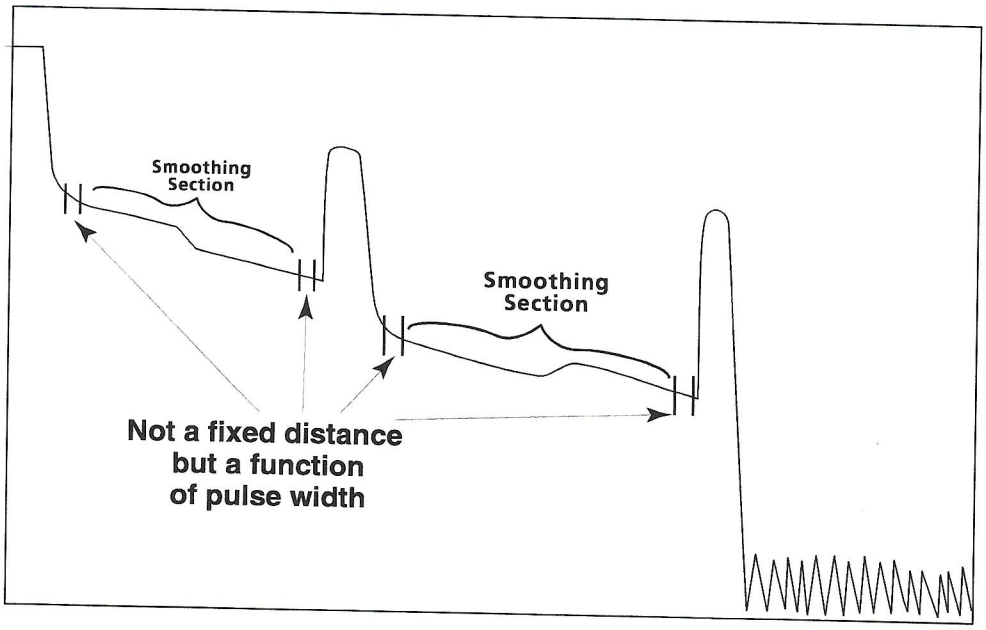


Figure 11–2 CMA4000 Smooth Function

Chapter 12

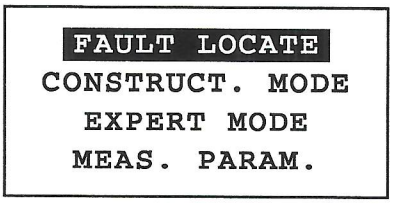
Auxilliary Functions

12.1 HELP MODE

The CMA4000 has a **HELP** hardkey that provides on-line instructions.



Press the **HELP** hardkey or the "H" key on an optional external keyboard to activate Help Mode. A pop-up menu will appear in the upper right of the screen with an index of available help topics.



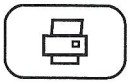
You can select a topic using the up and down arrow keys or the **NEXT PAGE** and **PREVIOUS PAGE** softkeys.

The help text will appear in a box in the center of the screen. When you enter Help Mode for the first time the very top menu item will be selected and the relevant text will be displayed for that topic.

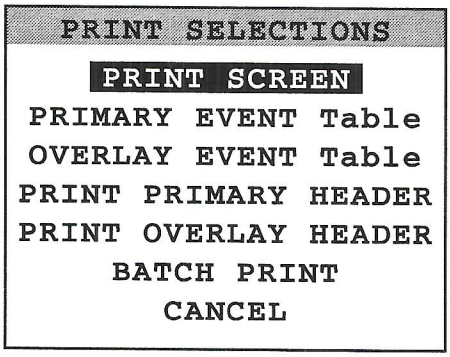
Use the **EXIT HELP** softkey to return to the mode you were working in before entering Help Mode.

12.2 PRINTING

The CMA4000 provides a **PRINT** hardkey.



Press the **PRINT** hardkey to display the Print Selections menu:



Move the highlight up or down using the up and down arrow keys. Press the **A/B SELECT** hardkey to select a highlighted menu item.

12.2.1 Print Screen

The current screen display image is sent to the active printer port specified in Printer Setups (see section 4.3.2). If any other fields (trace parameters, event table, header) are enabled in setups, this information is printed immediately following the screen print.

12.2.2 Primary Event Table

The analysis information for the current primary trace is printed ***without*** a copy of the trace grid. The entire Event Table is printed, not just the information displayed on the screen.

