MeasuringPad™ MP7

USER'S GUIDE

DAYTRONIC CORPORATION
2211 Arbor Boulevard
Dayton, Ohio 45439

WARNING

Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Connection of this instrument to an electrical system must be performed in compliance with the National Electrical Code (ANSI/NFPA 70-2005) of USA and any additional safety requirements applicable to your installation.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved."

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2004) of USA and any additional workplace safety requirements applicable to your installation.

Published by Daytronic Corporation
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Printed in the United States of America.

P/N UG-MP7 Rev. B

ADVERTENCIA

Una conexión incorrecta de este instrumento puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda este manual antes de conectar. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.

La conexión de este instrumento a un sistema eléctrico se debe realizar en conformidad con el Código Eléctrico Nacional (ANSI/NFPA 70-2005) de los E.E.U.U., además de cualquier otra norma de seguridad correspondiente a su establecimiento.

La instalación, operación y mantenimiento de este instrumento debe ser realizada por personal calificado solamente. El Código Eléctrico Nacional define a una persona calificada como "una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados."

El personal cualificado que trabaja encendido o acerca a los conductores eléctricos energizados expuestos debe seguir prácticas y procedimientos relacionados seguridad aplicable del trabajo incluyendo el equipo protector personal apropiado en conformidad con el estándar para los requisitos de seguridad eléctricos para los lugares de trabajo del empleado (ANSI/NFPA 70E-2004) de los E.E.U.U. y cualquier requisito de seguridad adicional del lugar de trabajo aplicable a su instalación.

AVERTISSEMENT

Si l'instrument est mal connecté, la mort, des blessures graves, ou un danger d'incendie peuvent s'en suivre. Lisez attentivement ce manuel avant de connecter l'instrument. Lorsque vous utilisez l'instrument, suivez toutes les instructions d'installation et de service.

Cet instrument doit être connecté conformément au National Electrical Code (ANSI/NFPA 70-2005) des Etats-Unis et à toutes les exigences de sécurité applicables à votre installation.

Cet instrument doit être installé, utilisé et entretenu uniquement par un personnel qualifié. Selon le National Electrical Code, une personne est qualifiée si "elle connaît bien la construction et l'utilisation de l'équipement, ainsi que les dangers que cela implique".

Le personnel qualifié qui travaillent dessus ou s'approchent des conducteurs électriques activés exposés doit suivre des pratiques en matière et des procédures reliées par sûreté applicable de travail comprenant le matériel de protection personnel approprié conformément à la norme pour des conditions de sûreté électriques pour les lieux de travail des employés (ANSI/NFPA 70E-2004) des Etats-Unis et toutes les conditions de sûreté additionnelles de lieu de travail applicables à votre installation.

WARNUNG

Der falsche Anschluß dieses Gerätes kann Tod, schwere Verletzungen oder Feuer verursachen. Bevor Sie dieses Instrument anschließen, müssen Sie die Anleitung lesen und verstanden haben. Bei der Verwendung dieses Instruments müssen alle Installation- und Betriebsanweisungen beachtet werden.

Der Anschluß dieses Instruments muß in Übereinstimmung mit den nationalen Bestimmungen für Elektrizität (ANSI/NFPA 70-2005) der Vereinigten Staaten, sowie allen weiteren, in Ihrem Fall anwendbaren Sicherheitsbestimmungen, vorgenommen werden.

Installation, Betrieb und Wartung dieses Instruments dürfen nur von Fachpersonal durchgeführt werden. In dem nationalen Bestimmungen für Elektrizität wird ein Fachmann als eine Person bezeichnet, welche "mit der Bauweise und dem Betrieb des Gerätes sowie den dazugehörigen Gefahren vertraut ist."

Qualifiziertes Personal, das an bearbeiten oder herausgestellte angezogene elektrische Leiter sich nähern, muß anwendbare Sicherheit bezogener Arbeit Praxis und Verfahren einschließlich passende persönliche schützende Ausrüstung gemäß dem Standard für elektrische Sicherheitsauflagen für Angestellt-Arbeitsplätze (ANSI/NFPA 70E-2004) der Vereinigten Staaten und alle zusätzlichen Arbeitsplatzsicherheitsauflagen folgen, die auf Ihre Installation anwendbar sind.

Safety Summary

Definitions

WARNING statements inform the user that certain conditions or practices could result in loss of life or physical harm.

CAUTION statements identify conditions or practices that could harm the MP7, its data, other equipment, or property.

NOTE statements call attention to specific information.

Symbols

The following International Electrotechnical Commission (IEC) symbols are marked on the top and rear panel in the immediate vicinity of the referenced terminal or device:

 Caution, refer to accompanying documents (this manual).

 Direct current (DC) operation of the terminal or device.

 Power Switch

Definiciones

Las ADVERTENCIAS informan al usuario de ciertas condiciones o prácticas que podrían producir lesiones mortales o daño físico.

Las PRECAUCIONES identifican condiciones o prácticas que podrían dañar la MP7, sus datos, otros equipos o propiedad.

Las NOTAS llaman la atención hacia la información específica.

Símbolos

Los siguientes símbolos de la Comisión Internacional Electrotécnica (IEC) aparecen marcados en el panel superior y el posterior inmediatos al terminal o dispositivo en referencia:

 Precaución, consulte los documentos adjuntos (este manual).

 Operación de corriente continua (CC) del terminal o dispositivo.

 Interruptor de encendido

Continued on next page

Définitions

Les messages d'AVERTISSEMENT préviennent l'utilisateur que certaines conditions ou pratiques pourraient entraîner la mort ou des lésions corporelles.

Les messages de MISE EN GARDE signalent des conditions ou pratiques susceptibles d'endommager "MP7", ses données, d'autres équipements ou biens matériels.

Les messages NOTA attirent l'attention sur certains renseignements spécifiques.

Symboles

Les symboles suivants de la Commission électrotechnique internationale (CEI) figurent sur le panneau arrière supérieur situé à proximité du terminal ou de l'unité cité:

 Mise en garde, consultez les documents d'accompagnement (ce manual).

 Fonctionnement du terminal ou de l'unité en courant continu (CC).

 Interrupteur de tension

Definitionen

WARNUNGEN informieren den Benutzer darüber, daß bestimmte Bedingungen oder Vorgehensweisen körperliche oder tödliche Verletzungen zur Folge haben können.

VORSICHTSHINWEISE kennzeichnen Bedingungen oder Vorgehensweisen, die zu einer Beschädigung von MP7, seiner Daten oder anderer Geräte bzw. von Eigentum führen können.

Symbole

HINWEISE machen auf bestimmte Informationen aufmerksam.
Die folgenden Symbole der Internationalen Elektrotechnischen Kommission (International Electrotechnical Commission; IEC) befinden sich auf der Abdeck- und Seitenplatte unmittelbar am betreffenden Terminal oder Gerät.

 Vorsichtshinweis, siehe Begleitdokumente (dieses Handbuch).

 Gleichstrombetrieb im Terminal oder Gerät.

 Netzschalter

Continued on next page

Safety precautions

The following safety precautions must be followed whenever any type of voltage or current connection is being made to the MP7.

- Wear proper Personal Protective Equipment, including safety glasses and insulated gloves when making connections to power circuits.
- Hands, shoes and floor must be dry when making any connection to a power line.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
- Set the MP7 power switch to Off.

  Before connecting to electric circuits to be monitored, open their related circuit breakers or disconnects. DO NOT install any connection of the MP7 to live power lines.
- Pods should be connected first to the MP7, then connect to the circuit to be monitored.
- If the equipment is used in a manner not specified in this user's guide, the protection provided by the equipment may be impaired.

These safety precautions are repeated where appropriate throughout this manual.

Statements and Notices

Statement of warranty

All products of Daytronic are warranted to the original purchaser against defective material and workmanship for a period of one year from the date of delivery. Daytronic will repair or replace, at its option, all defective equipment that is returned, freight prepaid, during the warranty period. There will be no charge for repair provided there is no evidence that the equipment has been mishandled or abused. This warranty shall not apply to any defects resulting from improper or inadequate maintenance, buyer-supplied hardware/software interfacing, unauthorized modification or misuse of the equipment, operation outside of environmental specifications, or improper site preparation or maintenance.

Statement of reliability

The information in this manual has been reviewed and is believed to be entirely reliable, however, no responsibility is assumed for any inaccuracies. All material is for informational purposes only and is subject to change without prior notice.

Notice regarding FCC compliance

This device has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Notice regarding proprietary rights

This publication contains information proprietary to Daytronic. By accepting and using this manual, you agree that the information contained herein will be used solely for the purpose of operating equipment of Daytronic.

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Copyright

Trademarks

MeasuringPad is a trademark of Daytronic.

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Daytronic MeasuringPad™ MP7

CHAPTER 1

Getting Started

Overview

MeasuringPad description

The Daytronic MeasuringPad™ MP7 is a portable, hand-held, sixteen analog and eight digital channel data acquisition instrument. It is designed with a color liquid crystal display (LCD) 1/4 VGA, using touch screen technology. It can monitor, record and display data of up to 16 differential analog inputs and up to 8 logic-level digital inputs simultaneously.

MP7 is also capable of processing Calculates, which are math functions performed on one or more channels combined. These calculated pseudo channels are formed from analog input channels and/or from other calculated channels. Unless otherwise indicated, “channel” references to an analog, digital, or calculated channel.

Transducers and sensors monitor machines or process equipment can connect to MP7 through external Pods. The Pods easily plug in to the connector pannel of the instrument and are available as optional accessories. MP7 automatically detects input signals from a DC/AC 600V Voltage Pod, DC/AC 300V Voltage Pod, DC/AC 30V Voltage Pod, DC/AC 20MA Current Pod, 1.5VAC RMS Universal Current Clamp Pod, and/or Thermocouple Pod. A maximum of four Pods per instrument are supported. Each Pod has 4 analog channels and 2 digital channels which can be enabled to send data to the instrument.

At the touch of a button, MP7 can export and store data in MS® Excel file format for further analysis, graphing, or inclusion in reports.

MP7 Firmware

The firmware for MP7 is contained on internal FLASH memory. It has an operating system capable of performing multiple applications. When an updated version of the firmware is released, the user can upgrade the internal program by putting the latest MP7 firmware program card in the appropriate slot of the mainframe. **See page 1-10 for instructions on how to upgrade the MP7 firmware from a data card.**

The MP7 firmware architecture is designed to collect, monitor and display measurement data from multiple sensor inputs. This provides for a powerful tool for troubleshooting, maintenance, process tuning, fault recording, trend analysis, and much more.

This manual

This manual contains instructions for operating the Daytronic MeasuringPad MP7.

In this chapter

The following topics are covered in this chapter.

Unpacking the MP7

Introduction

For maximum protection against possible shipping damage, the MP7 has been sealed in a two-piece, plastic suspension pack, enclosed within a durable shipping carton. After opening the carton, inspect the contents for possible shipping damage and check the carton inventory.

Unpacking

Unpack the MP7 from the carton as follows:

Step	Action
1	Remove any literature inside the top of the carton.
2	Carefully remove the MP7 from its shipping carton.
3	Remove all accessories inside the carton. Check that all of the standard accessories (see page 1-4) are included.

Shipping damage inspection

Visually inspect the MP7 for possible shipping damage. If any damage exists, first notify and file an insurance claim with your carrier or underwriter or both. Then notify Daytronic Customer Service Department of your intentions to return the unit. DO NOT return the MP7 without prior instructions from Daytronic Customer Service Department. Daytronic Customer Service Department can be reached at 1-800-668-4745 or 937-293-2566.

Repacking for return shipment

If the unit must be returned to Daytronic for service or repair, wrap the unit securely in heavy packaging material and place in a well padded box or crate to prevent damage. Do not return the MP7 in an unpacked box. Daytronic will not be responsible for damage incurred during transit due to inadequate packing on your part.

Return notice

Notify Daytronic Customer Service of your intention to return the unit. Do not return the unit without prior instructions from Daytronic. A Return Material Authorization (RMA) will be issued. Daytronic Customer Service Department can be reached at 1-800-668-4745 or 937-293-2566.

Standard Accessories

Standard accessories

The following table lists the MP7's standard accessories.

Description	Part Number
Easel	116038-G1
Carry Strap	116040-G1
AC Adapter	MP-ACADP (117029-G2)
32MB CompactFlash Data Card	MP-32M
*US Power Cord, 125V, 10A	USSTDCORD (900744)
*European Power Cord, Shielded	EUROSTDCORD (115369-G1)
*United Kingdom Power Cord, Shielded	UKSTDCORD (115368-G2)
*Australian Power Cord, Unshielded	AUSTDCORD (901347)
Notice: Charge Battery	899142
MeasuringPad MP7 User's Guide	UG-MP7
*User specified, one standard only.	

Optional accessories

Refer to Appendix A for the list of hardware optional accessories available for use with MP7.

Batteries

Refer to Appendix C for the description and replacement of the batteries contained in MP7.

Replaceable parts

Refer to Appendix D for the user replaceable parts.

Calibration

The recommended calibration interval for this unit is once every 12 months.

We recommend that you return the unit to the factory for calibration. If you decide to do so, first contact the Daytronic Customer Service Department to obtain an Authorization Number.

Telephone: 1-800-668-4745 or 937-293-2566
FAX: 937-293-2586

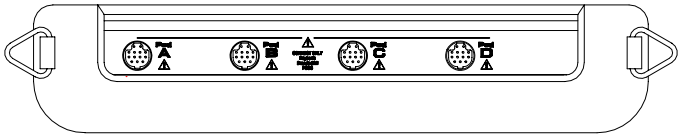
Fill out the Repair/Service Order form enclosed in the shipping carton and ship it along with the unit to the Daytronic Repair Department. (If this form is missing, ask the Daytronic Customer Service Department for a replacement.)

MP7 Controls, Indicators, and Connectors

Dimensions

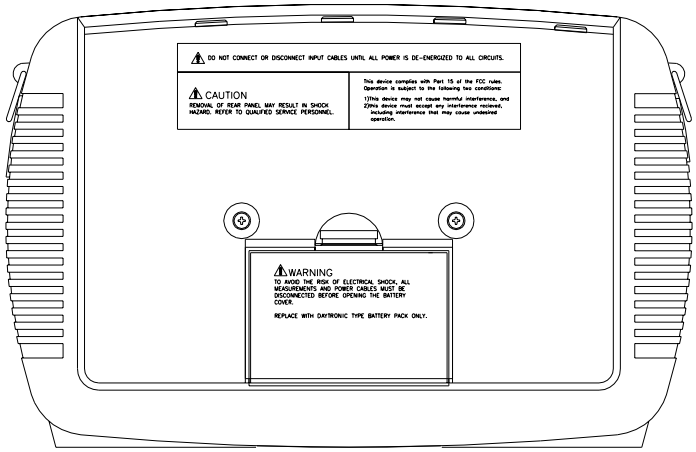
MP7 is a self-contained, portable instrument weighing a little over 4 pounds and measuring 8" (20.3 cm) deep by 12" (30 cm) wide by 2.5" (6.4 cm) high. This section identifies and describes the controls, indicators, and connectors on all panels of the instrument (shown here with rubber boot installed).

Top View

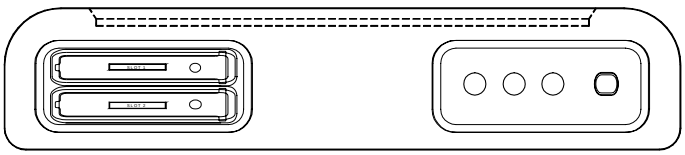


Front View

Rear View

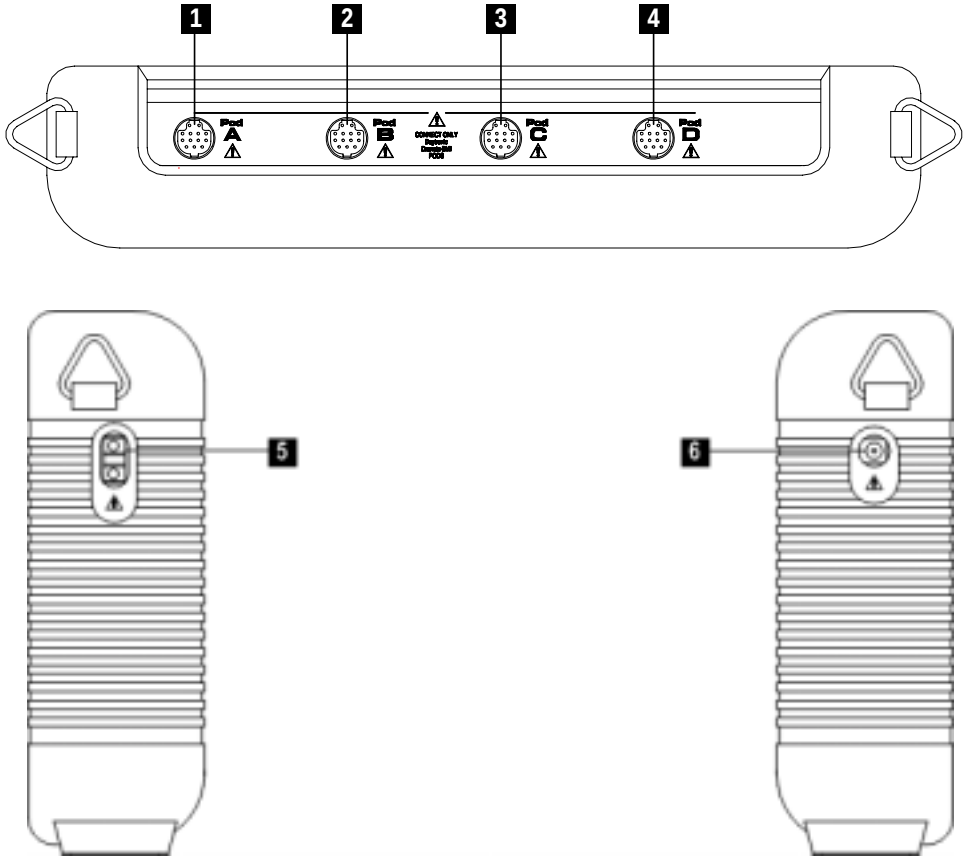


Bottom View



Top and Side views

The top view features four input Pod channel connectors. The left side contains the optical interface port. The right side contains the AC adapter input connector. Both sides have rings for attaching the supplied carrying strap. See below for descriptions of the top and side connectors.

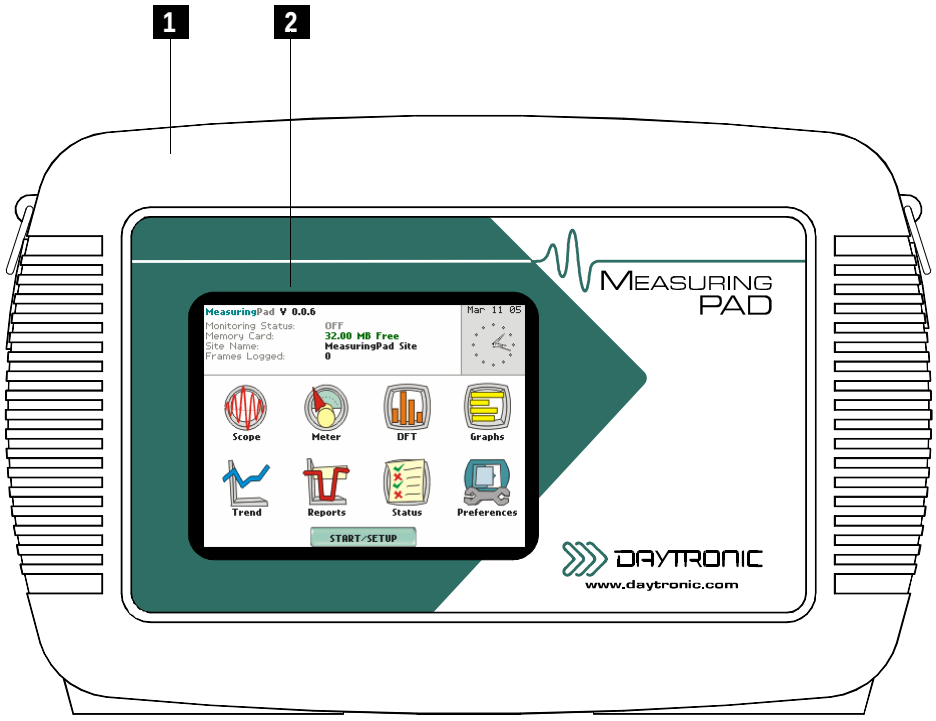


Parts table

Part	Function
1	Channel A Input Pod Connector
2	Channel B Input Pod Connector
3	Channel C Input Pod Connector
4	Channel D Input Pod Connector
5	Optical Serial Data Port NOTE: This data port is not activated at this time.
6	AC Adapter/Battery Charger Input Connector

Front view

The front view primarily shows the color touch screen LCD. See below for descriptions of the MP7 front panel.



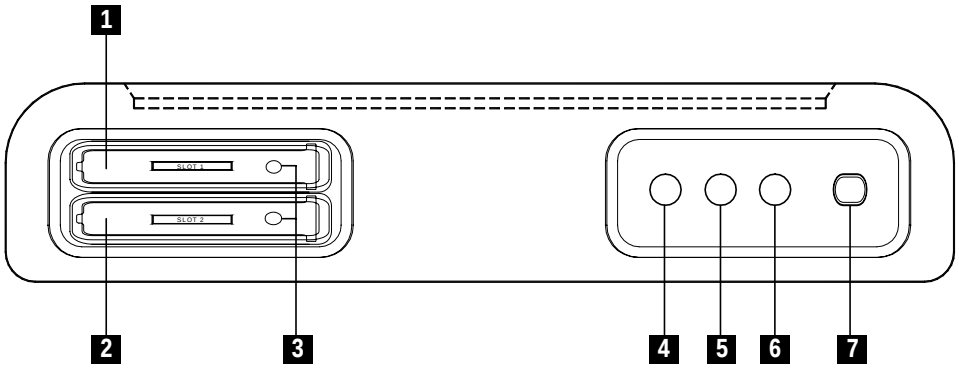
Parts table

Part	Function
1	Mainframe Protective Rubber Boot Enclosure
2	Liquid Crystal Display (LCD). Provides 3.75 x 4.75 inches display consisting of 1/4 VGA size screen of text and graphic information. The color LCD is equipped with touch screen technology, operable using the finger and/or PDA stylus. Touch screen display permits menu selection, alphanumeric data entry, and has a compact fluorescent (CCFL) backlighting that can be turned on for low light level viewing. The following are some basic care instructions for the LCD monitor: • Use and store the unit within the specified temperature and humidity range. The LCD screen may be adversely affected by exposure to high temperature or humidity. Condensation or moisture produced by sudden temperature changes may also damage the LCD screen. Clean any moisture from surface immediately. • Be careful when cleaning or removing stains on the LCD surface. Gently wipe the surface with a soft cloth or cotton pad. Isopropyl alcohol may be used, but make sure that all solvent residue is removed. • Do not apply excessive force to the LCD surface. The LCD screen contains sensitive electronic components that may be damaged due to strong impact.

Bottom view

The bottom view features two slots. Either slot can be used to hold the data card. It also displays the LED indicators and the On/Off power button. See below for descriptions of the slots, indicators, and button.

NOTE: Use only one card slot (one data card) at a time. The additional slot will be used for future communications options. Also, use only Daytronic supplied Compact Flash data cards. Do not use cards purchased elesewhere. Daytronic Compact Flash cards have been tested to work properly with the MP7. Non-Daytronic Compact Flash cards may not be compatible with the instrument and cannot be supported by Daytronic Customer Service in case problems arise.

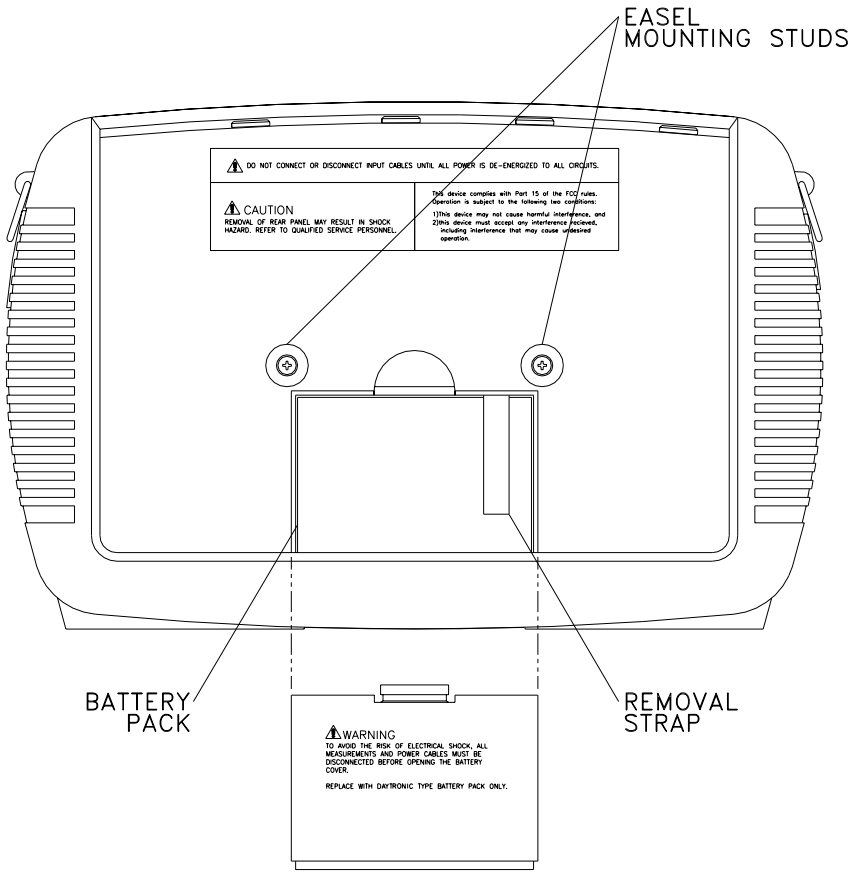


Parts table

Part	Function
1	Slot 1. Holds and connects data card to internal circuitry. Data card works in either Slot 1 or Slot 2.
2	Slot 2. Holds and connects data card to internal circuitry. Data card works in either Slot 1 or Slot 2. NOTE: This additional slot will be used for future options.
3	Data Card Release: Eject data card in Slot 1 or Slot 2 by pushing the appropriate data card release button.
4	Battery Charge Indicator. LED will light steadily while battery is fast charging and blink when fully charged.
5	Status Indicator. LED will light steadily when abnormal condition is detected. The unit is operating normally when light is off. NOTE: Status indicator will light for approximately 3 seconds when unit is turned on.
6	Power Indicator. LED will blink in a heartbeat fashion (once per second) when the unit is operating normally.
7	On/Off Power Button. Push for on, push for off.

Rear view

The rear view shows the battery compartment and the easel studs to mount the unit to desired angular position for use on a flat surface or to hang from a panel.



Upgrading Firmware from a Data Card

MP7 firmware web upgrade

Users can upgrade the MP7 internal program by downloading the latest firmware update release from the web and installing it into the MP7 internal memory. Refer to the instructions below on how to upgrade the MP7 firmware.

Firmware upgrades for the MP7 can be downloaded from the Daytronic website. Log on to www.daytronic.com for the latest information on MP7 firmware update releases.

Copy MP7 firmware program in data card

The procedure below specifies how to download the latest MP7 firmware from the web and copy it into a data card.

Step	Action
1	Locate the latest version of the firmware upgrade (in data file format “hostcode.bin”) from the Daytronic website www.Daytronic.com. Daytronic regularly posts the latest information and instructions regarding MP7 firmware upgrade releases.
2	Format the Compact Flash data card using the Memory Card options in MP7. The card must be formatted before it can be written to. Refer to Chapter 3 Start/Setup Operations - Site Name/Memory Card on page 3-17 for instructions on how to format the data card. NOTE: All data and setups stored in card will be lost when you format the data card. Copy any files that you want to save to a computer first before formatting the card.
3	Insert the Compact Flash data card into the appropriate slot in the computer. If the computer does not accommodate a Compact Flash card in its native format, use a compatible PC card adapter to read/write data into the card.
4	Download and copy the latest version of the MP7 firmware upgrade program (data file “hostcode.bin”) from the Daytronic website to the data card. Refer to page 1-11 for instructions on how to install the data card containing the latest firmware upgrade to the MP7.

Install data card to MP7

The procedure below specifies how to install the data card containing the latest firmware upgrade to the MP7.

Step	Action
1	Make sure that the unit is off. If not, press the MP7 On/Off power button to turn the unit off.
2	Remove the data card from its protective holder and check that the plug end of card is clean and free of any obstruction. NOTE: If plug end of card is dirty, clean with static-free, dry, low pressure air to remove any foreign material causing obstruction of the plug holes.
3	At the bottom of the unit, position the data card with the label facing up and the plug end facing the top slot (Data Card Slot 1). Make sure that there are no other cards in the unit except for the data card.
4	Insert the card fully into the top slot (Data Card Slot 1) until resistance is felt, then press firmly until the card engagement is felt. NOTE: Do not force the card further into the slot if no card engagement is felt. Remove the card and check if there is a foreign object on or in the plug end of the card. Remove any obstruction. Reinsert program card and repeat card engagement. If card cannot be engaged, STOP all further action and call Daytronic Technical Support at 1-800-668-4745 for assistance.
5	Turn the unit on by pushing the on/off button. The loader should display “Booting from program card”. If not, call Daytronic Technical Support for assistance.
6	The instrument will prompt the user to verify whether or not to upgrade the firmware. Press Yes and the upgrade procedure will commence. Do not turn the power off nor remove the data card while firmware upgrade is in progress.
7	If no errors were detected, a window displaying “Installation Complete” will pop up. Remove the data card from the unit.

MP7 Features

Touch screen function	All MP7 functions described below are operable using a color LCD touch screen technology. Users may use a finger and/or a PDA stylus to apply pressure to the LCD screen to result in touch screen recognition. Touch screen buttons will show visual feedback of contact along with audible feedback when pressed. In order to reduce power consumption, the backlight of the LCD screen times-out after a specified programmable time of no user activity. The backlight reactivates by touching any part of the screen.
Scope mode	Scope mode functions as an oscilloscope, displaying real-time waveforms of voltage and current for up to ten channels simultaneously, with one second update rate. The number of channels to plot, horizontal and vertical scale division for axis values, and colors of waveform display are user programmable. Users can also adjust the vertical position of the waveform, view trigger updates on screen, and ground out the channel to see where zero would show on the screen for that channel.
Meter mode	Meter mode functions display either the dc or ac value of the channels along with other calculated parameters. Meter readings are displayed in numerical format using user-specified labels or tag names. The number of active meters are based on user setups. The limits from the setups also control whether the numbers appear as black (within limits) or red (out of limits).
DFT (Discrete Fourier Transform)	DFT displays the frequency components that make up the channel's signal values of selected analog inputs up to approximately 4kHz. DFT defaults to a graphical spectrum display, although users have the option to choose between the graph and list form.
Graph	Graph displays the channel values in a horizontal bar graph as a percent of their full scale value. Users can select up to eight channel bar graphs to display.
Setup Wizard	Users may perform instrument setup by following a step-by-step sequence where they can specify data monitoring intervals and configure input channels (analog, digital or calculates) depending on the measurement Pods connected to the instrument. Users can configure threshold values that control the violation data recorded by MP7. Setup operation also includes setting the filename and formatting the data card in preparation for monitoring and writing of data.

Continued on next page

Trend	Users can generate plots for all recorded data. Trend can simultaneously display up to four plots with two parameters per plot.
Reports	Reports present data saved in Frames. A Frame is a record of sample scaled measurements recorded at a fixed time interval or immediately upon detection of any trigger violation. Users have the option to view a record in more detail i.e. display its data plot, threshold values, or edit parameter settings. Users can also use the Export function which instantly stores a data file on a memory card in MS® Excel file format.
Status	Status presents a graphic summary of the limit compliance of analog input and calculation channels. It also shows if digital channels from logic inputs are on or off. The channels/parameters appear in user-specified labels or tag names and are color coded for limit conformance or on/off status.
Data Card	MP7 only supports the use of Daytronic supplied Compact Flash data cards with AT LEAST 32MB storage capacity. The user replaceable data card is used as primary storage for data. Data monitoring CANNOT proceed without the data card. The MP7 is designed to accommodate the Compact Flash card in its native format, and does not require the use of a PC card adapter. However, a PC card adapter can be used to read the data into a laptop or other computer with a PC card slot.

Basic Operation

Introduction

The normal power source for the MP7 is its internal battery pack. The AC Adapter/ Battery Charger is used to charge the battery. Always charge the battery fully before use. The MP7 will always operate on the charger and is designed to do so, regardless of the state of charge of the battery.

Battery pack

Type: Sealed, rechargeable NiMH (Nickel Metal Hydride) cells.

Length of operation: The MP7 can operate on a fully charged battery pack for more than two (2) hours with the backlight on. When the backlight is turned off, the unit can operate for more than three (3) hours. For information on how to turn backlight on or off, see Chapter 6 Instrument Settings - Set Display Preferences on page 6-6.

Charging: The battery pack can be charged by connecting the AC Adapter/Battery Charger to the MP7. A screen warning will appear during operation when battery charge is low. A depleted battery pack can be recharged in six (6) hours whether the unit is on or off. The Battery Charge Indicator glows steadily while charging, and flashes when fully charged.

NOTE: The Battery Charge Indicator functions whenever the AC Adapter/Battery Charger is properly connected.

AC power source

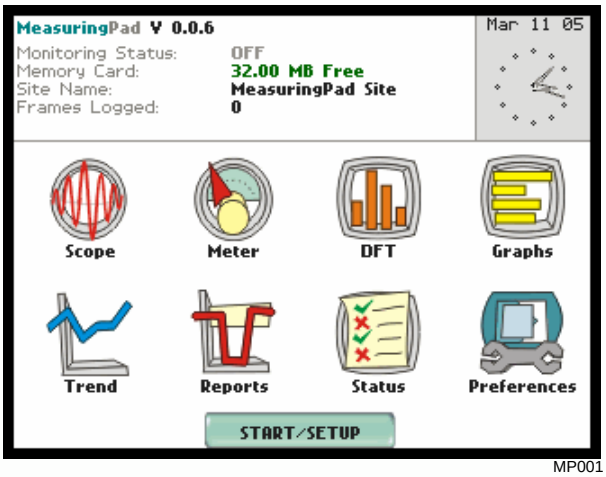
The MP7 can be operated from a 50/60 Hz 120/230V AC power source with or without the battery pack installed.

Connect the AC Adapter output cable to the Input Connector on the right side of the MP7. Connect the appropriate AC Adapter power cord for the country in which you are using the equipment into an appropriate ground outlet. Always use one of the available specified cords (refer to page 1-4) that have a protective ground terminal which must be connected to the protective ground earth.

Refer to Appendix C for the specifications and replacement of the batteries contained in MP7.

Power on sequence

Follow these steps to turn on the MP7 and display the Home screen.

Step	Action
1	Connect ac adapter/battery charger plug into the right side of MP7.
2	Plug the ac adapter into an ac power source.
3	Press the MP7 On/Off power button to turn the unit on. Result: The Home screen will be displayed.  MP001

Home screen features

Home screen is frequently referenced as the starting point for all major functionalities of the MP7.

The date and time appear on the top right corner of the Home screen. Both can be configured to appear in a different format. See page 6-3 for the procedure on how to set and reformat the time and date.

The unit name and model, MP7 program revision level, and status messages appear in the upper portion of the Home screen. Pertinent information that appear in the status message area include the monitoring status, amount of free space in data card, site/file name, and number of frames stored.

MONITORING STATUS: OFF indicates that the instrument is not actively monitoring data. The monitoring status message will change to ON, DONE or ARMED, depending upon the state of data monitoring. See page 3-21 for the procedure on how to turn monitoring on/off.

The Home screen contains the icons used to access the various MP7 functions. See page 1-16 for the description of each icon found in Home screen.

Home screen icons

Home screen contains the following icons used to access various MP7 functions. Note that data values are displayed only after the input channels have been set up and enabled.

Start/Setup - Start/Setup contains functions to set up the application for monitoring, use existing setups for monitoring, load previously saved setups for monitoring, and transfer stored data from card to MP7. See Chapter 3 Start/Setup Operations.

Scope - Scope mode shows real-time waveforms of the signals on the measuring inputs. See Chapter 4 View Real Time Data - Section A Scope Mode.

Meter - Meter readings come from analog inputs, digital inputs, and calculation channels. The values are color-coded for limit conformance. See Chapter 4 View Real Time Data - Section B Meter Mode.

DFT - DFT screen displays a spectral graph and textual matrix featuring amplitude and harmonic frequeny for a selected input value. See Chapter 4 View Real Time Data - Section C DFT.

Graph - Graph shows a horizontal bar graph of a selected channel value as a percent of the full scale value. See Chapter 4 View Real Time Data - Section D Graph.

Reports - Reports contain records of limit-violations listed in the order that they occurred. Users have the option to view a record in more detail i.e. display its data plot, threshold values, or edit parameter settings. There is also the Export function which instantly stores a data file on a memory card in MS® Excel file format. See Chapter 5 View Recorded Data - Section A Reports.

