Model 100XP
Meter-Master Pressure Recorder
(with external pressure sensor)

Operating Instructions

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Chapter One

GETTING STARTED

1.1 About The Meter-Master Model 100XP

The METER-MASTER MODEL 100XP Pressure Recorder is a battery-powered, portable, electronic pressure recording instrument. A rocker switch toggles the recording on/off. The current pressure may be checked at any time without interrupting a recording session. The durable, ABS/polycarbonate case includes an integral handle that allows the instrument to be chained for security. The pressure sensor is located external to the recorder case. The pressure sensor includes an electronic connector and cable for attaching to the recorder and a 1/4" NPT male fitting (or as otherwise specified) for attachment to pipe fittings. The recorder is submersible, easy to set up, and highly accurate. Standard sensors are not submersible; however, submersible sensors are available as an option.

Twenty different recordings at different locations may be made before downloading. Memory capacity provides 1.5 days to 3 months of recording time before downloading. A double memory option is available. Recording time depends on the size of the data storage interval you select. Recording automatically stops when the memory is used up; the recorder will not overwrite.

The pressure data is logged into memory for later downloading and analysis on your PC. The Model 100 Program software functions with the Meter-Master recorder and provides a variety of report and graph options. Data may also be exported into other widely used software, such as Lotus®, Excel®, Quattro Pro®, WordPerfect®, and MS Word®. The Model 100 Program also offers a real-time 3-D graphic display of the current pressure level.

Two internal 2 volt, lead-acid, rechargeable batteries power the unit. A nonrechargeable lithium battery version is also available. Because the rechargeable batteries release small quantities of gas when overcharging occurs, there is a low-pressure relief valve on the back of the unit which enables the gas to escape (not included with lithium version). Batteries are recharged by using the battery charger provided; recharging completely discharged batteries takes at least 14 hours. Continuous AC operation is available via the battery charger (not included with lithium version). With proper care, the rechargeable batteries should last a minimum of three years.

Important Before using the Model 100XP for the first time, be sure to read the next section, "Meter-Master Care And Maintenance".

Meter-Master products are durably built for long, accurate service in accordance with military quality standards. Each unit is manufactured at our factory and shipped ready for operation.

All instruments are warranted for two years from either the date of purchase or the date of manufacture. Maintenance agreements are available following the initial two year warranty period.

1.2 Meter-Master Care And Maintenance

The Model 100XP requires a minimum of care and maintenance. However, as a piece of electronic equipment powered by internal, rechargeable batteries, several points should be kept in mind.

➔   **Keep Batteries Charged.** (This section does not apply to lithium version.) Lead-acid battery life is maximized when the batteries are maintained in a charged condition as often as possible. Complete discharging of lead-acid batteries can result in their permanent damage. Although Meter-Master batteries should last a minimum of 3 months after being fully charged, whenever possible, connect the Meter-Master to the battery charger when the Meter-Master is connected to the computer and always recharge the batteries after each use if time permits. Leave the Model 100XP connected to the charger whenever it is not in the field.

Because the Model 100XP is built to power-down when it senses low battery power, the batteries are protected from complete discharge during normal operation. However, after a power-down due to low battery power, do not allow the Meter-Master to sit for more than 7 days without recharging.

The Model 100XP uses battery power whether it is recording or not. Do not store the Meter-Master in a discharged condition unless it is connected to the battery charger. Store the instrument either fully charged or, preferably, connected to the battery charger. If not connected to the charger while in storage, remember to recharge the batteries at least once each month.

A battery charger is furnished with the Meter-Master. It has been selected as optimal for this application. Other chargers may not provide the same level of battery performance.

➔   **Avoid Needless Submersions.** Although the Meter-Master is sealed to resist water intrusion, care should be taken to avoid needless submersion. If the unit is chained inside a pit, ensure that it can float up to the top if the pit fills with water. If water accumulates inside the unit, it should be returned to the factory for service.

➔   **Handle Cables With Care.** To ensure long cable life, handle cables carefully and avoid attempting to insert a cable into the wrong receptacle on the front of the unit. Each connector has a unique number of pins and two channel guides for proper connector mating. Each cable should seat easily into the receptacle; never try to push or press a cable into place. (NOTE for rechargeable units: Although the RS232 cable and battery cable have a different number of pins, the RS232 cable can be mistakenly plugged into the Meter-Master battery connection. No damage will result.)

➔   **Handle Degraded Batteries With Care.** Lead-acid batteries contain sulfuric acid. If contact is made with the acid, immediately flush the area with water. A good neutralizing solution for sulfuric acid is household baking soda in water. Dispose of lead-acid

batteries with automotive battery scrap at an authorized reclaimer. Under normal circumstances, battery replacement will be performed at the factory.

1.3 Installing The Model 100 Program Software

> *IF YOU HAVE AN INFRARED CONNECTION ON YOUR COMPUTER (E.G., PALM PILOT OR MS ACCESS SYNC): Any infrared connection must be disabled when using Meter-Master software.*

The Model 100 Program for Windows software is designed to run on Windows 3.1, 3.11, 95, 98, NT, 2000, ME, and XP. As a minimum, your computer should have a Pentium processor, 16MB RAM, and 100MB free hard disk space. A minimum of 32MB of RAM is recommended.

While the Meter-Master software has been designed to run on a network, it does not work in all network environments and is not currently supported by F. S. Brainard & Co. in a network environment. If you encounter a Meter-Master software problem while operating on your network, reinstall the Meter-Master program on a stand-alone computer.

TO INSTALL SOFTWARE

1. **Insert the CD into your computer's CD ROM drive.**

    If the install program does not start automatically, select RUN from the Windows Start menu ("File" menu in Windows 3.1) and type "E:\setup" (without quotes) in the Open text box. (Replace "E" with the drive letter of your CD ROM.)

2. **Click OK Or Next To Continue. Follow The Onscreen Commands.**

    When finished, the setup program will create Meter-Master icons and prompt you to reboot your computer.

3. **Open The Meter-Master Program.**

   Select the Meter-Master for Windows program group and then double-click on the MMV31 icon.

4. **Review Communication Port Settings.**

    After loading the software, you must tell the Meter-Master program which serial port you will be using to attach the Meter-Master RS232 cable. The default is COM 1.

5. Confirm Communication With The MM100XP.

Update Screen

Connect the unit to your computer's serial port with the RS-232 cable provided. Click on "Update Screen" on the Main Screen of the Model 100 Program. "Pressure Recorder is Connected" should appear on the screen just above "Update Screen".
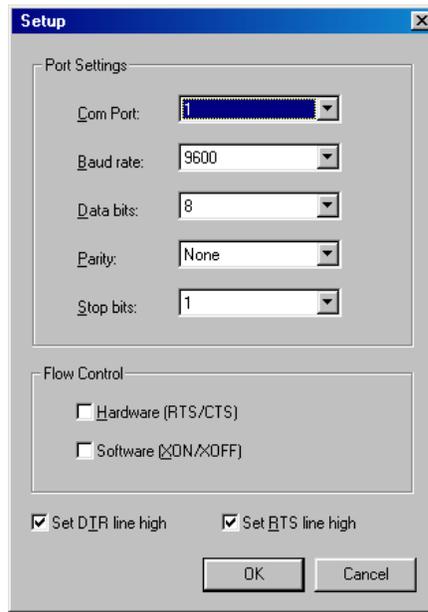
The Port Settings may be changed at any time by clicking the "Setup" menu bar option at the top of the Main Screen and choosing "Port" (the Meter-Master does not have to be connected). The default baud rate is 9600.

   The default Port settings are: Com Port: 1; Baud Rate: 9600; Data Bits: 8; Parity: None; Stop Bits: 1; RTS/CTS: Off; XON/XOFF: Off; DTR: High; RTS: High.