12.2.3 Overlay Event Table

If the Event Table for the Overlay trace is present it can be printed using this softkey.

12.2.4 Print Primary Header

Prints just the current primary trace header information.

12.2.5 Print Overlay Header

Prints just the overlay trace header if available.

12.2.6 Batch Print

Possible future enhancement.

12.2.7 Cancel

Select CANCEL to return to the previous state of the instrument without executing a print function.

After a print function has started an icon indicating printing in progress is displayed in the Status Window.

Press the **CANCEL** softkey if you want to terminate the print process.

Press the **EXIT** softkey

12.3 VISUAL FAULT LOCATE OPTION

The CMA4000 can be equipped with an optional visible light source giving the instrument the ability to function as a visual fault locator. See *Figure 2–4 CMA4000 Top View* showing the Visual Fault Locator option labelled **Item 13.**

— WARNING —
Class 2 Laser.

— WARNING —
Laser Radiation.
Do not stare into beam.
Class 2 laser product

12.3.1 Accessing

From the CMA4000 Operating Mode Selection screen press the **VFL** softkey to enter Visual Fault Locate Mode. The Visual Fault Locate Mode screen will appear – see Figure 12–2.

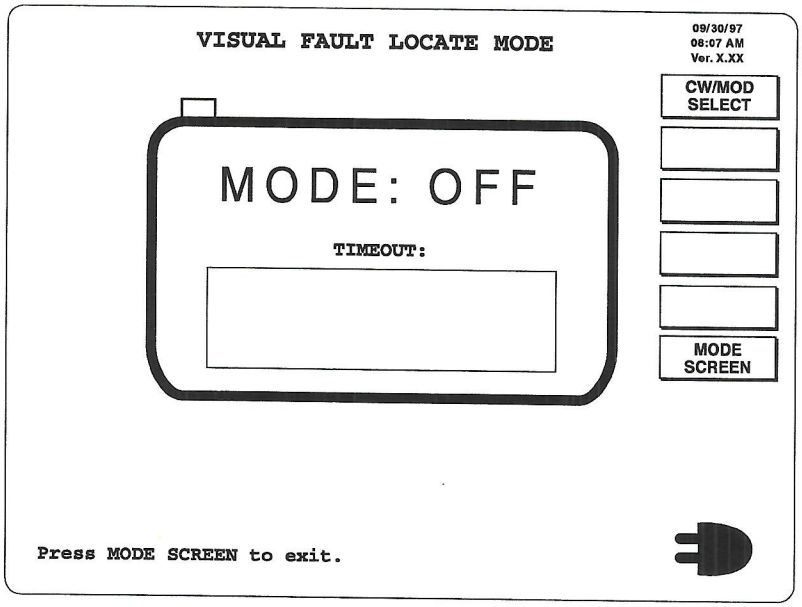


Figure 12–2 Visual Fault Locate Mode Screen

Only two softkeys are available in this mode Press the **CW/MOD SELECT** softkey to enable the light source and the Timeout feature. See Figure 12–3 for an example of the Visual Fault Locate Mode screen after this button is pressed once.