Trend - Trend allows users to view plots of recorded data. See Chapter 5 View Recorded Data - Section B Trend.

Status - Status shows a quick overview of the limit conformance of analog input and calculation channels. It also shows the on/off status of digital input channels. See Chapter 5 View Recorded Data - Section C Status.

Preferences - Users can set instrument preferences like time and date, threshold alarm feedback, language selection, LCD display, data card operation, and dictionary. See Chapter 6 Instrument Settings.

CHAPTER 2

Input Pod Connection

Overview

Introduction

This section describes the six types of external Pods and how they can be plugged in the instrument. Each Pod has different terminal connectors allowing fast and easy connection of various kinds of transducers or sensors to the MP7. A maximum of four Pods per instrument is supported, where each Pod has four analog and two digital channels which can be enabled to send data in the instrument.

In this chapter

The following topics are covered in this chapter.

WARNING

Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Connection of this instrument to an electrical system must be performed in compliance with the National Electrical Code (ANSI/NFPA 70-2005) and any additional safety requirements applicable to your installation.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved".

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2004) of USA and any additional workplace safety requirements applicable to your installation.

Continued on next page

ADVERTENCIA **Una conexión incorrecta de este instrumento puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda este manual antes de conectar. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.**

La conexión de este instrumento a un sistema eléctrico se debe realizar en conformidad con el Código Eléctrico Nacional (ANSI/NFPA 70-2005) de los E.E.U.U., además de cualquier otra norma de seguridad correspondiente a su establecimiento.

La instalación, operación y mantenimiento de este instrumento debe ser realizada por personal calificado solamente. El Código Eléctrico Nacional define a una persona calificada como "una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados."

El personal cualificado que trabaja encendido o acerca a los conductores eléctricos energizados expuestos debe seguir prácticas y procedimientos relacionados seguridad aplicable del trabajo incluyendo el equipo protector personal apropiado en conformidad con el estándar para los requisitos de seguridad eléctricos para los lugares de trabajo del empleado (ANSI/NFPA 70E-2004) de los E.E.U.U. y cualquier requisito de seguridad adicional del lugar de trabajo aplicable a su instalación.

AVERTISSEMENT **Si l'instrument est mal connecté, la mort, des blessures graves, ou un danger d'incendie peuvent s'en suivre. Lisez attentivement ce manuel avant de connecter l'instrument. Lorsque vous utilisez l'instrument, suivez toutes les instructions d'installation et de service.**

Le raccordement de cet instrument à un système électrique doit être effectué conformément au Code Électrique National (ANSI/NFPA 70-2005) des Etats-Unis et à toutes les exigences de sécurité applicables à votre installation.

Cet instrument doit être installé, utilisé et entretenu uniquement par un personnel qualifié. Selon le Code Électrique National, une personne est qualifiée si "elle connaît bien la construction et l'utilisation de l'équipement, ainsi que les dangers que cela implique".

Le personnel qualifié qui travaillent dessus ou s'approchent des conducteurs électriques activés exposés doit suivre des pratiques en matière et des procédures reliées par sûreté applicable de travail comprenant le matériel de protection personnel approprié conformément à la norme pour des conditions de sûreté électriques pour les lieux de travail des employés (ANSI/NFPA 70E-2004) des Etats-Unis et toutes les conditions de sûreté additionnelles de lieu de travail applicables à votre installation.

WARNUNG

Der falsche Anschluß dieses Gerätes kann Tod, schwere Verletzungen oder Feuer verursachen. Bevor Sie dieses Instrument anschließen, müssen Sie die Anleitung lesen und verstanden haben. Bei der Verwendung dieses Instruments müssen alle Installation- und Betriebsanweisungen beachtet werden.

Anschluß dieses Instrumentes zu einem elektrischen System muß gemäß dem Nationalen Elektrischen Code (ANSI/NFPA 2005) der Vereinigten Staaten, und allen zusätzlichen Sicherheitsauflagen durchgeführt werden, die auf Ihre Installation anwendbar sind.

Installation, Betrieb und Wartung dieses Instruments dürfen nur von Fachpersonal durchgeführt werden. In dem nationalen Bestimmungen für Elektrizität wird ein Fachmann als eine Person bezeichnet, welche "mit der Bauweise und dem Betrieb des Gerätes sowie den dazugehörigen Gefahren vertraut ist."

Qualifiziertes Personal, das an bearbeiten oder herausgestellte angezogene elektrische Leiter sich nähern, muß anwendbare Sicherheit bezogener Arbeit Praxis und Verfahren einschließlich passende persönliche schützende Ausrüstung gemäß dem Standard für elektrische Sicherheitsauflagen für Angestellt-Arbeitsplätze (ANSI/NFPA 70E-2004) der Vereinigten Staaten und alle zusätzlichen Arbeitsplatzsicherheitsauflagen folgen, die auf Ihre Installation anwendbar sind.

Safety precautions

The following safety precautions must be followed whenever any type of voltage or current connection is being made to the MP7.

- Wear proper Personal Protective Equipment, including safety glasses and insulated gloves when making connections to power circuits.
- Hands, shoes and floor must be dry when making any connection to a power line.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
- Set the MP7 power switch to Off.
  Before connecting to electric circuits to be monitored, open their related circuit breakers or disconnects. DO NOT install any connection of the MP7 to live power lines.
- Pods should be connected first to the MP7, then connect to the circuit to be monitored.
- If the equipment is used in a manner not specified in this user’s guide, the protection provided by the equipment may be impaired.

Types of Measurement Pods

Pod description

The external Pods operate independently of each other when connected to the MP7. Each Pod has different terminal connections which allows the instrument to operate with various sensors/transducers and to process signals in a wide range of measurement applications. The Pods are self-discoverable in that each has a memory device that the MP7 reads to detect the Pod type - whether it is a MP600V Voltage Pod, MP300V Voltage Pod, MP30V Voltage Pod, MP20MA Current Pod, MPUC Universal Current Pod, or MPUT Thermocouple Pod. The first four types have analog inputs with the ability to select AC (rms) or DC signals. Several TR current probes can be used with the MPUC pod. Digital inputs can be configured as frequency measuring, counter, state detector, quadrature, or reset (used to clear counters, reset min/max, etc). Thermocouple has some special functions such as Cold Junction Reference. Each channel has high/low limits that control trigger violation.

Actual photos and part numbers are shown below to aid users in Pod identification. External pods are available as optional accessories for MP7. See Appendix B Technical Specifications for the detailed specifications of each Pod type.

MP600V Voltage Pod

MP300V Voltage Pod

MP30V Voltage Pod

MP20MA Current Pod

MPUC Universal Current Pod

MPUT Thermocouple Pod

Pod Connections

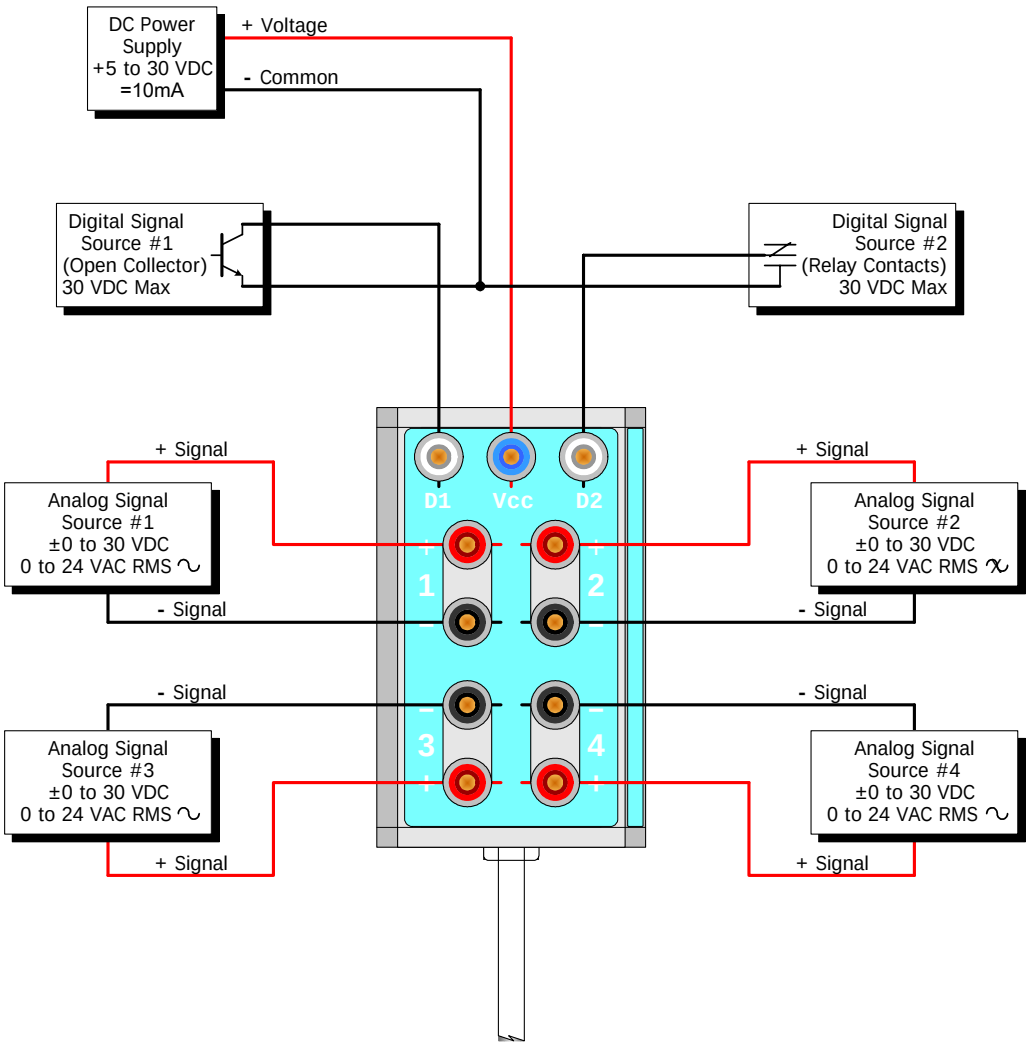
Introduction

This section contains wiring diagrams of voltage and current connections required to connect transducers or sensors to the measurement Pods. The wiring configurations should assist users in the connection of Pod type appropriate for their application.

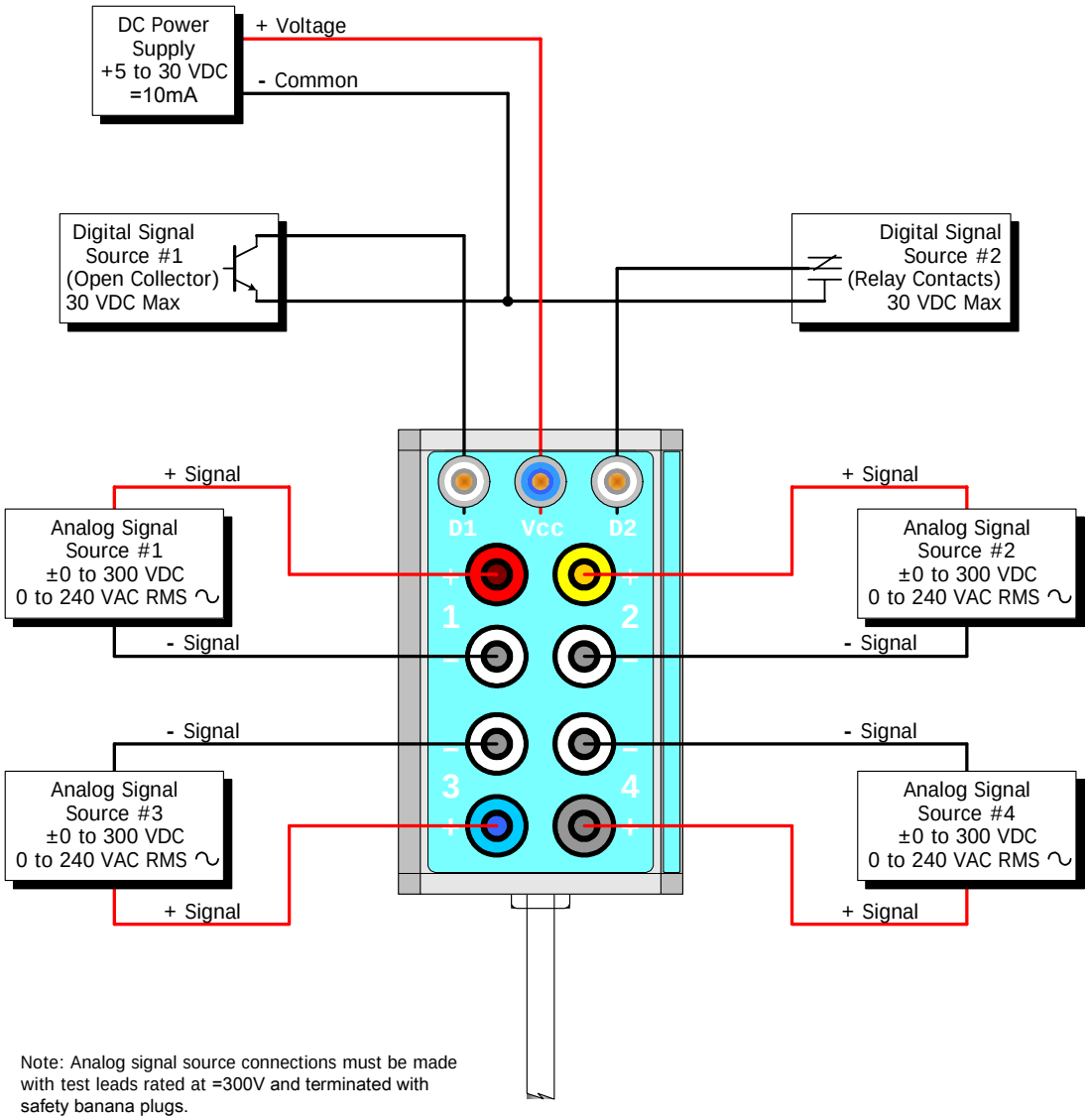
WARNING

To reduce the risk of fire, electric shock, or physical injury, it is strongly recommended that connections be made with all Pod inputs de-energized and current carrying conductors fused. If it is necessary to make connections on energized Pods, these must be performed by Qualified Personnel ONLY with proper Personal Protective Equipment.

MP30V Pod connections

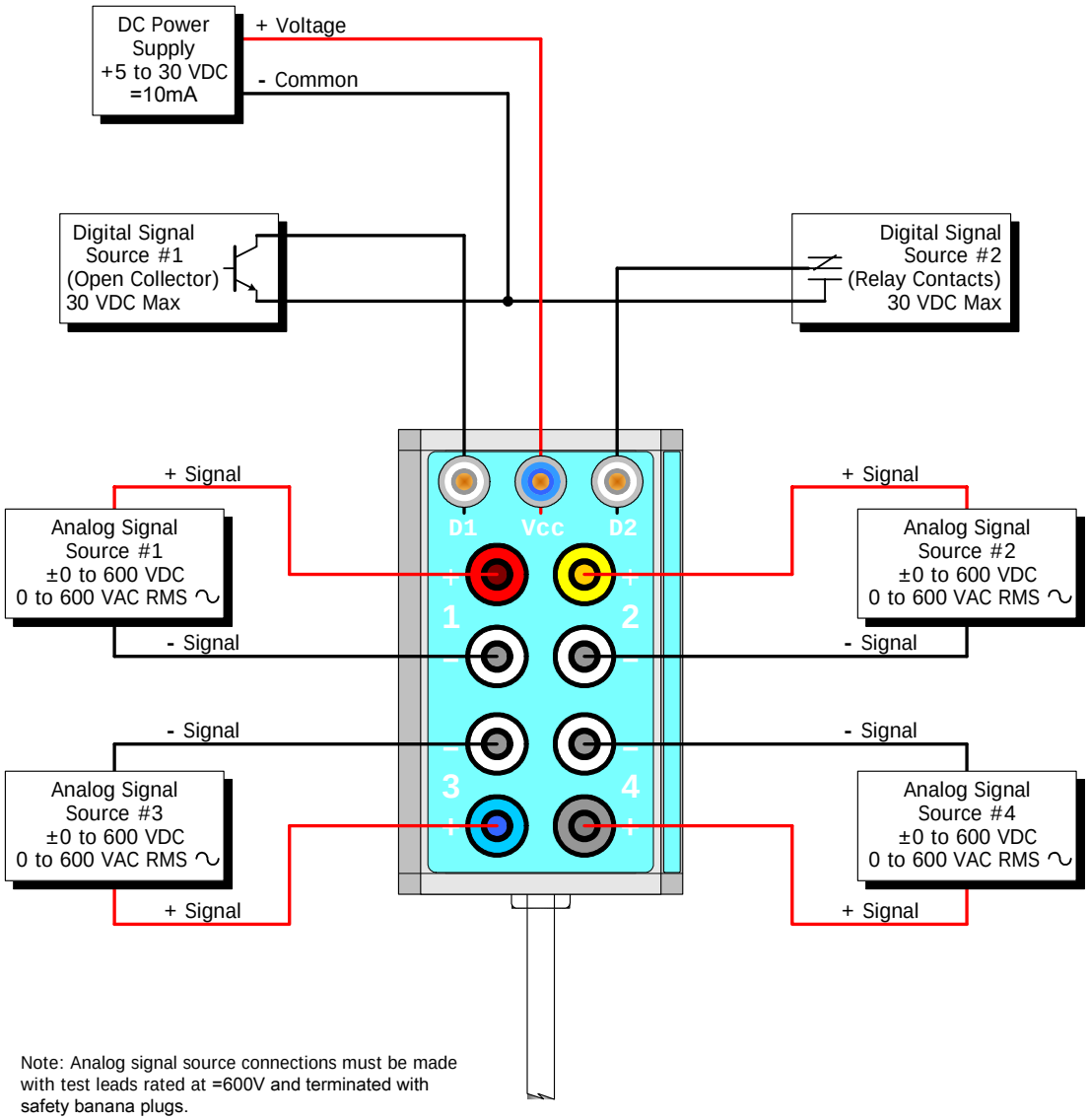


MP300V Pod connections



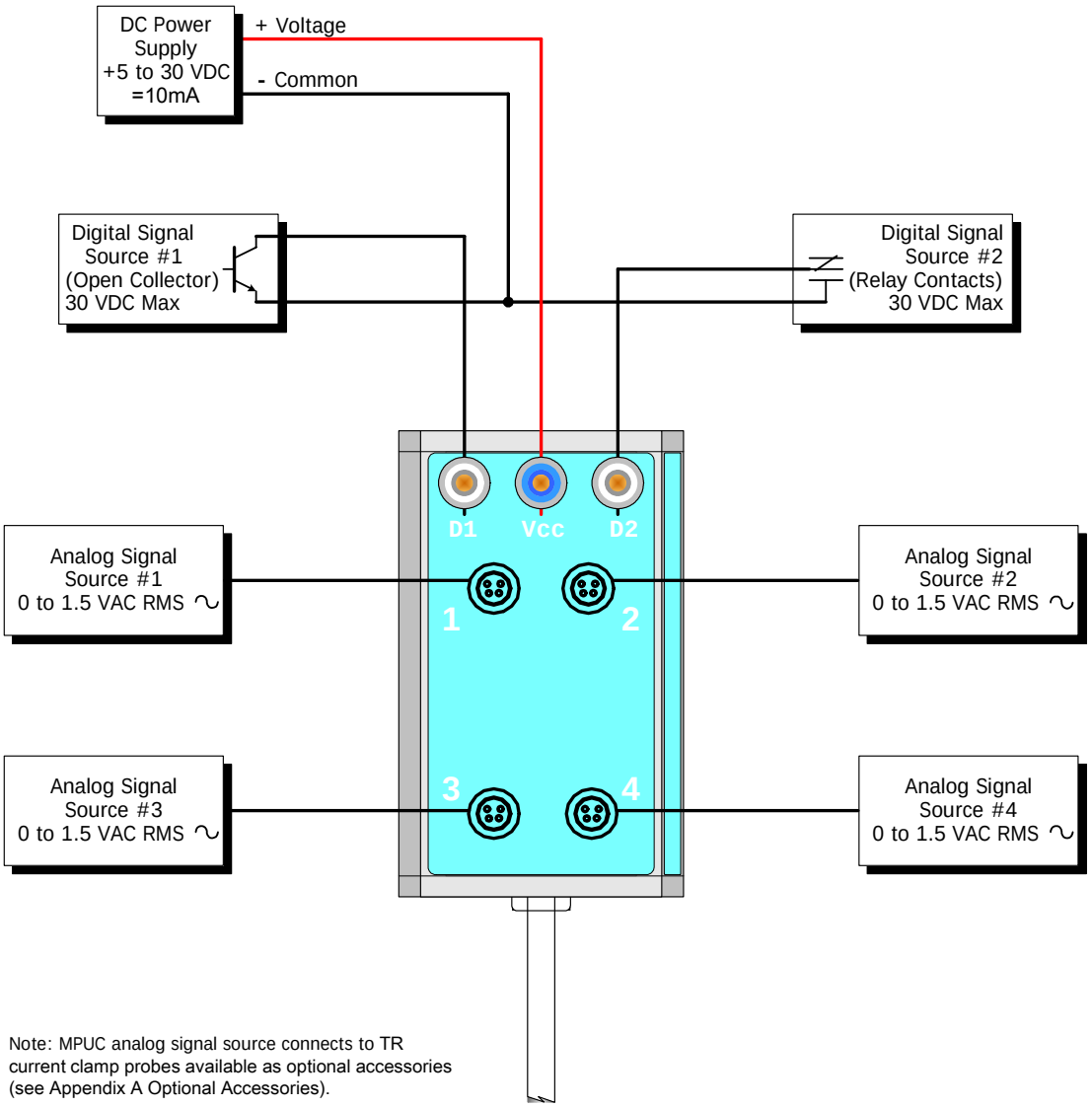
Note: Analog signal source connections must be made with test leads rated at =300V and terminated with safety banana plugs.

MP600V Pod connections



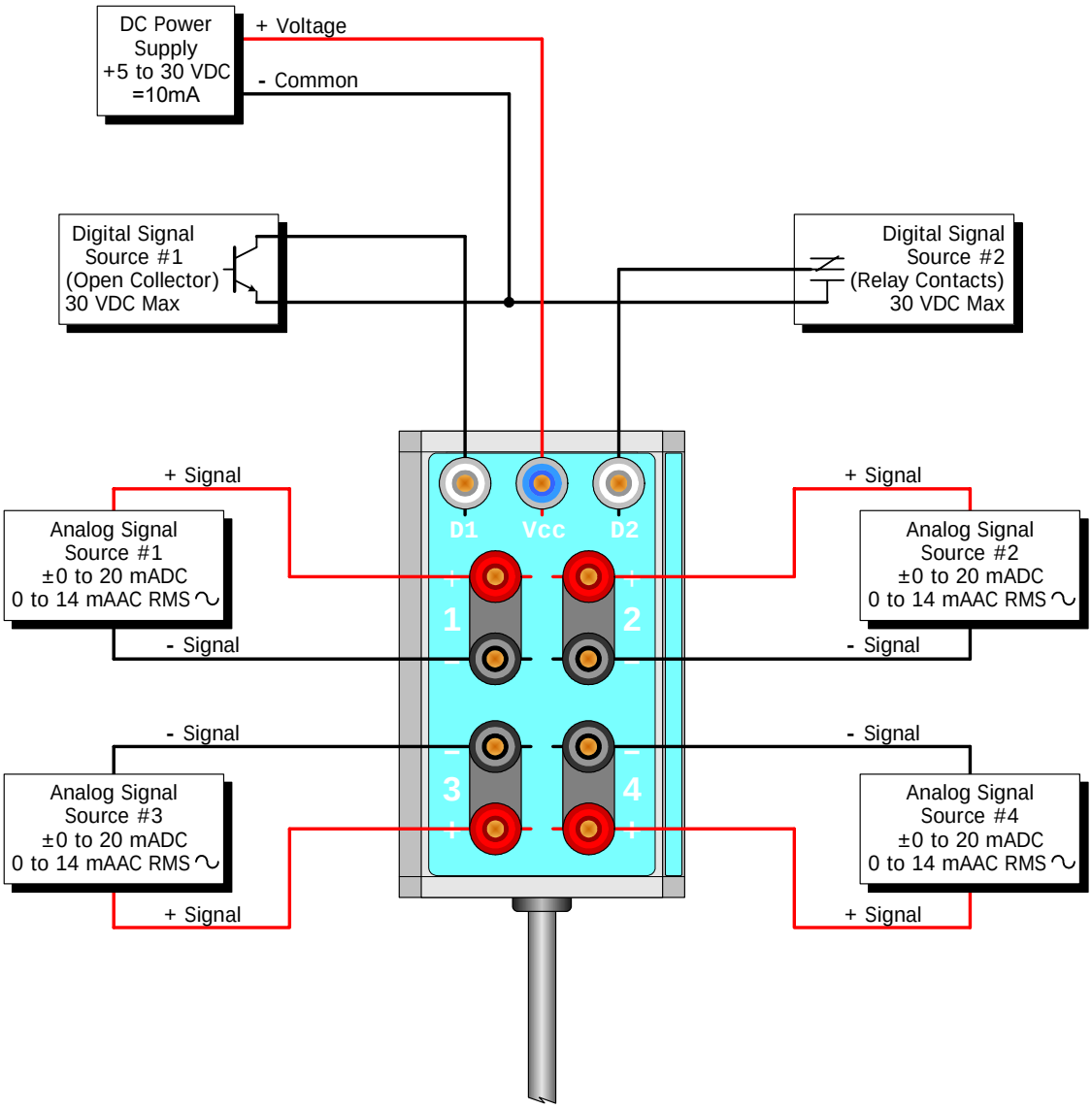
Note: Analog signal source connections must be made with test leads rated at =600V and terminated with safety banana plugs.

MPUC
Universal
Current Clamp
Pod connections

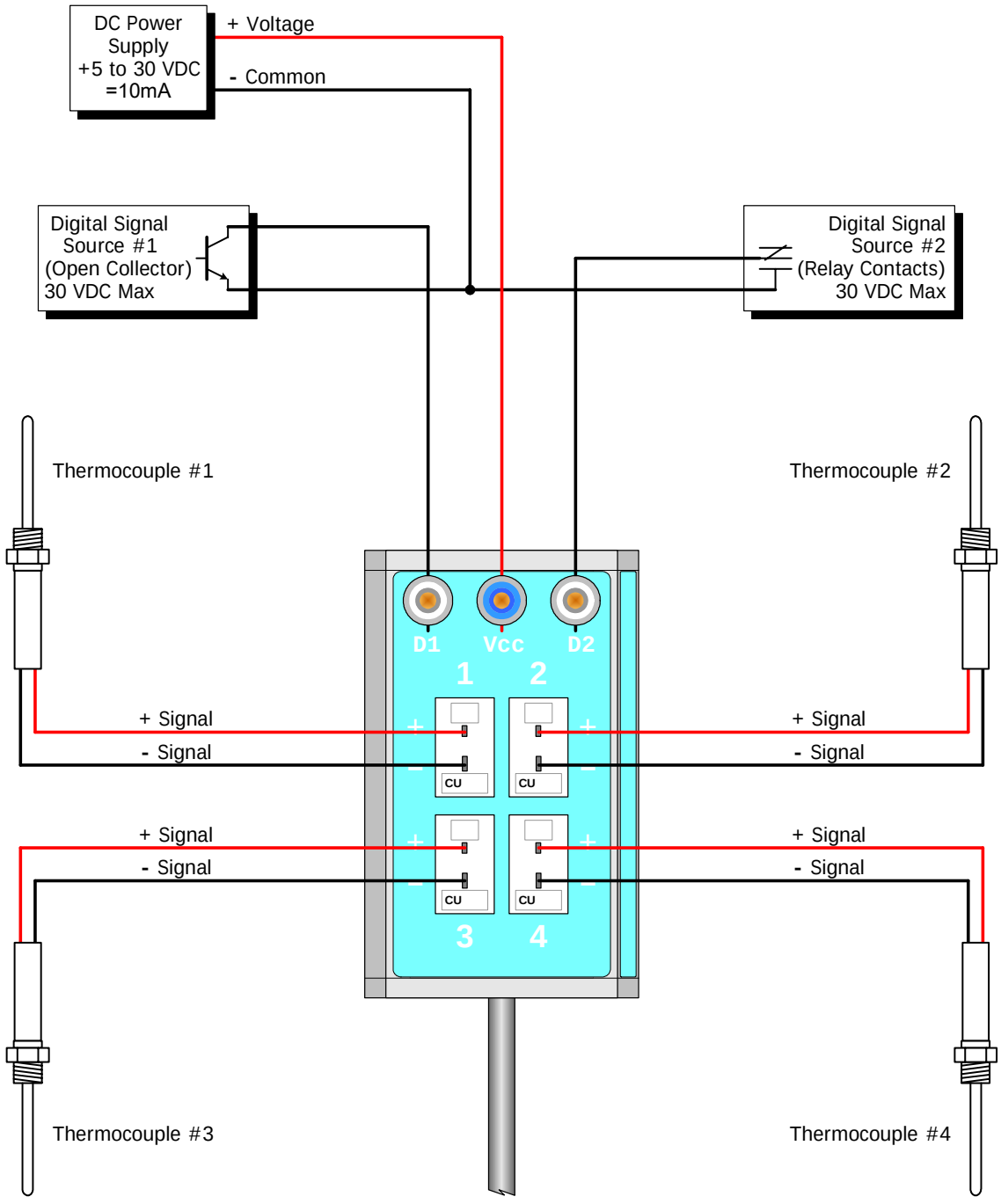


Note: MPUC analog signal source connects to TR current clamp probes available as optional accessories (see Appendix A Optional Accessories).

MP20mA Pod connections



MPUT Pod connections



Note: Analog signal source connections must be made with thermocouple wire or thermocouple extension cable of the appropriate type (B, E, J, K, N, R, S, or T), and terminated with mini plugs.

Connecting the Pods to the Cable Panel

Pod connectors

The input connectors for measurement Pods are found on the top panel of the MP7. The markings on the panel show the Channel labels for each connector - Pod A, Pod B, Pod C, and Pod D. Simply plug the external Pod to the connector channel that you prefer. The six types of Pods are designed to fit in any of the four Pod channels in the cable panel. Pods should be plugged in with the instrument powered off and Pod inputs de-energized.

Once the Pods are plugged in and instrument turned on, the unit will automatically detect the Pod type. MP7 allows four Pods to connect to the instrument at the same time, in any combination.

The Input Configuration screen under Start/Setup menu will display which Channel the Pod is connected to. See Chapter 3 Start/Setup Operations for more information on MP7 input configurations.

WARNING **Connect only Daytronic/Dranetz-BMI Pods to the cable connectors.**

CHAPTER 3

Start/Setup Operations

Overview

Start/Setup menu options

The Start/Setup functions allow users to perform the following: set up the MP7 for monitoring of an entire process or piece of equipment, load previously saved setups from card, and load data from card.

Setup configurations depend on user application and extent of familiarity with the operation of the intrument. The length of time to monitor a system can vary from a few minutes to a few weeks depending on user application.

Setup Wizard takes the user through a series of screens prompting for information about the process to be monitored. The user is allowed to modify the default trigger parameters and intervals used to log data. The user sets up the external Pods which connect MP7 to transducers or sensors. The instrument can work with up to four Pods simultaneously, each Pod having 4 analog and 2 digital channels. Each channel in the Pod must be turned on individually, but any combination can be used. In addition, the user can also record data using Calculate functions that can be applied to up to 8 channels. Threshold limits can be set for each channel using any values within the acceptable range. If the limit is exceeded, a violation occurs and data will be stored at the user-defined rate until the user programmed depth has expired or the input is back within limits. Setup also includes filename and format card operations to prepare the instrument for data monitoring.

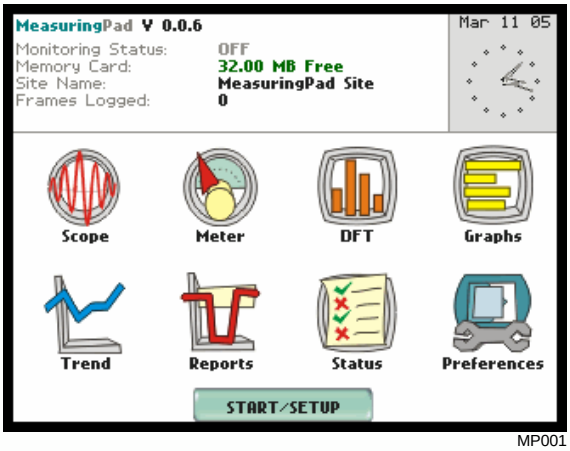
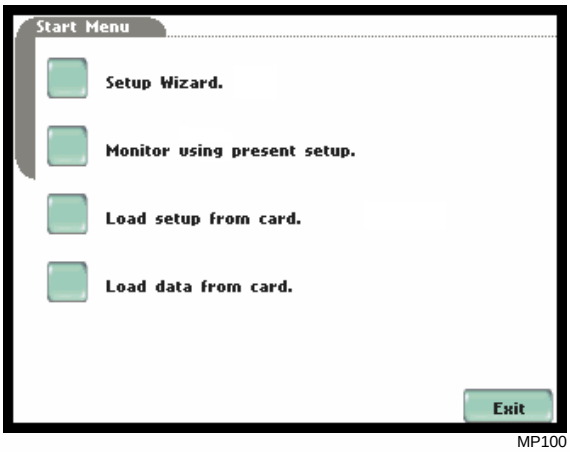
Monitor using present setup makes use of the existing setup for monitoring. If a setup configuration has been previously saved to the card, you may load it using the menu below.

Load setup from card enables you to use previously saved setups. If you wish to load a previously saved data file from the card, use the menu below.

Load data from card allows you to transfer saved data from the memory card to MP7.

Displaying Start Menu

Follow these steps to display the Start/Setup Menu.

Action...	Result...
STEP 1: Press the MP7 On/Off power button to turn the unit on. The Home screen will be displayed.	 MP001
STEP 2: Press **Start/Setup**. The Start Menu will be displayed.	 MP100

In this chapter

This chapter is divided into five sections:

Section	Title	See Page
A	Setup Wizard	3-3
B	Monitor using Present Setup	3-21
C	Load Setup from Card	3-29
D	Load Data from Card	3-30

Section A

Setup Wizard

Overview

Introduction

MP7 allows users to configure multiple setups unique to their task or applications. Make sure that the external Pods through which input sensors connect to MP7 are properly hooked up before setting up the instrument for monitoring. See Chapter 2 Input Pod Connection for information on how to connect external Pods to the instrument.

Definitions

Setup: A pre-set condition of parameter thresholds and frame capture settings for each channel that determines what will constitute a violation and how many data frames will be saved when this violation occurs.

Violation: A violation occurs when a pre-set threshold is crossed. Violations result in a contiguous collection of frames that are saved into memory. A violation consists of the pre-trigger sample data (captured before the start and end of violation) and the maximum depth of violation data stored in frames. Both the time duration (in msec) to record pre-trigger data and the amount of violation data samples to store (in frames) are user-programmable.

Parameter threshold: A value that the MP7 compares to a measurement to decide if a violation occurs. Also called a limit. For example, if the input voltage is measured as 135 Vrms, and the parameter threshold for voltage is 132 Vrms, MP7 saves this limit crossing to memory as a violation until depth expires or input is back within limits.

Trigger mechanisms

MP7 constantly scans all active analog inputs at 10kHz, digital inputs at 40kHz, or calculates at various rates based on formula. It evaluates the samples through the following triggering mechanisms:

- Storing data by limit-violations. Applies to analog, digital and calculation channels. When Threshold Beeper is set to on, the unit will provide audible alarm signals when thresholds are crossed and violations occur (refer to Chapter 6 Instrument Settings on page 6-11 for the procedure to turn threshold beeper on/off). See page 3-4.
- Auto-saving data by time. This is used to store longer-term trend data at one second or longer intervals when no violations occur. See page 3-4.
- Enabling digital input triggers from logic inputs. See page 3-8.
- Manually starting and stopping monitoring. See page 3-22.

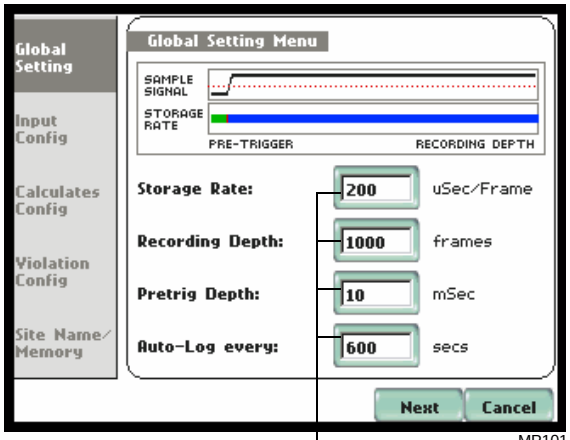
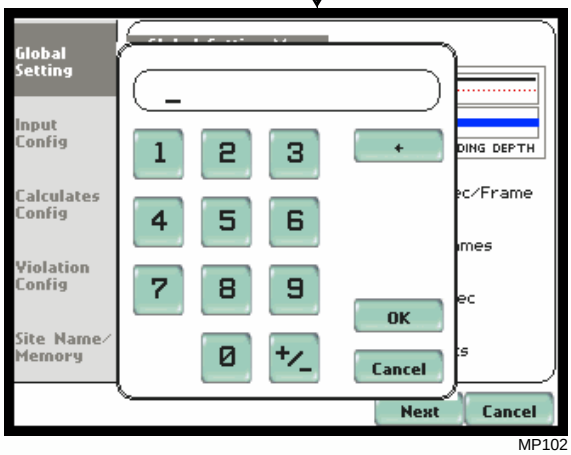
In this section

The following topics are covered in this section.

