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so your equipment works exactly as you specify.

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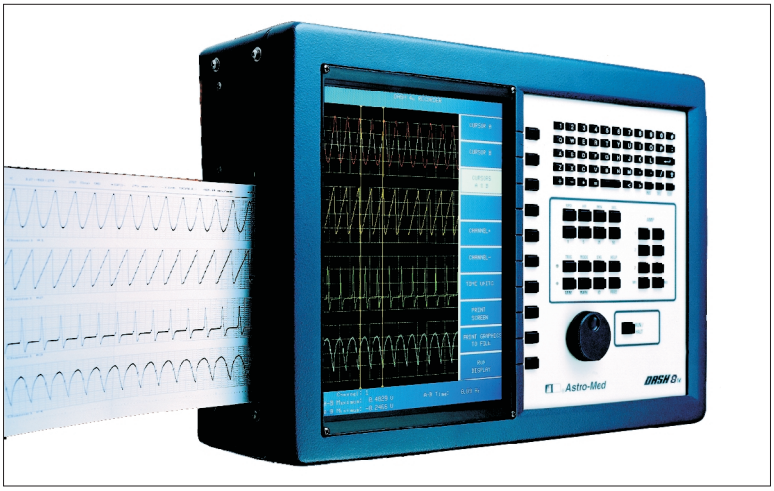
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Find the *AstroNova / Astro-Med Dash 8u* at our website: ***Click HERE***

DASH 8n/8u

Portable 8-Channel Field Recorder
Portable Universal 8-Channel Field Recorder



Operations Manual

Astro-Med®

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Dash 8n/8u
Operations Manual

Part No. 22834-455

05/99
Specifications are subject to change without notice.

Astro-Med, Inc.
600 East Greenwich Avenue
West Warwick RI 02893
1.401.828.4000

Technical Support 1.800.343.4039
mtgroup@astro-med.com

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Table of Contents

Important Information **1**

Copyright 1
Canadian Emissions Requirements 1
FCC Compliance Statement 1
Limited Warranty 2
Year 2000 2

Chapter 1 Before You Get Started **3**

Dash 8n/8u Differences in Functionality 3

Dash 8n/8u Portable 8-Channel Field Recorder Identification 4

Shipping Checklist 5

Before Real-time Recording 6

Physical Overview 7

Dash 8n/8u Features 18
Color LCD Monitor 18
Internal Hard Drive and External Zip Drive 18
Easy-access Front Panel Controls 18
Initial Operation in Last Recording Mode 19
Convenient Side Panel Connections 19
Digital Signal Processing (DSP) 19
High Performance Built-in Signal Conditioning 19
Eight Flexible-format Recording Channels 19
Eight Universal Input Channels - Dash 8u ONLY 20
Chart Calibration in Engineering Units 21

Quick Reference to Menus & Commands 22
[SYS] Hotkey Menus 22
[AMP] Hotkey Menus for the Dash 8n ONLY 25
[AMP] Hotkey Menus for the Dash 8u ONLY 27
[MODE] Hotkey Menus 30
[SPD] Hotkey Menus 32

Detailed Command Instructions 33
[SYS] Hotkey Menu Commands 33
Auto-Chart Setup 33
Customize Chart 34
Change Grid 35
Change Waveforms 36
Change Event Markers 37
Change Time Mark 38

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Default All Charts 39
Copy Charts 40
Edit Labels/Text 41
Setup Data Capture 42
Setup Trigger 43
Setup Waveform 44
Setup Clock Trigger 45
Zip Disk Operations 46
Setup Clock 47
Setup Color 48
Setup TCP/IP 49
Setup Keyboard 50
Setup Utility I/O 51
System Default 53
System Upgrade 54
[AMP] Hotkey Menu Commands 55
Set Attenuator, Dash 8n ONLY 55
Set Attenuator, Dash 8u ONLY 56
Set Range, Dash 8n ONLY 57
Set Range, Dash 8u ONLY 58
Set Offset, Dash 8n ONLY 60
Set Offset, Dash 8u ONLY 61
DC / GND 63
PK-PK / RMS 64
Setup DSP/Filter 65
Setup User Scaling 67
Autobalance, Dash 8u ONLY 69
Setup Math Channel 70
Copy Amplifier 72
Calibrate, Dash 8n ONLY 73
Calibrate, Dash 8u ONLY 74
[MODE] Hotkey Menu Commands 77
Run Chart 77
Run Data Logger 78
Timed Recording 79
Dual Speed Recording 80
Find Record 81
Screen Preview 82
Setup Playback 84
FFT Analysis 86
Edit Label 88
Record Description 89
Delete Records 90
Purge Records and Compact 91
Format Capture Drive 92
Backup/Export Record w/Zip 93
Restore Record w/Zip 94
[SPD] Hotkey Menu Commands 95
Set Chart Speed 95
Data Log Speed 96

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Set Display Speed 97
Motor Source Toggle 98
[HELP] Hotkey Menu Commands 99
Print Information/Status Reports 99