If you are unable to complete any of these steps, see Chapter 5, "Troubleshooting".

1.4 MM100XP Specifications

- **Size:** 8.6" x 5.4" x 2.1" (225 mm x 139 mm x 54 mm).

- **Weight** (including internal batteries; excluding cables): 3.75 lbs. (1.7 kg).

- **Portable, Submersible, Electronic Recorder**: No moving parts or charts.

- **Pressure Sensor:** Ranges from 0-5 psi to 0-20,000 psi. Standard sensors are not submersible. Submersible sensors are available as an option.

- **Detachable 6' External Electrical Cable** for connection to the pressure sensor. Pressure sensor has 1/4" NPT male fitting (alternate fittings available as options).

- **Easy-to-Use On/Off Rocker Switch** design to toggle recording on/off.

- **LED Signal Light** integral to the rocker switch indicates power on.

- **Durable ABS/Polycarbonate Case** with integral handle to chain unit for security.

- **Capacity to Make 20 Records:** Recording can be started/stopped 20 times before downloading. Brief records of less than one data storage interval in length are ignored.

- **Variable Data Storage Interval:** 5 interval settings: 1, 5, 10, 30, and 60 seconds.

- **Data Storage Capacity:** 130,000+ intervals. Provides the following recording periods: 1 second interval = 1.5 days; 5 sec. = 7.5 days; 10 sec. = 15 days; 30 sec. = 45 days; 60 sec. = 90 days. Recording stops when memory is used up; unit will not overwrite. Double memory option is available.

- **External Battery or AC Operation** for extended recording time (not applicable to lithium battery version).

- **Internal Power:** 2 rechargeable lead-acid, 2 volt, 5 amphour batteries. Internal battery life (approx.): 3+ months. Relief valve allows battery gases to escape when overcharging occurs. Nonrechargeable lithium battery version is available.

- **Low Battery Power-Down:** Automatically stops recording and powers-down when battery is low to preserve recorded data and avoid battery damage.

- **Overnight (14 hours) Battery Charging**.

- **Computer, Minimum Requirements:** Receptacle for RS232 cable (9 pin or adapter); Windows: 3.1, 3.11, 95, 98, NT, 2000, ME, XP; Pentium processor; 16MB RAM; 100MB free hard disk space. (Program files use 12MB of hard disk space; swap space plus real memory should be at least 30MB.) Any infrared connection (Palm Pilot, MS Access Sync) must be disabled when using Meter-Master software.

- **Presentation Capability:** Multiple built-in graph/report options, exports easily to other applications such as MS Word, Excel, Lotus, Quattro Pro, etc.

- **Units Of Measure:** PSI, Feet, Metres, Bars, Kilopascals.

- **Realtime Display** shows current pressure on your computer without interrupting recording.

- **Compatible With Other Meter-Master Products**. The 100XP uses the same Model 100 Program version 3.0+ as does the Model 100EL flow recorder.

- **Temperature Compensation** is calibrated under environmental conditions at the factory.

- **Resolution:** 4 significant digits (psi).

- **Pressure Offset to Account for Current Atmospheric Pressure:** Zero pressure set in field by depressing rocker switch for 20 seconds or by software command.
- **Pressure Media:** Materials compatible titanium.
- **Accuracy, Combined Non-Linearity/Hysteresis:** ± 0.25% of full scale.
- **Repeatability:** ± 0.1% of full scale.
- **Log Term Stability:** ± 0.2% of full scale.
- **Media Temperature:** – 50° to 120° C maximum.
- **Ambient Temperature:** – 40° to 80° C maximum.
- **Temperature Effect Zero:** ± 0.03% °C.
- **Temperature Effect Span:** ± 0.03% °C.
- **Humidity (sensor):** ± 95% relative humidity.
- **Two Year Warranty**.

Chapter Two

COLLECTING DATA

## 2.1 Making A Recording

IN THE OFFICE BEFORE A TEST

1. Verify That The Meter-Master Rocker Switch Is In The OFF Position.

The rocker switch on the Meter-Master toggles the recording on/off. It does not turn the power on/off. The Meter-Master's power is always on, unless it has powered down due to low battery charge because the charger was not connected for 3 months, or, in the case of lithium batteries, the batteries require replacement.

2. Confirm Battery Charge And Memory Available.

Connect the MM100 to the computer and enter the Model 100 Program. Click on "Update Screen" to refresh the information on the Main Screen and confirm connection to the MM100. If "Meter-Master is Not Connected" appears on the Main Screen, see Section 5, "Troubleshooting". The screen displays the remaining battery charge (lead acid, rechargeable battery version) and remaining data storage capacity of the connected Model 100XP.
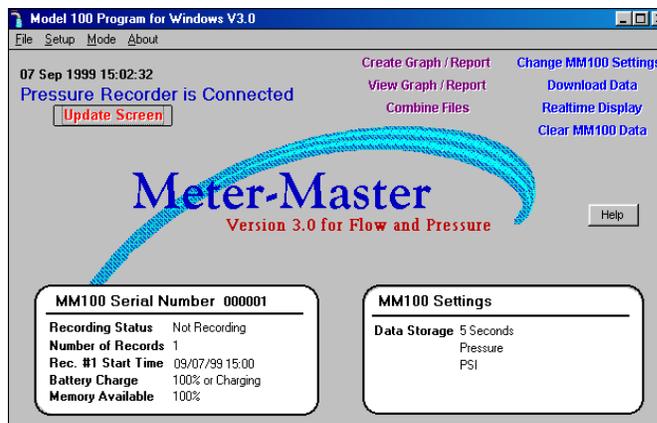
Lead acid batteries last approximately 3 months with a full charge. Whenever possible, connect the charger to the Meter-Master so that the batteries remain as fully charged as possible.

The number of days of recording time permitted by the available memory depends on the Data Storage Interval (see box later in this section, "About The Data Storage Interval").

> ***When First Turning On The Instrument During Or After Recharging From A Power-Down State:*** *Make sure to depress the ON side of the rocker switch completely. There is a 3 minute delay while the electronics settle before the signal light appears that marks the beginning of the recording session. The 3 minute delay only occurs if the unit has powered-down due to a low battery charge. In normal use, this should not occur.*

To Access The Model 100 Program:

1. Connect the Model 100XP to your computer and enter the Model 100 Program.
2. Enter the Model 100 Program by selecting the Meter-Master for Windows program group and then selecting MMV31.
3. Once the Main Screen appears, click on "Update Screen".
4. Check to ensure that "Pressure Recorder is Connected" appears at upper left of the Main Screen. If the screen indicates that the Meter-Master is not connected, see on-screen "Help" (click on "Help" button) or see Section 5.3 in the Troubleshooting chapter of this manual.

To Clear Meter-Master Memory Of Prior Records:

`Clear MM100 Data`

- Click on "Clear MM100 Data".

To Recharge The Meter-Master Lead Acid Batteries (not applicable for lithium version):

1. Connect the battery charger. (Whenever the Model 100XP is not in the field, it should remain connected to the charger continuously.)
2. Recharge overnight. If the Meter-Master has powered down due to low battery, recharge for at least 14 hours. Power-down is indicated by a 6 second alternating long-short flash on the Meter-Master rocker switch LED when the switch is toggled ON from the OFF position.