Global Setting Menu

Global sampling and recording setting

The term “global” implies that all recording settings apply to analog, digital, and calculation channels which can have high and/or low limit ranges for violation triggering. When a limit is crossed, the instrument records data to include Pre-trigger samples before the start and end of violation. Data is saved in Frames, which consist of sample scaled measurements recorded at a fixed time interval. Users can change the rate by which data is saved to make it equal to or slower than the default scan rate. Analog channels are scanned at a fixed rate of 10 KHz per input channel. Digital channels are scanned at a rate of 40KHz. Calculate channels are scanned at various rates based on formula.

Action...	Result...
From the Start Menu, press Setup Wizard to display the Global Setting Menu screen. The indicator window provides a graphic display of the value settings of the parameters below. • Press **Storage Rate** window to set how often data will be saved once limits are crossed. Storage occurs continuously at user-defined rate until all limits are cleared, or depth of storage has been exceeded, or memory space is full. • Press **Recording Depth** window to specify the amount of violation data samples that you want to store. The memory will fill and stop with violation records until the set recorder depth is reached if channel remains out of limits. • Press **Pre-Trig Depth** window to specify the time duration (in milliseconds) to save samples before the start and end of violation. • Press **Auto-Log every** window to set the time interval to record data even when no violations occur.	 MP101  MP102

Continued on next page

Global sampling and recorder setting (continued)

Action...	Result...
• Use the numeric keypad to enter values within the acceptable range. Press OK to accept new value or Press Cancel to discard changes and return to the previous screen. • When done with the event trigger settings, press **Next** and go to page 3-6. • Press **Cancel** to quit and return to Start menu.	

Auto-log rate vs. Storage rate

MP7 will record sample scaled measurements using the Auto-Log rate while no violation occurs. Once the unit detects a trigger violation, recording will begin at a special Storage rate that can be up to high speed. Recording of violations will continue until all enabled channel inputs return within limits, or depth of storage has been exceeded, or memory space is full.

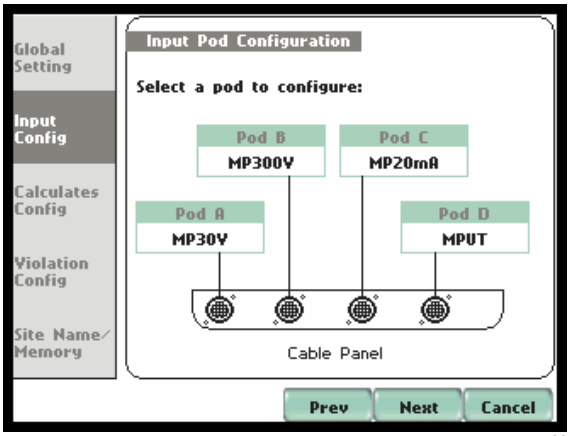
If the channels returned within limits prior to the recording depth count being exceeded, then monitoring using the auto-log rate will begin again.

If monitoring ends due to recording depth being exceeded or memory space being full, the unit will stop recording data until the user purposely turns monitoring on immediately or at a specified time and date (see Section B Monitor using Present Setup on page 3-21).

Input Configuration

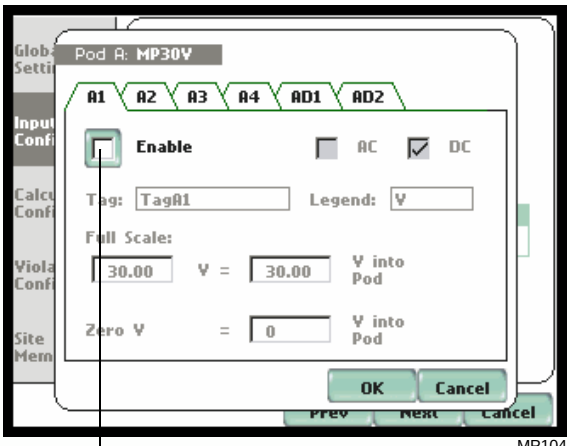
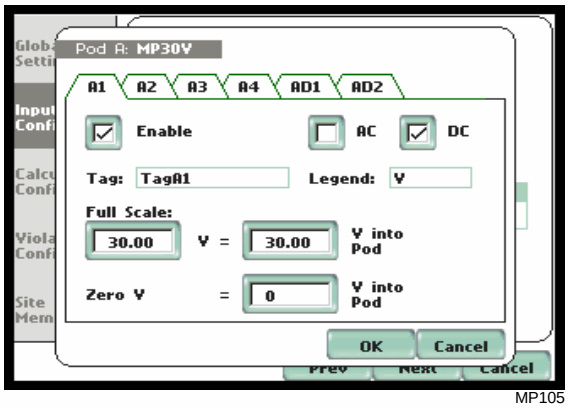
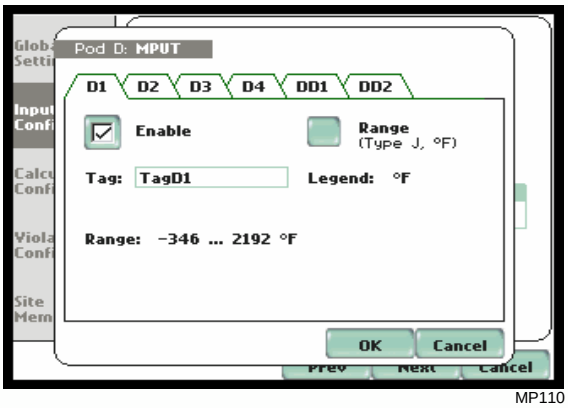
Input channel settings

Sensors can connect to MP7 via external Pods (see Chapter 2 Input Pod Connection for more information on the Pod accessories). Each Pod has four analog and two digital channels. Once the Pods are plugged in, MP7 automatically detects the Pod type. Up to four Pods can connect to the instrument at the same time.

Action...	Result...
From the Global Setting Menu screen, press Next to display Input Pod Configuration. The instrument auto-detects and displays the type of input Pod and the channel it connects. For Example: The screen shows MP30V Voltage Pod, MP300V Voltage Pod, MP20mA Current Pod, and MPUT Thermocouple Pod connected to Channels A, B, C and D respectively. • Press the Pod where you want to turn channels on or modify settings. Each channel in the Pod must be turned on individually, but any combination can be used. Example 1: Select a Pod and see page 3-7 for analog input settings. Example 2: Select a Pod and see page 3-8 for digital input settings. • When done configuring input Pods, press **Next** and go to page 3-15. • Press **Cancel** to quit and return to Start menu.	 MP103

Analog input channel settings

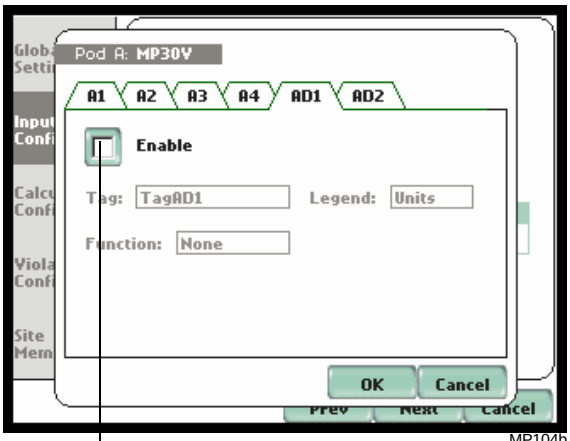
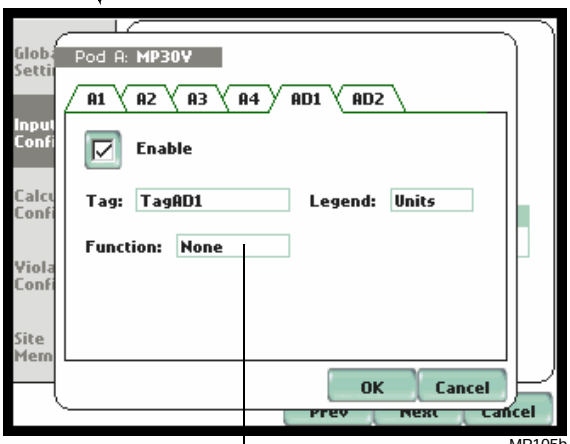
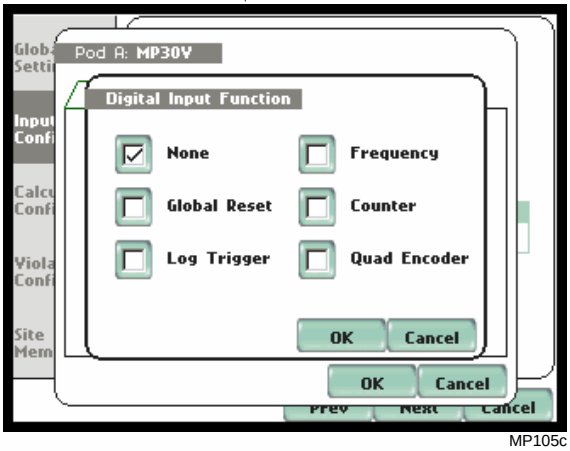
Select the channel that you want to enable and monitor data from. The sample screens below show the input settings for an analog channel.

Action...	Result...
Check **Enable** to set data configurations for the Analog channel. The settings below will affect how the channel will be scaled and displayed. • For Non-thermocouple Pods, select between **AC (rms)** or **DC** input signal. For Thermocouple Pods, press **Range** to select temperature range and degree scale (^{o}F or ^{o}C). • Press **Tag** window to enter channel label or tag name. • Press **Legend** window to enter engineering units for the channel. • Press **Full Scale** window to enter the desired full scale reading versus volts or milliamps into the Pod. • Press **Zero** window to enter the desired zero offset value. • Press **OK** to accept value settings and return to Input Pod Configuration screen. • Press **Cancel** to discard changes in value settings and return to Input Pod Configuration screen.	The following screens will appear if an analog input channel is selected:  MP104 Analog input settings for Non-thermocouple Pods.  MP105 Analog input settings for Thermocouple Pods.  MP110

Digital input channel settings

The example below shows the input settings for a digital channel.

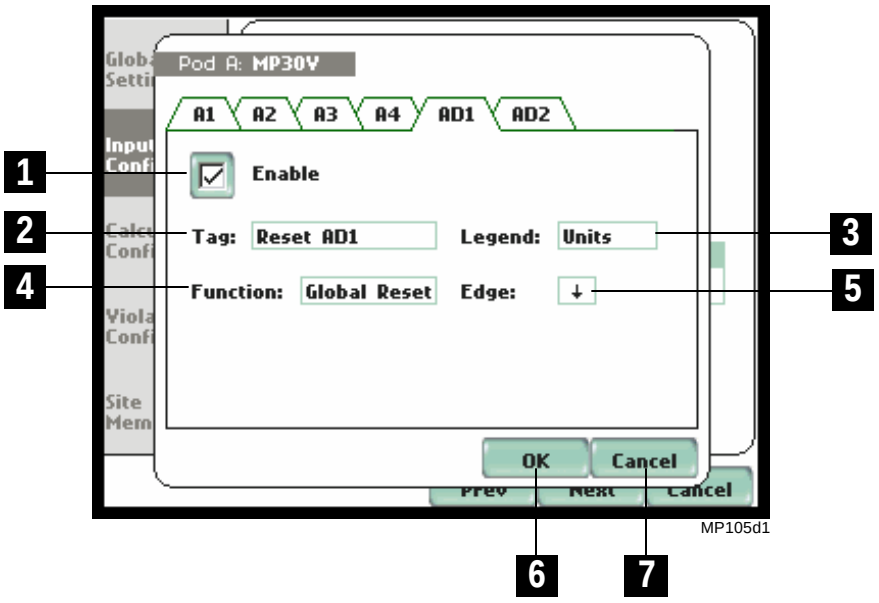
Action...	Result...

Check **Enable** to set data configurations for the Digital channel. The settings below will affect how the channel will be processed and displayed.
 	
• Press **Tag** window to enter channel label or tag name.
• Press **Legend** window to enter engineering units for the channel.
• Press **Function** window to display the available logic input settings for the digital channel. A digital input can be configured as a:
  • Global Reset
  • Log trigger
  • Frequency channel
  • Counter
  • Quad encoder
 	
  See pages 3-9 to 3-14 for the description of each digital input setting.
 	
• Press **OK** to accept the digital input settings and return to Input Pod Configuration screen.
 	
• Press **Cancel** to discard changes in settings and return to Input Pod Configuration screen.
	The following screens will appear if a digital input channel is selected:
	
	 
	
	MP104b
	
	 
	
	MP105b
	
	 
	
	MP105c

Digital settings

Digital inputs can be configured to work as a: Global Reset, Log Trigger, Frequency channel, Counter, or Quad Encoder. Digital functions are typically used to input digital signals from switches, contacts, and frequency generating devices. Digital channels are scanned at a rate of 40kHz (four times the analog input scan rate). The next section shows the possible input settings for the digital channel.

Digital input as Global Reset is used to clear counters.

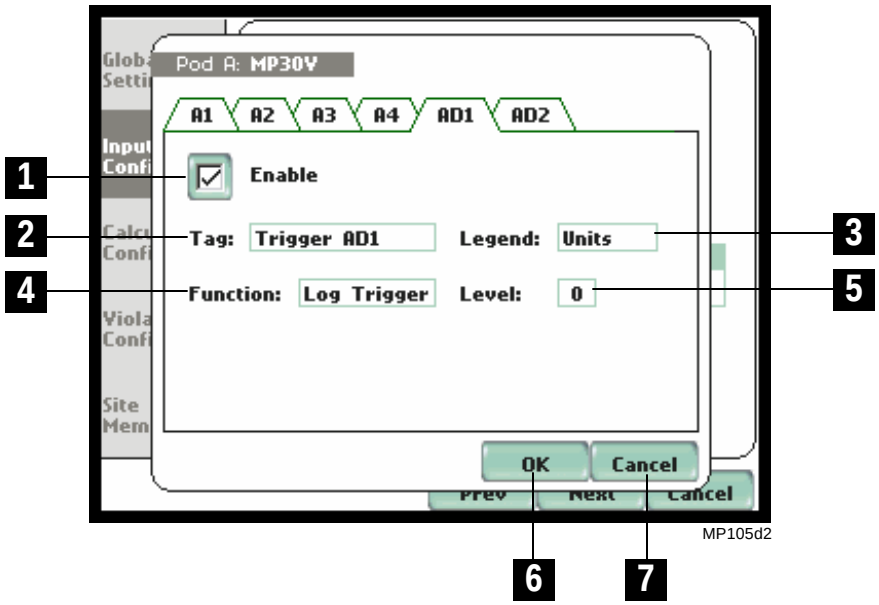


	Function
1	Enable. Check/Uncheck the box to turn the channel on/off.
2	Tag. Press to enter a user-specified label or tag name for the channel.
3	Legend. Press to enter the engineering units appropriate for the channel application.
4	Function. Shows the digital function setting for the channel. Press to modify.
5	Edge Trigger. Toggles between ↓ , ↑ , ↕ .
6	OK. Press to accept the channel input setting and return to the Input Pod Configuration screen.
7	Cancel. Press to discard changes in channel input setting and return to the Input Pod Configuration screen.

Continued on next page

Digital settings (continued)

Digital input as Log Trigger. In this configuration, a frame will be saved when a trigger is detected.



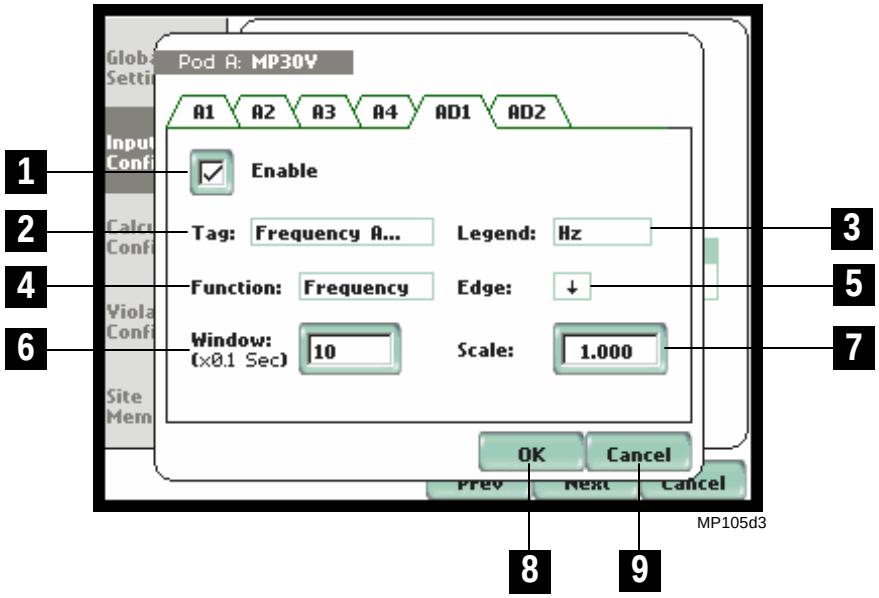
	Function
1	Enable. Check/Uncheck the box to turn the channel on/off.
2	Tag. Press to enter a user-specified label or tag name for the channel.
3	Legend. Press to enter the engineering units appropriate for the channel application.
4	Function. Shows the digital function setting for the channel. Press to modify.
5	Trigger Level. Toggles between 0, 1.
6	OK. Press to accept the channel input setting and return to the Input Pod Configuration screen.
7	Cancel. Press to discard changes in the channel input setting and return to the Input Pod Configuration screen.

Continued on next page

Digital settings (continued)

Digital input as a Frequency counter. In this configuration, the digital input measures the frequency of state transitions over the specified window.

Hint: To measure frequency in Hz, set the Scale to 1 and the Edge to ↓ or ↑.

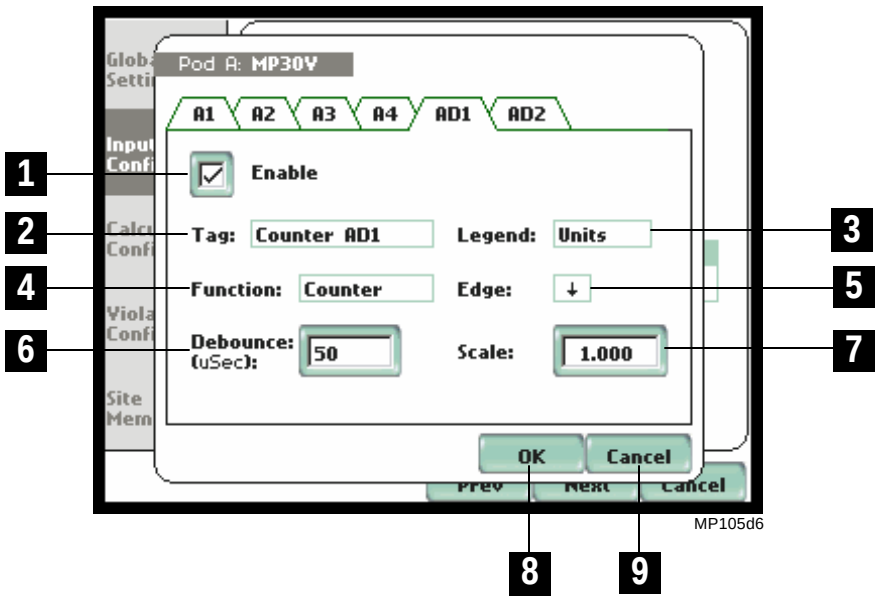


	Function
1	Enable. Check/Uncheck the box to turn the channel on/off.
2	Tag. Press to enter a user-specified label or tag name for the channel.
3	Legend. Press to enter the engineering units appropriate for the channel application.
4	Function. Shows the digital function setting for the channel. Press to modify.
5	Edge Trigger. Toggles between ↓, ↑, ↕.
6	Measurement Window (sec) of which the frequency measurement is taken.
7	Scale. The factor by which the number of scale divisions recorded by the instrument must be multiplied to compute the measurement value.
8	OK. Press to accept the channel input setting and return to the Input Pod Configuration screen.
9	Cancel. Press to discard changes in the channel input setting and return to the Input Pod Configuration screen.

Continued on next page

Digital settings (continued)

Digital input as a Counter. In this configuration, the input counts the number of state transitions. The counter is reset by another digital input that is configured as Global Reset.

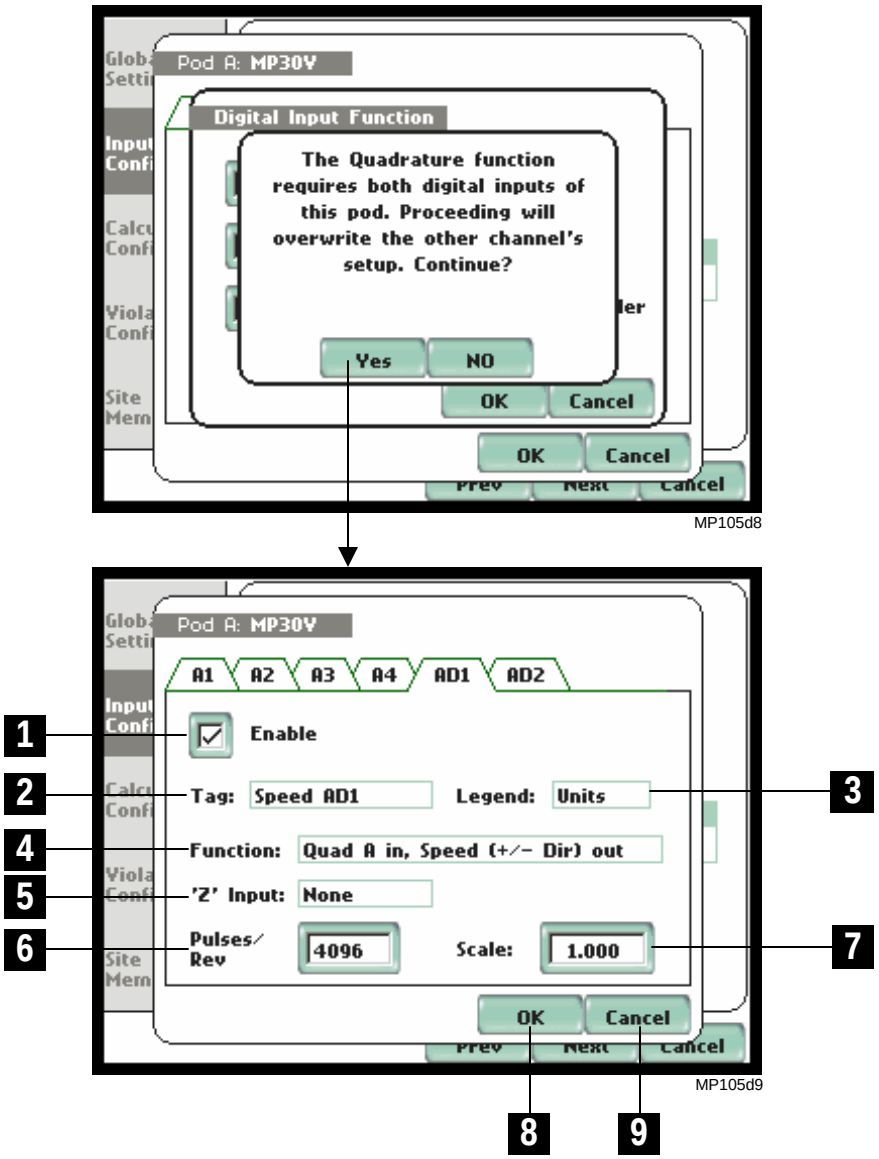


	Function
1	Enable. Check/Uncheck the box to turn the channel on/off.
2	Tag. Press to enter a user-specified label or tag name for the channel.
3	Legend. Press to enter the engineering units appropriate for the channel application.
4	Function. Shows the digital function setting for the channel. Press to modify.
5	Edge Trigger. Toggles between ↓, ↑, ↕.
6	Debounce (uSec). If set, this value shows the number of microseconds to wait before considering a new transition valid.
7	Scale. The factor by which the number of scale divisions recorded by the instrument must be multiplied to compute the measurement value.
8	OK. Press to accept the channel input setting and return to the Input Pod Configuration screen.
9	Cancel. Press to discard changes in the channel input setting and return to the Input Pod Configuration screen.

Continued on next page

Digital settings (continued)

Both digital inputs of the Pod are required for the Quadrature Encoder function. Typically, input 1 measures the speed while input 2 measures the phase. Another channel can be assigned as the z input in order to provide phase reference.



See screen legend on page 3-14.

Continued on next page

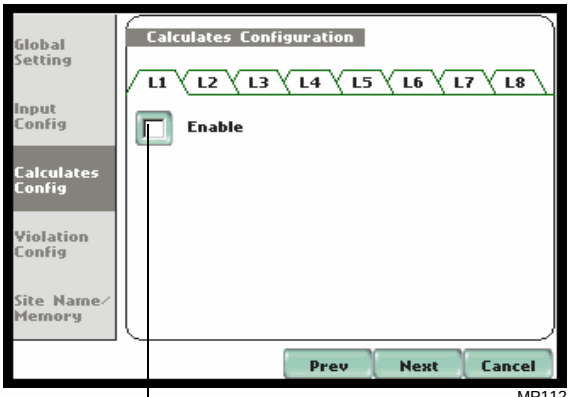
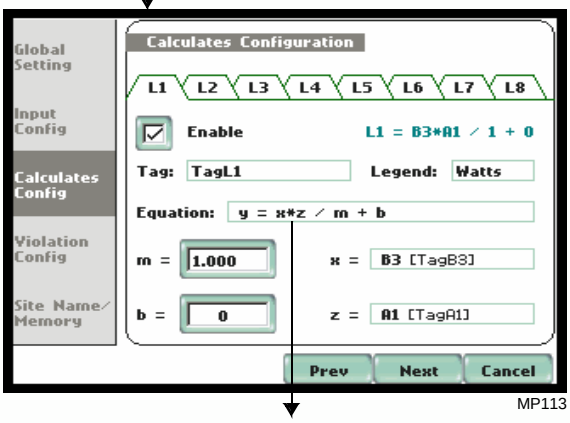
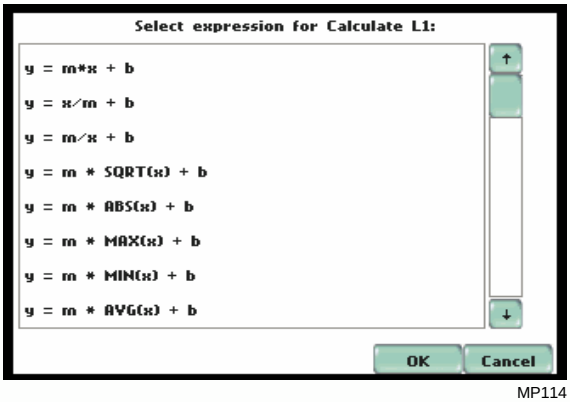
Digital settings (continued)

	Function
1	Enable. Check/Uncheck the box to turn the channel on/off.
2	Tag. Press to enter a user-specified label or tag name for the channel.
3	Legend. Press to enter the engineering units appropriate for the channel application.
4	Function. Shows the digital function setting for the channel. Press to modify.
5	'Z' Input. An external input (digital input from another Pod) that is considered as Phase. Also known as Phase Reference.
6	Pulses/Rev. The sum of the A and B pulses per revolution.
7	Scale. The factor by which the number of scale divisions recorded by the instrument must be multiplied to compute the measurement value.
8	OK. Press to accept the channel input setting and return to the Input Pod Configuration screen.
9	Cancel. Press to discard changes in the channel input setting and return to the Input Pod Configuration screen.

Calculates Configuration

Calculation channel settings

Calculates are math functions that can be applied to one or two channels, be it analog, digital or another calculate channel. Up to eight internal cross-channel math calculations can be set up for display. Calculation channels can be used to monitor additional process variables such as horsepower, efficiency, and corrected flow.

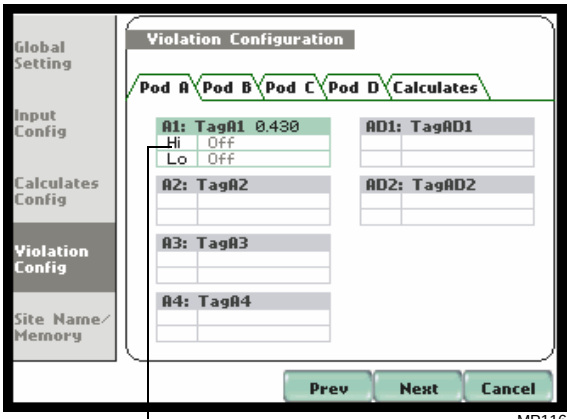
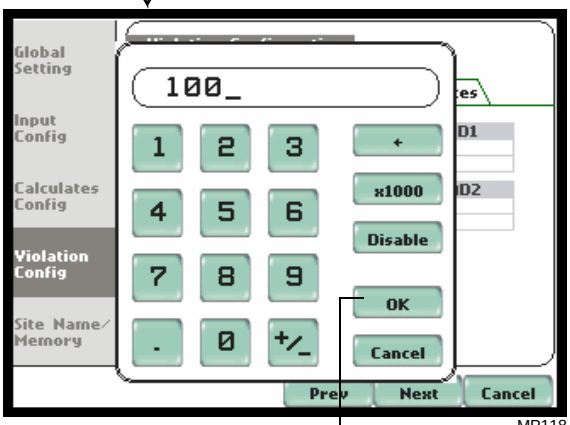
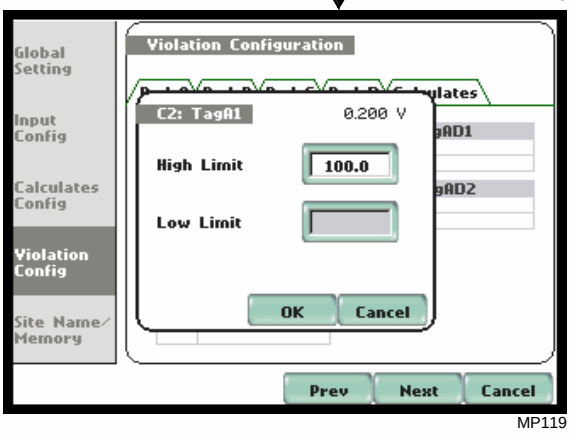
Action...	Result...
From the Input Pod Configuration screen, press Next to display Calculates Configuration. Check **Enable** to set data configurations for the calculation channel. • Press **Tag** window to enter channel label or tag name. • Press **Legend** window to enter engineering units for the channel. • Press **Equation** window to show the list of math equations that can be applied to input channels. • Click on the corresponding equation variable **m** or **b** to enter desired values. • Click on the corresponding equation variable **x** or **z** to enter desired channels. • When done configuring calculation channels, press **Next** and go to page 3-16. • Press **Cancel** to quit and return to Start menu.	 MP112  MP113  MP114

NOTE: Inter-channel mathematics can be configured for purposes of user readability in engineering units suitable for the application i.e. add, subtract, multiply, divide, absolute, maximum, minimum, average, square root.

Violation Configuration

Logging data by limits

Each analog, digital (when configured as a frequency channel, timer, or quad encoder), and calculation channel has threshold limits that serve as triggers of violations. Users can set the threshold units by which high and low limits of voltage and current trigger are calculated. Thresholds are set in ranges with high limit (threshold above the normal range) and low limit (threshold below the normal range). All limit values are used to determine if corresponding reporting action should take place.

Action...	Result...
From the Calculates Configuration screen, press Next to display Violation Configuration. • Press to select the channel/ parameter where you want to set limits to capture violation data. The limit fields will be activated to allow you to enter values. Meter values for voltage and current inputs are also displayed for active channels. Use the numeric keypad to enter threshold values for High Limit, Low Limit, or both for the corresponding channel. High Limit: specifies an absolute limit for comparison that is higher than the low limit. Low Limit: specifies an absolute limit for comparison that is lower than the high limit. • Once a limit is set, and you want to turn the limit off, use the **Disable** button on the keypad. • When done with violation configurations, press **Next** and go to page 3-17. • Press **Cancel** to quit and return to Start menu.	 MP116  MP118  MP119

Site Name/Memory Card

Where you can save data

The MP7 uses the Compact Flash data card as primary storage for data. It automatically saves data in the card when monitoring is on. The Compact Flash card must be installed in either data card Slot 1 or Slot 2 in order to record data.

NOTE: Although MP7 is able to detect availability of data card in either slot, Daytronic strongly recommends the use of only one card slot (one data card) at a time.

Data card size

The MP7 requires a Compact Flash data card with minimum storage capacity of 32MB, maximum of 256MB. See Appendix A Optional Accessories for the part numbers of Compact Flash cards supplied by Daytronic.

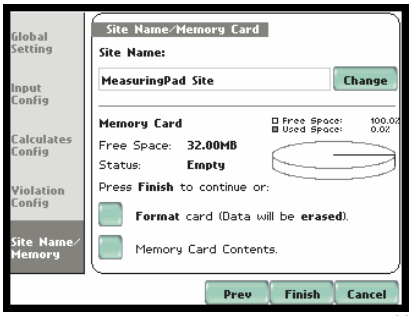
NOTE: Daytronic Compact Flash data cards have been tested to work properly with the MP7. Non-Daytronic Compact Flash cards may not be compatible with the instrument and cannot be supported by Daytronic Customer Service in case problems arise. Users are advised to use only Daytronic parts and accessories.

Filename

The following files are created on the data card: *filename*.set for setups and *filename*.ddb for saved violations. The maximum allowable length for a site/file name is 32 characters.

Data card screen

The final step in Setup Wizard is configuring the filename and formatting the data card prior to monitoring. The Site Name/Memory Card screen reports the current operational status of the data card.



MP120

Data card status messages

The following messages may appear in the data card status line.

Status Message	Description
Not Inserted	Data card not inserted or not detected. Insert a valid data card to proceed.
Empty	Data card is empty.
Contains File	Data card presently contains files.

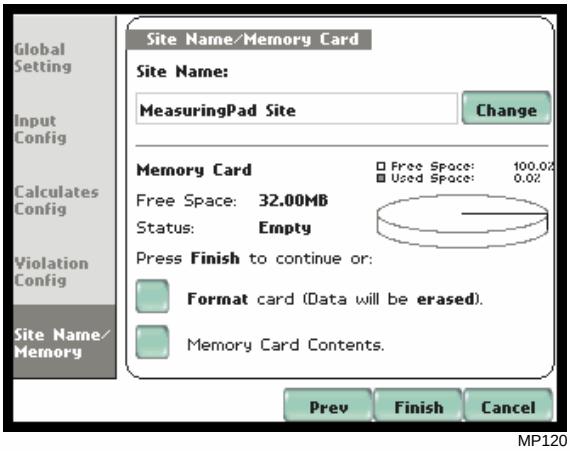
Continued on next page

Data card status messages (continued)

Status Message	Description
Fragmented	A fragmented FAT was detected. Monitoring cannot proceed with a fragmented data card. Either change the data card or format to continue.
Unformatted	Data card is not formatted. Format the data card or replace with a different card to continue.
Invalid Card	Data card is not valid for monitoring. Change the data card to proceed.

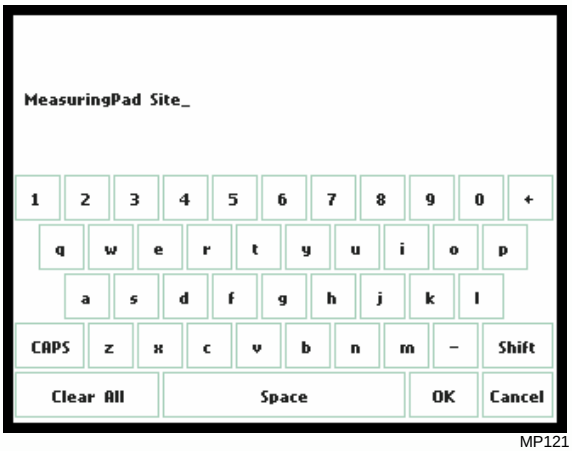
Data card operation

The data card screen prompts users to set filename and format card in preparation for monitoring and writing of data.