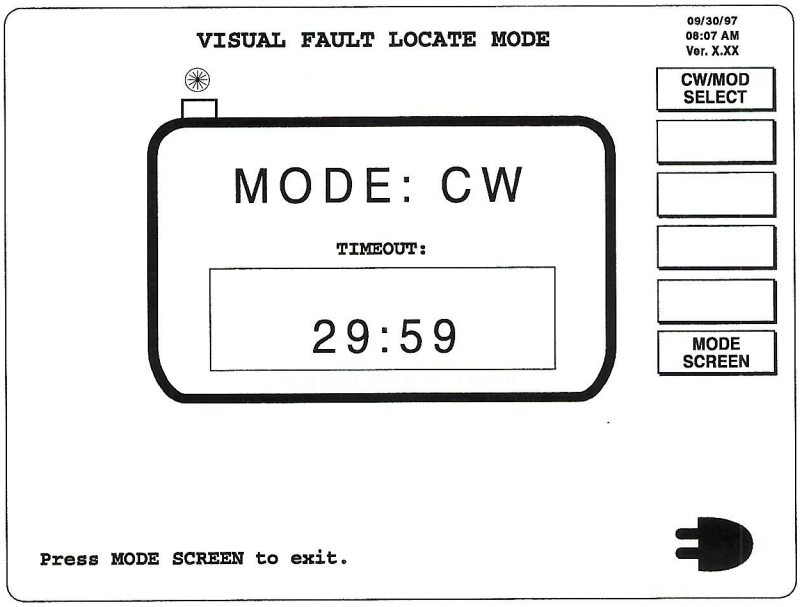


Figure 12–3 Light Source On

12.3.2 Timeout Feature

The Timeout feature in Visual Fault Locate Mode automatically turns the laser off after 30 minutes or 10 minutes if the CMA4000 is operating on batteries.

If you want to reset the timer, with the Timeout clock displayed press the **CW/MOD SELECT** softkey three times.

12.3.3 VFL Modes

Press the **CW/MOD SELECT** softkey to change the state of the light source. The three states available for the Visible Light Source are `CW`, `MOD` and `OFF`.

- CW, or Continuous Wavelength, is a steady stream of light through the fiber.
- MOD (2HZ), or modulation mode, turns the light source on and off 2 times per second.
- OFF, the light source is inactive.

NOTE — When the visible light source is on, either in CW or MOD operation, a laser icon will flash on and off in the upper left corner of the screen.

12.3.4 Exit VFL Mode

Press the **MODE SCREEN** softkey to return to the CMA4000 Operating Mode Selection screen. The visible light source is automatically turned off regardless of the state of the instrument. It will remain off until you reenter VFL mode and press the **CW/MOD SELECT** softkey again.

Appendix A

CMA4000 Specifications

Display	VGA LCD Display (8.4" color or 8.2" monochrome)
Mass Storage	Up to 125 traces internal storage. Over 65,000 traces with optional hard drive, 3.5 inch 1.44 MB floppy disk drive standard (Traces stored in DOS format)
Stored Data Points	16,384 maximum
	Group Refractive Index Setting 1.400000 - 1.699999
Loss Modes	ORL, 2-point, 2-point LSA, dB/distance, dB/distance LSA, LSA splice, Reflectance
Trace Compare Modes	Overlay, Bi-directional, Delta trace compare, Real Time
Data Acquisition	Real Time, Fast Scan, Medium Scan, Slow Scan, Timed Average (user selectable)
Information Output	Trace display, FAS event table, integrated trace display with event information window, header page, measurement parameters
Analysis	High speed integrated fiber analysis
Vertical Scale Setting	0.125/0.25/0.5/1/2/4/8 dB (module dependent)
Horizontal Scale Settings	0.001 km/div. to 1.18 km/div. @ 8 km; 0.001 km/div. to 37.64 km/div. @ 256 km
Interfaces	Standard: Integral alpha-numeric keyboard, (2) RS-232 Serial, (1) Parallel, VGA, Mouse, External Keyboard Port
Language Capability	English standard (others per request)
Physical Dimensions & Weight	9" H x 15" W x 3.5" D (22.86 x 38.10 x 8.89 cm) / 10.7 lbs. (4.85 kg) Includes mainframe, battery and one module.
Power	Power Supply 92-132 VAC, 47-63 Hz (weight 1.7 lbs. [.77 kg]) 184-264 VAC, 47-63 Hz
	Battery Sealed Lead Acid Battery Pack
	Battery Life ≥ 4 hours (color, OTDR mode)
	≥ 6-8 hours (monochrome, OTDR mode)
	≥ 1-2 hours (laser source)

Environmental

	AC Power	Battery
Operation:		
Temperature	-15°C to 50°C (5°F to 122°F)	0°C to 40°C (32°F to 104°F)
Humidity	70% RH max. non-condensing	95% RH max. non-condensing
Maximum Altitude	50,000 feet	50,000 feet
Storage:		
Temperature	-25°C to 60°C (-13°F to 140°F)	
Humidity	95% RH max. non-condensing	
Maximum Altitude	50,000 feet	

OPTICAL MODULE SPECIFICATIONS[1]