3. Select Pressure Range, Unit Of Measure, and Data Storage Interval.

1. Make sure that you are at the Main Screen and that you are connected to the Meter-Master (see above).

`Change MM100 Settings`

1. Click on "Change MM100 Settings".
2. Identify the sensor model (range and unit of measure) and select the desired Data Storage Interval. Click on item to display pull-down menu and see options; click on option to select.
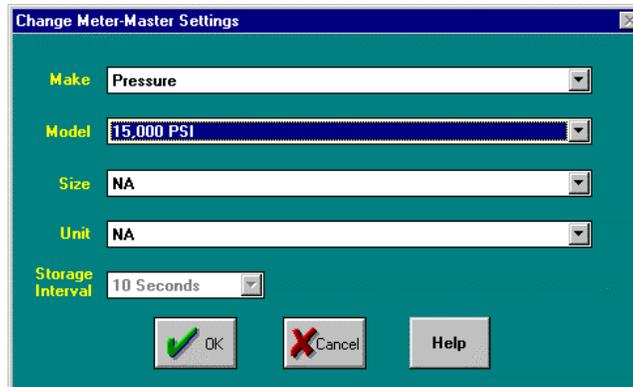
3. Click on "OK" button to save the new settings. Click on "Cancel" button to keep the prior settings. WARNING: clicking on "OK" will erase all data in the Meter-Master!

The MM100XP will store one pressure recording for each time interval selected. (see box later in this section, "About The Data Storage Interval").

Changing the Model 100XP settings also automatically sets the Meter-Master date/time to the computer date/time.

> *Changing The MM100 Settings Erases All Data In The Meter-Master!! Ensure that you have successfully downloaded the data from the prior test(s) before continuing.*

ABOUT THE DATA STORAGE INTERVAL (1, 5, 10, 30, 60 seconds): Determines the resolution of the Meter-Master data file (*.MDB) from which all subsequent graphs and reports are created. This is the resolution of the original data recorded by the Meter-Master in the field: the shorter the interval, the greater the detail possible in subsequent graphs and reports. For example, a data storage interval of 10 seconds samples the pressure once every 10 seconds and allows accurate data analysis for periods of 10 seconds or longer. The Data Storage Interval is chosen before the Meter-Master goes into the field.

This interval effects the size of the data file and the length of time you can record before running out of memory. The same test recorded with a 5 second interval will take up six times more memory in the Meter-Master than one stored with a 30 second interval. The recording times for the 5 intervals are: 1 sec. interval = 1.5 days; 5 sec = 7.5 days; 10 sec. = 15 days; 30 sec. = 45 days; 60 sec. = 90 days.

Choosing the Data Storage Interval: The interval selected depends on the desired resolution of the recorded data. Should you find you want more detail, shorten the interval; if you want to record for longer time periods, lengthen the interval.

ABOUT MULTIPLE TESTS: The Model 100XP can hold up to 20 individual records (brief records of less than one Data Storage Interval in length are ignored). As long as there is still room in the Meter-Master memory for the additional data you wish to collect, you may end a Meter-Master recording, move the Meter-Master to a new location, and then start a new record.

TO BEGIN A TEST

1. **Set Zero Pressure (if necessary).**

   Make sure the Meter-Master pressure sensor is open to the atmosphere. Press the rocker switch ON for about 20 seconds until the LED turns on. (If the LED turns on when you first press the switch, wait until it turns off then on again.) The Meter-Master will take a pressure reading and adjust its zero pressure value accordingly. Turn recording OFF again until you are ready to begin recording. You do not need to zero the pressure again until you are recording in an area where the local atmospheric pressure is meaningfully different. *WARNING: PRESSING THE ROCKER SWITCH FOR 20 SECONDS (AS DESCRIBED ABOVE) ERASES ALL DATA!* Alternatively, you can zero the pressure using the software by selecting "Set zero pressure" under "Setup" on the Main Screen toolbar.

2. **Secure The Pressure Sensor To The Pipe.**

   The Meter-Master pressure sensor comes with a 1/4" NPT male fitting to attach to a pipe fitting. Attach the sensor to the pipe. Alternate fittings are available as options.

3. **Attach The Pressure Sensor To The Meter-Master.**

   Attach the cable provided to the MM100XP and the Pressure Sensor.

4. **Turn Meter-Master Recording On.**

   Press and release the ON side of the rocker switch (with the LED). The switch will automatically return to its center position. The LED will light for approximately 3 seconds indicating that the recording session has begun.

   If the unit was just recharged after a power-down state, recording will start 3 minutes after being turned on in order to allow time for the electronics to settle. When turning the instrument on after it has powered-down, make sure to depress the ON side of the rocker switch completely and then let it return to its center position. In normal operation (unit has not powered-down due to low battery), it is not necessary to push the switch beyond the center position when starting a recording.

   > *Low Battery Signal: If the signal light displays alternating long-short flashes for six seconds, the batteries are low and the instrument has powered-down. Recording is not possible without first recharging the batteries.*

TO END A TEST

1. **Turn Meter-Master Recording Off.**
    Push rocker switch to OFF position.

2. **Disconnect Cable From The Sensor.**
    Release pressure from the sensor. Disconnect the cable from the sensor.

3. **Disconnect Sensor.**

4. **Remove All Equipment From The Site.**

2.2 Downloading Data And Adding Customer Information

The Downloading Data routine transfers Meter-Master data to your computer and enables you to add customer information to the data file. The Meter-Master holds up to 20 records at a time; you may download them in any order and multiple times. The dialog box indicates whether or not each record in the MM100 has been downloaded. The customer information may be edited later when creating a graph or report.

TO DOWNLOAD DATA AND ADD CUSTOMER INFORMATION

1. **Connect The Meter-Master To Computer And, If Possible, To Battery Charger; Enter The Model 100 Program.**

    Click on "Update Screen" to confirm connection to the Meter-Master. "Pressure Recorder is Connected" should appear on the Main Screen. If not, refer to Chapter 5, "Troubleshooting". The Meter-Master should not be recording (rocker switch should be in the OFF position).

    Whenever the instrument is in the office, it is good practice to leave it connected to the battery charger. Batteries last longer if they are charged often and stored attached to the charger.

2. **On The Main Screen, Click On "Download Data" Button.**

    Clicking on Download Data brings up the Meter-Master Download Screen.
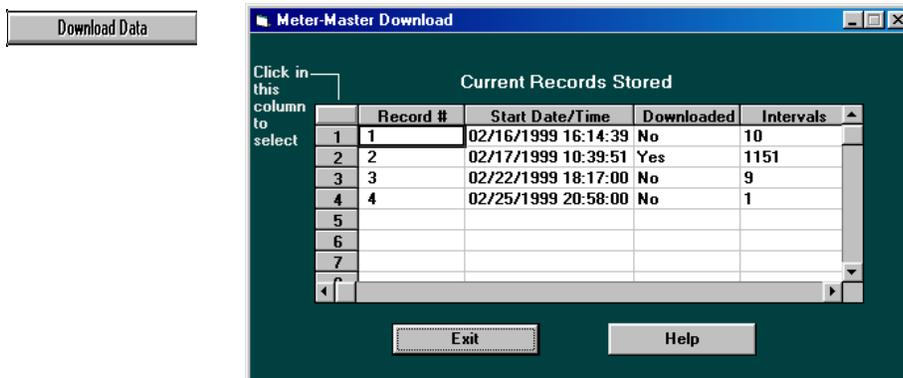
3. **Verify Dates/Times.**

    If any record start date/time is not correct, double click on each incorrect date/time and edit. Make sure you maintain the exact same format. You may also permanently fix the start date/time when you create a graph or report (see Section 3.4, "Data Grid And Customer Information Screen").

4. Select Record To Download.

Click on column to left of record desired. If any short records were created inadvertently, you can identify the record you want by the large number of intervals. A short record will have only a few intervals.

5. Enter File Name.

File names have a maximum of 8 characters; an ".mdb" extension will automatically be added if you do not include one. Do not use an existing file name. Use letters and numbers; do not use the space bar or punctuation symbols. You can download to any directory desired. Click on "OK" when done. (Click on "Exit" if you do not want to continue with the download procedure.) After entering the filename, the data will take a few moments to download.