Action...	Result...
STEP 1: From the Violation Configuration screen, press Next to display data card status. • If the default filename is acceptable without change, and if the card is formatted to save data, press **Finish**. The system is ready to begin monitoring. Go to Section B Monitor using Present Setup on page 3-21. • Press **Change** to enter a new site/file name. Proceed to Step 2 on page 3-19. • Press **Format card** to format the data card. NOTE: All data and setups stored in data card will be lost when you format the card. Copy any files that you want to save to a computer first before formatting card. • Press **Memory Card Contents** to view list of data files stored in card. • Press **Cancel** to discard changes and return to Start Menu.	 MP120

Continued on next page

Data card operation (continued)

Action...	Result...
STEP 2: Enter a new site/file name using the keypad. Press **OK** to accept the new site/file name. • Press **Shift** to enter a character in uppercase. • Press **CAPS** to enter all characters in uppercase. • Press **Space** to enter a space in between characters. • Press **Clear All** to delete the entire name on the space provided. • Press ← to erase a character. • Press **Cancel** to retain the default site/file name and return to Site Name/Memory Card screen.	 MP121

Writing setup to data card

Saving the current setup means writing the current configuration and threshold settings to the data card. Configurations and setups include the following:

- Input Pod and Global Setup
- Analog and digital channel configuration
- Calculates configuration
- Violation configuration
- Site name

NOTE: The filename extension for the setup is SET, i.e. *filename*.set.

Guidelines on file data transfer

The MP7 treats the Compact Flash card like a hard disk storing files in DOS format. For successful card data transfer, keep the following points in mind:

- MP7 supports a maximum DOS directory size of 256MB. Minimum required Compact Flash data card size is 32MB.
- Compact Flash cards allow users to store multiple files in one card. The Site name will be used as the filename for record files (i.e. if the site name is MeasuringPad Site, the filename will be MeasuringPad Site00.DDB). A number is automatically appended to the name such that filenames are automatically incremented every time the user starts monitoring with that same filename.
- MP7 does not support file fragmentation. When creating a file, it will take the largest contiguous block and use that size block for data storage. You cannot use the unit to delete individual files from the data card. When there is no more space available to begin new data storage, transfer the data files to a computer and then reformat the card using the MP7.

Section B

Monitor using Present Setup

Overview

Introduction

Menu options for monitoring become available only after setting up the instrument or loading a setup from the data card.

Monitoring options

Users have the option to begin monitoring immediately or at a specified time and date.

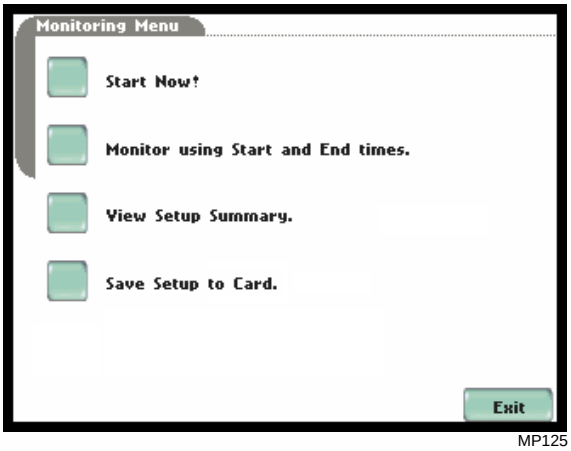
In this section

The following topics are covered in this section.

Turning Monitoring On/Off

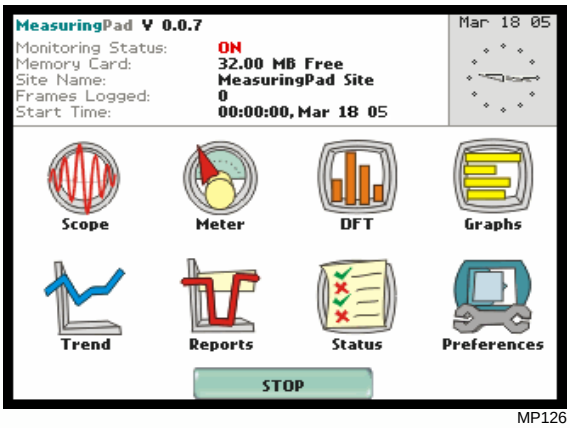
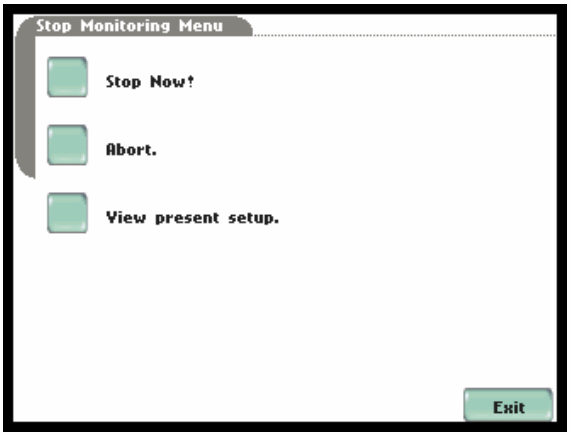
Start/Stop monitoring

Follow these steps to start and end monitoring.

Action...	Result...
STEP 1: From the Start Menu screen (see page 3-2), press Monitor using Present Setup. NOTE: Monitoring Menu screen will only be available after setting up the instrument or loading a setup from card. OR STEP 1: At the end of Setup Wizard, the Site Name/Memory Card screen prompts users to press Finish so as to start monitoring (see page 3-18). The Monitoring Menu screen will be displayed. • To start monitoring at the Auto-Log rate, press **Start Now!** Proceed to Step 2 on page 3-23. • To start and end monitoring at a specified date and time, press **Monitor using Start and End times**. Go to page 3-25. • To review the present setups, press **View Setup Summary**. Proceed to Step 5 on page 3-24. • Press **Save Setup to Card** to load a setup to the data card. • Press **Exit** to cancel and return to Home screen.	 MP125

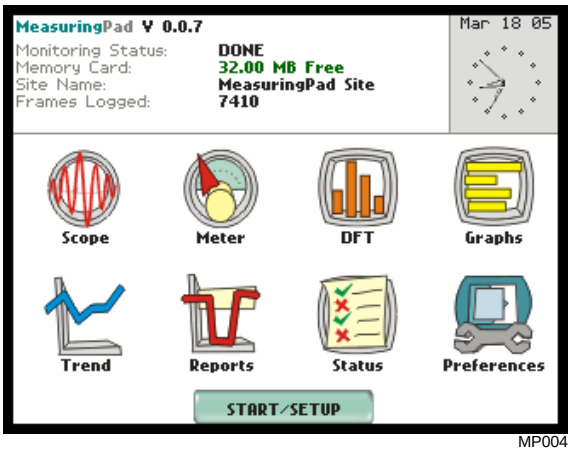
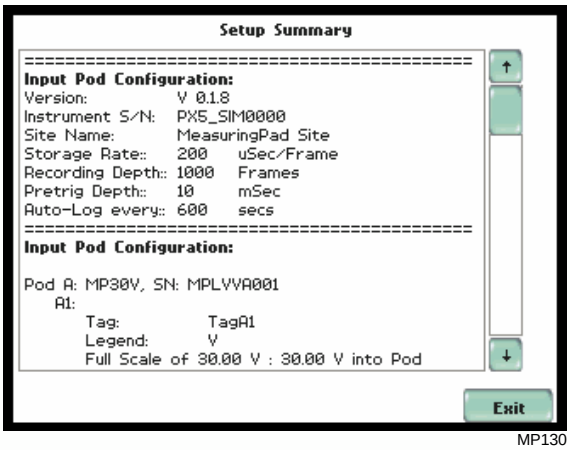
Continued on next page

Start/Stop monitoring (continued)

Action...	Result...
STEP 2: While the instrument is actively monitoring data, the message MONITORING STATUS: ON appears on the top section of the Home screen (see NOTE). Users cannot change the time and date nor perform data card operations while the instrument is actively monitoring data. However, the rest of the function keys, including date style and clock style, are operable even while monitoring status is ON. • To end monitoring, press **Stop**. Proceed to Step 3.	 MP126 NOTE: The following status messages are displayed after monitoring is turned on. MONITORING STATUS: ON (monitoring will continue until Stop is pressed or when specified end time is reached) MEMORY CARD: xx MB Free (remaining space in the data card in megabytes) SITE NAME: User specified or MeasuringPad Site xx.ddb (where xx increments every time data is saved using the same file name) FRAMES LOGGED: xx (counter on the number of data frames recorded) START TIME: start time and date are displayed while monitoring is on
STEP 3: Stop Monitoring Menu confirms whether users want to end monitoring, cancel monitoring, or view present setup. • To turn monitoring off, press **Stop Now!** This will save any pending data and close the file. Proceed to Step 4 on page 3-24. • To cancel monitoring, press **Abort**. All data collected will be lost when monitoring is aborted. • To view setup, press **View present setup**. This will not save any monitoring parameters. Proceed to Step 5 on page 3-24. • To continue monitoring, press **Exit**.	 MP127

Continued on next page

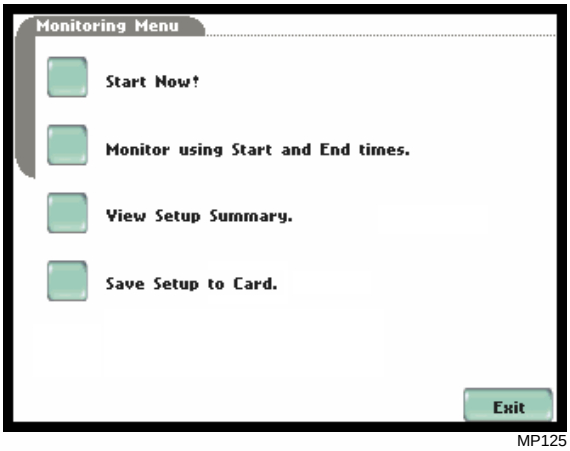
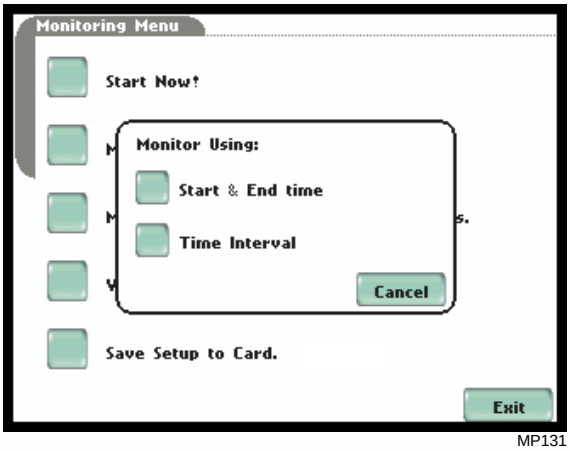
Start/Stop monitoring (continued)

Action...	Result...
STEP 4: When monitoring ends, the message MONITORING STATUS: DONE appears on screen (see NOTES). • To capture a new set of data or to edit threshold settings, press **Start/Setup.** The Start Menu screen will be displayed. Go to page 3-2. • To view data, press **Trend** or **Reports**. Go to Chapter 5 View Recorded Data.	 MP004 NOTE 1: The message MONITORING STATUS: DONE appears to indicate that monitoring is completed and active recording is disabled. NOTE 2: The Reports button will display data if periodic measurements at regular intervals are available or if thresholds have been crossed. See Chapter 5 View Recorded Data.
STEP 5: Press View present setup to display the parameter settings in effect. Setup summary is available for review before, during, and after monitoring. • Press **Up/Down** arrow keys to scroll the page up or down by one line. • Press and drag the scroll bar to move the page up or down. • When done reviewing the Setup Summary, press **Exit**. The screen will return to the Stop Monitoring Menu options on page 3-23.	 MP130

Monitoring at a Specified Time and Date

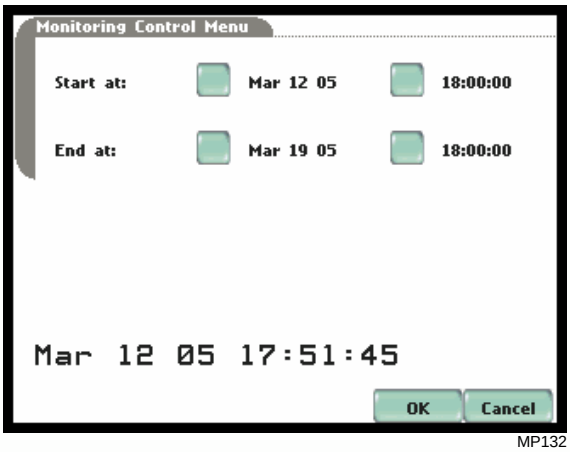
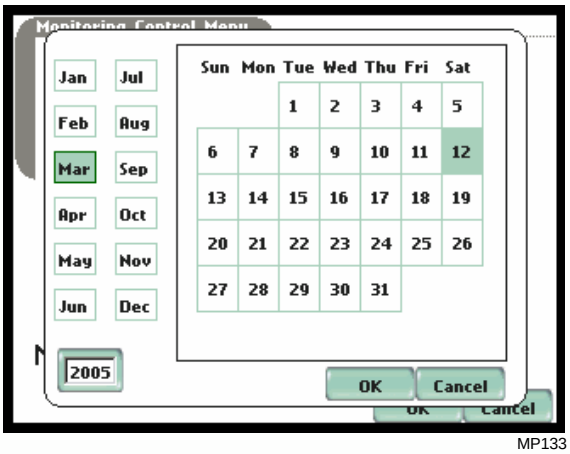
Schedule monitoring

Follow these steps to set monitoring at a specified time and date.

Action...	Result...
STEP 1: From the Start Menu screen (see page 3-2), press Monitor using Present Setup. NOTE: The Monitoring Menu screen will only be available after setting up the instrument or loading a setup from the data card. OR STEP 1: At the end of Setup Wizard, the Site Name/Memory Card screen prompts users to press Finish so as to start monitoring (see page 3-18). The Monitoring Menu screen will be displayed. • To set monitoring at a specified date and time, press **Monitor using Start and End times**. Proceed to Step 2. For functional descriptions of the other buttons, refer to Section B Monitor using Present Setup - Turning Monitoring On/Off on page 3-22.	 MP125
STEP 2: The MP7 will monitor and collect data using either of the following monitoring schedules: • Press **Start & End time** to specify the date/time when the unit will begin and end monitoring. See page 3-26. • Press **Time Interval** to specify the length of the recording interval for each file, and the time/date to start monitoring interval. See page 3-28. • Press **Cancel** to quit and return to the monitoring menu.	 MP131

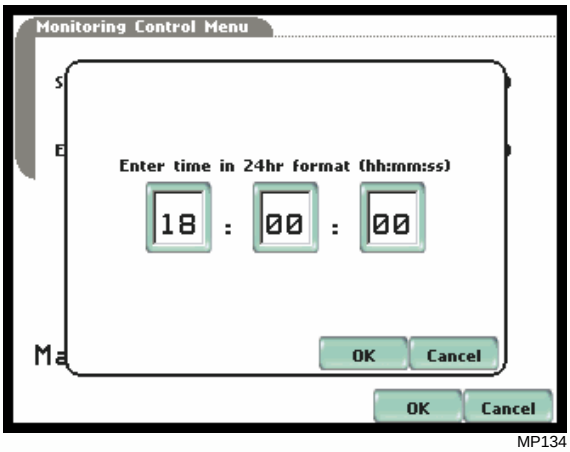
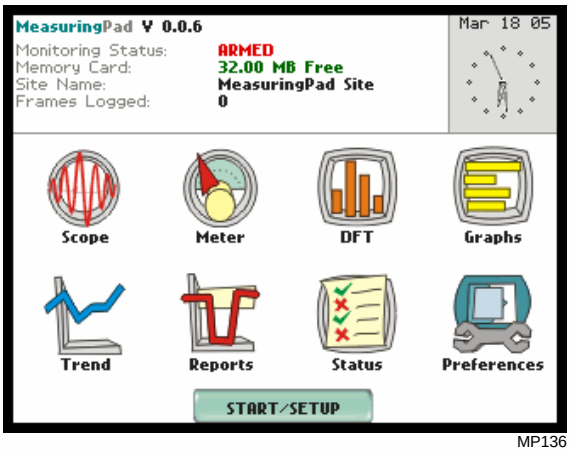
Monitoring using start & end time

You can specify the date and time when the unit will begin and end monitoring.

Action...	Result...
STEP 1: When monitoring using the **Start & End time** schedule, the current date and time (set to the next full hour) are displayed on screen. • **Start at:** indicates the date and time when the unit will begin data monitoring. • **End at:** indicates the date and time when the unit will stop data monitoring. By default, the system will automatically end monitoring one week from the time/date monitoring starts. However, users are allowed to specify their own time/date when they want to stop monitoring. For Example: Set monitoring to - **Start at:** March 12, 2005; 18:00:00 **End at:** March 19, 2005; 18:00:00 Press the End at: Date and Time keys and proceed to Step 2. • Press **OK** to accept the settings and return to Home screen. • Press **Cancel** to retain previous monitoring settings and return to Home screen.	 MP132
STEP 2: Use the Date and Time function keys to set when monitoring will start and end. • Press **Date** to enter desired month-day-year to start/end monitoring. Use the numeric keypad to enter the year. • Press **OK** to accept changes in date settings. Continue with Step 2 on page 3-27. • Press **Cancel** to discard changes in date and return to Monitoring Control Menu.	 MP133

Continued on next page

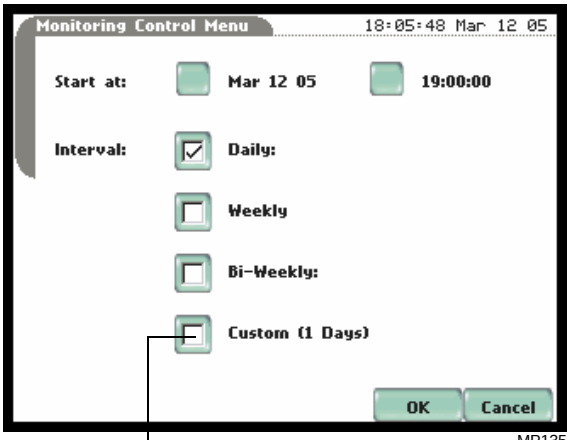
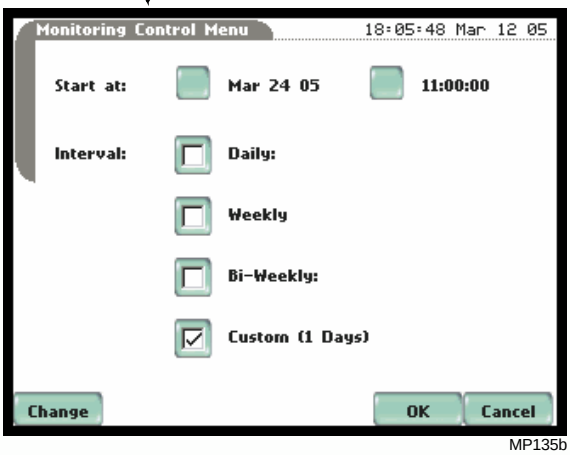
Monitoring using start & end time (continued)

Action...	Result...
STEP 2 (continued): • Press **Time** to enter desired hour-minute-second to start/ end monitoring. Press to select the hour/minute/second field to display the numeric keypad. Use the keypad to enter time settings. • Press **OK** to accept changes in time settings. The screen will display the new settings once the monitoring Start time/date and End time/date have been set. Proceed to Step 3. • Press **Cancel** to discard changes in time and return to Monitoring Control Menu.	 MP134
STEP 3: After specifying the Start and End time/date of monitoring, the message MONITORING STATUS: ARMED appears on screen. **Armed** means that the system will automatically begin monitoring at the specified Start time and date. Once monitoring status is ON, follow the Start/Stop monitoring procedure found on page 3-23.	 MP136

Monitoring at scheduled intervals

You can specify the date and time when the unit will begin monitoring, and choose from the following interval cycles when the unit will end recording and start a new file: daily, weekly, bi-weekly, or a customized number of days.

Action...	Result...

STEP 1: When monitoring using **Time Interval**, the current date and time (set to the next full hour) are displayed on screen. Select the interval schedule on how often you want the unit to automatically end and start a new data file.
• **Start at:** Indicates the date and time when the unit will begin monitoring.
• **Interval:** Indicates the time period when the unit will automatically collect and download event data.
  • **Daily:** Monitors data in 24-hour cycle and then starts a new file. The unit will append the filename for data collected every 24 hours.
  • **Weekly:** Monitors data in 7-day cycle and then starts a new file. The unit will append the filename for data collected every 7 days.
  • **Bi-Weekly:** Monitors data in 14-day cycle and then starts a new file. The unit will append the filename for data collected every 14 days.
  • **Custom:** The user specifies the time period (in days) when the unit will end recording interval. Press **Change** to set new time interval.
• Press **OK** to accept the settings and return to Home screen. The message MONITORING STATUS: ARMED appears on screen.
• Press **Cancel** to retain previous monitoring settings and return to Home screen.
	
	MP135
	 
	MP135b

Section C

Load Setup from Card

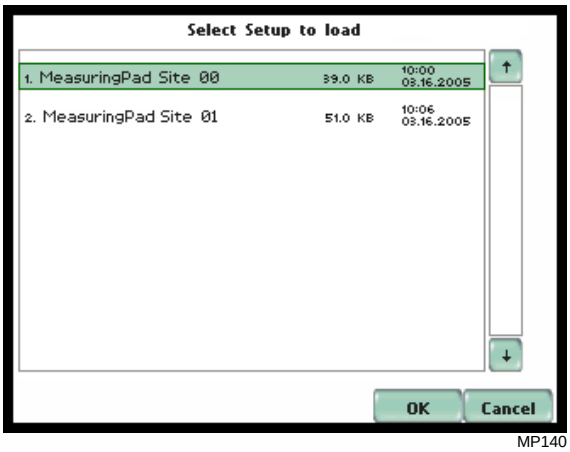
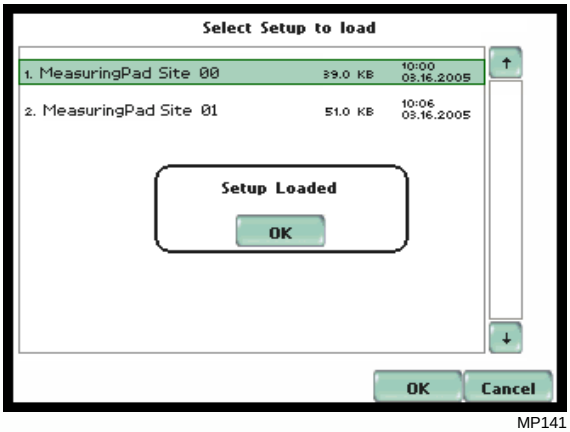
Overview

Introduction

MP7 enables users to load saved setup files (.set) from the data card.

NOTE: Loading a setup from the card will overwrite your existing setup.

Loading saved setups

Action...	Result...
STEP 1: From the Start Menu, press Load setup from card. MP7 lists the setup files (.set) stored in data card, along with file size, time and date when the setup files were recorded. Setup files are arranged in the order of date and time they were recorded. • Press **Up/Down** arrow keys to scroll the page up or down by one line. • Press to select (highlight) the desired setup file. • Press **OK** to load setup from card to MP7. Proceed to Step 2. • Press **Cancel** to quit and return to Start Menu.	 MP140
STEP 2: The message Setup Loaded appears once the setup is successfully loaded from the data card to MP7. • Press **OK** to exit. The Monitoring Menu screen will appear and users can begin monitoring.	 MP141

Section D

Load Data from Card

Overview

Introduction

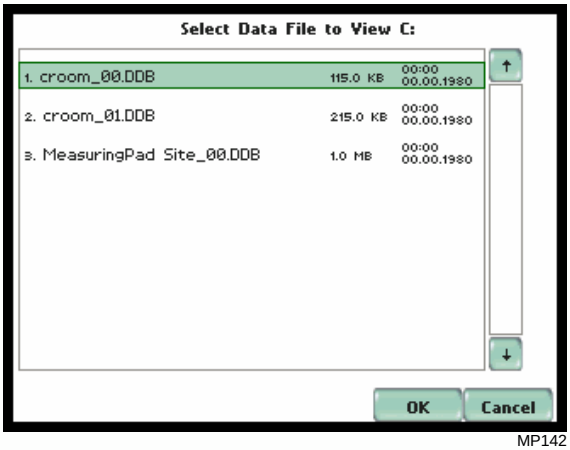
Data files (.ddb) consist of violations that are saved to the data card while monitoring is on. MP7 allows users to load stored data directly from card.

In this section

The following topics are covered in this section.

Loading data from card

Follow these steps to load data from card.

Action...	Result...
STEP 1: From the Start Menu, press Load data from card. The MP7 lists the data files (.ddb) stored in card, along with file size, time and date when data files were recorded. Data files are arranged in the order of date and time they were recorded. • Press **Up/Down** arrow keys to scroll the page up or down by one line. • Press to select (highlight) the desired data file. • Press **OK** to load data from card to the MP7 and return to Home screen. • Press **Cancel** to quit and return to Start Menu.	 MP142

NOTE

If an error message is displayed, refer to Card Error Messages on page 3-31.

Card Error Messages

Error messages

The following error messages may be displayed.

Error Message	Description
Card not inserted	No data card inserted or inserted improperly.
Card not ready	The Compact Flash data card controller is not ready. Try reinserting the data card.
Card read error	The data contains errors or the file has an invalid version.
No files on card	No valid data file on card.

CHAPTER 4

View Real Time Data

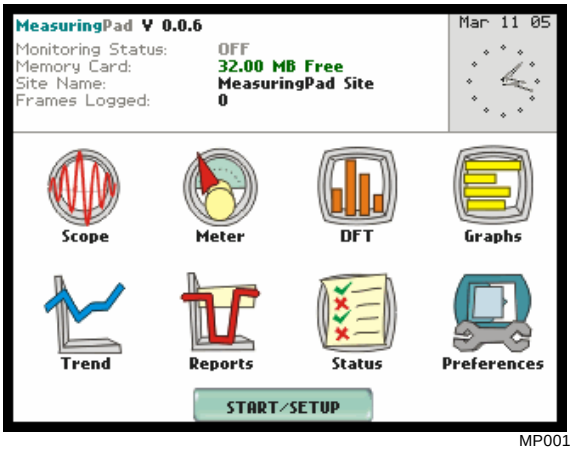
Overview

Introduction

The MP7 allows users to view measurement data as it happens, when it happens. The instrument is able to capture and process data in real time, and allows users to view it in Scope mode, Meter mode, DFT, and Graph.

Access to real time data

Icons for Scope mode, Meter mode, DFT, and Graph are available in the Home screen.



MP001

In this chapter

This chapter is divided into four sections.

Section A

Scope Mode

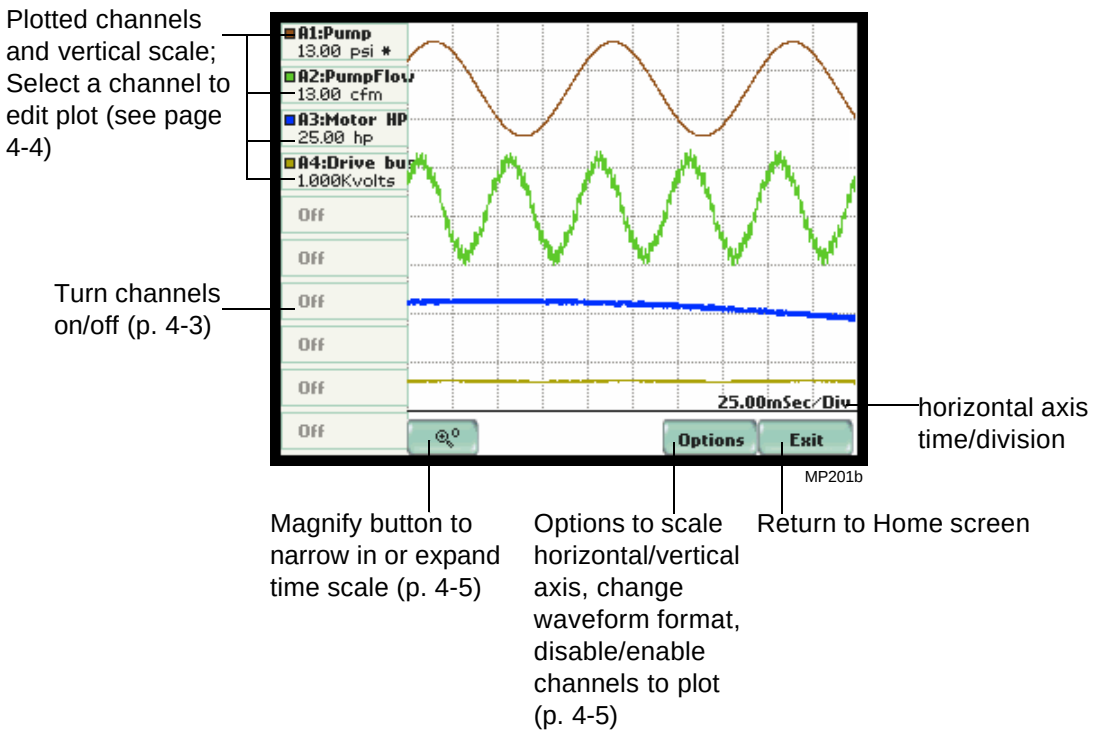
Overview

Introduction

The Scope is designed to emulate a traditional analog oscilloscope. Scope mode allows you to view real-time waveforms for up to ten channels simultaneously.

Scope screen

Press Scope on the Home screen to access the Scope key functions. Note that you have to turn the channels on to view data plots in Scope mode (see screen below).



In this section

The following topics are covered in this section.

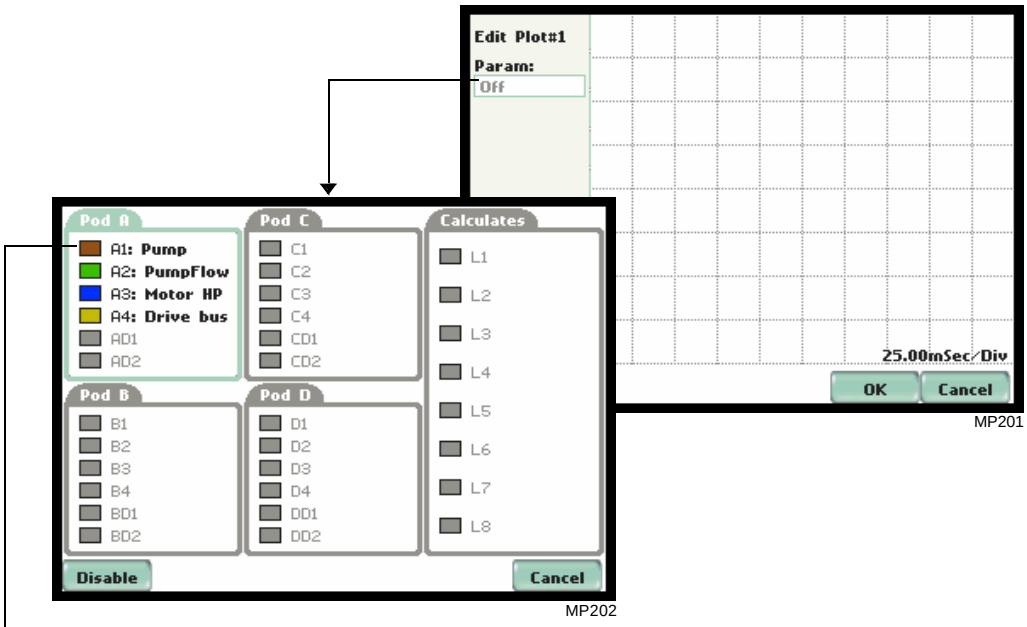
Turn Channels On/Off

Enabling or disabling channels

All channels are disabled by default from the factory. Once the Scope screen is connfigured, enabled channels are stored in memory upon exiting the Scope screen. Only activated channels can be selected for display.

Channel selection screen

The channel selection screen allows you to disable or select a channel for a particular plot. To select a channel, simply select an active Pod where the channel of interest is grouped.

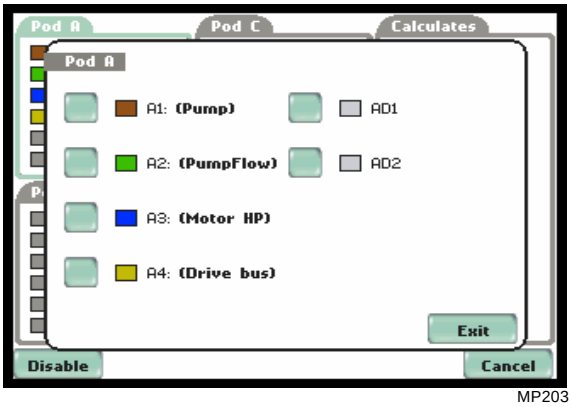


MP201

MP202

Use the Disable button if you want to turn off the active channels. The parameters in color are the active channels. Those in gray indicates that none of the channels in the Pod are enabled.

Once a Pod has been selected, the next screen allows you to select a specific channel in the Pod.

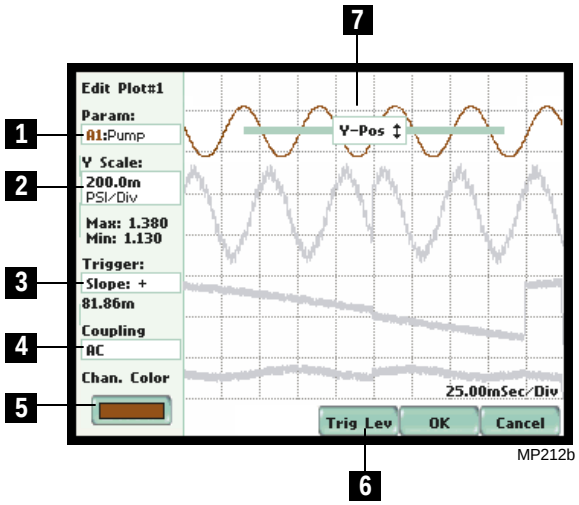


MP203

Edit Plot

Edit plot functions

Users have the option to edit the plot display for further analysis. The selected plot appears in color, while other plots appear in gray.

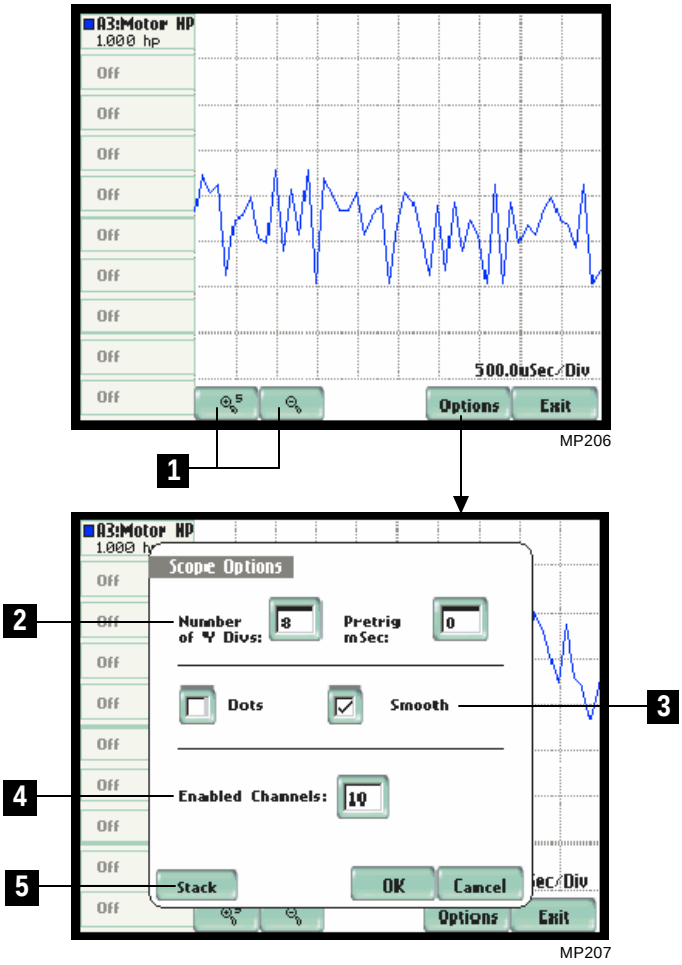


	Function
1	Parameter. Shows the parameter currently being displayed. Press to change the parameter.
2	Y Scale. Shows the vertical value of the active plot. Setting to a higher number will make the plot smaller and vice versa.
3	Trigger. Shows the current trigger mode to synchronize input signals. Note that on the main scope screen, the trigger is marked by an asterisk (*). Press to step through the following selections: Auto Continuously updates the sweep regardless of the slope Slope: + Updates the sweep on the positive (+) slope, using the level selected by the “Trig Level” button Slope: - Updates the sweep on the negative (-) slope, using the level selected by the “Trig Level” button Other Channel Another channel is used as trigger to the sweep NOTE: The Scope trigger function is not the same trigger used to store data when a violation occurs.
4	Coupling. Selects the way in which the signal is interpreted by the Scope. Press to step through the following selections: DC Signal is directly coupled AC Signal is shown with its average value removed Ground The ground reference is shown instead of the signal
5	Channel Color. Show the current color code for the channel on display. Press to change color selection for channel .
6	Trig Level. Determines the amplitude point of the input signal required to trigger the sweep. Adjust by moving the trigger level bar up or down.
7	Y-Pos. Controls the vertical position of the plot relative to other plots on screen. Scroll the bar up or down to move plot up or down the screen.

Scope Options

Optional display functions

The optional functions in Scope mode allow users to view plot waveforms in greater detail and give them greater flexibility in managing the display screen.