Models	OPT25	OPT24	OPT23
Center Wavelength	1310 nm ± 20 nm 1550 nm ± 20 nm	1550 nm ± 20 nm	1310 nm ± 20 nm
Fiber Type	Singlemode 9/125µ	Singlemode 9/125µ	Singlemode 9/125µ
Spectral Width (RMS)	1310 nm: ≤10 nm 1550 nm: ≤10 nm	1550 nm: ≤10 nm	1310 nm: ≤10 nm
Dynamic Range[2] (SNR=1)	1310 nm: 36 dB[3] 1550 nm: 34 dB[3]	1550 nm: 34 dB	1310 nm: 36 dB
Initial Reflective[4] Deadzone	1310 nm: 3 meters (typical) 1550 nm: 3 meters (typical)	1550 nm: 3 meters (typical)	1310 nm: 3 meters (typical)
Initial Non-Reflective[4] Deadzone	1310 nm: 15 meters (typical) 1550 nm: 20 meters (typical)	1550 nm: 20 meters (typical)	1310 nm: 15 meters(typical)
Pulsewidth	5 ns to 20µ sec >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		
Distance Readout Resolution	0.0001 km; 0.1 meters >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		
Distance Sampling (range dependent)	0.25, 0.5, 1, 2, 4, 8, 16 meters >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		
Distance Accuracy	0.0025% of distance measurement ± distance resolution ± index uncertainty >>>>		
Distance Range Setting	2/4/8/16/32/64/128/256 km >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>		
Loss Resolution	0.001 dB >>		
Laser Safety	Meets CDRH Class 1 Requirements (Eye Safe) >>>>>>>>>>>>>>>>>>>>		

Models	OPT35	OPT34
Center Wavelength	1310 nm ± 20 nm 1550 nm ± 20 nm	1550 nm ± 20 nm
Fiber Type	Singlemode 9/125µ	Singlemode 9/125µ
Spectral Width (RMS)	1310 nm: ≤10 nm 1550 nm: ≤10 nm	1550 nm: ≤10 nm
Dynamic Range[2] (SNR=1)	1310 nm: ≥ 36 dB[3] 1550 nm: ≥ 40 dB (41.5 dB[3])	1550 nm: ≥ 40 dB
Initial Reflective[4] Deadzone	1310 nm: 3 meters (typical) 1550 nm: 3 meters (typical)	1550 nm: 3 meters (typical)
Initial Non-Reflective[4] Deadzone	1310 nm: 15 meters (typical) 1550 nm: 20 meters (typical)	1550 nm: 20 meters (typical)
Pulsewidth	5 ns to 20µ sec >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	
Distance Readout Resolution	0.0001 km; 0.1 meters >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	
Distance Sampling (range dependent)	0.25, 0.5, 1, 2, 4, 8, 16 meters >>>>>>>>>>>>>>>>>>>>>>>>>>>	
Distance Accuracy	0.0025% of distance measurement± distance resolution ± index uncertainty >>>>	
Distance Range Setting	2/4/8/16/32/64/128/256 km >>>>>>>>>>>>>>>>>>>>>>>>>>>	
Loss Resolution	0.001 dB >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	
Laser Safety	Meets CDRH Class 1 Requirements (Eye Safe) >>>>>>>>>>>>>>>>>>>	

Notes:

1. All measurements made using FC/SPC connectors at 25°C (77°F).
2. Subtract approximately 2 dB for range to 98% peak noise. Bellcore TR-TSY-000196 Issue 2 Section 4.1.2.
3. Using 20µs pulsewidth. Bellcore TR-TSY-000196 Issue 2 Section 5.1.5.
4. Using Bellcore TR-TSY-000196 Issue 1. Deadzones measured on -45 dB reflections.

Our equipment is constantly being improved. Hence, specifications are subject to change without notice.

MULTI-TEST FUNCTIONS

Dual Source (singlemode optics only; factory installed)

Wavelength	4403:1310/1550 ± 30 nm 4413: 1310/1550 ± 20 nm
Output	-10 dBm
Transmission Mode	CW, 1 KHz and 2 KHz
Output Fiber	9/125µm, SM fiber
Optical Connector	Same as OTDR
Modes of Operation	CW, 1 KHz and 2 KHz
Stability	± 0.2 dB (8 hours)
Spectral Width	Same as OTDR
Safety	Same as OTDR

Optical Meter (factory installed)

Detector Type	2 mm Ge
Range	+ 10 to - 50 dBm or + 20 to -40 dBm with AM460 filter
Calibrated Wavelengths	27 total
Resolution	0.01 dB, dBm
Store Reference Mode	Yes
OCWR ORL Option	Yes - with external accessory
Accuracy	4% (± 0.18 dB)
Linearity	± 0.04 dB, + 5 dBm to -50 dBm