6. Add Customer Information.

After the record is downloaded into your computer, the Customer Information Screen appears. Use the Tab key or mouse to select items, then enter information. The Customer Information Screen may also be edited later through the Create Graph/Report procedure (Section 3.4). You must enter a "Location/Meter ID"; the program uses this number to identify the file later.

7. Click On "OK" Button When Finished.

8. Repeat Steps 4-7.

Repeat the above routine until all desired records are downloaded, then exit.

9. If Desired, Initialize For Next Test.

Once downloading has been completed, you may prepare for the next recording. If you wish to change the data storage interval, click on "Change MM100 Settings" on the Main Screen to clear current stored records and to initialize for a new test. If the data storage interval is to remain the same, clicking on "Clear MM100 Data" will

clear the current Meter-Master records. If desired, you can store more data without clearing records as long as there is adequate memory available.
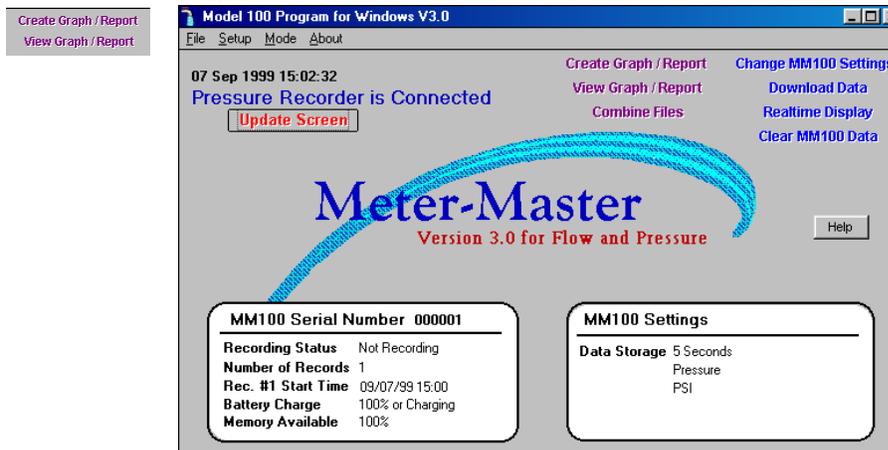
Chapter Three

GRAPHS AND REPORTS

3.1 Overview: Creating, Printing, Saving, Exporting, Viewing

Create Graph/Report: Generates, prints, saves, and exports graphs and reports from a data file in a variety of styles.

View Graph/Report: Displays graphs and reports that you have previously created and saved or exported.

For customizing graphs and for customizing and exporting reports to other applications, see the sections following this one.
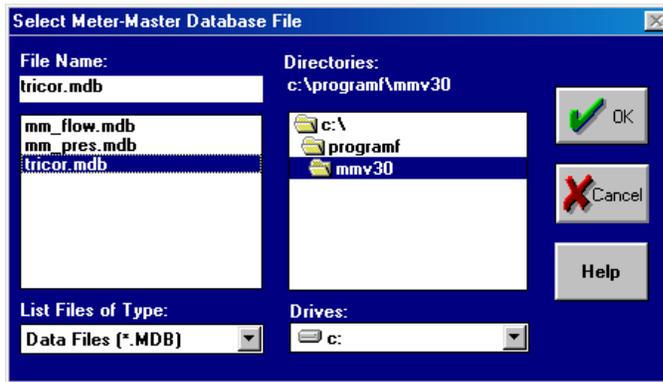
TO CREATE A GRAPH OR REPORT

1. **Enter The Create Graph/Report Procedure by clicking on the Create Graph/Report button on the Main Screen.**

   The Select File Dialog Box appears.

2. **Select The Desired Data File (*.MDB).**

   In the Select File Dialog Box, choose a data file; Meter-Master data files have a *.mdb extension. You may select a file in any drive or directory.

Once you have selected a downloaded file, click on "OK". The Display Options Dialog Box appears.

3. Select Display Options.

The Display Options Dialog Box controls general features of the data display.
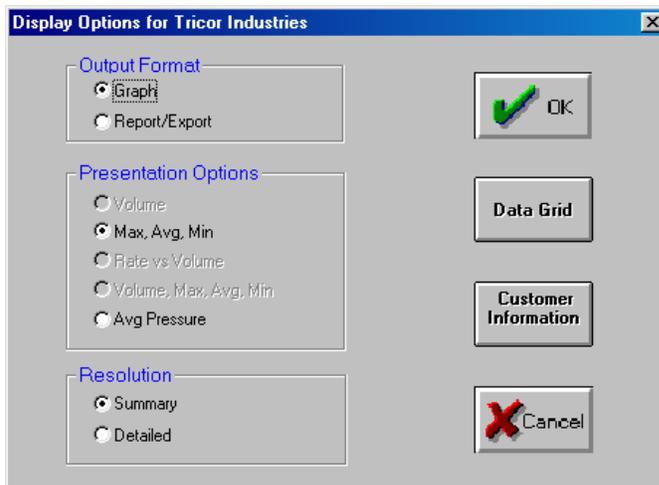
- **Choose An Output Format.** In the Display Dialog Box, click on:
    - **Graph** to create a graph.
    - **Report/Export** to create a report and to export data to a third party program such as MS Word or Excel.
- **Choose Among Presentation Options.** Click on:
    - **Max, Avg, Min** for graphs/reports showing maximum, average, and minimum pressure for each grid interval.
    - **Avg Pressure** for graphs/reports showing average pressure for each grid interval.
- **Choose Resolution.** Click on:
    - **Summary** to display all data in a condensed format. Graph displays entire record on one screen.
    - **Detailed** to display all data in an expanded format. Graph shows entire test on multiple screens with a scroll bar.

4. If Desired, Change Data Start Time, Report Start Time, Grid Interval, Or Edit The Customer Information Screen.

Start Time, End Time, and Grid Interval for graphs and reports are edited on the **Data Grid Screen**. Customer information (the file header) is edited on the **Customer Information Screen**.

- **Changing Graph/Report Resolution:** The default graph/report shows approximately 150 data intervals unless the raw data file has less than 450 intervals, in which case, a smaller number of data intervals are used. If you wish to increase the number of intervals, click on "Data Grid" and then decrease the Grid Interval so that more data points are displayed.

- **Changing Unit of Measure For Graph/Report:** If you would like graphs and reports to have a different unit of measure, click on "Customer Information" and then on "Change MM100 Settings" and change the unit of measure to the one desired.

5. When Done, Click On "OK" To Display Graph Or Report.

6. Working With Graphs and Reports (see following sections).

When the Graph Screen or Report Screen appears, you may scan data and customize, save, export, and print the graph or report:

To Scan Data:
- **Summary Graph:** Initial graph shows entire file. Intervals to the right side of the graph will be condensed if you have significantly decreased the Grid Interval on the Data Grid. Click once on graph and then use cursor movement keys (End/Home, Page Up/Down, Up/Down/Right/Left arrows) to change first interval displayed on graph. Graph will then show the new first interval through end of record. Double-click on any colored section of the graph, and a balloon will appear with date/time and values associated with the two (2) grid intervals closest to that point on the graph. (See also Section 3.2, "The Graph Screen".)

- **Detailed Graph:** Initial graph shows first 12 or so intervals of record. Place cursor on bottom axis of graph (becomes an up/down arrow) and pull up approximately half way in order to expose the date/time associated with each graph interval. Use the scroll bar below x-axis or cursor movement keys (End/Home, Page Up/Down, Up/Down/Right/Left arrows) to scan the rest of the record. (See also Section 3.2.)

- **Reports:** To scan report, use scroll bar on right of window or cursor movement keys (End/Home, Page Up/Down, Up/Down/Right/Left arrows). There are also buttons for page changing on top of the window. (See also Section 3.3, "The Report Screen And Exporting".)