	Function
1	Magnify buttons. Zoom function keys have a plus/minus sign to zoom in/out on plot display.
2	Number of Y Divs. Shows the value for the vertical axis division. Pretrig mSec. Shows the value for the horizontal axis division.
3	Smooth. Displays plot coordinates in smooth continuous form. Dots. Displays plot coordinates in dotted form.
4	Enabled Channels. Shows the number of channels available to plot on screen.
5	Stack. Stacks enable plots to appear evenly on screen.

Section B

Meter Mode

Overview

Introduction

Meter mode allows you to view real-time meter data. The instrument is able to generate meter readings from voltage and current inputs, user-defined calculate functions, and/or thermocouple devices. Metered parameters depend on user setup.

In this section

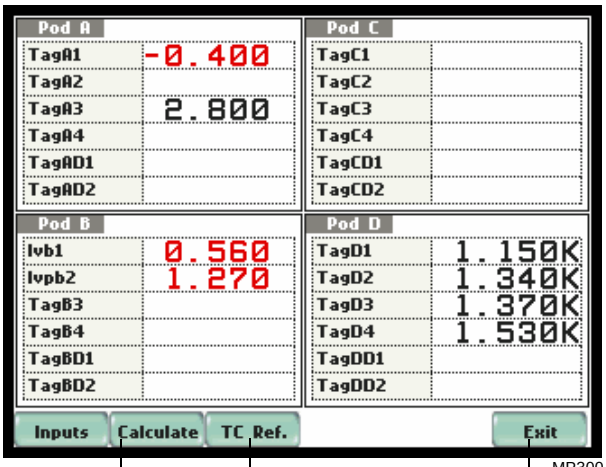
The following topics are covered in this section.

Physical Inputs

Meter screen

The first page of the meter screen shows the measured value across the input terminals.

NOTE**:** Meter mode operation does not interfere with any of MP7's other monitoring or recording functions.



Displays meter reading for calculated parameters (p. 4-8)

Displays meter readings for Thermocouple Cold Junction temperature (p. 4-9)

Return to Home screen

The metered parameters on screen are based on user-specified labels or tag names. Disabled channels are not shown in the meter screen. Meter values are color-coded such that those that appear in black means they are within threshold limits, values that appear in red means they are out of limits.

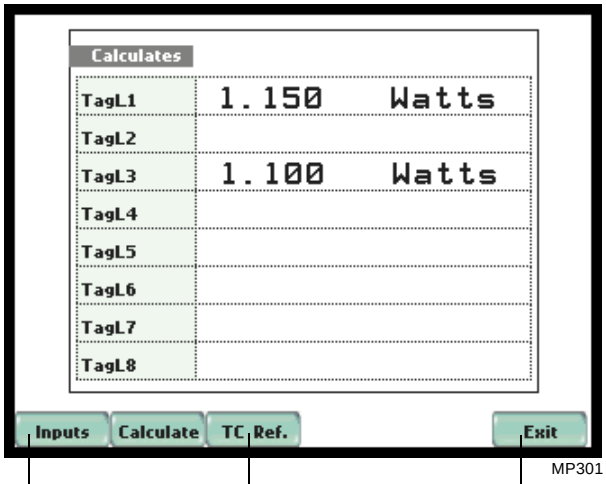
See Chapter 3 Start/Setup Operations - Section A Setup Wizard for more information on input configurations.

Calculates

Calculates meter screen

Calculates are math functions that can be applied to one or two channels, which can either be analog, digital or another calculate.

MP7 is programmed to convert input readings from the math equations into usable engineering units that appear in the Calculates meter table. Up to eight internal cross-channel math calculations can be set up for display. Similar to input channels, the user can also assign labels or tag names for each calculate channel.



Displays meter reading for physical input (p. 4-7)

Displays meter reading for thermocouple cold junction temperature (p. 4-9)

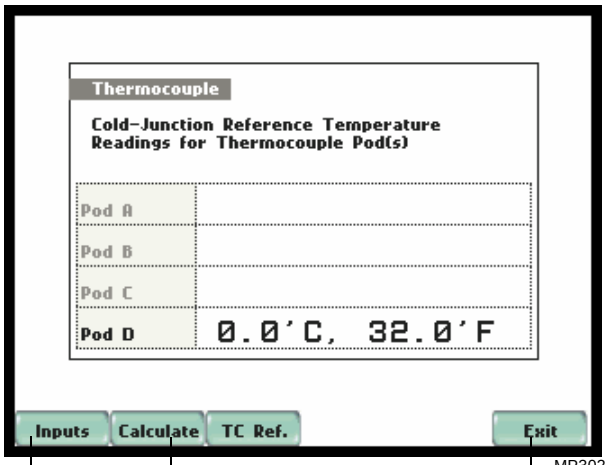
Return to Home screen

See Chapter 3 Start/Setup Operations - Section A Setup Wizard for more information on calculates configuration.

Thermocouple Function

Thermocouple meter screen

MP7 allows users to enter the type of thermocouple used in the application. Users will have to set up and enable the thermocouple settings during setup operations in order to generate temperature readings for the Thermal Cold Junction Reference table.



Displays meter reading for physical input (p. 4-7)

Displays meter reading for calculated parameters (p. 4-8)

Return to Home screen

See Chapter 3 Start/Setup Operations - Section A Setup Wizard for more information on thermocouple settings.

Section C

DFT (Discrete Fourier Transform)

Overview

What is DFT?

MP7 allows users to view a scaled plot of a complex series of a Discrete Fourier Transform (DFT) known as frequency spectrum. Fourier transforms provide a way to convert samples of a standard time-series into the frequency domain. DFTs are useful because they reveal periodicities in input data as well as the relative strengths of any periodic components.

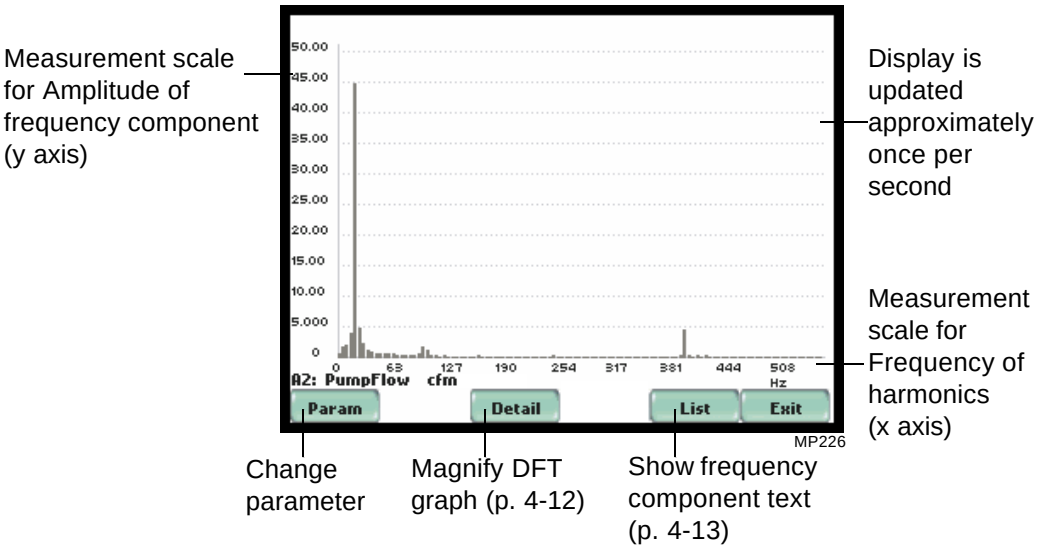
In this section

The following topics are covered in this section.

DFT Spectrum Graph

Graph display

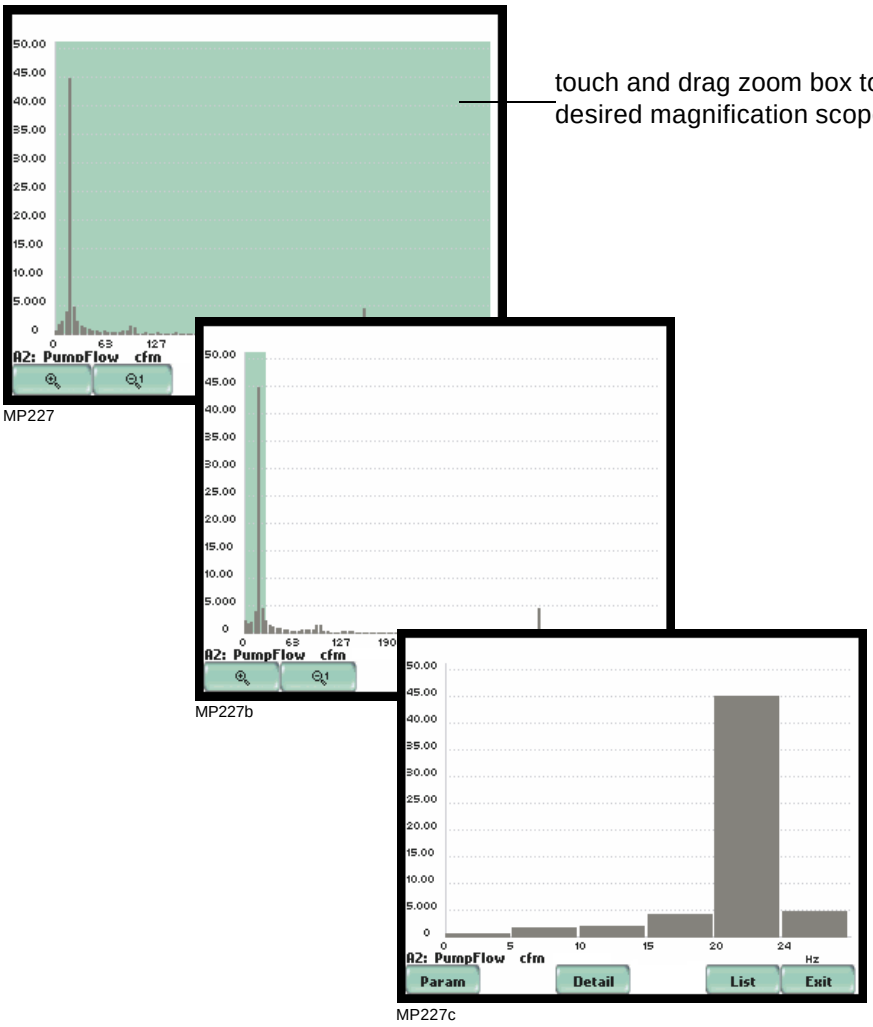
The spectrum graph can be displayed by pressing DFT on the Home screen. Once input channels are enabled, the screen defaults to a graphical spectrum display. The graph shows the magnitude of the frequency components. The vertical axis features amplitude values showing the magnitude of variation in a changing quantity from its zero value. The horizontal axis represents the frequency components and are displayed in Hertz. The graphs can be zoomed and rescaled.



Graph Details

Graph trends

MP7 allows users to determine the numbers or the range of frequency components to display. A green box showing the default zoomed area appears once the Detail button is pressed. Touch any side of the zoom box to activate the drag function. Touch and drag the sides of the zoom box to expand or narrow in on a select number of harmonic graphs. The zoom box moves horizontally only. The vertical scale will autoscale when zoomed.



MP227

MP227b

MP227c

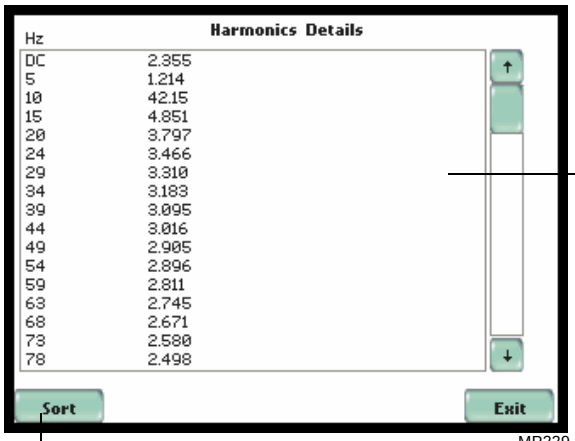
The magnify buttons serve as zoom function keys, each of which feature a plus sign or a minus sign within. Press **Zoom+** to display the zoomed area and view spectrum graphs in greater detail. Users may repeatedly zoom in on a plot for up to seven (7) levels. Press **Zoom-(n)** to unzoom graph display one increment at a time, where n is the counter of how many times the spectrum graphs have been magnified.

Frequency Spectrum List

Harmonic text display

To view the frequency spectrum magnitude text display, press List from the DFT graph. The list displays frequency components in Hz.

By default, the frequency values are arranged per increment of 5Hz. Use the Sort button to organize harmonic text display in order of ascending frequency or in order of descending magnitude.



Section D

Graph

Overview

Enable channels to display graphs

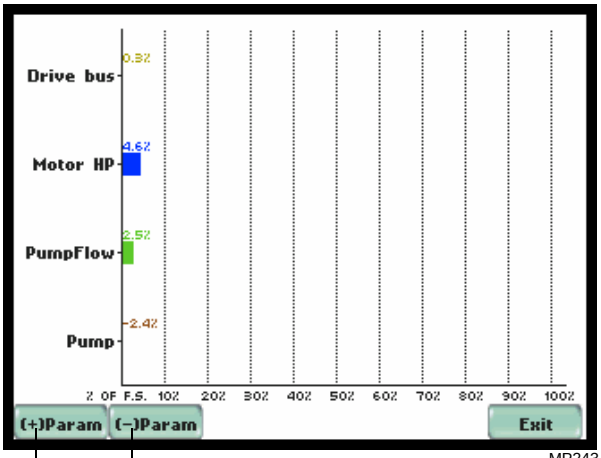
The Graph displays the selected channel values in horizontal bar graph form. The channels appear in user-specified labels or tag names.

In this section

The following topics are covered in this section.

Graph display

The graph displayed on screen is shown autoscaled as a percent of the full scale value that was configured under Setup Wizard (see Chapter 3 Start/Setup Operations -Section A Setup Wizard on page 3-3), with zero percent to the right. Actual percent values appear in text form on top of the graphs. The values are color coded in the same way that the bar graphs are.



Use the (+)Param/(-)Param command buttons to enable/disable the horizontal bar graph of a selected channel. Depending on the channels being monitored, up to eight bar graphs may be displayed at any one time.

CHAPTER 5

View Recorded Data

Overview

Types of data display

MP7 offers a graphical display of recorded data. The firmware architecture of MP7 is designed to engage in various stages of acquisition and visualization of auto-saved data and violation data.

Reports: Reports display data saved in Frames. A Frame consists of sample scaled measurements recorded at fixed time interval or immediately upon detection of any trigger violation. A violation occurs when a programmed threshold is crossed.

Trend: A trend is a graph of the value of one or more parameter or channel over time. Trends aim to show a macro view of auto-saved data. Data saved due to a violation is also displayed. Users can zoom in on trends for a more detailed view.

Status: Status displays a quick overview of the limit compliance of measurement values for analog, calculation, and numeric digital (frequency, counter, quad encoder) channels. It also shows whether the digital channel reset and log trigger are on or off.

Icons to view recorded data

The Reports, Trend, and Status icons are used to view recorded data. All icons are accessible at the Home page.

The Reports button displays records of auto-log (time-based) and violation (trigger-based) data, record Detail magnification, and Param to change and/or add parameters/channels to plot. A convenient Export command button is also available to store a recorded data file in MS® Excel format.

NOTE: Record data becomes available while the instrument is monitoring or by loading a previously saved file from the data card. Otherwise, a message appears indicating that there is no data available to view.

The Trend button displays time plots of auto-log and violation (if triggered) data. Data from analog, digital and calculation channels are available to plot. The Trend screen can display up to four plots, with a maximum of two parameters per plot. One parameter can have multiple channels to plot. Users have the option to enable/disable plot display, where display area will resize according to the number of plots for active display. The Trend screen also features a Zoom box, where users can expand or narrow the zoomed area via touch and drag. Users can select the trend coordinates to view in detail.

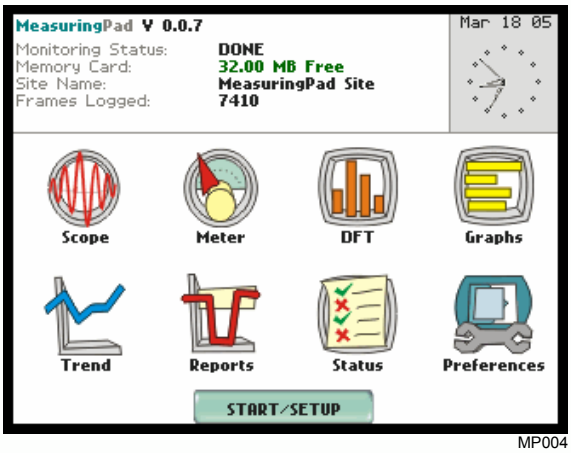
Continued on next page

Icons to view recorded data (continued)

The Status button presents a summary of the limit conformance or on/off status of measurement values. The values appear in user-specified labels or tag names and are color-coded for limit conformance or on/off status. The user may choose to clear or reset existing data status on the panel and restart time/date from which the panel will monitor status anew.

View Recorded Data using Reports, Trend, Status

Follow these steps to display data.

Action...	Result...
STEP 1: Reports, Trend and Status are accessible from the Home screen. Note that data will be available for display while monitoring or upon reading a stored file from the data card. A monitoring status message appears on the top section of the screen. Refer to Chapter 5 Start/ Setup Operations for the procedure on how to turn monitoring on. • Press **Reports** to view the list and graphs of recorded data. Proceed to Section A - Reports on page 5-3. • Press **Trend** to view time plots. Proceed to Section B - Trend on page 5-12. • Press **Status** to view limit compliance of measurement values. Proceed to Section C - Status on page 5-14.	 MP004

In this chapter

This chapter covers the following topics.

Section	Topics	See Page
A	Reports	5-3
B	Trend	5-12
C	Status	5-14

Section A
Reports

Overview

What is displayed?

Sample scaled measurement are recorded using the auto-log rate while no violations occur. Upon detection of a trigger violation, recording will begin at a storage rate that can reach a high speed level (see Chapter 3 Start/Setup Operations - Global Setting Menu on pages 3-4 and 3-5 for more information on data sampling and recording settings).

The Reports screen display a violation in a graph or a data list. Reports enable users to customize data plots, allowing them to change and/or add parameters/channels for up to four plot displays. Zoom box features, wherein users can expand or narrow the size of a zoomed area via touch and drag, are also available for more thorough data analysis and interpretation. Users can also export data into CSV (comma separated value) format which can be viewed using industry-standard applications like MS® Excel.

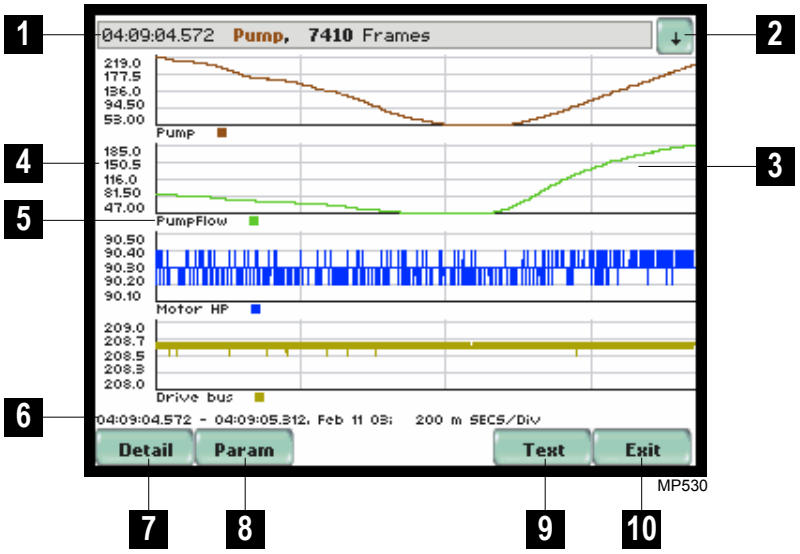
In this section

The following topics are covered in this section.

Record Data Display

Record screen

From the Home screen, press Reports. Data will be available while monitoring or upon reading a stored file from the data card (see screen below). A record screen will display an activity graph of auto-log and violation data, and buttons like Detail magnification, Param to change and/or add parameters/channels to plot, and Text to display the summary list of recorded data.



	Function
1	Violation start time; Parameter label or tag name; Number of frame data
2	Display record list
3	Record plot display
4	Vertical axis for parameter
5	Plot label
6	Violation start and end time; Date; Horizontal axis time/division
7	View record detail
8	Change/add channel/parameter to plot
9	Text/Graph display mode toggle
10	Return to Home screen

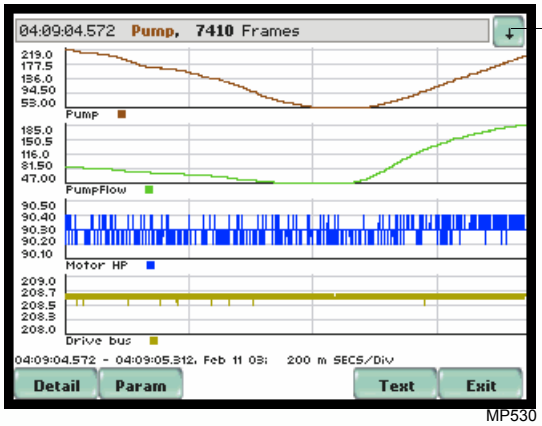
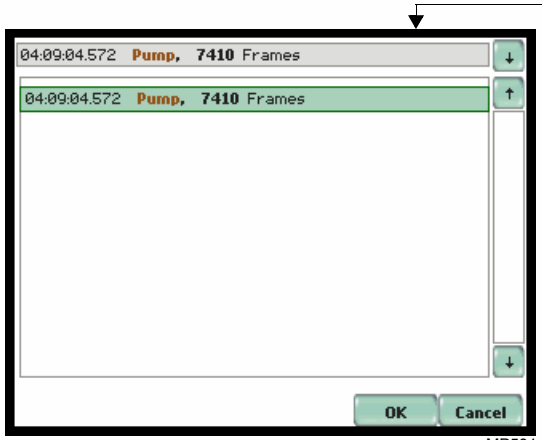
Record List

Record list description

The list presents a summary of all captured records of violations in the order that they occurred. Each record contains a general heading indicating the time when the violation started, the parameter label or tag name, and the record duration in Frames.

View record list

The procedure below describes how to access the list.

Action...	Result...
From the Home screen, press Reports. The down arrow button located on the top right section of the screen is used to access the record list. • Press the **down arrow** button to view the list of violations. Each entry in the list is identified by the time when the record was captured, the recorded parameter in color code, and the record duration in Frames. Entries are arranged in the order of date and time they were recorded. • Press **Up/Down** arrow keys to scroll the page up or down by one line or press and drag the scroll bar to move the page up or down. • Press to select (highlight) the desired record entry. • Press **OK** to view details of the selected record entry. • Press **Cancel** to ignore entry selection and return to the Reports screen.	 MP530  MP531

Record Detail

Detail screen

MP7 allows users to view recorded data in detail. The Detail screen features zoom buttons to examine the plotted data in detail. Users can resize the zoom box via touch and drag. The Detail screen also features an Export function to save the data file for viewing in MS® Excel.

Horizontal axis

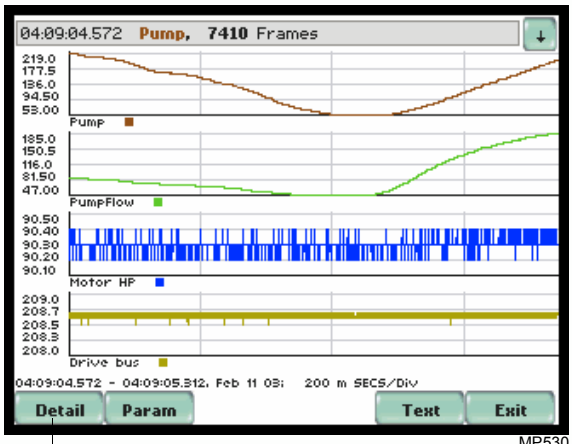
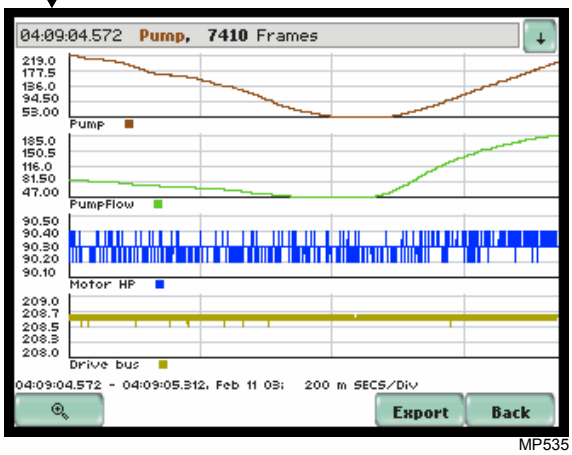
Auto-scaled to display all data in the duration of the violation.

Vertical axis

Auto-scaled to the minimum and maximum value.

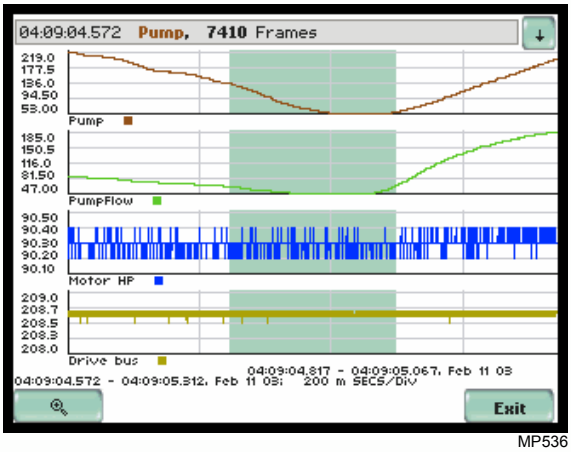
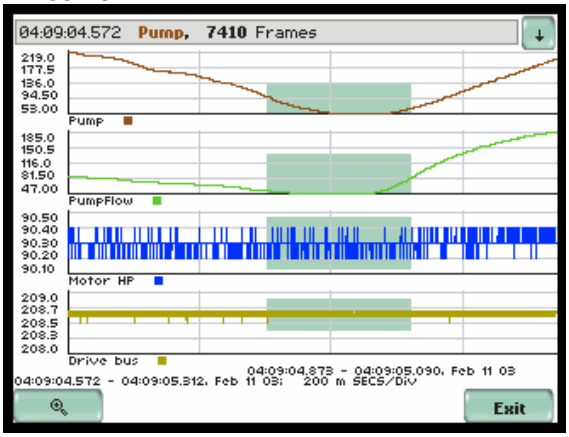
View record detail

A detail screen is generated for each record entry. Follow these steps to view record details.

Action...	Result...
STEP 1: From the Home screen, press Reports. Violation data must be available before it can be displayed. Use the record list to scroll through data entries. • Press **Detail** to use the zoom features and view data in detail. Proceed to Step 2 on page 5-7.	 MP530  MP535

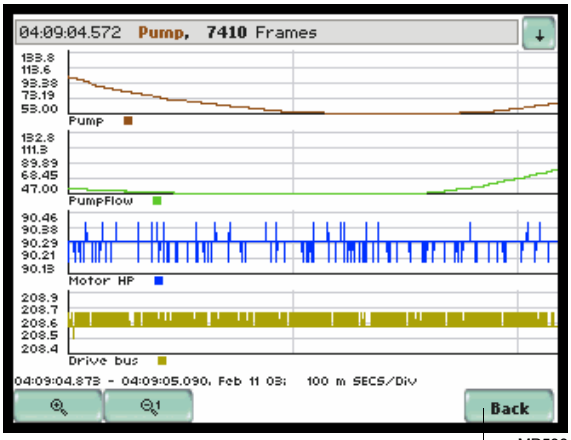
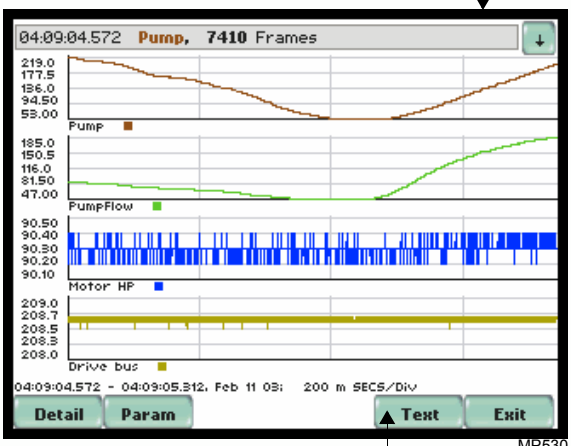
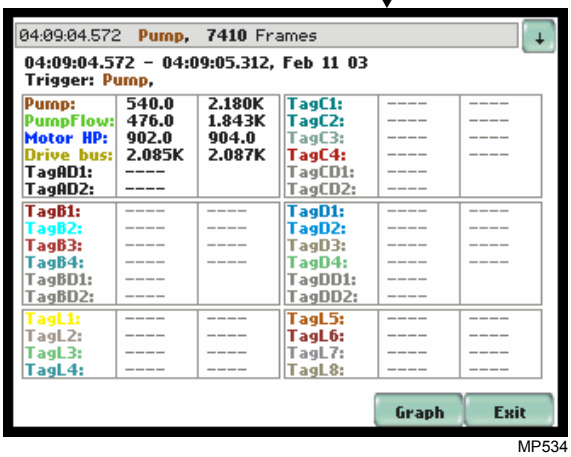
Continued on next page

View record detail (continued)

Action...	Result...
STEP 2: Once the magnify button is pressed, a green box showing the default zoomed area appears. The touch screen zoom functionality allows users to select the time range of recorded data that they can zoom in. Touch any side of the zoom box to activate the drag function. Touch and drag the sides of the zoom box to expand or narrow in on data. The duration (in seconds) of record data covered in the zoom box is also displayed. NOTE: The horizontal drag is locked between all graphs. This means the horizontal drag will apply consistently to all data plots. The vertical drag is independent by axis. • Once the zoom area is determined, press the **Magnify** button once. Proceed to Step 3 on page 5-8.	 MP536 Resize/move zoomed area by touching and dragging the sides of the zoom box.  MP537

Continued on next page

View record detail (continued)

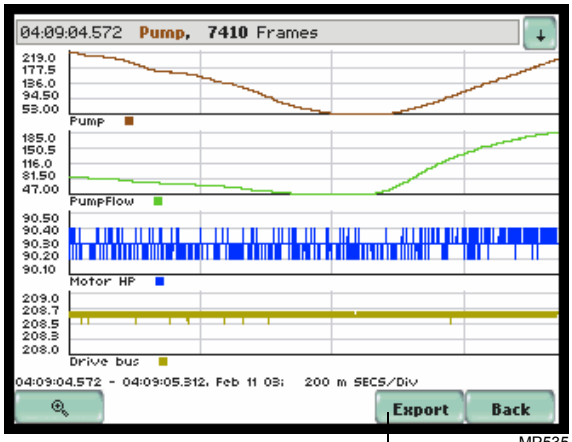
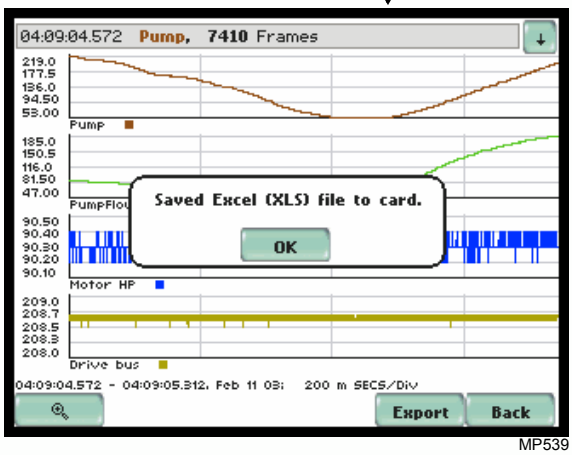
Action...	Result...
STEP 3: The magnify buttons serve as zoom function keys, each of which feature a plus sign or a minus sign within. • Press **Zoom+** to display the zoomed area and view data in greater detail. Users may repeatedly zoom in on a plot for up to seven (7) levels. • Press **Zoom-(n)** to unzoom the display one increment at a time, where n is the counter of how many times the data has been magnified. NOTE: Data will only be displayed for channels that are enabled. • Press **Back** to return to the Reports screen. • Use the **Text** button to display the tabular min and max values over the duration of the violation that occurred. This also toggles between Text and Graph display.	 MP538  MP530  MP534 NOTE: The threshold values are color coded for limit conformance. Red indicates that the parameter is out of limits. Black indicates that the parameter is within limits.

Export Data File

Saving data file

At a touch of a button, MP7 instantly stores a data file on a standard Compact Flash memory card in CSV (comma separated value) format. The CSV format is a universally compatible ASCII text format often used to exchange data between applications without the need for special drivers or version dependent operating systems.

MP7 directly exports the CSV format into MS® Excel where users can do additional data manipulation and graphing.

Action...	Result...
From the record detail screen, press **Export** to save the data file in memory card. Data is exported into CSV format for viewing in MS Excel. A message confirming that the file is saved in Excel (.xls) format appears on screen.	 MP535  MP539

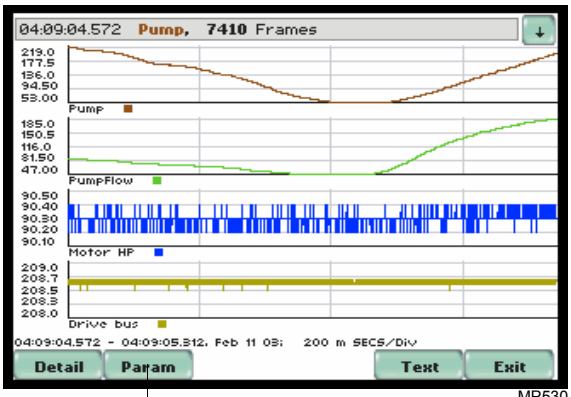
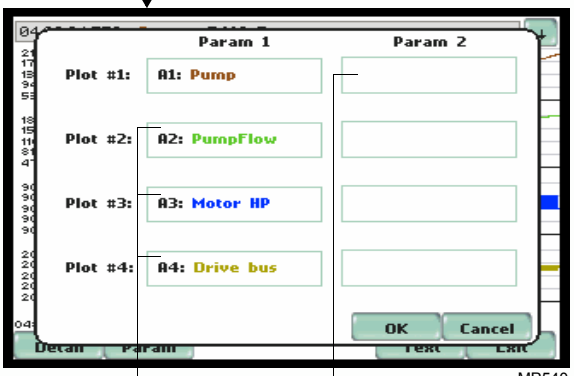
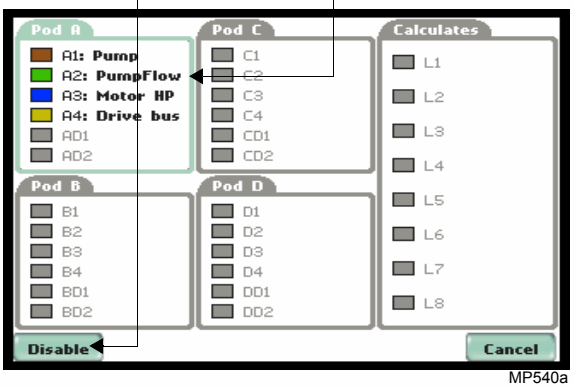
Plotted Parameter

What is displayed on a time plot?

A time plot is a graph of the value of one or more parameter over time. MP7 is able to display time plots for individual analog, digital or calculation channels, depending on the enabled channels in input Pod. Users have the option to change and/or add parameters/channels to plot. Up to four plots with two parameters per plot can be displayed on screen.

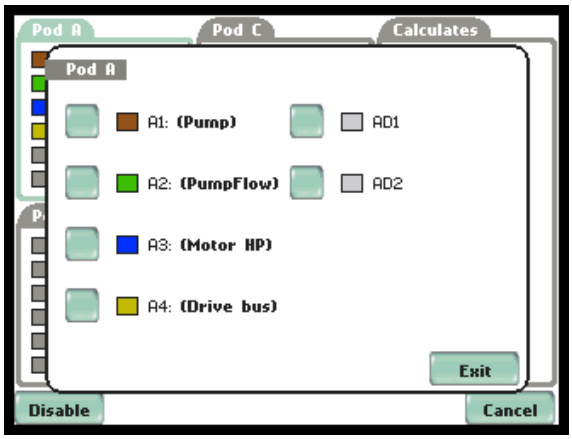
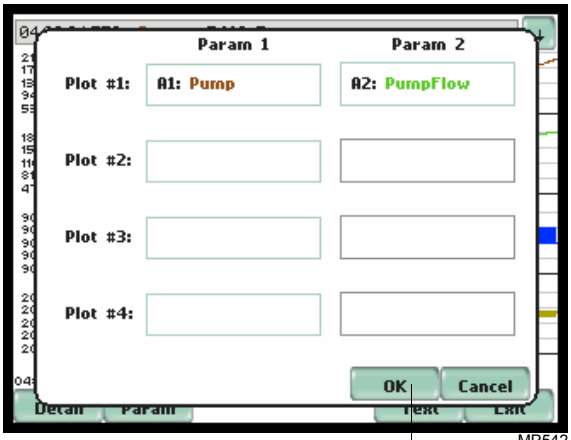
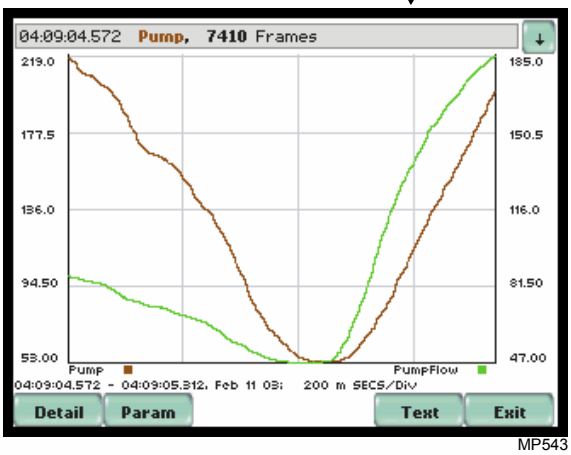
View record parameter

The following describes the procedure to change/add parameters to plot.