Visual Fault Locator (field installed)

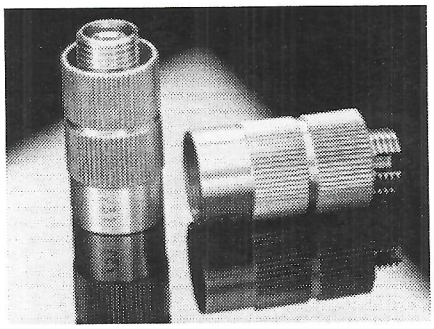
Wavelength	635 ± 10 nm
Output	0 dBm
Transmission mode	CW or 2 Hz
Output Fiber	9/125µm, SM fiber
Optical Connector	FC, SC, ST - fixed connector
Safety	IEC 825 Class 2, FDA (21 CFR 1040. 10 class 2)

Appendix B

Connecting to the CMA4000

This appendix has critical information for proper use of the CMA4000. Some of this information will be second nature to experienced fiber optics technicians, so a quick but careful reading will be sufficient. For new users, we recommend an in-depth examination of the following procedures and, whenever possible, an actual physical test.

UNIVERSAL CONNECTOR AND ADAPTER – INSTRUCTIONS FOR USE



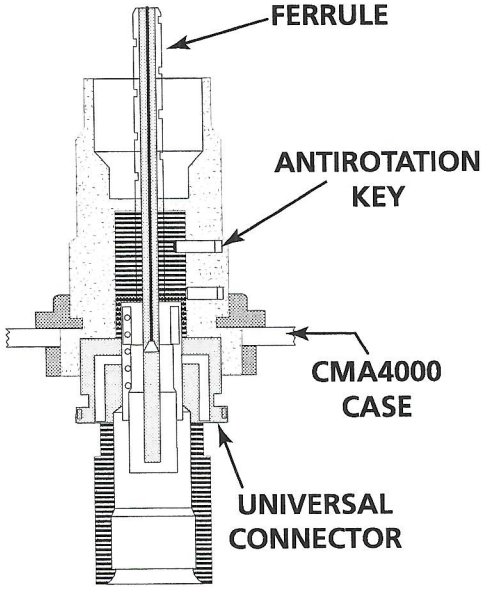


Figure B–1 Universal Connector

UNIVERSAL CONNECTOR

The universal connector (Universal Fiber Optic Interface) is an interface to the CMA4000 that accepts adapters for all fiber connector types. The universal connector's dust cap protects the ferrule's tip from dust, dirt or damage which could affect measurement results.

Standard equipment supplied with the singlemode CMA4000 is a super-polish ferrule. Optional is a Universal ultra or angled-polish. The angled-polish Universal adapters are designed for angled-mating requirements. Part numbers range from UC-130-01 to UC-130-70.

Standard equipment supplied with the multimode CMA4000 is a 62.5m, SPC-polish ferrule. Other core sizes, 50m or 100m, can also be supplied if requested.

Procedure to clean the ferrule tip prior to switching on the CMA4000:

1. Remove the dust cap
2. Blow the ferrule tip with compressed air.
3. Wipe the ferrule tip clean with a precision cleaning tissue moistened with isopropyl alcohol.
4. Blow the ferrule tip dry with compressed air.
5. MAKE SURE that the instrument is switched off and inspect the ferrule using a hand microscope or magnifier. It should appear as in the picture below right.

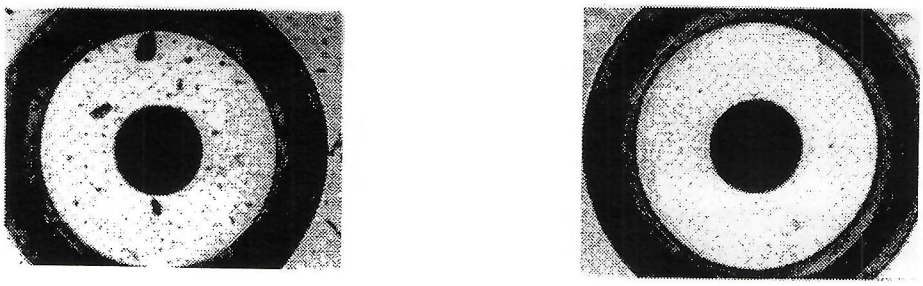


Figure B–2

Contaminated Ferrule Tip *Clean Ferrule Tip*
(Both photographs are 200X magnification)

Universal Adapter

It is advisable to clean the universal adapter using a round nylon brush or a cleaning tissue and compressed air before mounting it on the universal connector.