To Print A Graph Or Report:
- Click on "printer" button. For landscape printing, you must select landscape in your Windows printer control.

To Save A Graph/Report To A File:

- **Graphs:** Click on "diskette" button (2nd button from left). Enter a filename (max. 8 characters); the program will automatically add a ".chf" extension. Change drive/directory if desired.

- **Reports:** Click on "envelope" button at the top of the window. Select desired file format from options displayed. Enter filename; change drive and directory if desired.

To Export Data To Another Application (Report Routine):

- Click on "envelope" button at the top of the report window. Select desired application from options displayed, e.g., Lotus, Excel, Quattro Pro, WordPerfect, or MS Word. Enter filename, change drive and directory if desired.

TO VIEW SAVED GRAPHS AND REPORTS

1. Click On "View Graph/Report" Button On Main Screen.

After clicking on "View Graph/Report", the Select File Dialog Box will appear.
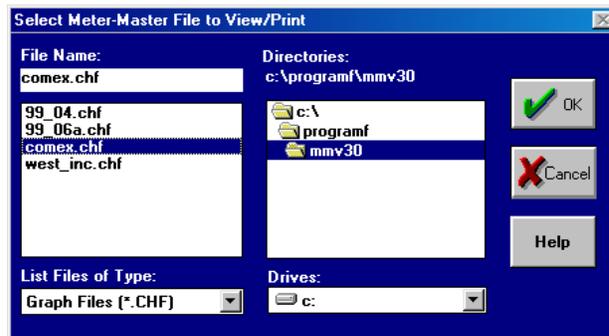
### 2. Select An Existing File (e.g., *.CHF, *.XLC, *.DOC).

Once a file is selected, it will open in whatever format it was saved.

- **Graph File:** Graph files (*.CHF) open within the Meter-Master graphic software described above and in the next section. You may modify the appearance of the graph, but not the display options, customer information, and data grid.

- **Report File:** A report may be opened in the appropriate application (e.g., Excel, Microsoft Word, WordPerfect) from within the Model 100 Program software, as long as the Model 100 Program directory, the report file's directory, and the third-party program directory are all on the current PATH in your AUTOEXEC.BAT file. Alternatively, you can access files exported to other applications (third-party programs) through the applications themselves.

3.2 The Graph Screen

Graphs made with the Meter-Master software are created and viewed using the Graph Screen. When creating a graph, the Graph Screen appears whenever the "Graph" Output Format is selected on the Display Options Screen. To view a previously saved graph, select the "View Graph/Report" option on the Main Screen and then select the desired *.CHF file in the Select File Dialog Box.
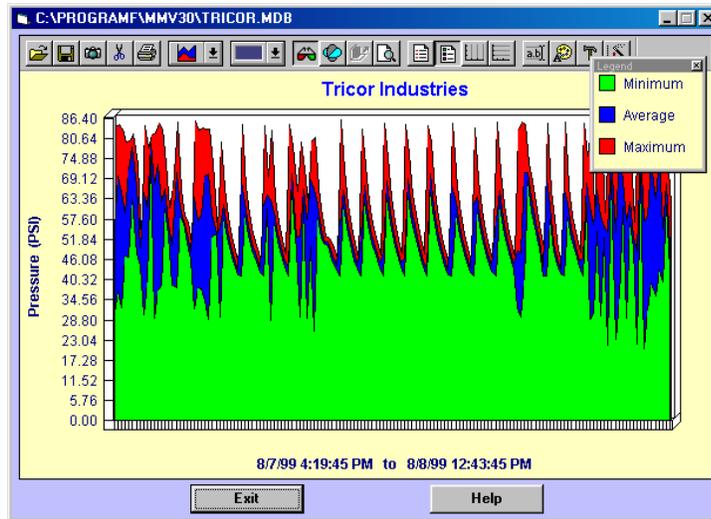
The Graph Screen generates, displays, prints, and saves graphs from a data file in a variety of styles. Each plotted vertical bar represents one Grid Interval, which can be viewed/edited on the Data Grid Screen before a graph is created. You may double-click anywhere on the colored portion of a graph, and a balloon will appear with data associated with the two closest intervals.

COMMON PROCEDURES

To Display A Text Description Of Each Button On Toolbar:
- Click on graph, then move mouse pointer over top of button. After a short time, a balloon will appear with button description.

To Display Legend Of Any Visible Graph Interval:
- Click on graph, then double-click the mouse button while holding mouse pointer over desired interval on graph.

To Increase/Decrease The Size Of A Graph:
1. Move mouse pointer to any edge of graph; a double vertical or horizontal arrow will appear.

2. Click and hold mouse button while dragging the edge up/down or right/left to desired position. Release button.

To Display X-Axis Legend In Its Own Box And Scan Data:

1. Click on the first of the two legend buttons on the toolbar (8th button from right; on right of "magnifying glass" button). To display dates/times (volume and max, avg, min graphs), you may need to click-and-drag left border of legend to left. The legend begins with the first interval on the left side of the graph.
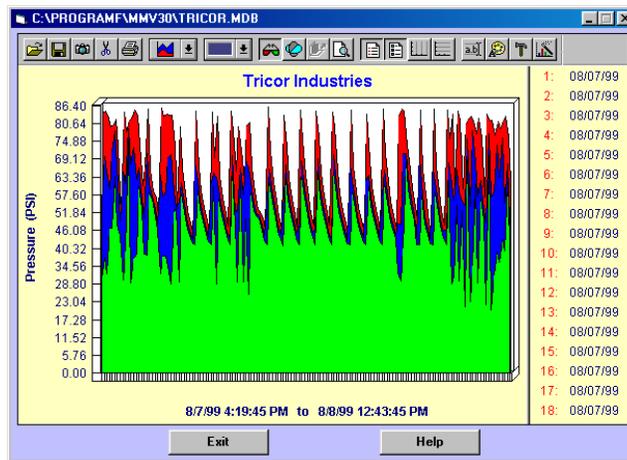

1. Use cursor movement keys (End/Home, Page Up/Down, up/down/right/left arrows) to scan data. The graph will begin at another Data Interval and the legend will change accordingly. Summary graphs show data from that point onward; detailed graphs show approximately 12 Grid Intervals at a time.

To Display X-Axis Date/Time Legend Along Bottom Of Detailed Graph:
(Detailed volume and max, avg, min graphs only)

1. Move mouse pointer to x-axis of graph; a double vertical arrow will appear.

2. Click and hold mouse button while dragging base of graph halfway up screen. Release button; legend will appear along bottom.
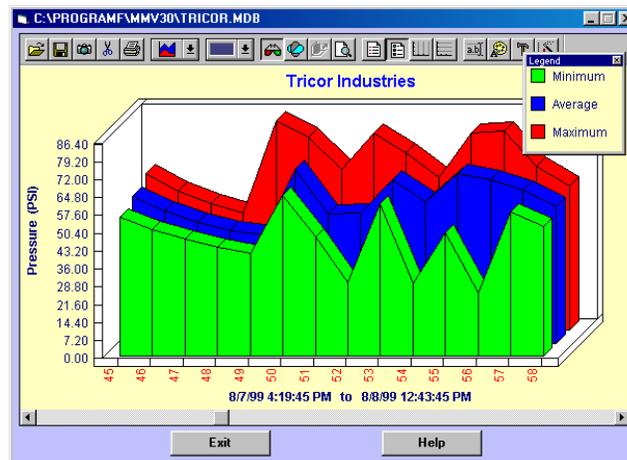
3. Reverse procedure to return graph to original size.

To Zoom A Portion Of Graph To Full Graph Size:
1. Click on magnifying glass icon (11th button from left; in middle of toolbar).
2. Move mouse pointer to corner of rectangle you wish to expand.
3. Press and hold down left mouse button as you move mouse pointer to opposing corner. Rectangle on screen highlights area to be graphed.
4. Release mouse button to show expanded graph. Double-click on any segment, and a balloon will identify data associated with that interval.
5. Click on magnifying glass button again to return to prior screen.