Action...	Result...
From the Reports screen, press Param. For Example: The screen shows four plots of four different parameters. The parameter labels and plots are color coded for easy association. The Plot #s appear on the left side of the screen. Users have the option to enable/disable parameters for any Plot #. The plot display area will resize according to the number of parameters enabled/disabled for display. • Press the **Parameter** that you want to enable for display. For parameters that are already enabled, use the Disable button to turn parameter off. For example: Disable Plot #2, Plot#3, and Plot#4. Enable CHA2 Pump Flow in Plot#1, Parameter 2. See resulting changes in plot display on page 5-11.	 MP530  MP540  MP540a

Continued on next page

View record parameter (continued)

Action...	Result...
The plot display area will resize according to the number of parameters enabled/disabled for display. • Press **OK** to accept changes and view new plot display. • Press **Cancel** to ignore changes and return to the Reports screen.	 MP540b Resulting changes in plot display:  MP542  MP543

Section B
Trend

Overview

What is displayed on a trend?

A trend will display timeplots of auto-saved and violation (in case it is triggered) data for the parameter/channel on display.

Users have the option to enable/disable a trend or plot display, wherein display area will resize according to the number of plots enabled for display. In addition, users have the option to enable/disable channels to trend in a select parameter. Each parameter can have one or multiple channels to plot.

The trend screen also features a Zoom box, wherein users can expand or narrow in on the size of a zoomed area via touch and drag.

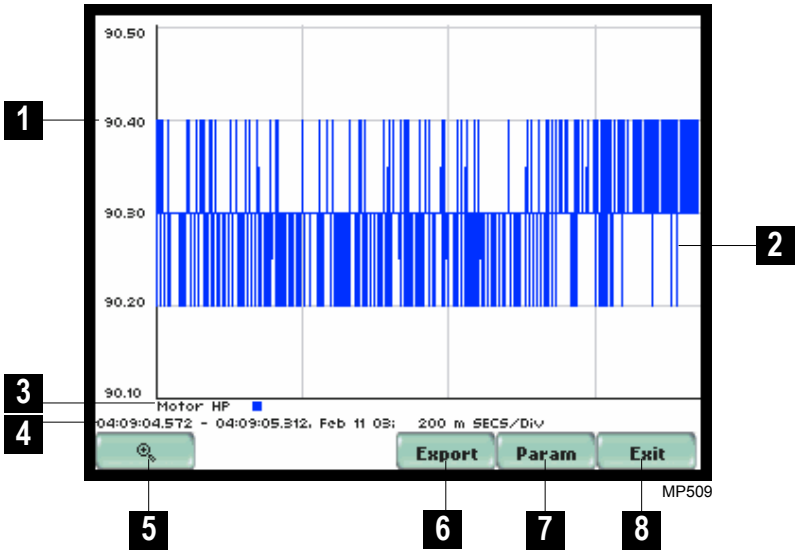
In this section

The following topics are covered in this section.

Trend Display

Sample trend screen

From the Home screen, press Trend. At start-up, auto-saved data from input channels is not displayed. You have to select the input channels to view trend data. The Trend screen will display buttons like Magnify for zoom features and Parameter to change and/or add channels/parameters to trend.



	Function
1	Vertical axis
2	Trend plot display
3	Parameter (in user-specified label or tag name) and color code
4	Trend start and end time; Date; Horizontal axis time/division
5	Magnify to zoom in/out on plot display
6	Export data to MS® Excel file format
7	Parameter used to change/add channel/parameter to trend
8	Return to Home screen

Section C
Status

Overview

Status description

Status presents a quick overview of the limit compliance of all active analog input, numeric digital input (frequency, counter, quad encoder), and calculation channels. It also shows whether digital channels from logic inputs (reset, log trigger) are on or off. The color-coded status display provides a readout of whether or not measurement values conform to user-defined specifications.

In this section

The following topics are covered in this section.

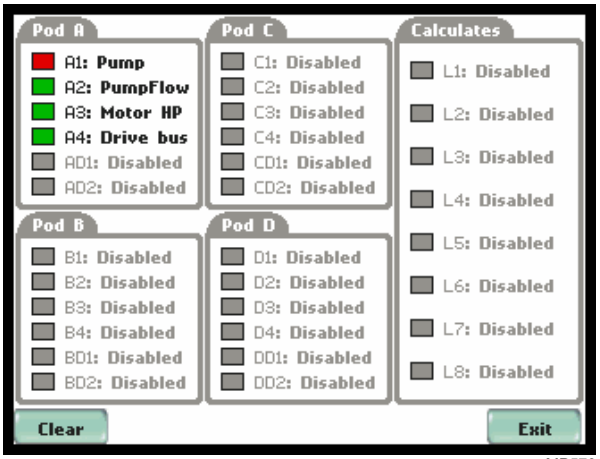
Status Display & Operation

Status display

Status features input channels/parameters in user-specified labels or tag names. The user may choose to clear or reset existing data status on the panel and restart time/date from which the panel will monitor status anew.

Disabled parameters appear in gray. A parameter is considered disabled if it is not an active input channel source.

Enabled parameters, on the other hand, are the active input channels configured during setup operation. The enabled parameters are color-coded to indicate limit conformance or on/off status (see text below). The Status display is active while the instrument is monitoring or by loading a previously saved file from the data card.



MP570

For analog input, digital input (frequency, counter, quad encoder), and calculation parameters:
Enabled parameters can have two states (Normal or Out of Limits). When monitoring, parameters that are within limits are shown in green (indicates Normal state). Those that are out of limits, exceeding Low or High threshold limits, are shown in red (indicates Out of Limits state).

For digital input (reset, log trigger) parameters:
Enabled parameters are monitored as being On or Off. Parameters that are in green are on. Those that are in red are off.

CHAPTER 6

Instrument Settings

Overview

Introduction

This chapter describes the miscellaneous tasks that users can perform to keep the MP7 running efficiently. These are tasks that users might perform only occasionally.

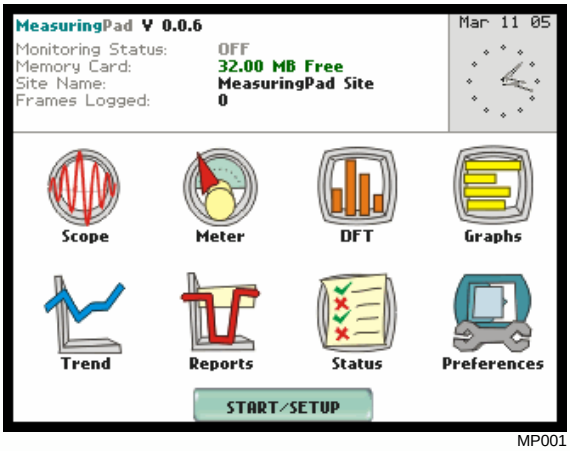
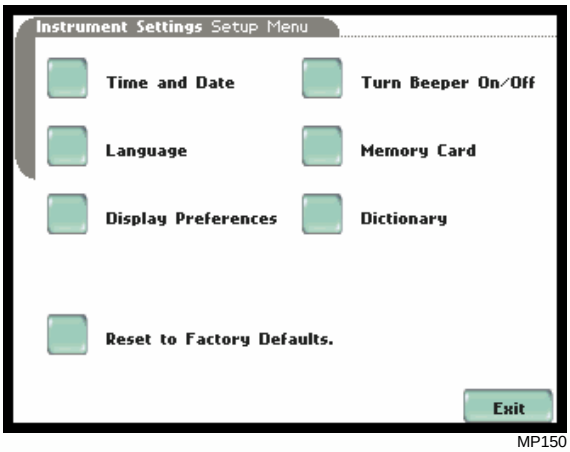
In this chapter

The following topics are covered in this chapter.

Access Instrument Settings Menu

Preferences menu screen

All functions in this chapter are found under the Instrument Settings menu. Follow these steps to display the Instrument Settings Setup Menu.

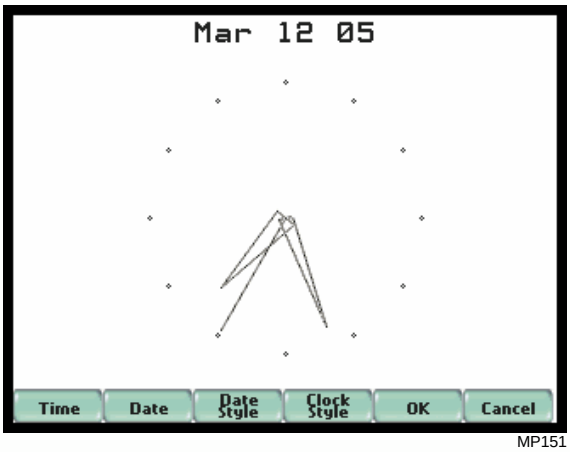
Action...	Result...
STEP 1: Press the MP7 On/Off power button to turn the unit on. The Home screen will be displayed.	 MP001
STEP 2: Press **Preferences**. The Instrument Settings Setup Menu will be displayed.	 MP150

Time and Date Settings

Time and Date display

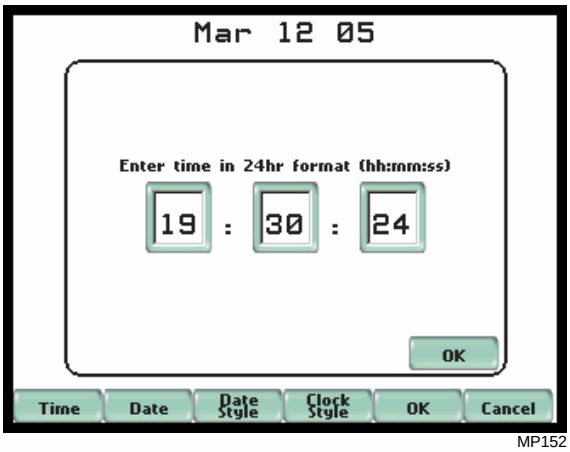
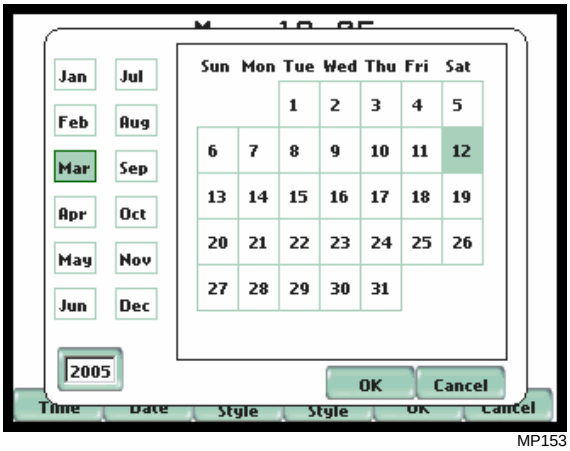
Users have the option not only to set the exact time and date, but also to select the format of how time and date will appear on screen.

Action...	Result...

STEP 1: From the Instrument Settings Setup Menu, press Time and Date.
• Press **Time** if you want to change the time settings. Proceed to Step 2 on page 6-4.
• Press **Date** if you want to change the date settings. Proceed to Step 3 on page 6-4.
• Press **Date Style** to select the format in which you want date displayed on screen. View the three different date format selections each time you press Date Style.
  • mm/dd/yy format
  • dd/mm/yy format
  • yy/mm/dd format
• Press **Clock Style** to select the format in which you want time displayed on screen. View the three different time format selections each time you press Clock Style.
  • analog
  • digital using 1 to 12 hr format (AM/PM)
  • digital using 1 to 24 hr format
• Press **OK** to accept new time/ date settings and return to Instrument Settings menu.
• Press **Cancel** to discard changes in time/date settings and return to Instrument Settings menu.
	
	MP151

Continued on next page

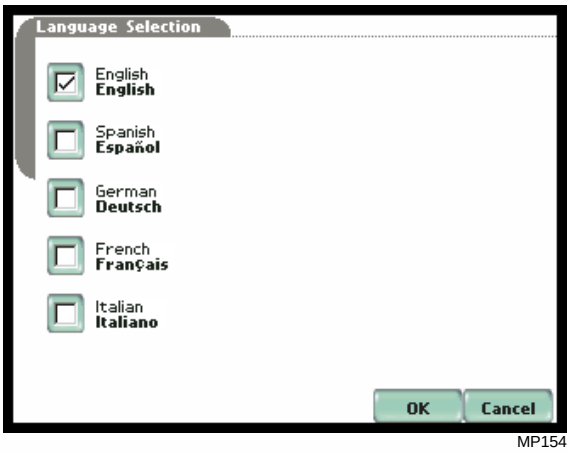
Time and Date display (continued)

Action...	Result...
STEP 2: Press the field representing hours, minutes, and seconds to change time settings. Use the numeric keypad to enter new time settings. Time should be entered in a 24-hour format (example: 19:00:00 for 7:00 PM). • Press **OK** to accept changes in time settings. • Press **Cancel** to discard changes in time settings. NOTE: Clock time and format can be changed anytime following this same procedure.	 MP152
STEP 3: Press to select the month, day, and year. Enter the year using numbers from the keypad. • Press **OK** to accept changes in date settings. • Press **Cancel** to discard changes in date settings. NOTE: Date settings and format can be changed anytime following this same procedure.	 MP153

Select Language

Select language

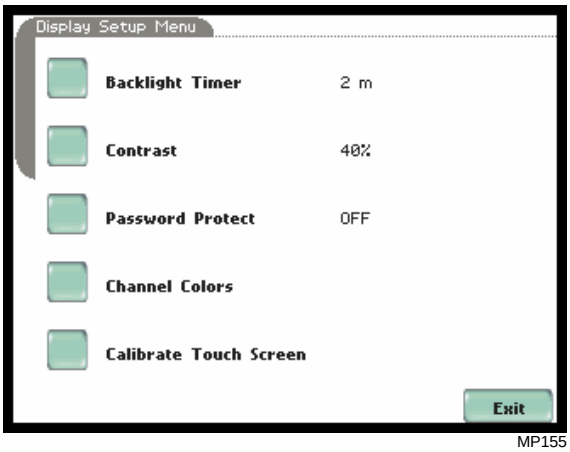
The MP7 menu screens appear in the English language by default. Users have the option to set screen display to any of the following languages: English, Spanish, German, French, or Italian.

Action...	Result...
From the Instrument Settings Setup Menu, press Language. • Check to select the desired language in which you want display screens to appear. • Press **OK** to accept new language selection. The screen will return to Instrument Settings menu. All screens will automatically change to the selected language. • Press **Cancel** to retain present language.	 MP154

Set Display Preferences

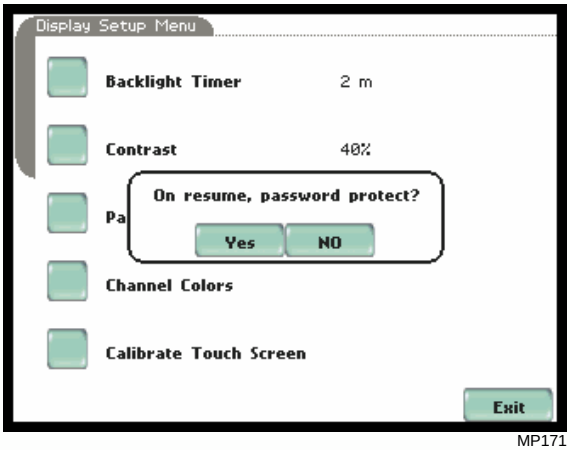
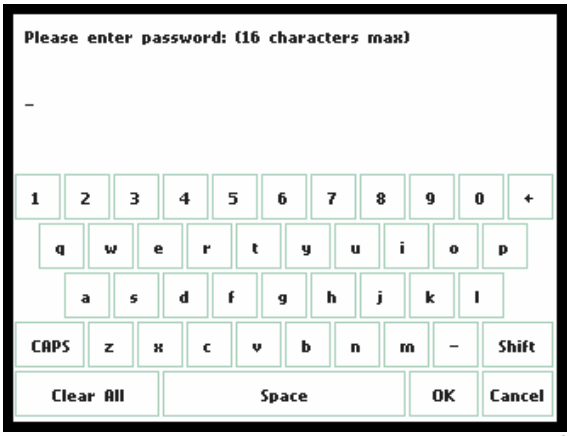
LCD settings

User programmable settings for the LCD screen include the backlight timer, contrast, password protect, parameter/channel colors, and touch screen calibration.

Action...	Result...
From the Instrument Settings Setup Menu, press Display Preferences. • Automatic backlight shutoff timer is provided for the LCD display. Press **Backlight Timer** to automatically turn off backlight after 1, 2, 5, 10 or 15 minutes of no user activity. Set timer to Always On if you do not want the backlight to shut off. NOTE: The auto-shutoff feature extends the life of the battery and should be duly considered. • Press **Contrast** to brighten/dim screen display to preferred percentage. • Press **Password Protect** to enable/disable password log-in code to the MP7. See page 6-7 for the procedure on how to enable password protect. • Press **Channel Colors** to change the color of the parameter/ channel display. Select a new channel color from the color palette that will appear on screen. • Press **Calibrate Touch Screen** to calibrate the unit's touch screen functionalities. See page 6-9 for the procedure on touch screen calibration. • Press **Exit** to return to Instrument Settings menu.	 MP155

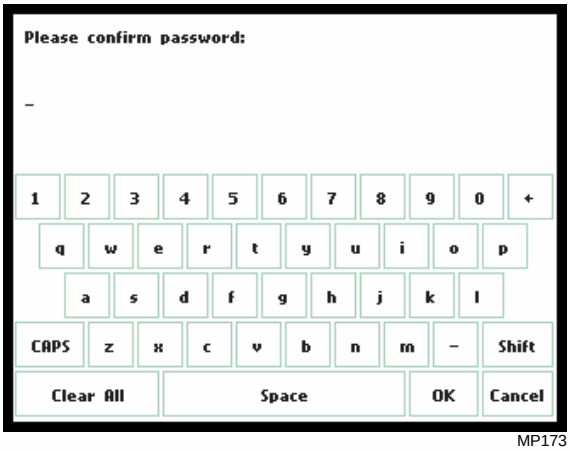
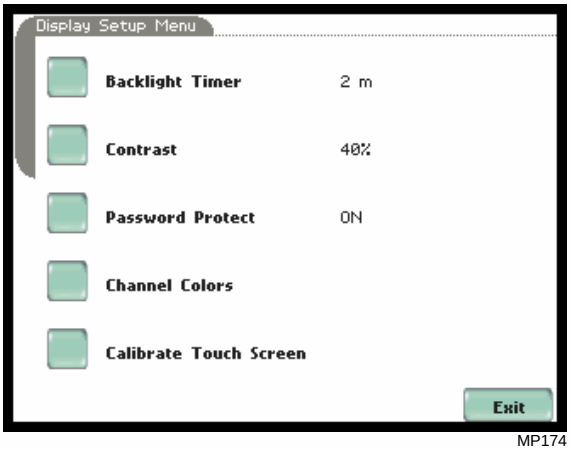
Password setting

Password protect is an optional feature that allows users to guard against unwanted access to MP7. When password is enabled, only those with password privileges can access the MP7 touchscreen functions.

Action...	Result...
STEP 1: Password protect is disabled by default. To enter a password, press Password Protect from the Display Preferences menu. • Select **Yes** if you want to turn on password protect upon resume. Proceed to Step 2. • Select **No** if you do not want to use password. The screen will return to Display Preferences menu.	 MP171
STEP 2: Enter the desired password using the keypad. A password can be written in alpha, numeric, or a combination of alphanumeric characters. No space is allowed in between characters. Up to 16 characters are allowed per password name. • Press **Shift** to enter a character in uppercase. • Press **CAPS** to enter all characters in uppercase. • Press **Space** to enter a space in between characters. • Press **Clear All** to delete the entire name on the space provided. • Press ◄— to erase a character. • Press **OK** when done with password entry. Proceed to Step 3 on page 6-8. • Press **Cancel** to quit and return to Display Preferences menu.	 MP172

Continued on next page

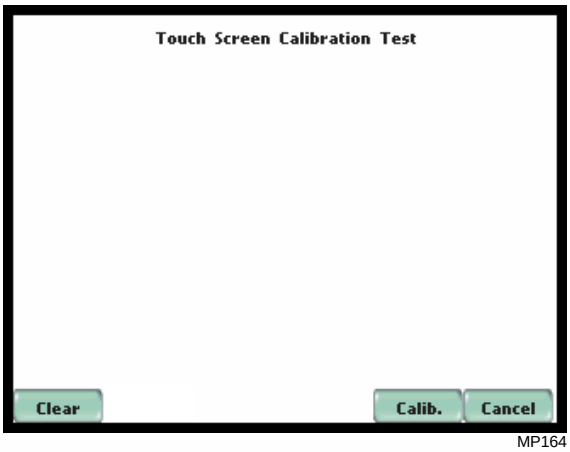
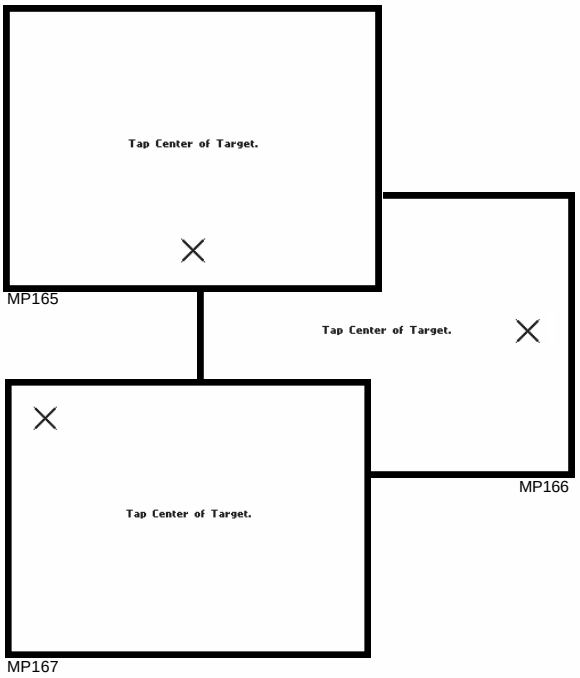
Password setting (continued)

Action...	Result...
STEP 3: Enter the password once again for confirmation. The message **Invalid Entry. Please try again.** will appear when an incorrect password is entered. • Press **OK** to accept password confirmation. Proceed to Step 4. • Press **Cancel** to quit and return to Display Preferences menu.	 MP173
STEP 4: A password is enabled when the Password Protect is set to ON. NOTE: When password protect is enabled and the user reactivates the unit from auto-shutoff (see Backlight Timer setting on page 6-6), the keypad screen used to enter the password will appear. The user will have to enter the correct password to continue using the MP7. The message **Invalid Password!** will appear when an incorrect password is entered. • Press **Exit** to return to the Instrument Settings Setup Menu. To disable the password, use the Reset to Factory Defaults function found under Instrument Setting Setup Menu. See page 6-16 for instructions on how to reset the unit to factory configurations.	 MP174

Touch Screen Calibration

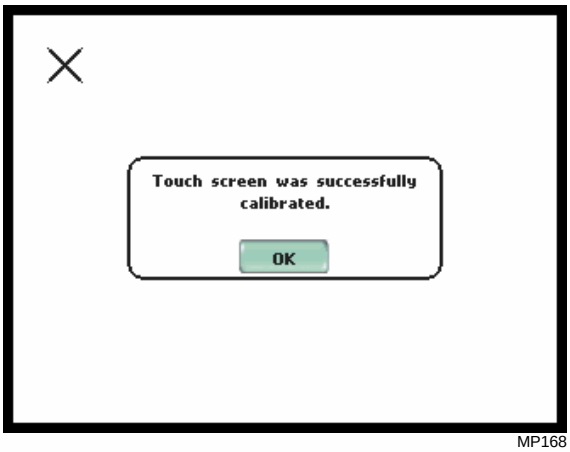
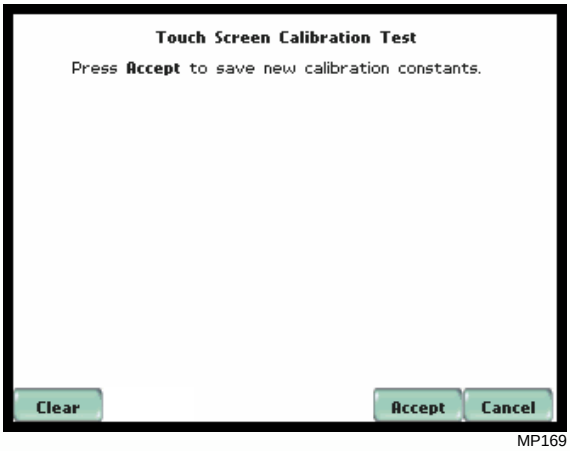
Calibration procedure

The MP7 is able to perform calibration to ensure the proper operation of the unit's touch screen functions. The calibration procedure will correct the problem of out of tolerance touch screen malfunction. Note that errors corrected by this calibration procedure are specific only to touch screen operation.

Action...	Result...
STEP 1: From the Display Setup Menu (see page 6-6) screen, press Calibrate Touch Screen. Test if touch screen recognition operates properly by applying pressure on the LCD screen. • Press **Clear** to reset LCD screen and delete display markings. • Press **Calib** to begin touch screen calibration procedure. Proceed to Step 2. • Press **Cancel** to end calibration test and return to Display Setup.	 MP164
STEP 2: Follow the instruction **Tap Center of Target** to begin calibration. Target object **X** is initially located in the lower middle section of the screen. • A series of screens will flash showing movement of the target object: from the lower middle section to mid-right and finally to upper left section of the screen. • To end touch screen calibration, tap the center of the target object X now located in the upper left section of the screen. Proceed to Step 3 on page 6-10.	 MP165 MP166 MP167

Continued on next page

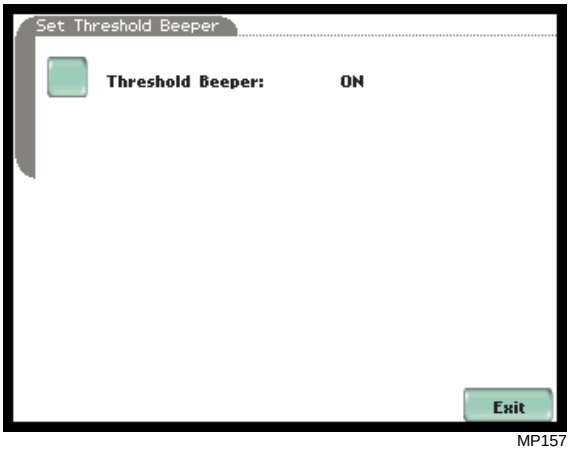
Calibration procedure (continued)

Action...	Result...
STEP 2 (continued): Once touch screen calibration is done, a message will appear to indicate **Touch screen was successfully calibrated.** • Press **OK** to continue on with calibration test verification. Proceed to Step 3.	 MP168
STEP 3: Test if touch screen recognition operates properly by applying pressure on the LCD screen. • Press **Clear** to reset LCD screen and delete display markings. • Press **Accept** to complete the touch screen calibration procedure. Accepting will save and store new touch screen calibration data in memory. Once the new data is stored, the old touch screen calibration data is lost. The screen will return to the Display Setup Menu. • Press **Cancel** to discontinue the touch screen calibration procedure. Pressing Cancel will retain the previous touch screen calibration constants, no new calibration data will be stored in memory. The screen will return to the Display Setup menu.	 MP169

Turn Threshold Beeper On/Off

Audible alarm

When threshold beeper is set to ON, the unit will beep when thresholds are crossed and violations occur. The beep that provides audible feedback to pressing touch screen key is not affected by this setting.

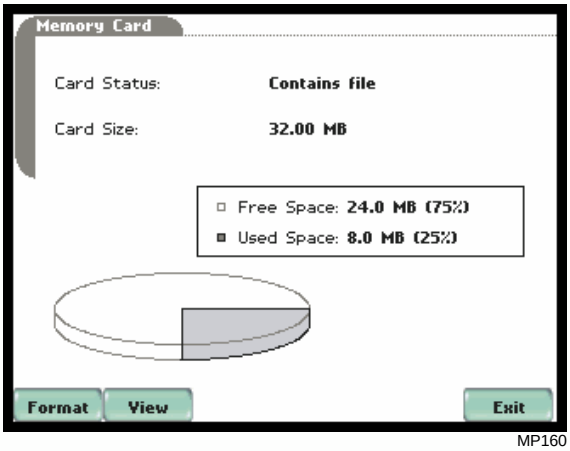
Action...	Result...
STEP 1: From the Instrument Settings Setup Menu, press Turn Beeper On/Off. • The unit can provide audible alarm signals when triggered. Press **Threshold Beeper** to turn the alarm ON or OFF. • Press **Exit** to return to Instrument Settings menu.	 MP157

Format Data Card

Format/View data card

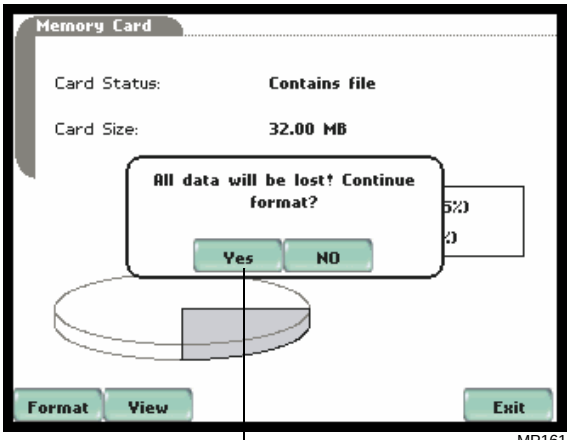
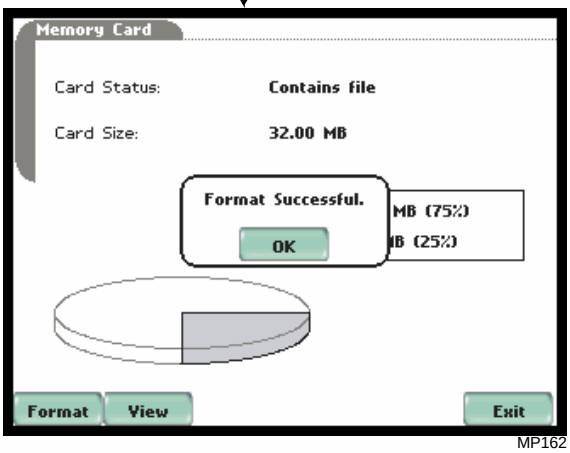
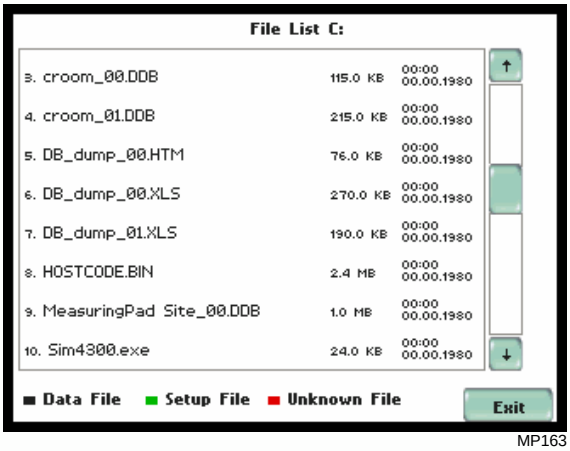
The Memory Card screen displays information on the card inserted in the data card slot, including the amount of total space, available space, and used space in card. The Memory Card screen also prompts users to set filename and format card in preparation for monitoring and writing of data.

Action...	Result...

STEP 1: From the Instrument Settings Setup Menu, press Memory Card.
 	
• **Card Status** indicates status condition of the card inserted in the data card slot. The following messages may appear under Card Status (refer to pages 3-17 to 3-18 for a detailed description of each card status message):
  • Not Inserted
  • Contains File
  • Empty
  • Fragmented
  • Unformatted
  • Invalid Card
 	
• **Card size** indicates the full storage capacity of the data card. The amount of remaining space and used space in data card are also displayed on screen.
 	
• Press **Format** to format the data card. Proceed to Step 2 on page 6-13.
 	
• Press **View** to display files stored in data card. Proceed to Step 3 on page 6-13.
 	
• Press **Exit** to discard changes and return to Instrument Settings menu.
	
	MP160
	
	NOTE 1: The MP7 does not support file fragmentation. When creating a file, it will take the largest continuous block and use that size block for data storage. You cannot use MP7 to delete individual files from the data card. Whenever possible, transfer the files to a computer and then reformat the card using the MP7 when there is no more space available to begin new data storage.
	
	NOTE 2: Refer to Chapter 3 Start/Setup Operations - Site Name/Memory Card on pages 3-17 to 3-20 for more information on data card operation.

Continued on next page

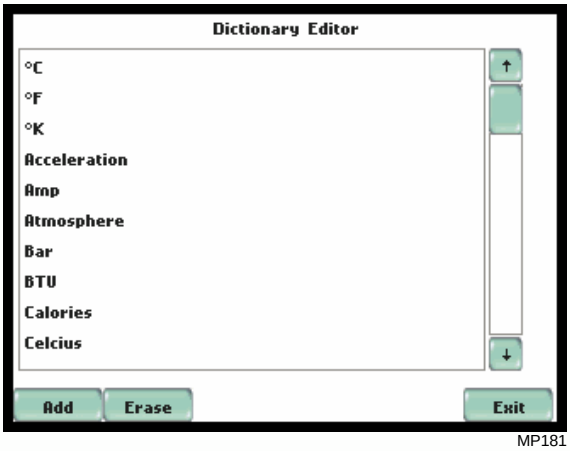
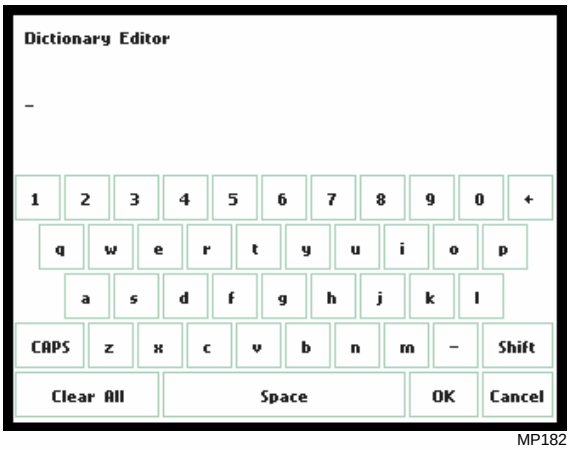
Format/View data card (continued)

Action...	Result...
STEP 2: All data and setups stored in data card will be lost when you format the card. • A confirmation message verifies whether you want to continue with data card format or not. Press **Yes** to continue data card format. Press **No** to cancel data card format. • The message Format Successful indicates that data card format has been completed. Press **OK** to exit card format procedure and return to the Memory Card screen.	 MP161  MP162
STEP 3: The MP7 lists data file names stored in card, along with file size, time and date when data was recorded. The text color indicates the type of file: black is for data file (.ddb), green is for setup file (.set), and red is for an unknown file. • Press **Up/Down** arrow keys to scroll the page up or down by one line. • Press and drag the scroll bar to move the page up or down. • Press **Exit** to quit and return to Memory Card screen.	 MP163

Edit Dictionary

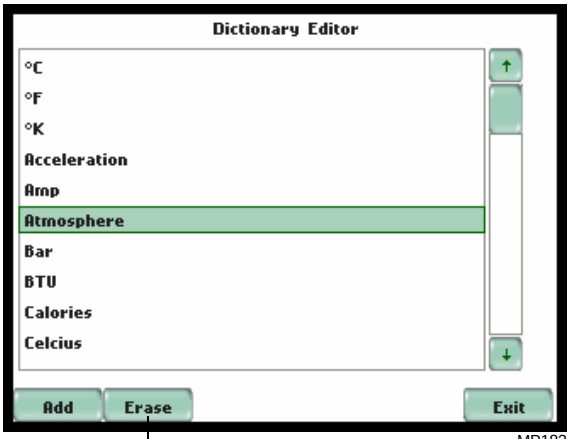
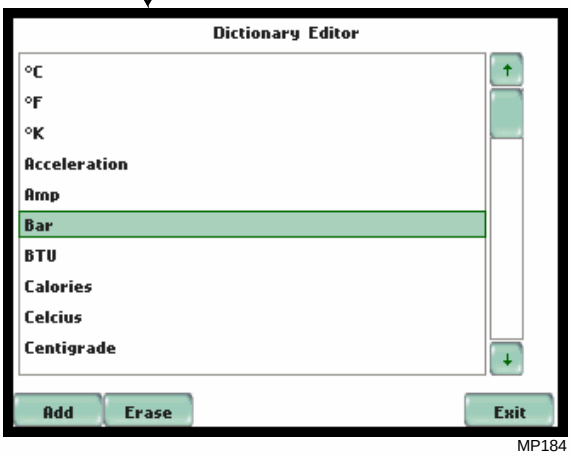
Procedure

The dictionary displays units of measurement listed in alphabetical order. Users can refer to this list when choosing a tag label and/or engineering unit appropriate for the channel application. The dictionary is integrated in the Tag key and Legend key used to configure input channels under setup operations. Users are allowed to customize contents of the dictionary, meaning they can add new measurement unit selections or delete pre-existing ones.