CAUTION

Do not attempt to engage the universal coupler and adapter at an angle.
Keep alignment as straight as possible.

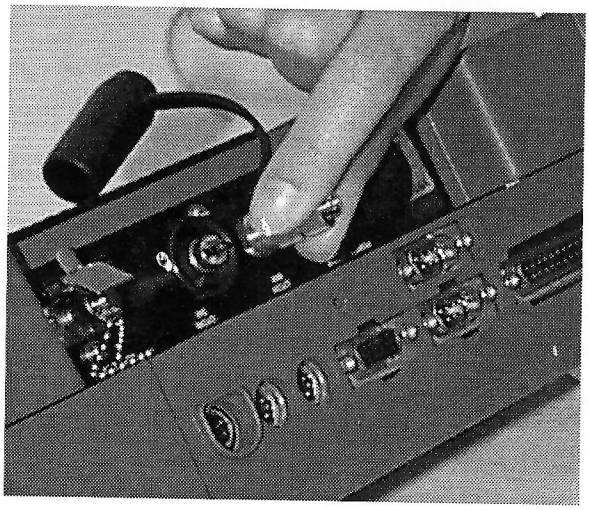


Figure B–3 Attaching the Universal Connector Adapter

To attach the Universal Adapter to the CMA4000:

1. Remove the protective cap from the ferrule.
2. Be sure the anti-rotation key on the universal connector (see Figure B–1) is engaged in the slot on the universal adapter (see Figure B–4) before starting to screw the coupling nut. You can test this by attempting to turn the adapter gently to ensure that it doesn't move.
3. Turn the coupling nut clockwise to tighten the adapter to the coupler.

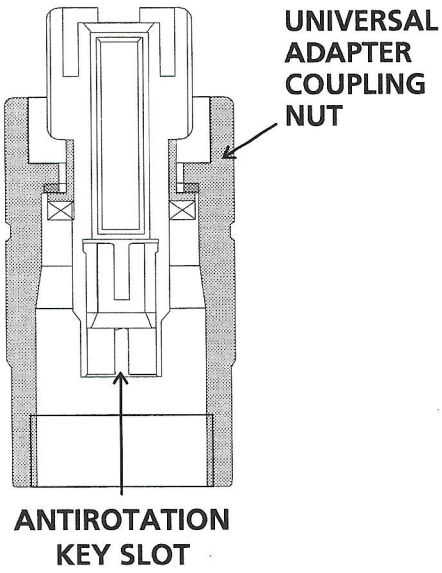


Figure B–4 Universal Adapter

Each connector type, ST, FC, SC-PC, and so on, has a specific adapter sleeve. Most industry-standard connectors can be affixed to an instrument equipped with this interface.

Different adapters are required for angled-polish universal connectors. There are two types of angled connectors available at this writing; Seiko NTT, with a 2.14 mm alignment slot, and Seikoh-Giken (JDS, Alcoa Fujikura), with a 2 mm slot. The Universal A/PC adapter supplied with the CMA4000 has a 2.14 mm key which mates with both connectors.

Mating the Patchcord to the Universal Adapter

The connector from the system to be measured should be cleaned using the procedure described in the previous section before mating it to the universal connector and adapter.

Once again, straight alignment is the key to avoiding damage to the sleeve in the universal adapter. No force should be necessary to mate the system connector to the universal adapter. You may feel slight resistance. The connection should be snug.

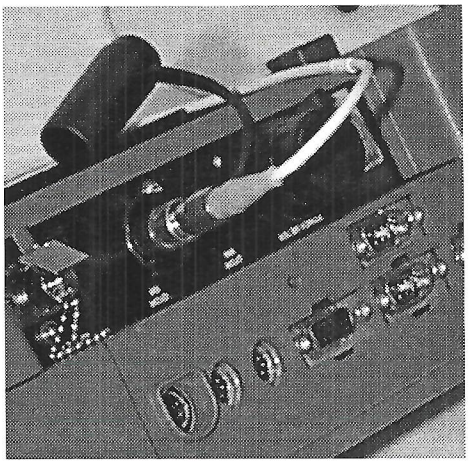


Figure B–5 Patchcord Connected to OTDR Port

Keep the optical fiber as straight as possible, also. Radial force on the connector due to fiber optic cable weight will then be minimized.