To Copy Graph Or Data To A Third Party Software Product:

The camera button copies the current graph to the Windows clipboard as a bitmap file; the scissors button copies the data as text to the clipboard. They can then be easily pasted into a spreadsheet or a word processor document.
1. Display the desired graph.
2. Click on either the camera button or the scissors button.
3. Minimize or close the Meter-Master software.
4. Open your spreadsheet or word processor and place the cursor where you want the graph or data.
5. In the Edit menu, choose "Paste" (or press Ctrl-V).

To Save A Graph To A File:
1. Click on diskette button (second button from left). The Export Chart Dialog Box will appear.
2. Enter a new file name in the space provided; program will automatically add ".chf" as file extension. If desired, you may choose a different drive and/or directory into which you would like the file to be saved.

To Print A Graph:
- Click on printer button (fifth button from left). The program uses your default Windows printer setup. To change from portrait to landscape orientation, you must exit the program and change your default printer setting.

TOOLBAR BUTTON DESCRIPTIONS (LEFT TO RIGHT)

Open File Button: Imports a previously saved graph for viewing.

Diskette (Save) Button: Saves and exports the current graph with a *.CHF extension to any directory.

Camera Button: Copies the current graph image to the Windows clipboard as a bitmap image so that it can be pasted into any document.

Scissors Button: Copies the current graph data to the Windows clipboard as a text file so that it can be pasted into a document.

Printer Button: Prints the current graph.

Graph Style Button: Changes the current graph style.

Color Button: Enables you to change the color of any graph segment including the background and frame. Click on color desired and then click again and drag the color (cursor will change to a paint bucket image) down to the applicable graph segment, and release button.

Glasses Button: Switches current graph between 2-D and 3-D.

Rotate Chart Button: Changes the 3-D viewing properties.

Z-Clustered Series Button: Available only for certain graph styles. Enhances 3-D perspective.

Magnifying Glass (Zoom) Button: Enables you to zoom in on a specific graph segment by clicking and dragging the mouse pointer to frame the segment desired. As with any graph displayed, once the zoomed portion is displayed, you may double-click anywhere on the graph to see the legend associated with that data point.

Legend Button: Displays the legend associated with each interval along the x-axis. You may need to click-and-drag the left border of box to the left in order to expose both date and time for Volume and Max, Avg, Min graphs.

Series Legend Button: Defines each graph color.

Vertical Grid Button: Inserts vertical grid lines in the current graph.

Horizontal Grid Button: Inserts horizontal grid lines in the current graph.

Edit Titles Button: Enables you to edit the axis labels displayed on each side of the graph.

Text Fonts Button: Enables you to change the font style, size, and color of all text associated with the graph.

Tools Button: Enables you to control the display of legends, tool bars, etc.

Graph Options Button: Enables you to change properties of the current graph.

3.3 The Report Screen And Exporting

MM100 reports are created using the Report Screen. Exporting to other applications (e.g., Microsoft Word, Excel, Lotus, Quattro Pro, WordPerfect) is also accomplished through the Report Screen. Once a report file has been exported, you can easily add a graph by pasting a graph copied to the clipboard using the camera button on the Graph Screen.
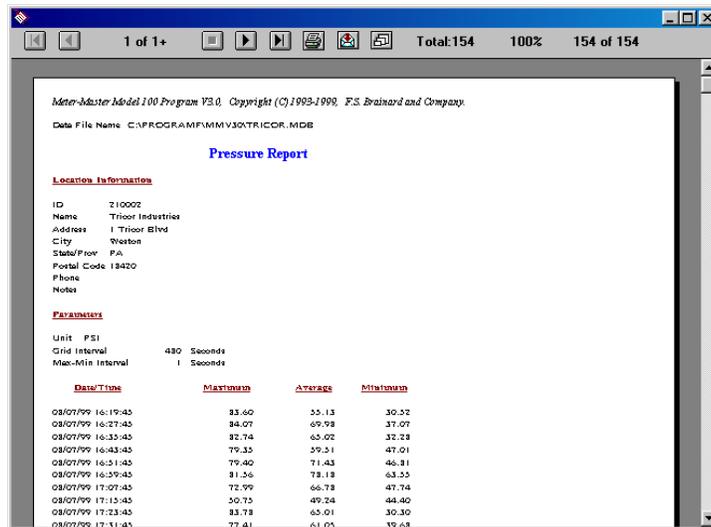
The pressure report displays the customer information followed by the data, with each row of data representing one Grid Interval. Report data may be viewed/edited on the Data Grid Screen before a report is created. Reports can be customized within third-party software after they are saved in the format appropriate for that third-party software. Saving is the same as exporting in the report routine; both are accomplished by clicking on the "envelope" button at the top of the window.

After a report has been created and saved, you may view and edit it through the View Graph/Report routine. A report will automatically open in the host application as long as the Model 100 Program directory, the report file's directory, and the third-party program directory are all on the current PATH in your AUTOEXEC.BAT file. Alternatively, you can always access files saved/exported in third-party software formats through the third-party programs themselves.

COMMON PROCEDURES

To Save A Report To A File Or Export To Another Application:

1. Click on envelope button. The Export Dialog Box will appear.
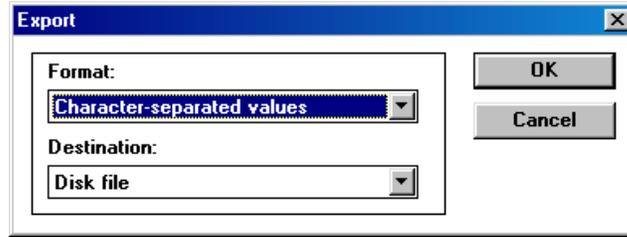
2. Select the desired file format from the pull-down options on left. Many options are offered, including Microsoft Word, WordPerfect, Lotus, Excel, and Quattro Pro. Click on "OK" and the Choose Export File Dialog Box will appear.

3. Enter a new file name in the space provided; the program will add the appropriate file extension (e.g., ".doc" for Word) if you do not include one. Select the drive/directory into which you would like the file to be saved. Click on "OK".

To Print A Report:

- Click on printer button at top of window. The program uses your default Windows printer setup.

TOOLBAR BUTTON DESCRIPTIONS (LEFT TO RIGHT)

Go To Beginning Button: Goes directly to beginning of report.

Page Up Button: Goes to the previous report page.

Page Down Button: Goes to the next report page.

Go To End Button: Goes directly to end of report.

Printer Button: Prints the current report.

Envelope Button: Saves/exports the current report in various formats to any directory.

Resize Button: Changes size of text in window (3 options).

3.4 Data Grid And Customer Information Screen

The Data Grid: Enables you to change the graph/report resolution by changing the Grid Interval. You may select a portion of the data for a graph or report instead of the entire data file. You may also correct the Data Start Time, select any Report Start Time desired, and edit individual data cells on the grid.

The Customer Information Screen: Allows you to edit customer information and the unit of measure.

To Edit The Data Grid

To access the Data Grid, click on "Data Grid" on the Display Options Screen.

- **The Grid Interval**

  The Grid Interval is the time interval represented by each vertical segment on a graph or each line of data in a report; the longer the interval, the fewer the points plotted on a graph and the shorter a report.

  The Grid Interval can be any multiple of the Data Storage Interval (displayed above the grid). The length of the default Grid Interval for any given file is designed to plot approximately 150 Grid Intervals on a graph. (See box below, "About The Grid Interval", for more information.)

  To Change The Grid Interval:
  1. Click in the Grid Interval box (below grid) and edit as desired. The default Grid Interval varies with the size of the data file: the larger the data file, the larger the default Grid Interval.
  2. Click on the "Recalculate" button to display the new spreadsheet.