Action...	Result...
STEP 1: From the Instrument Settings Setup Menu, press Dictionary. • Press **Up/Down** arrow keys to scroll the page up or down by one line. • Press and drag the scroll bar to move the page up or down. • Press **Add** if you want to enter a new unit of measurement in the list. Proceed to Step 2. • Press **Erase** if you want to delete a unit of measurement from the list. Proceed to Step 3 on page 6-15. • Press **Exit** to return to the Instrument Settings menu. If the dictionary has been edited, a message will appear to verify if you want to save changes (press Yes) or not (press No).	 MP181
STEP 2: Enter a new unit of measurement using the keypad. • Press **Shift** to enter a character in uppercase. • Press **CAPS** to enter all characters in uppercase. • Press **Space** to enter a space in between characters.	 MP182

Continued on next page

Procedure (continued)

Action...	Result...
STEP 2 (continued): • Press **Clear All** to delete the entire name on the space provided. • Press ← to erase a character. • Press **OK** when done with new entry. The new measurement unit will automatically be included in the dictionary list, arranged alphabetically. • Press **Cancel** to quit and return to the Dictionary Editor.	
STEP 3: Select the unit of measurement that you want to delete from the Dictionary Editor. • Press **Erase** to delete the selected unit from the list. The unit will automatically be removed from the dictionary list.	 MP183  MP184

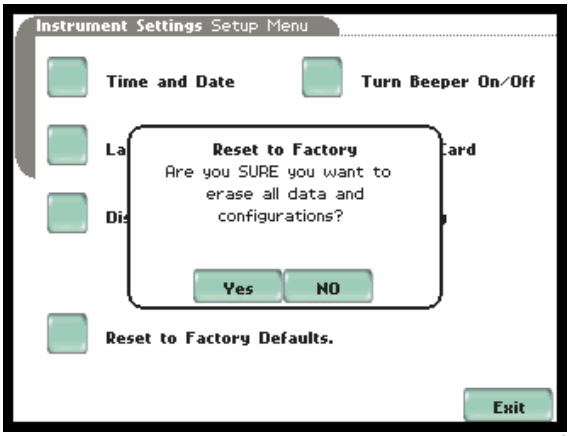
Reset to Factory Configuration

Definition

Factory configurations are the default settings of all programmable features of the MP7 as it left the factory.

Procedure

Follow these steps to reset the MP7 to its factory configuration.

Action...	Result...
STEP 1: From the Instrument Settings Setup Menu, press Reset to Factory Defaults. A confirmation message verifies if you want to reset the instrument to factory configuration and lose all new data and settings. • Press **Yes** to erase existing settings (including user-enabled password) and reset the instrument to factory-configured setups. The screen will return to the Instrument Settings menu. • Press **No** to cancel.	 MP156

A P P E N D I X A

Optional Accessories

Overview

Introduction

This appendix lists the optional accessories for the MP7. It covers the hardware accessories available for use with MP7.

Ordering information

To order accessories, contact Dranetz-BMI Customer Service Department at:

Daytronic
2211 Arbor Boulevard
Dayton, Ohio 45439 USA
Attention: Customer Service

Tel: (937) 293-2566
Tel: 1-800-668-4745
Fax: (937) 293-2586
www.daytronic.com

Hardware Accessories List & Descriptions

Hardware Accessories List

Accessory	Part Number
Measurement Pods	
600V Voltage Pod	MP600V
300V Voltage Pod	MP300V
30V Voltage Pod	MP30V
20mA Current Pod	MP20MA
Universal Current Clamp Pod	MPUC
Thermocouple Pod	MPUT
Current Probes	
Current Probe Assembly, 10 to 500 A RMS	TR-2500
Current Probe, 10 to 500 A	TR-2500A
Current Probe Assembly, 0.1 to 10 A RMS	TR-2510
Current Probe, 1 to 10 A	TR-2510A
Current Probe Assembly, 300 to 3000 A RMS	TR-2520
Current Probe, 10 to 3000 A	TR-2520A
Current Probe Assembly, 1 to 30 A RMS	TR-2021
Current Probe Assembly, 1 to 300 A RMS	TR-2019B
Current Probe Assembly, 10 to 1000 A RMS	TR-2022
Current Probe Assembly, 10 to 3000 A RMS	TR-2023
Current Probe Assembly, 1 to 150 A RMS	TR-2550A
Current Probe Assembly, 1 to 1200 A RMS	TR-2540A
Current Probe Assembly, 1 to 300 A RMS	TR-2530A
Data Card	
Compact Flash Data Card (32 MB)	MP-32M
Compact Flash Data Card (64 MB)	MP-64M
Compact Flash Data Card (128 MB)	MP-128M
Compact Flash Card Reader, Parallel	FLASHREADER-P
Compact Flash Card Reader, USB	FLASHREADER-USB
Miscellaneous Hardware	
High Voltage Cable Set	MP-HVC
Soft Carrying Case	MP-SCC
Reusable Shipping Container	MP-RSC
Battery Pack, 7.2V, 2.7Ah	MP-FRB
External Battery Charger/UPS	MP-EXB

Measurement Pods

The measurement Pods act as interface between the sensor generating devices and the MP7. MP7 supports up to four Pods connected at one time. Photos and specifications of input Pods are found in Chapter 2 Input Pod Connection.

MP600V Voltage Pod: Measures differential inputs up to ±600 Vdc or 0 to 600 Vac rms. Pod connections for measurement devices are via safety banana jacks.

MP300V Voltage Pod: Measures differential inputs up to ±300 Vdc or 0 to 240 Vac rms. Pod connections for measurement devices are via safety banana jacks.

MP30V Voltage Pod: Measures differential inputs up to ±30 Vdc or 0 to 24 Vac rms. Pod connections for measurement devices are via five-way binding posts.

MP20MA Current Pod: Measures differential inputs from 4 to 20mAdc or 0 to 20 mAac rms. Pod connections for measurement devices are via five-way binding posts.

MPUC Universal Current Clamp Pod: Measures differential inputs up to 1.5 Vac rms. Pod connects to the TR probe series, using Hypertronics connectors.

MPUT Thermocouple Pod: Measures differential inputs from 0 to ±80m Vdc for thermocouple signals. Pod connections for measurement devices are via thermocouple mini-jacks with cold junction compensation.

Current probes

Several Daytronic current probes can be used with the MP7: models TR2500/A, TR2510/A, TR2520/A, TR2019B, TR2021, TR2022, TR2023. Some TR current probes plug directly to the Model MPUC Universal Current Clamp Pod, while others use Hypertronics connectors to interface with the MPUC current pod

TR2500, TR2510, TR2520 (TR2500A, TR2510A, TR2520A): These models will measure rms currents from 10 to 500 A, 0.1 to 500 A, 300 to 3000 A, respectively. They plug directly into the current input connectors on the MPUC current pod. These probes are not recommended for measuring medium or high frequency transients.

TR2021, TR2019B, TR2022, TR2023: These probes can be used with the MP7 by using Hypertronics connectors. They can measure rms currents in ranges of 1 to 30 A, 1 to 300 A, 10 to 1000 A, and 10 to 3000 A, respectively, and are needed to accurately measure medium and high frequency transients.

Data card

Compact Flash Data Card: MP7 supports the use of Compact Flash cards in its native format, without the need for PC card adapter. Compact Flash cards are available in three sizes: 32MB, 64MB, and 128MB.

Compact Flash Card Readers: Two types of card readers are available for easy data manipulation and data transfer from the Compact Flash card to the computer: via USB port (FLASHREADER-USB) or via parallel port (FLASHREADER-P).

Miscellaneous hardware

Soft Carrying Case: Heavy-duty, padded, nylon carrying case. Includes pockets for cable set, current probes, and other accessories.

Reusable Shipping Container: Lockable, high-impact plastic case with foam insulation for protecting the instrument during shipping.

Battery Pack: NiMH (Nickel Metal Hydride) battery cells are used in MP7. See Appendix C Battery Specifications and Replacement Procedure.

External Battery Charger: The MP-EXB charges a battery pack while the instrument is in use.

APPENDIX B

Technical Specifications

Overview

In this appendix The following specifications are covered in this appendix.

General

Dimensions	Size: 12” Width x 2.5” Height x 8” Depth (30 x 6.4 x 20.3 cm) Weight: 4.2 lbs. (1.9 kg)
Environmental	Operating: 0 to 50 °C (32 to 122 °F) NOTE: MP300V and MP600V operating range ±5 to 50 °C (41 to 122 °F) Storage: -20 to 55 °C (4 to 131 °F) Humidity: 95% non-condensing Altitude: 2000 m (6560 ft) maximum Intended Use: Indoor
System Time Clock	Crystal controlled; 1 second resolution Event time clock displays to 1 msec resolution Time displayed in analog or digital (12 or 24 hour) format Accurate to 60 seconds per month
Compact Flash Data Card	Sizes range from 32MB to 256MB
Power Requirements	Use ONLY the external power supply provided with the unit for operation and battery charging. Use of any other power supply is not recommended. Voltage: 90-264V AC, 47-63 Hz Consumption: 20 watts maximum Field replaceable batteries: More than 2 hours run-time (3 hours typical) when fully charged.

Interfaces

Installation Categories	Mains supply: Installation Category II, Pollution Degree 2 Measurement inputs: Installation Category III, Pollution Degree 2
Display	Type: 1/4 VGA color graphic, touch screen Liquid Crystal Display (LCD) with compact fluorescent (CCFL) backlighting. Programmable backlight time-out to reduce power consumption. Reactivates with touch. Resolution: 320 x 240 dot matrix Size: 3.75 x 4.75 inches
Alarm	Audible alarm of short (approximately 0.1 second) or long (approximately 1 second) duration to call attention to an error condition or violation trigger, respectively.
Connection	Connect to the MP7 mainframe using the following external Pod interface: MP600V Voltage Pod, MP300V Voltage Pod, MP30V Voltage Pod, MP20MA Current Pod, MPUC Universal Current Clamp Pod, and MPUT Thermocouple Pod.

Input Parameters

Analog Inputs

Up to four external Pods can connect to either Channels A, B, C or D. Each Pod has four DC-coupled differential analog inputs of the same type. Analog inputs are sampled at 10kHz rate.

Pod type: MP600V Voltage Pod
Operating Range (Differential and Common-Mode): ±0 to 600 Vdc or 0 to 600 Vac RMS
Resolution: Tenths of a volt
Input impedance: 16 MΩ (differential); 8 MΩ (common mode)
Accuracy: ±0.1% Full Scale up to 400 Hz; ±0.5% Full Scale up to 3 KHz; ±1% Full Scale up to 6 KHz
Connection: Safety banana jacks
Identification: EEPROM for Pod ID and storage of calibration values

Pod type: MP300V Voltage Pod
Operating Range (Differential and Common-Mode): ±0 to 300 Vdc or 0 to 240 Vac RMS
Resolution: Hundredths of a volt
Input impedance: 40 MΩ (differential); 10 MΩ (common mode)
Accuracy: ±0.1% Full Scale up to 400 Hz; ±1.0% Full Scale up to 6 KHz
Connection: Safety banana jacks
Identification: EEPROM for Pod ID and storage of calibration values

Pod type: MP30V Voltage Pod
Operating Range (Differential and Common-Mode): ±0 to 30 Vdc or 0 to 24 Vac RMS
Resolution: Millivolts
Input impedance: 4 MΩ (differential); 1 MΩ (common mode)
Accuracy: ±0.1% Full Scale up to 400 Hz; ±1.0% Full Scale up to 6 KHz
Connection: Five-way binding posts
Identification: EEPROM for Pod ID and storage of calibration values

Pod type: MP20MA Current Pod
Operating Range (Differential and Common-Mode): 4 to 20m Adc or 14m Aac RMS
Resolution: Microamps
Input impedance: 250Ω (differential); 1 MΩ (common mode)
Accuracy: ±0.1% Full Scale up to 400 Hz; ±1.0% Full Scale up to 6 KHz
Connection: Five-way binding posts
Identification: EEPROM for Pod ID and storage of calibration values

Continued on next page

Analog Inputs (continued)

Pod type: MPUC Universal Current Clamp Pod
Operating Range (Differential): 1.5 Vac RMS = Rated full scale of probe;
Crest Factor: 2
Resolution: Dependent on clamp probe
Accuracy: Dependent on clamp probe (typically 1 to 3% for inputs greater than 10% of full scale)
Connection: Hypertronics connectors for TR series current probes

Pod type: MPUT Thermocouple Pod
Thermocouple Types Supported: Accepts types B, E, J, K, N, R, S, and T
Operating Range: -10m V to +80m Vdc
Resolution: 0.1 degree
Input impedance: 10 MΩ (differential); 1 MΩ (common mode)
Accuracy: ±0.1% Full Scale DC
Cold Junction Reference: Digital temperature sensor for cold junction compensation
Connection: Mini jacks
Identification: EEPROM for Pod ID and storage of calibration values

Digital Inputs

Available in all four Pod types. Each Pod has two digital inputs. Digital inputs are sampled at 40kHz rate.

Minimum Time Interval (for timed inputs): 1 msec
V_L: 0 to 0.6 Vdc
V_H: 4.5 to 30 Vdc
I_{IN}: -3 mA min for logic True
R_{IN}: 1.2 kΩ @ Vcc = 5 Vdc
Isolation: Optically isolated to 750 Vac RMS, common mode
Connection: Five-way binding posts

Software-selectable hysteresis debounce when digital inputs are used as logging triggers.

Digital inputs can be configured as:

- Reset
- Logic Trigger
- Frequency measuring
- Counter
- Quadrature Encoder

Calculated Parameters

Calculation formulae

Calculates are math functions that can be applied to one or two channels that can either be analog, digital or another calculate. Values for the following inter-channel calculation formulae are user-programmable.

CLC x = m (CHN y) + b

CLC x = (CHN y)/ m + b

CLC x = m (CHN y + CHN z) + b

CLC x = m (CHN y - CHN z) + b

CLC x = m (CHN y) (CHN z) + b

CLC x = (CHN y) (CHN z)/ m + b

CLC x = (CHN y) / (CHN z) m + b

CLC x = m (CHN y) / (CHN z) + b

CLC x = m / (CHN y) + b

CLC x = m (SQR CHN y) + b

CLC x = m (ABS CHN y) + b

CLC x = m (MAX CHN y) + b

CLC x = m (MIN CHN y) + b

CLC x = m (AVG CHN y) + b

MP7 allows a total of eight channels for inter-channel calculations. Calculations are for readability purposes and are not stored with live data.

APPENDIX C

Battery Specifications and Replacement Procedure

Overview

Introduction

The internal battery pack used in MP7 functions as the primary power source and UPS. Always charge the battery fully before using the unit. The MP7 will fully charge its internal battery in six (6) hours.

MP7 uses a non-volatile flash memory for backup that is not operator replaceable. Data will not be lost if the battery pack is removed. The flash memory will store data temporarily.

In this appendix

The following topics are covered in this appendix.

Battery Specifications

Battery pack	Type: Sealed, rechargeable NiMH (Nickel Metal Hydride) cells. Location: Battery compartment on the rear of the unit. Number of batteries in pack: 6 Voltage: 7.2 V dc Capacity: 2.7 Ah Charging: A depleted battery pack can be recharged in approximately six (6) hours. Length of operation: More than two (2) hours when fully charged and with backlight on. When backlight is turned off, the unit can run continuously for more than three (3) hours. Suggested replacement interval: Two years Part Number: MP-FRB NOTE: The length of time that the MP7 can operate on the battery pack degrades over the life of the batteries and the number of charge/discharge cycles.
Dimensions	Size: 2 3/8" Width x 6" Height x 4 1/2" Depth (30 x 6. 4 x 20.3 cm) Weight: 1.5 pounds (0.7 kg)
Environmental	Operating: 0 to 50 °C (32 to 122 °F) Storage: -20 to 55 °C (4 to 131 °F) Humidity: 0 to 95% non-condensing; indoor use Altitude: 2000 m (6560 ft) maximum Installation Category: Category II, Pollution Degree 2
Power requirements	Voltage: 90 - 264V AC, 45 - 66 Hz

Battery Safety Precautions

WARNING **DO NOT intentionally short circuit the battery pack. The batteries are capable of providing hazardous output currents if short circuited. The MP7 is equipped with an internal battery charger circuit. Do not attempt to charge the batteries with an external charger other than the Daytronic battery charger, since improper charging could cause battery explosion.**

ADVERTENCIA **NO ponga intencionalmente la bateria en cortocircuito. Las baterias son capaces de proporcionar corrientes de salida peligrosas si est·n en cortocircuito. La MP7 esta equipada con un circuito interno cargador de baterÌas. No intente cargar las baterÌas con un cargador externo que no sea el cargador de baterias Daytronic, puesto que la carga indebida podrÌa hacer que explote la bateria.**

AVERTISSEMENT **NE PAS court-circuiter délibérément le bloc-batterie. Lors díun court-circuit, les batteries risquent díémettre des courants effectifs dangereux. MP7 posséde un circuit de chargeur de batterie intégré. Ne pas tenter de charger les batteries au moyen díun chargeur externe autre que le chargeur de batterie Daytronic, car un rechargement fautif pourrait entrainer l'explosion de la batterie.**

WARNUNG **Die Batterien dürfen NICHT kurzgeschlossen werden. Im Falle eines Kurzschlusses konnen die Batterien lebensgefährliche Ausgangsstrome leiten. MP7 ist mit einem internen Batterieladegerät ausgestattet. Die Batterien sollten nur mit dem Ladegerät von Daytronic geladen werden. Die Verwendung eines externen Ladegeräts kann zu einer Explosion der Batterien führen.**

Safety precautions

Observe the following precautions when inspecting or replacing the battery pack:

- Do not attempt to replace individual batteries of the pack or substitute other battery types.
- Do not dispose of battery in fire.
- Dispose of a used battery promptly in accordance with local Environmental Protection Agency (EPA) regulations.
- Visually inspect the battery pack for corrosion.

  The batteries have a safety pressure vent to prevent excessive gas build-up and corrosion indicates that venting has occurred. Possible causes of venting are: a defective charger, excessive temperature, excessive discharge rate, or a defective cell.

  If corrosion is excessive, the battery pack may require replacement (contact Daytronic Customer Service Department).

External Battery Charger

Description

The External Battery Charger for the MP7 bears the part number MP-EXB and is available as an optional accessory. Charging the battery pack(s) is especially useful when monitoring for short durations, where no standard 115 or 230 VAC power is available. Having multiple charged battery packs can provide power to the unit for several hours, allowing users to perform monitoring analysis in remote locations.

NOTE: The battery charger is only operational for charging a single battery pack. It will not power the unit or charge the unit's internal battery. Do not connect the charger to the MP7 and then operate the unit since the battery pack will become discharged if the unit is in a powered "ON" state. Also, if the unit is in an "OFF" state, it will not charge the internal battery pack.

Charger operation

The following procedure describes the basic operation of the MP-EXB battery charger and its applications.

1. Insert the MP-FRB battery pack with the proper polarity into the MP-EXB battery charger.

2. Configure the AC power plug of the battery charger by sliding the proper plug supplied (US, Euro, UK or Australia) and locking it into place. Next, plug the AC power plug of the battery charger to the proper power source: 120 VAC for US plug or 230 VAC for Euro, UK, or Australia type plug.

3. Allow the battery to charge for a minimum of six (6) hours before use.

NOTE: The battery charger indicator glows steadily while charging, and flashes when the battery pack is fully charged.

4. After the 6-hour charge period, the battery pack can be removed from the charger and used for unit operation. If the battery is left in the charger, it will remain fully charged.

Battery Pack Replacement

Introduction The MP7 contains an easily replaceable internal battery pack. See Appendix D for ordering information.

WARNING **Replace with Daytronic NiMH battery pack MP-FRB only.**

ADVERTENCIA **Reemplace con batería Daytronic NiMH MP-FRB solamente.**

AVERTISSEMENT **Remplacer par la batterie Daytronic NiMH MP-FRB exclusivement.**

WARNUNG **Nur mit Daytronic NiMH MP-FRB Batteriesatz auswechseln.**

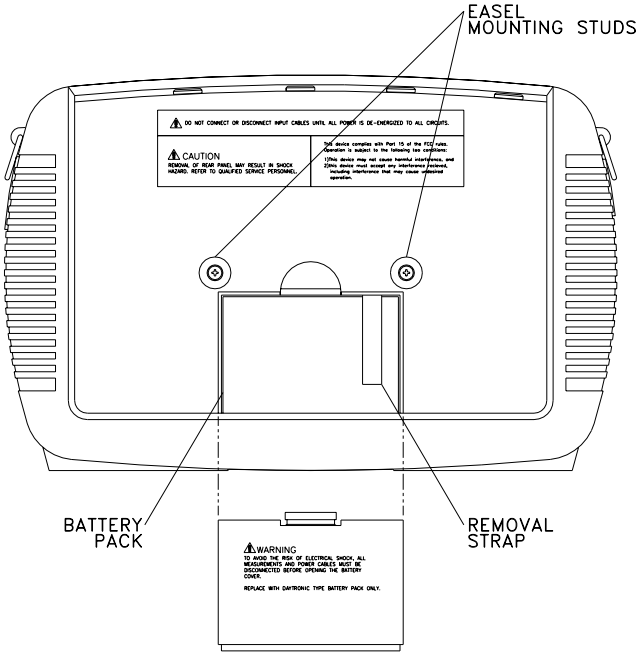
NOTE During normal operation, the battery pack will be slightly warm to the touch.

Procedure Follow these steps to replace the battery pack.

Step	Action
1	Press the MP7 power button to off.
2	Turn off power to the circuit being measured.
3	Disconnect voltage and current probes from the circuit and the MP7's rear panel.
4	On the bottom of the MP7, push the tab to release the battery cover. Refer to the diagram shown on page C-7.
5	Remove the cover.
6	Pull up on removal strap and remove battery pack.
7	Insert the new pack into the compartment making sure to observe polarity markings.
8	Replace the cover and press down until it latches closed.
9	Discard the old battery pack in accordance with Environmental Protection Agency (EPA) regulations.
10	Press the MP7 power button to on.

Continued on next page

Battery removal diagram



APPENDIX D

User Replaceable Parts List

Introduction

The following parts are easily replaced by the operator and do not require special tools or access to the interior of the unit.

To order parts

Call Daytronic Customer Service at (937) 293-2566 or 1-800-668-4745 to order any of the following parts.

Parts List

Part Description	Part Number
AC Adapter/Battery Charger	MP-EXB
Battery Door	116037-G1
Battery Pack	MP-FRB
Rubber Skin for MP7	116035-G4
High Voltage Cable Assembly (See below for separate parts)	MP-HVC (116042-G5)

Measurement cable set, parts list

Part Description	Quantity	Part Number
4MM Plug, 1000V Silicone Cable, Red	1	900366
4MM Plug, 1000V Silicone Cable, Yellow	1	900367
4MM Plug, 1000V Silicone Cable, Blue	1	900368
4MM Plug, 1000V Silicone Cable, Gray	1	900369
4MM Plug, 1000V Silicone Cable, White	4	900370
Alligator Clip, 4MM Plug-on, Red	4	900371
Alligator Clip, 4MM Plug-on, Black	4	900372
Cable Pouch	1	116043-G1

APPENDIX E

MP7 Menu Structure

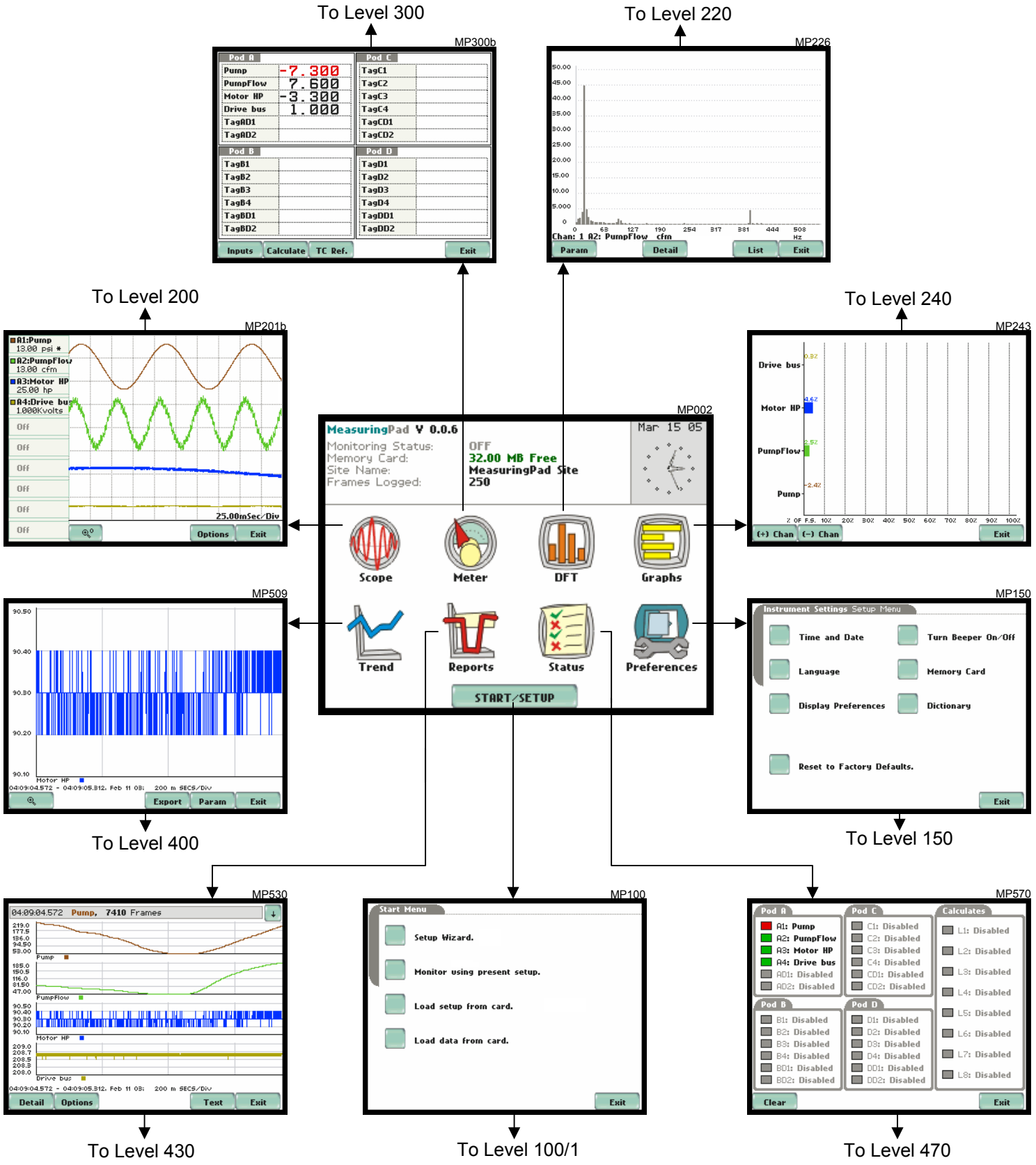
Menu structure description

The MP7 menu screen maps are shown in the following pages. Use the Level number and Heading as guide to navigate through the different menu screens. Each screen contains touch screen buttons which lead to related functions.

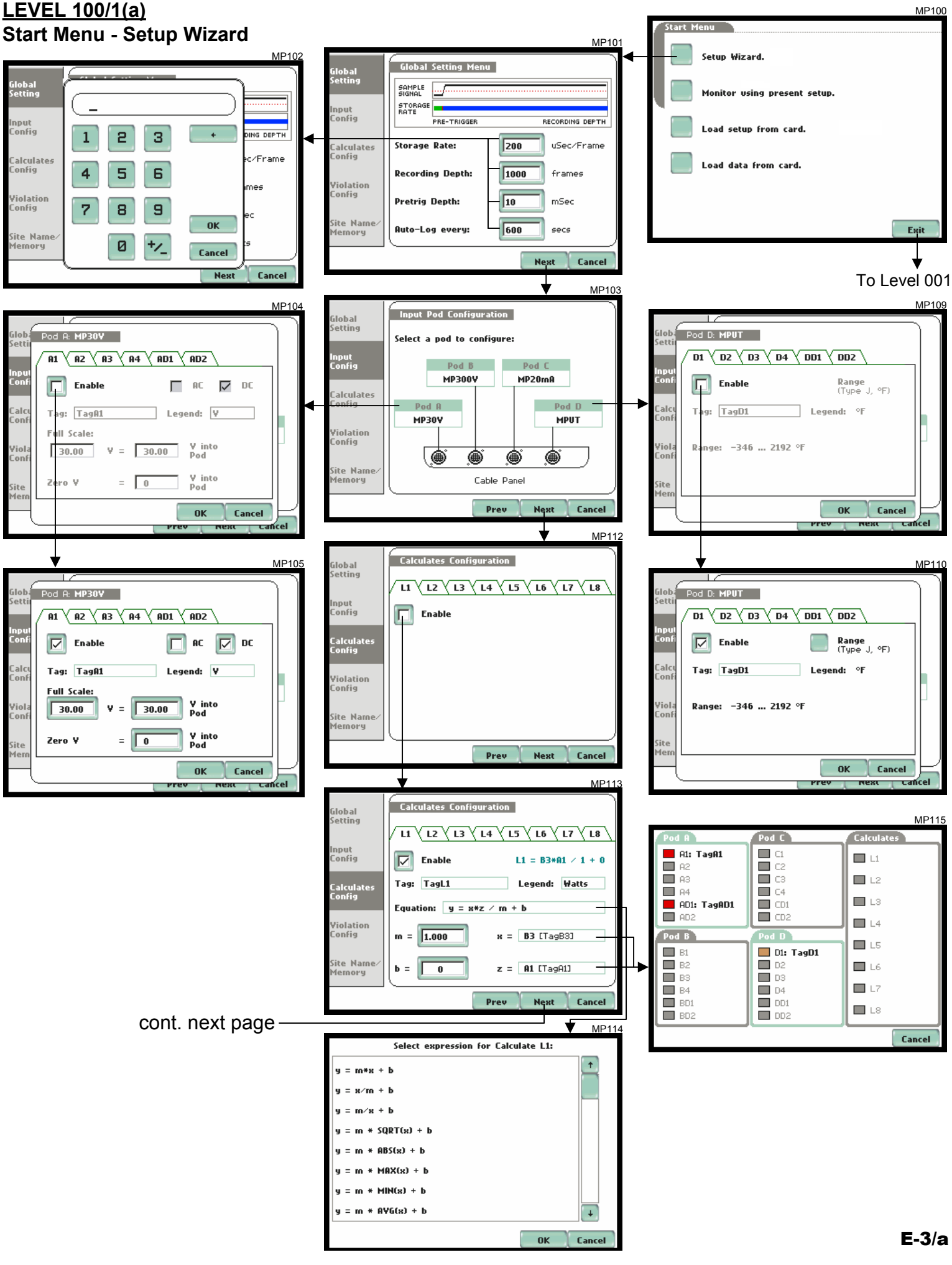
In this appendix

The following screen maps are shown in this appendix.