NOTE — Never force the connector ferrule or insert it at an angle into the adapter. USE GUIDED INSERTION.

The Power Meter Connector

The Power Meter connectors should be cleaned when normal backscatter signal levels cannot be obtained.

To clean optical connectors, you will need the following:

- ❑ isopropyl alcohol
- ❑ a can of compressed air
- ❑ fiber optics cleaning swabs
- ❑ fiber optics cleaning wipes

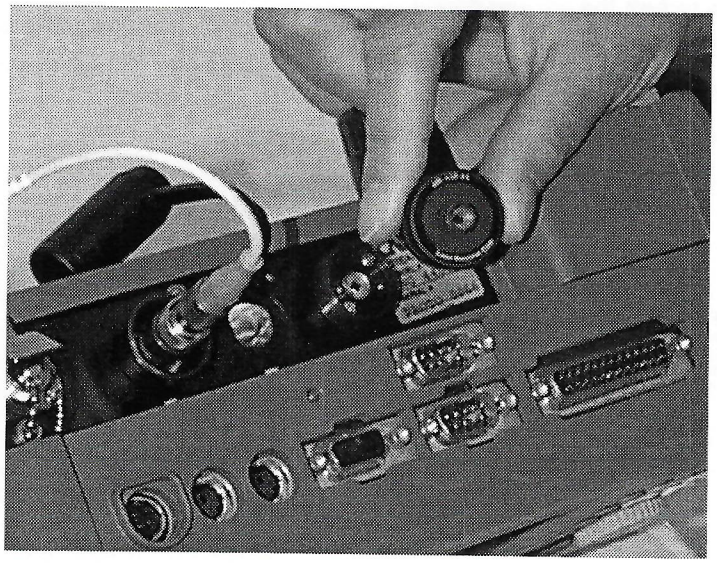


Figure B–6 Power Meter Connector and Adapter Cap

Handling the Power Meter Connector:

Optical fibers, especially singlemode fibers, are susceptible to loss from microbends or other stress. To ensure accurate, repeatable measurements, the fiber lead attached to the meter must be positioned to minimize mechanical strain. See Figure B–7.

1. Remove the dust cap from the detector housing at the top of the CMA4000 and screw on the appropriate connector adapter (AM-430-05 to AM-430-90).
2. Secure the fiber being tested to the connector adapter. Be sure to clean the test fiber before connecting it to the connector adapter.

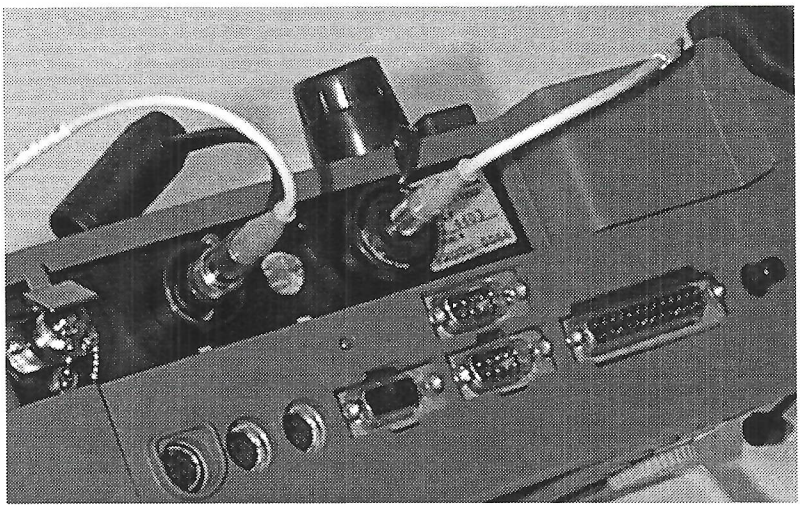


Figure B–7 Patchcord Connected to Power Meter Port

Cleaning the Power Meter Connector:

The power meter connector located on the top of the unit should be cleaned if you can see contaminant. It is not necessary to perform this procedure with each use.