- **The Max-Min Interval**

    Should be left equal to the Data Storage Interval (shown at top of screen) for all pressure graphs and reports.

- **Select A Portion Of Data**

    To Select Data Using Scrollbar (vertical bar with arrows on right of grid):
    1. Use scrollbar to locate interval where you would like graph/report to begin.
    2. Select beginning of graph/report: click on interval number in column to left of date/time column.
    3. Use scrollbar to move to where you would like graph/report to end, hold down Shift key, and click on ending interval number desired. Highlighted area indicates time period for graph/report.

   **To Select Data Using Cursor Movement Keys (Page Up, Page Down, etc.):**
    1. Use cursor movement keys to move cursor to where you would like graph/report to begin.
    2. Select beginning of graph/report: click on interval number in column to left of date/time column.
    3. Hold down Shift key as you move cursor to where you want graph/report to end. Highlighted area indicates time period for graph/report.

    To Select Data Using Mouse:
    1. Use scrollbar or cursor movement keys to locate interval where you would like graph/report to begin.
    2. Select beginning of graph/report: click on interval number in column to left of date/time column.
    3. Hold down mouse button as you drag mouse pointer down over desired time period. Release button. Highlighted area is graph/report time period.

- **Select Graph/Report Start Time**
    1. Click on "Select Graph/Report Start Time" button.
    2. Enter desired graph/report start time in the specified format, then click "OK". The graph/report will ignore all data prior to this date/time.
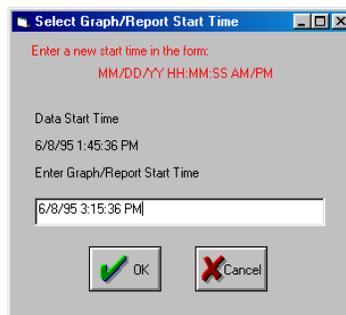
- **Fix Data Start Time**
    1. Click on "Fix Data Start Time" Button.

2. Enter correct data start time in the specified format and then click "OK". Note that this change is permanent.

- **Editing A Data Cell**

    The MM100 Graph/Report procedure allows access to individual data items for editing. Editing the data grid affects only the current session; pressing "Recalculate" or exiting the Create Graph/Report routine will return the original values.

    To Edit A Data Item:

    - Double-click on item in grid and enter desired value.

ABOUT THE GRID INTERVAL. The Grid Interval is the time interval represented by each plotted segment of a graph or each line of data in a report. For example, a Grid Interval of 300 seconds will provide maximum, average, and minimum pressure for each five minutes of the survey. The Grid Interval determines the resolution and size of a graph or report.

Choosing the Grid Interval (Default: Varies with size of data file in order to display approximately 150 intervals). The length of the Grid Interval depends on the purpose of the graph/report. You may find that you prefer to run short reports with long intervals first, and then run more detailed reports focusing on specific time periods. The Grid Interval must be the same as or a multiple of the Data Storage Interval. The program accepts only seconds; accordingly, hours and minutes must be converted to seconds when entering a Grid Interval. If you change one or both intervals, click on the "Recalculate" button after the change is made to display the new spreadsheet information.

TO EDIT THE CUSTOMER INFORMATION SCREEN

To access the Customer Information Screen, click on the "Customer Information" button on the Display Options Screen.

The Customer Information Screen enables editing of customer information stored with a data file. Customer information is originally entered during the download procedure. See Section 2.2, "Downloading Data And Adding Customer Information".

Use the mouse or Tab key to select items to edit.

- **Changing Unit Of Measure For Graphs/Reports**: If you want to create graphs and reports with a different unit of measure, click on "Customer Information" at the Display Options Screen and then on "Change MM100 Settings" and change the unit of measure to the one desired.

Chapter Four

OTHER FEATURES

4.1 Realtime Display

Displays the current pressure. Graph holds 20 intervals of data. The current pressure is shown above graph on right and is indicated by the moving vertical bar. The current temperature is shown above graph on left only when using the Model 100P, which has the sensor located inside the recorder. The Model 100XP does not display a temperature reading.
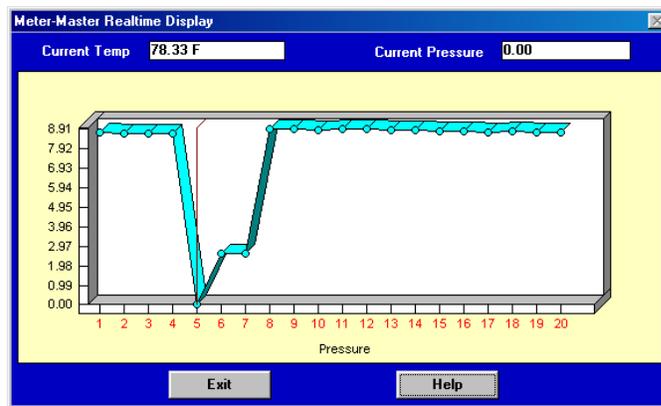
TO DISPLAY A REALTIME GRAPH OF CURRENT PRESSURE

1. **Press "Update Screen" To Verify That The Meter-Master Is Connected To Your Computer.**

   "Pressure Recorder is Connected" should appear on the Main Screen.

2. **Click On "Realtime Display" Button.**

   Dialog box to select Fahrenheit or centigrade appears, followed by real-time graph of current pressure and numeric displays of pressure and temperature. The temperature reading is only available with the Model 100P, not the Model 100XP.
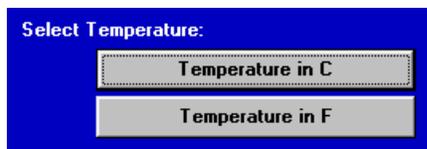
Chapter Five

TROUBLESHOOTING

5.1 List Of Topics

FIELD OPERATION (SECTION 5.2)

General
(1)   No 3-Second Signal When Rocker Switch Is Pressed ON

(2)   LED Flashes Long-Short For Six Seconds When Rocker Switch Is Pressed ON

COMPUTER OPERATION (SECTION 5.3)

Installing The Meter-Master Software
(3)   Error Immediately After Beginning Of Install Routine

(4)   Setup Does Not Finish (Does Not Create 4 Icons Or Prompt To Re-Boot Computer)

Entering Program
(5)   Unable to open Meter-Master Port

(6)   Meter-Master Is Connected To Computer But Screen Says It Is Not (COM Port Problems)

Downloading
(7)   Error After Naming File

(8)   Error Message During Downloading

Creating/Printing Graphs/Reports
(9)   Help Balloons For Graph And Report Screens Don't Always Appear

Anytime/Other
(10) Run-Time Error (Various)

5.2 Field Operation

GENERAL

(1)   No 3-Second Signal When Rocker Switch Is Pressed ON

- If rocker switch is in middle position, turn OFF. Leave off for 10 seconds and try again. The three second signal occurs only at beginning of recording, not when rocker switch is pressed ON again from middle position.

- If the Meter-Master is not connected to the battery charger, attach the charger and press the ON side of the rocker switch completely down and release. If no response, turn rocker switch OFF, wait at least three minutes, and then press switch ON again. If your Meter-Master responds after being connected to the battery charger, then the instrument powered down. To check to make sure that your batteries have not degraded, charge the unit for 14 hours, let sit off the charger for three days, and then use the screen display to confirm that the remaining battery charge is greater than 95%. If your Meter-Master has just been recharged after a power-down state, there is a 2 or 3 minute delay while the electronics settle before the signal light appears. When turning the Meter-Master ON after a power-down state, you must depress the ON side of the rocker switch completely.