LEVEL 001
Home Screen

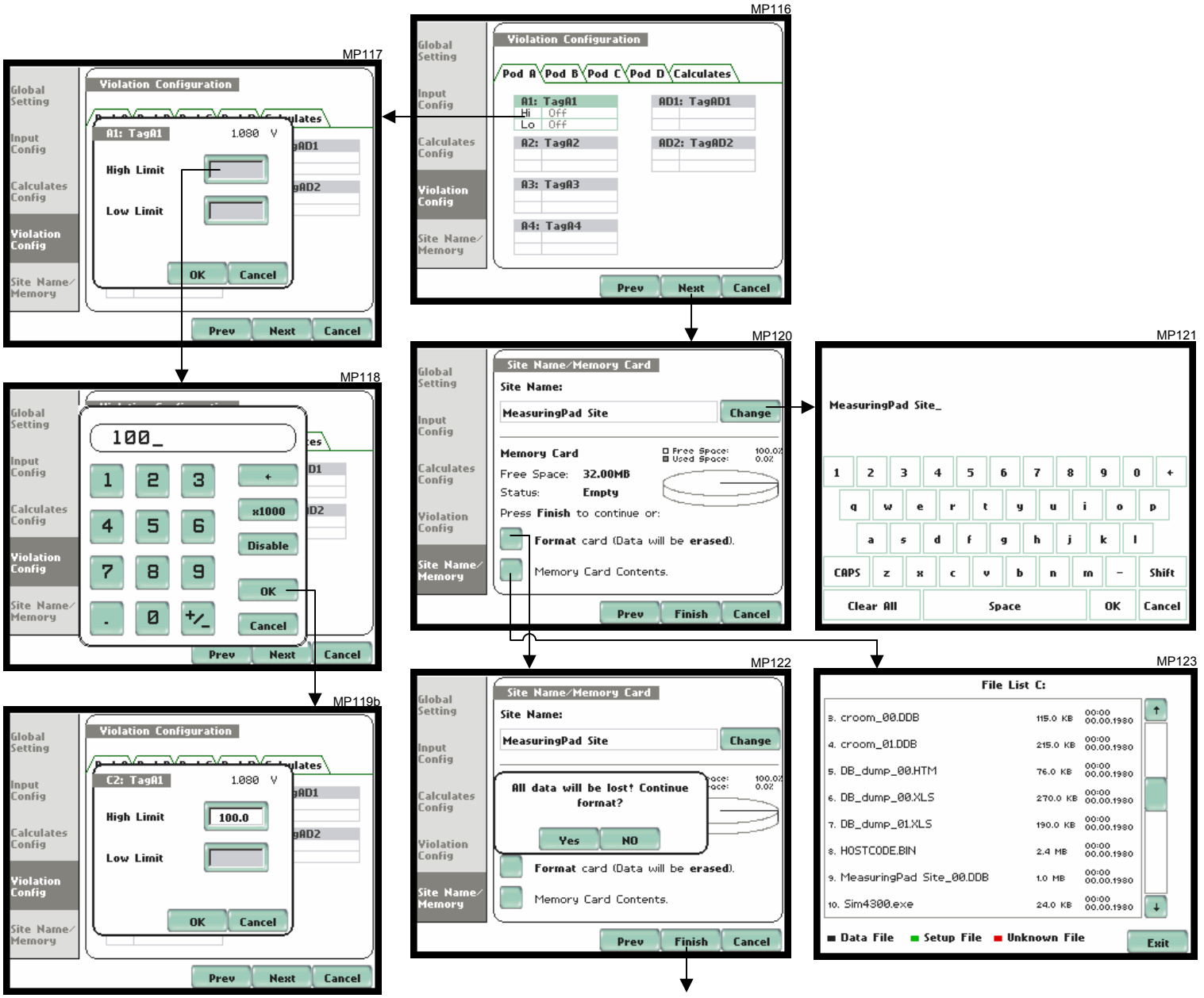


LEVEL 100/1(a)
Start Menu - Setup Wizard



LEVEL 100/1(b)

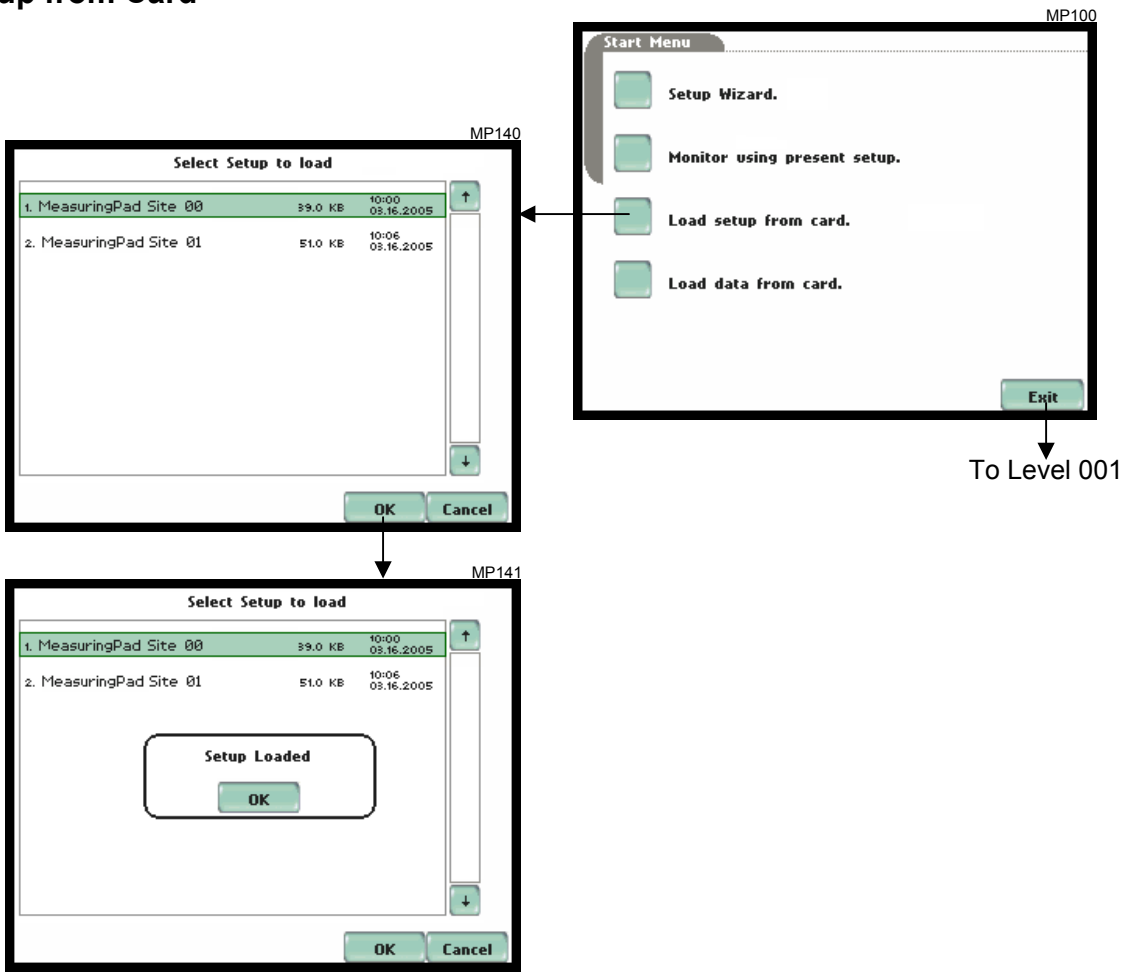
Start Menu - Setup Wizard



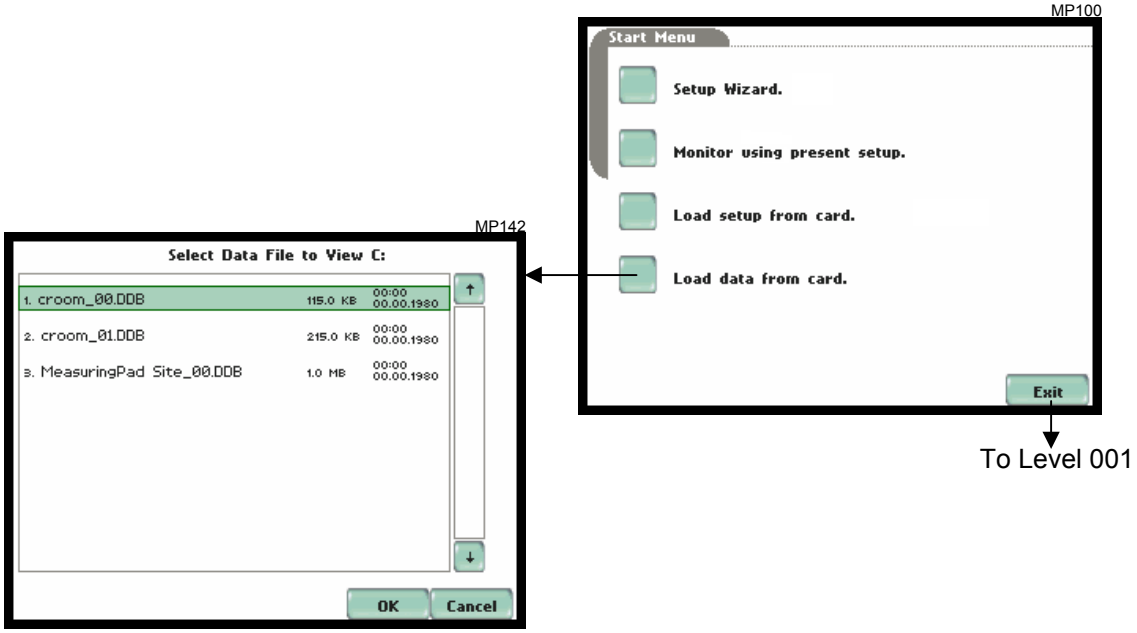
LEVEL 100/2

Start Menu - Monitor Using Present Setup

LEVEL 100/3
Start Menu - Load Setup from Card



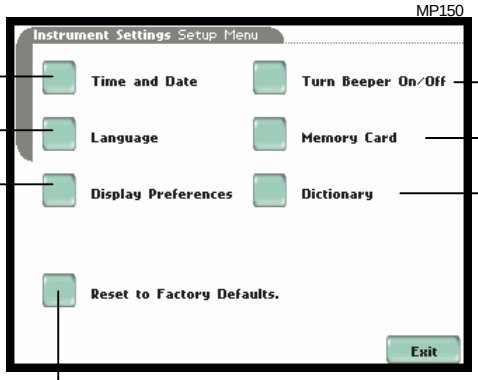
LEVEL 100/4
Start Menu - Load Data from Card



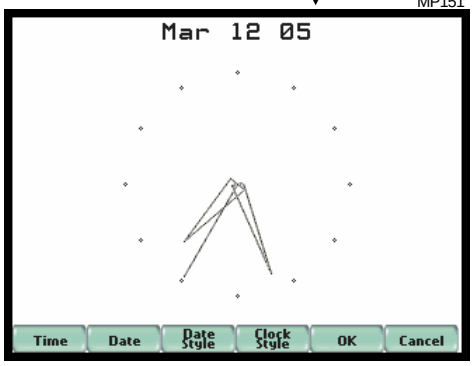
LEVEL 150

Instrument Settings

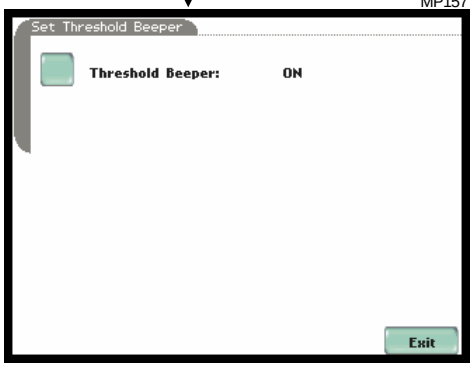
MP150



MP151

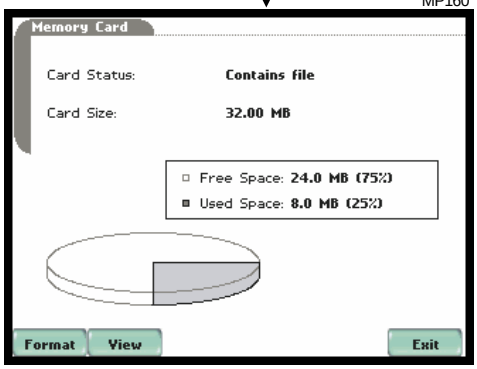


MP157

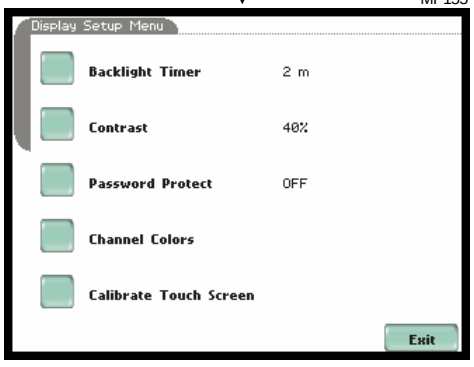


MP154

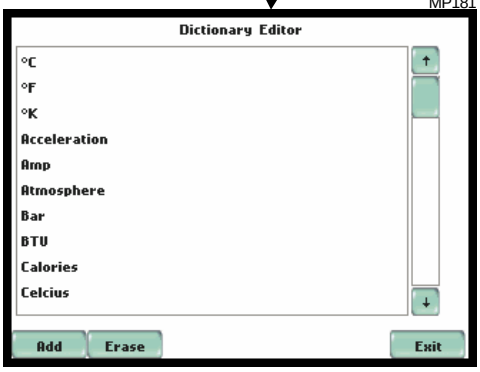
MP160



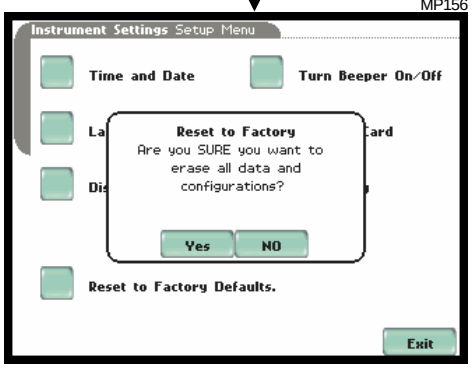
MP155



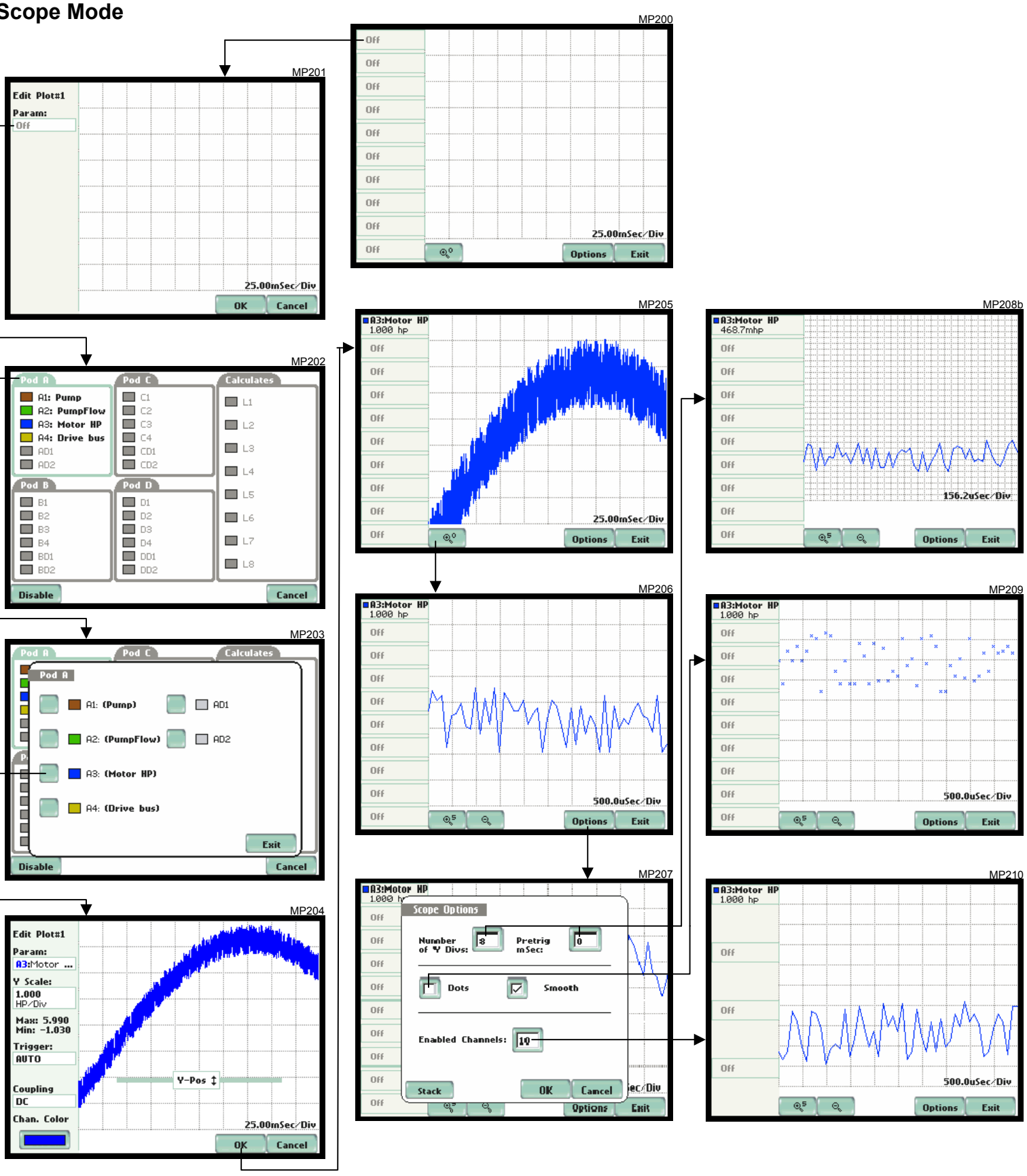
MP181



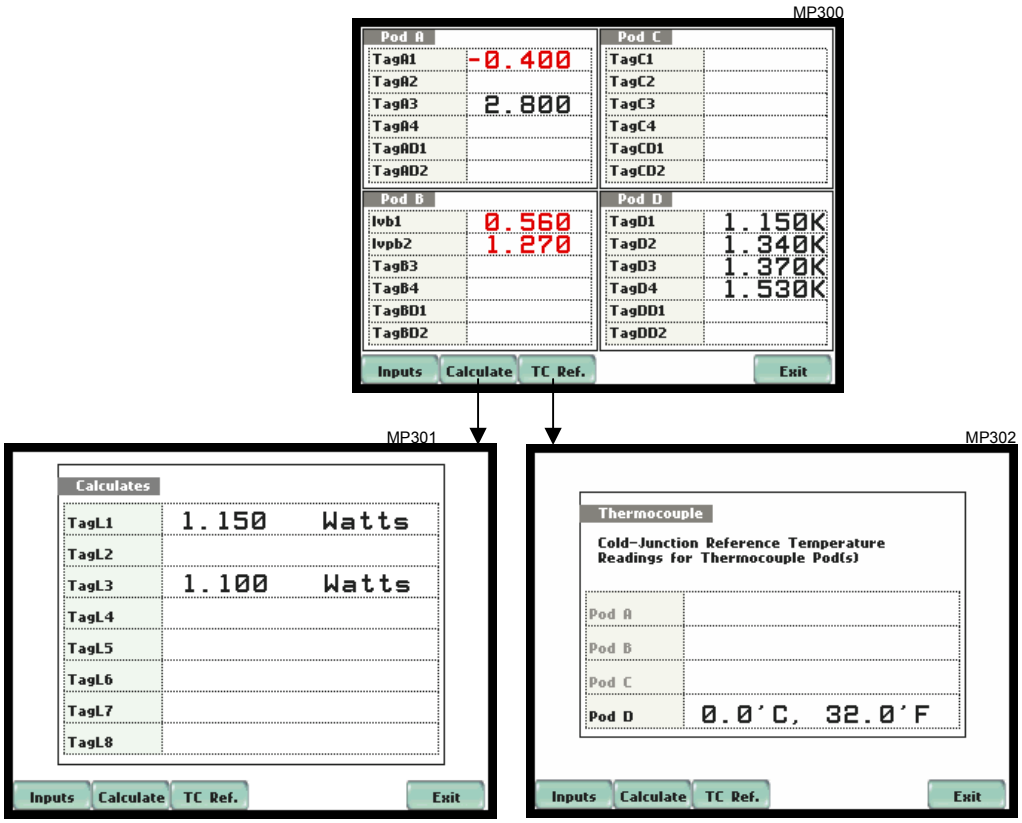
MP156



LEVEL 200
Scope Mode

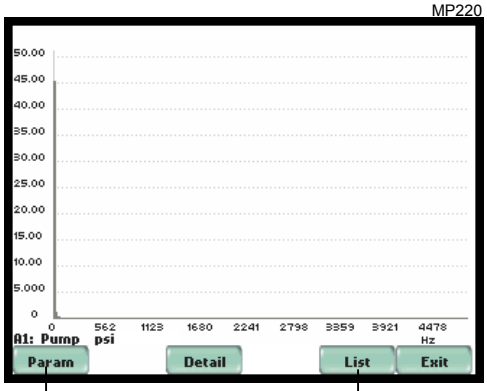


LEVEL 300
Meter Mode

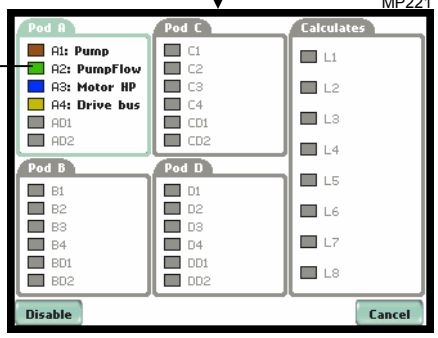


LEVEL 220
DFT

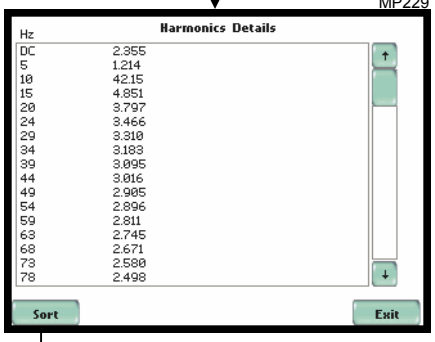
MP220



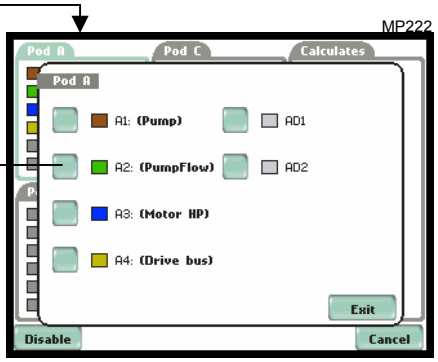
MP221



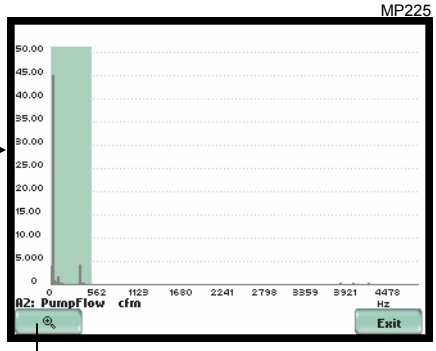
MP229



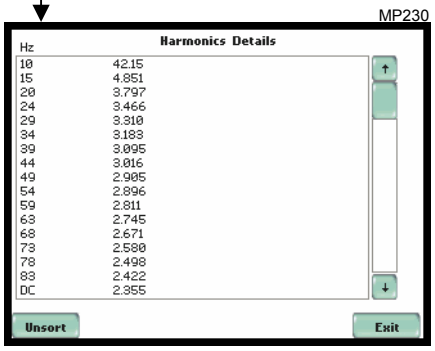
MP222



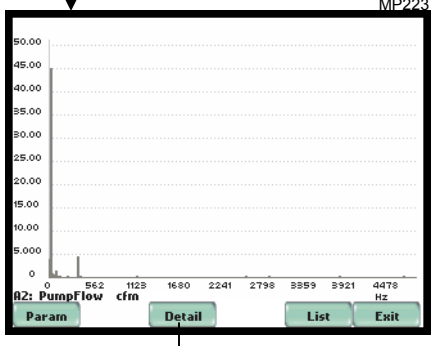
MP225



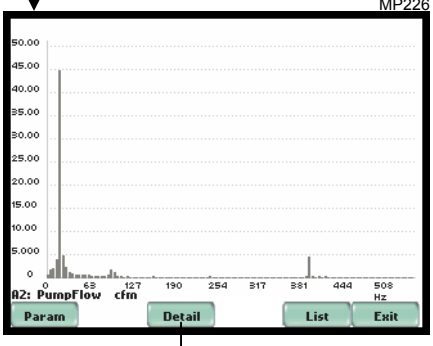
MP230



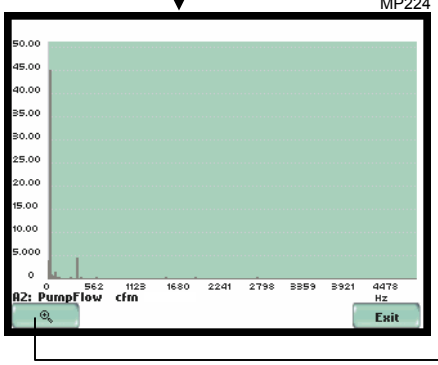
MP223



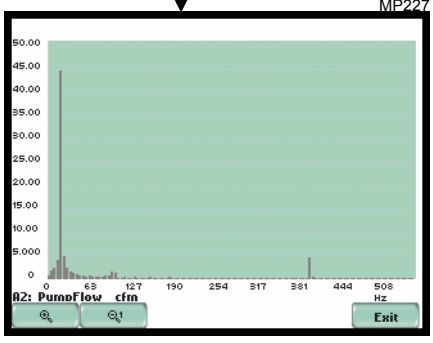
MP226



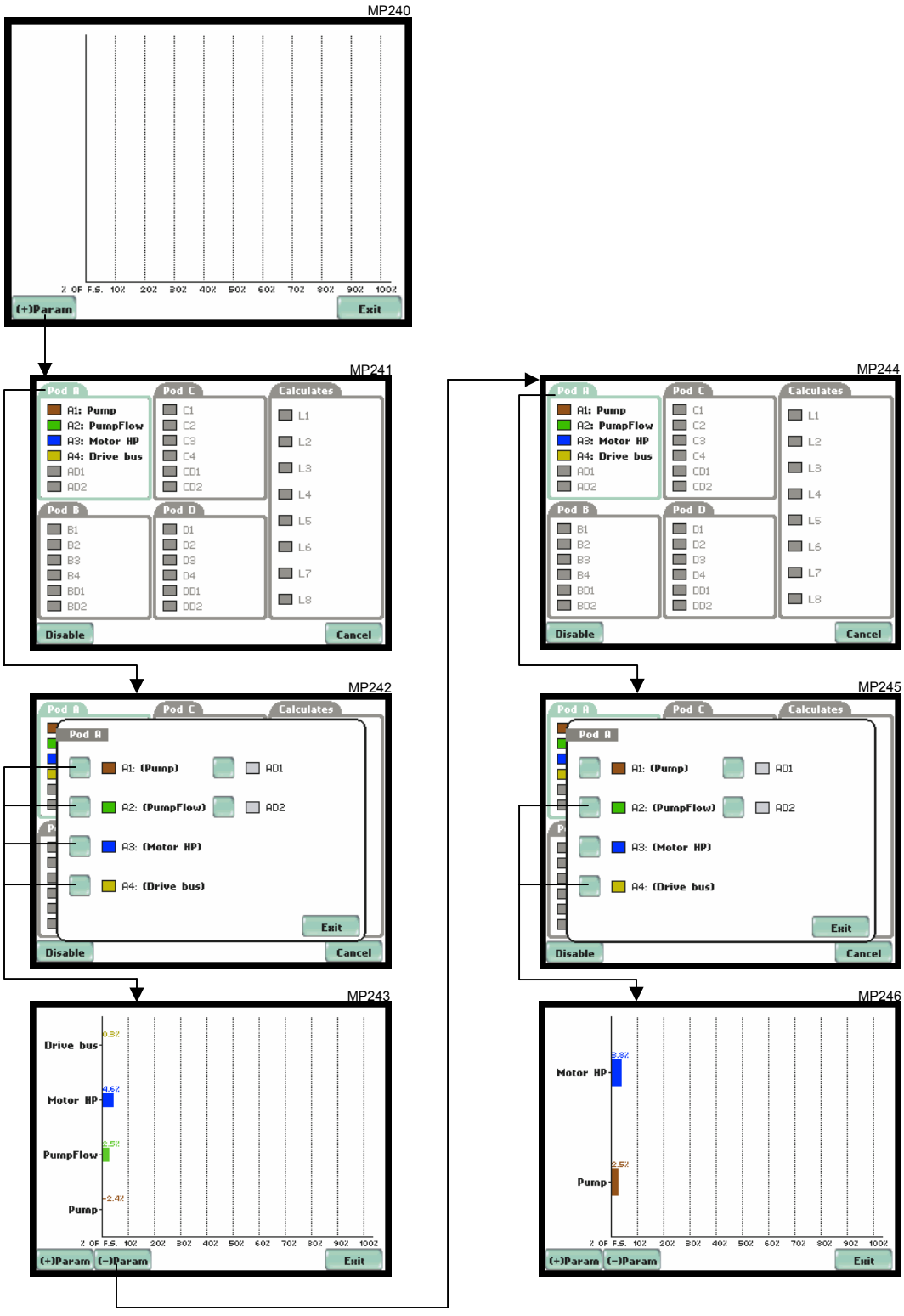
MP224



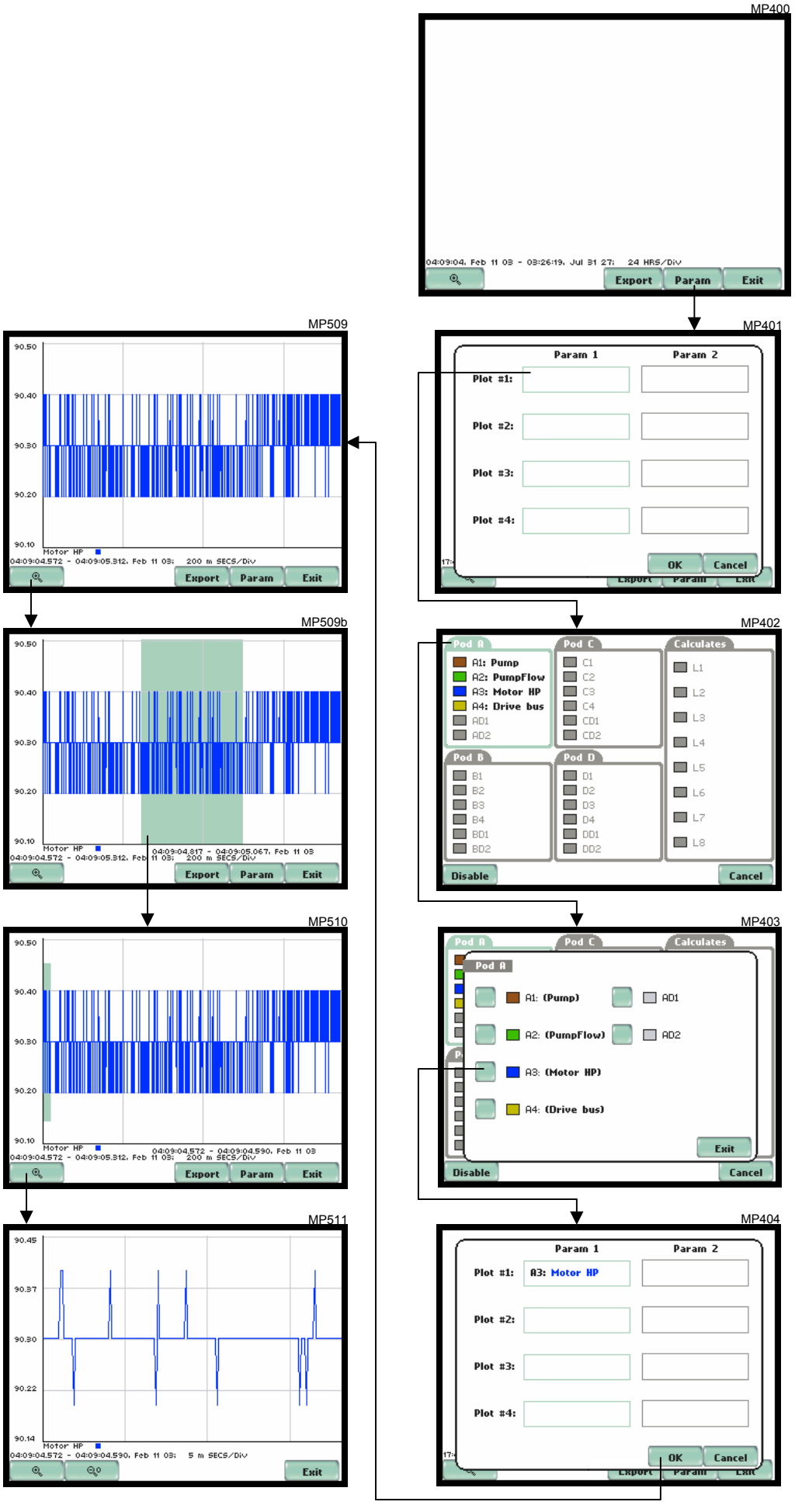
MP227



LEVEL 240
Graph

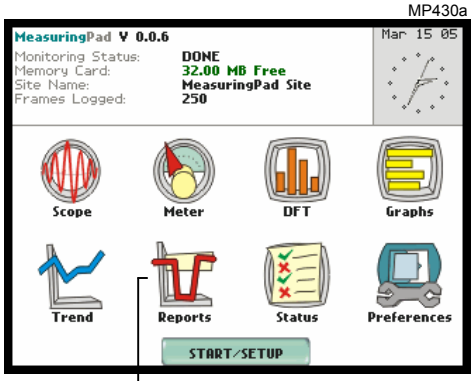


LEVEL 400
Trend

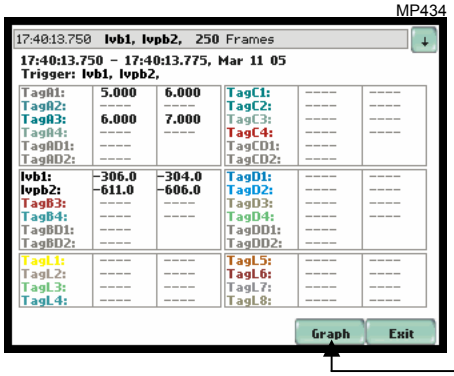


LEVEL 430
Reports

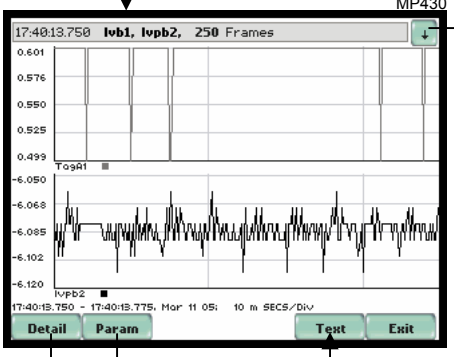
MP430a



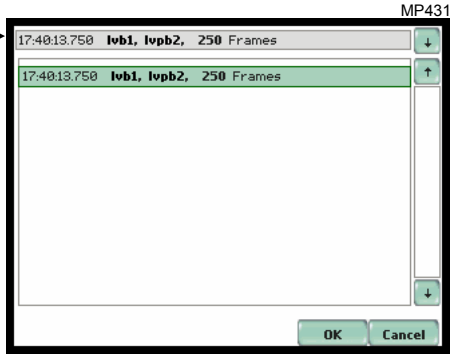
MP434



MP430

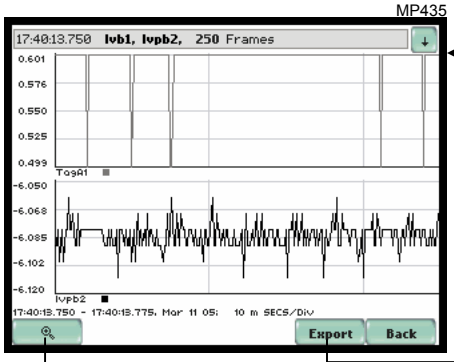


MP431



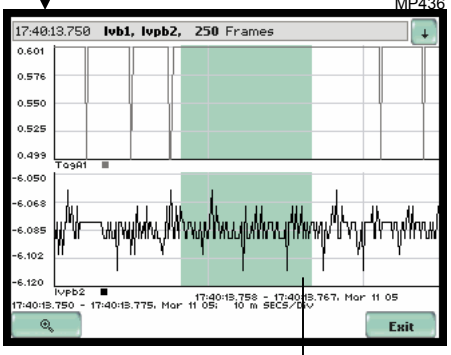
use scroll bar or up/down arrow keys to sort through record list, then press to select (highlight) desired violation entry

MP435

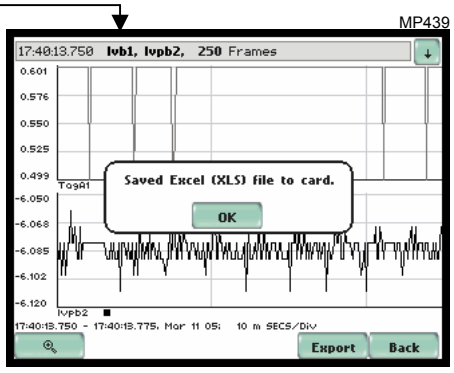


TO LEVEL 440

MP436

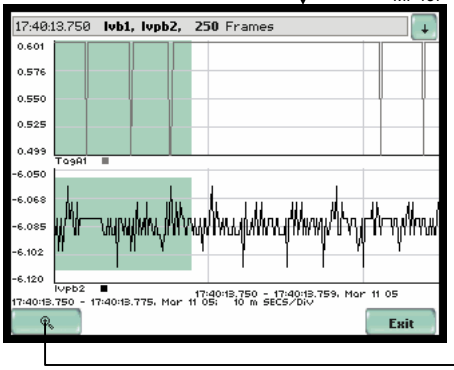


MP439

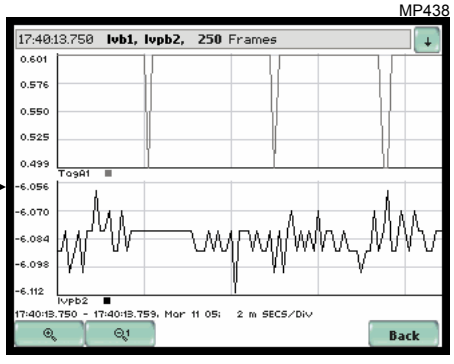


touch/drag zoom box to desired proportion

MP437

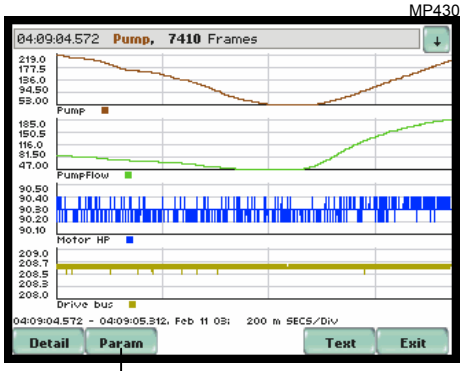


MP438

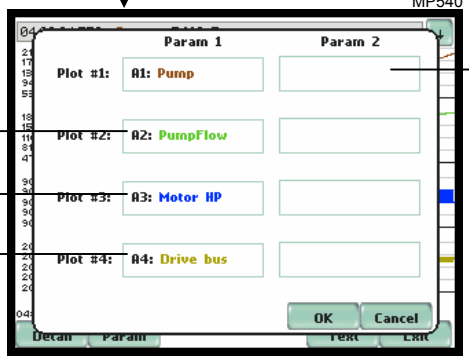


LEVEL 440
Report Parameters

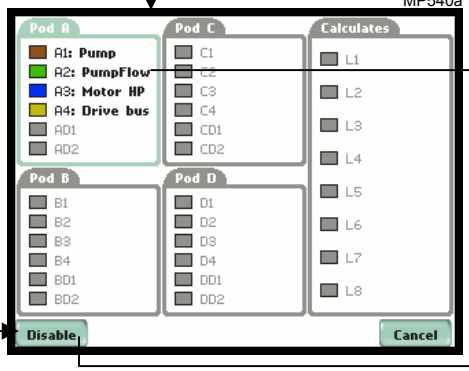
MP430



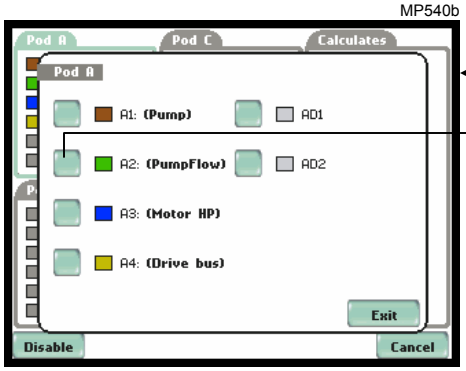
MP540



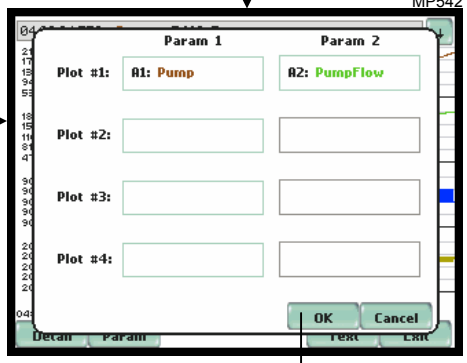
MP540a



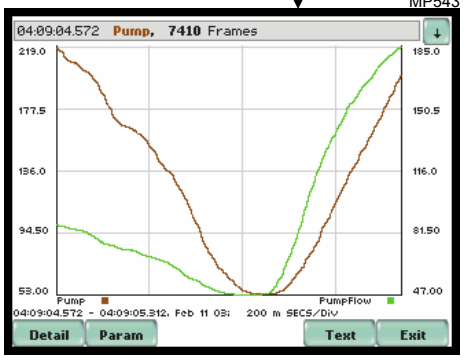
MP540b



MP542



MP543



LEVEL 470
Status

MP570