1. Remove the adapter (AM-430-05 to AM-430-90).
2. Moisten a lens-cleaning wipe with isopropyl alcohol and gently wipe the detector.
3. Hold a can of compressed air approximately 2" from the power meter connector and blow air into the connector once or twice.
4. Clean all threads on the adapter cap
5. Reconnect the adapter cap to the CMA4000.

   Note — Avoid hand contact with the power meter connector.

Appendix C

Creating A Custom Header

IMPORTANT INFORMATION ABOUT HEADERS

Headers hold valuable information about the trace file which may save a considerable amount of time and aggravation. For instance, if you ever need to recall a trace for comparison with a new trace acquired for fault location, having information such as the type of OTDR used, the serial number of the unit, the patchcord length used, and any other pertinent data, could save hours in determining the exact location of the fiber break.

If the standard header does not meet your needs, you can easily create a custom header template using the procedure in this appendix.

Only files with an extension of **.HDR** are available when the option appears in the softkeys.

CREATING A CUSTOM HEADER

A Custom Header can be created using any text editor on a PC as long as the file is saved in a text format with the suffix **.HDR**.

To create a Custom Header:

1. Start your text editing application.
2. Type the custom header template text using the following guidelines:
    - Line length limited to 50 characters
    - Maximum of 12 lines of text per page
    - Maximum of 10 pages
    - Any typed text will appear on screen each time the header is used
    - The symbol "@" creates an editable field in the header template. This information will appear every time the header template is used. It can be changed only by typing over it.
    - The symbol "$" creates a text field. This will be blank on the header template. New information can be typed in.

See Figure C– 1 for an example of a text screen used to create the template **PRACTICE.HDR.**

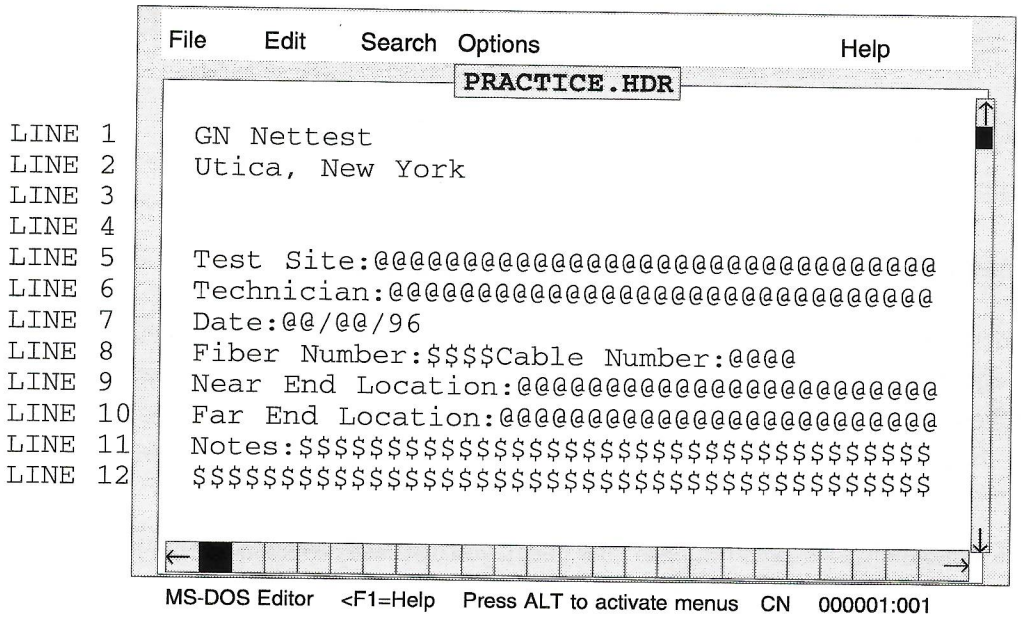


Figure C–1 Header Template As Entered in DOS Edit

4. Save the new header template to a DOS formatted disk.

The file name can be eight characters of your choice. The suffix **.HDR** must be added so the CMA4000 software will recognize the file when you enter the Select New Header mode.

5. Insert that disk to the CMA4000 and follow the Copy File(s) procedure in section 9.8 to copy the custom header template to the CMA4000 memory or hard drive.

The custom header will be available the next time you perform a Save Trace function.

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