- Try resetting the unit by zeroing the pressure. Press and hold down the ON side of the rocker switch for 20 seconds (the LED should turn on after 15-20 seconds and then off again signaling the reset). *WARNING: zeroing the Meter-Master erases all data!*

  Still no response; return unit to factory (call first for RMA #).

(2)   LED Flashes Long-Short For Six Seconds When Rocker Switch Is Pressed ON

- A long-short series of flashes indicates low battery charge. Connect battery charger and charge batteries at least 14 hours before making a recording. When turning the Meter-Master ON after a power-down state, make sure you depress the ON side of the rocker switch completely. If your Meter-Master has just been recharged after a power-down state, there is a 2 or 3 minute delay while the electronics settle before the signal light appears and the recording starts.

5.3 Computer Operation

INSTALLING THE METER-MASTER SOFTWARE

(3)   Error Immediately After Beginning Of Install Routine

- Close all non-essential programs running in the background. If you are using Windows 95+, press Ctrl+Alt+Del keys to open the Close Program dialog box. If you are on a desktop computer, close all programs except "Explorer" (if you are on a laptop, there may be other essential programs).

- The installation disk may be bad.

(4)   Setup Does Not Finish (Does Not Create 4 Icons Or Prompt To Re-Boot Computer)

- Make certain there are no other applications running before beginning install routine.

- Make sure you are not connected to any network.

- Make sure you have enough free hard disk space (Meter-Master program requires 100MB of free hard disk space as a minimum during operation).

- Other applications may have altered the Windows system environment such that the program cannot install certain files. Close all non-essential programs running in the background. If you are using Windows 95+, press Ctrl+Alt+Del keys to open the Close Program dialog box. If you are on a desktop computer, close all programs except "Explorer" (if you are on a laptop, there may be other essential programs).

- The installation disk may be bad.

ENTERING PROGRAM

(5)   Unable to open Meter-Master Port

- If you are using Palm Pilot Software, make sure it is disabled.

- Make sure mouse does not use the same COM port.

(6)   Meter-Master Is Connected To Computer But Screen Says It Is Not (COM Port Problems)

(A) If First Time Entering Meter-Master Program:

- Check the Meter-Master program COM port setting (under Setup) to make sure it matches the computer port you are using to connect the RS232 cable.

- Check cable connection (see "B" below).

- Make sure you are disconnected from any network (unless the Meter-Master software is installed on the network server).

- The Meter-Master cannot be used with any port that is already reserved for another device. If your computer has an internal fax/modem, make sure that its COM port is not the one used with the Meter-Master. If it is, try the

Meter-Master with another COM Port, or remove/disable the fax/modem. If you have a COM Port with a 25 pin connector, you can purchase a 25 to 9 pin serial adapter at a computer or electronics retailer.

(B) If Not First Time Entering Program:

- If you have not already done so, connect the Meter-Master to the battery charger. Wait two minutes and then press the ON side of the switch all the way down. Wait another two minutes and then press "Update Screen" again. If your unit is now connected to the computer, most likely the Meter-Master powered down due to low battery charge.

- Check RS232 cable connection. (NOTE: RS232 cable may be mistakenly plugged into Meter-Master battery connection. No damage will result.) Check that none of the receptacle pins are bent. Check that the black plastic insert inside the stainless steel RS232 receptacle on the Meter-Master is flush with the top of the steel shell (has not been pushed down through use).

- Confirm that your instrument is working properly. With your unit connected to the battery charger and the rocker switch in the OFF position for at least 10 seconds, press the rocker switch on and release. The LED should light for 3 seconds indicating the start of a recording.

- Should there still be a problem, try exiting the Meter-Master Program and then reentering the program.

DOWNLOADING

(7) Error After Naming File

- The following characters cannot be used when naming a file without causing an error: <space>, <comma>, <period>, +, =, /, [,], ", :, ;, ?, *, <, >, |.

(8) Error Message During Downloading

- Download again; the serial connection may have broken briefly.

- Confirm that Port Settings (under "Settings" on the Menu Bar) are correct. Specifically, make sure XON/XOFF is not checked.

- If Meter-Master software is on your PC and your computer is part of a network, make sure your computer is off the network.

- See #10, "Run-Time Error" below.

CREATING/PRINTING GRAPHS/REPORTS

(9) Help Balloons For Graph And Report Screens Don't Always Appear

- You must first click on the graph screen before holding mouse pointer over a button.

- Balloons initially come up only for graph buttons; not always for combo boxes (with down arrowhead). After a balloon comes up, move mouse pointer across to combo boxes to see their balloons.

- At present, there are no help balloons for the Report Screen.

ANYTIME/OTHER

(10) Run-Time Error (Various)

Especially while downloading or building reports/graphs.

- These errors can occur randomly due to software conflicts. Attempt the same routine again.
- Exit the program and then reenter the program and attempt the same routine again.
- If you are on a network, log off the network. Make sure your computer is operating as a stand-alone PC and is not sharing any system files with other workstations. Some networks continue to monitor workstations even after they have logged off. If this is the case, you may need to physically disconnect your computer from the network.

Chapter Six

SERVICE AND SUPPORT

6.1 Customer Service

Should you experience any problems with your Meter-Master product, fax or call our Customer Service Department between 8 A.M. and 5 P.M. (Eastern U.S. Time). Phone and fax numbers are shown on the front page of these instructions. You may also email us at service@meter-master.com. Explain the problem, and we may be able to solve it on the telephone, via fax, or via email.   If not, we will provide a Return Material Authorization Number (RMA #). Be sure to include: a packing slip with the RMA #, the serial number of the unit, a description of the problem, and a contact person including phone number, fax number, and address. Pack the equipment in a solid cardboard box secured with adequate packing material. You may want to keep the original packaging material for this purpose. Ship prepaid and insured to the address shown on the cover of this manual.

6.2 Two Year Limited Warranty

F. S. Brainard & Co. (FSBCO) warrants to the original consumer purchaser that this Meter-Master product shall be free from defects in materials and workmanship for a period of two years from either the date of purchase, provided a proof-of-purchase is presented, or alternatively, if proof-of-purchase is not presented, the date of manufacture. During the two year warranty period, liability shall be limited to replacing or repairing, at FSBCO's option, any defective product. Product which has been subjected to abuse, misuse, accident, alteration, neglect, unauthorized repair or installation is not covered by this warranty. FSBCO shall have the right of final determination as to the existence and cause of defect. As to product repaired or replaced, the warranty shall continue in effect for the remainder of the warranty period, or for ninety (90) days following date of shipment by FSBCO of the repaired or replaced product, whichever period is longer.

No liability is assumed for expendable items such as batteries and disks. No warranty is made with respect to custom equipment or products produced to buyer's specification, except as specifically stated in writing by FSBCO and contained in the contract. FSBCO liability arising out of its warranty shall be limited to a refund of the purchase price. In no event shall FSBCO be liable for costs of procurement of substitute products or services, loss of profits, or for any consequential, incidental, indirect, and/or other damages of any kind however caused and on any theory of liability, arising out of this warranty. Other products, not manufactured by FSBCO but distributed by FSBCO, such

as computers, modems, and printers, are offered as third party products. As such, these products are not warranted by FSBCO. Requests for warranty or nonwarranty repairs of third party products should be addressed directly to the manufacturers of such products. Should your FSBCO product require nonwarranty repair, please contact FSBCO for available repair information.

All FSBCO software is sold on an "as is" basis without warranty of any kind. The entire risk as to the quality and performance of such software is with the purchaser. FSBCO shall have no liability or responsibility to the original consumer purchaser or to any other person or entity with respect to any claim, loss, liability, or damage caused or alleged to be caused directly or indirectly by any FSBCO software. This disclaimer includes but is not limited to any interruption of services, loss of business or anticipatory profits, or any consequential, incidental, indirect, and/or other damages of any kind resulting from the purchase, use, or operation of any FSBCO software.