Dash 8n/8u Specifications 100
Chart Recorder 100
Physical 101
Power 101
Zip Drive 101
Front Panel Display 102
Data Capture 102
Data Logger 104
Digital Signal Processing 104
Environmental 106
Waveform Math 106
Event Inputs 107
Miscellaneous 107
Record Review 108
Trigger Acquisition Sources 108
Waveform Inputs, Dash 8n ONLY 108
Voltage Measurements, Dash 8u ONLY 110
Thermocouple Measurements, Dash 8u ONLY 111
DC Bridge, Dash 8u ONLY 112
RTD Module, Dash 8u ONLY 113
HV Module, Dash 8u ONLY 114
VHV Module, Dash 8u ONLY 115
FTV Module, Dash 8u ONLY 116
Fast Fourier Transform (FFT) 117
Analog Input, Dash 8n ONLY 118
Differential Input, Dash 8u ONLY 119
Single-ended Input, Dash 8u ONLY 119

Chapter 2 Set Up for Real-time Operation 121

Real-time Recording, Dash 8n ONLY 121

Real-time Recording, Dash 8u ONLY 123

Specifying System Setups 126
System Setup Functions 126
System Setup - Setup Clock 127
System Setup - Setup Color 127
System Setup - Setup TCP/IP 128
System Setup - Setup Utility I/O 128
System Setup - System Default 129

Specifying Speed 130
Speed Functions 130
Set Speed - Chart Speed 131
Set Speed - Display Speed 131

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Set Speed - Motor Source Toggle 132

Specifying Chart Setups 133
Chart Setup Functions 133
Default Chart 1 Layout 134
Default Chart 2 Layout 135
Default Chart 3 Layout 136
Default Chart 4 Layout 137
Setup up an Auto-Chart 138
Customize Chart Setups 138
Customize Chart - Change Grid 139
Customize Chart - Change Waveforms 140
Customize Chart - Change Event Markers 140
Customize Chart - Change Time Mark 141
Customize Chart - Default All Charts 141
Customize Chart - Copy Charts 142
Specifying Text 142
Editing Text Buffers 143
Printing Channel Identification Numbers 143

Configuring Dash 8u External Input Modules 146
External Input Modules, Dash 8u ONLY 146
Installing External Input Modules, Dash 8u ONLY 147
Resistance Temperature Detector, Dash 8u ONLY 148
High Voltage Module, Dash 8u ONLY 149
Very High Voltage Module, Dash 8u ONLY 150
Frequency to Voltage Module Dash 8u ONLY 151

Amplifier & Channel Settings 152
Specifying Signal Conditioning Settings 152
Input Range and Zero Suppression 152
Universal Input Channels, Dash 8u ONLY 155
Input Types, Dash 8u ONLY 157
Setting Attenuation 158
Setting Range 158
Setting Offset 159
Setting DC or GND 159
Specifying DSP / FILTER Settings 160
Specifying Differentiation 160
Specifying Integration 161
Setting Peak-to-Peak RMS 161
Copying Amplifier Settings 162
Printing Amplifier Settings 162
Autobalance for the Bridge Input Type, Dash 8u ONLY 162

Math Functions 163
Waveform Math Function 163
Addition and Subtraction 164
Multiplication and Division 165
Setting User-defined Engineering Units 166

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Calibrating Channels 168
Calibrating Channels, Dash 8n ONLY 168
Calibrating Channels, Dash 8u ONLY 168
Calibrating the FTV Module 169
Calibrating the VHV Module 170

Chapter 3 Real-time Operation 173

Timed & Dual-Speed Recording 173
Setup Dual Speed Recording 173
Setup a Timed Recording 174

Data Log 175
Data Log 175
Set Data Log Speed 175

Data Capture 176
Data Capture 176
Setting Up and Enabling Triggers 177
Turning on Trigger Sources 179
Setting up Waveform Triggers 179
Setting Trigger Levels on the FTV Module 181
Combining Waveforms in Logical (and/or) Relationships 182
Setting a Clock Trigger 182
Using an External Trigger Source 183
Setting up Data Capture 183
Arm The System 184
Trigger the System 185

Data Review and Playback 186
Data Review and Playback 186
Finding a Record 187
Previewing a Record 187
Preview Settings 188
Setup Playback to Paper 190
Inserting a Bookmark 190
Begin Playback 191
Labeling Records 191
Describing Records 192
Real-time Display 192
System and Event Markers 193

Fast Fourier Transform Utility 194
Fast Fourier Transform (FFT) Utility 194
Specifying FFT Window 194
Fixed End Point FFT Operation 195
Variable End-Point FFT Operation 196
N-Size/Referenced FFT Operation 197
Input Data Averaging 198
Input Data Interpolation to Fit Algorithm 199
FFT Windowing Processes 199

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Performing FFT Transform 201
FFT Analysis Output Definition 202
FFT Output Cursor 203
Axis Labeling 203
Post Zoom Support 204
Y-T Data Plot as an FFT Indicator....204
Hard Copy of FFT Output 205
FFT Analysis Timing....205

Data Record I/O 206
Data Record Input/Output....206
Deleting Records 206
Purging Records and Compacting Drive Space 207
Formatting the Hard Drive....209
Backing Up Records....209
Exporting Records....210
Restoring Records 210

Zip Disk Operations 211
Zip Disk Operations....211
Saving Setups 211
Recalling Setups 212
Printing Files 212
Copying Files....212
Renaming Files....212
Deleting Files....213
Formatting a Zip Disk....213
Drive Orientation....213

Using a PC with your Recorder....214
Host Computer Interface....214
AstroVIEW C 215
AstroSET....221

Chapter 4 Maintenance 223

Contacting Technical Support 223

Loading Z-Fold Thermal Paper 223

Cleaning the Printhead 226

Performing a System Software Upgrade....228

Verifying Calibration Output, Dash 8n ONLY....228

Verifying Calibration of the Interlock Detector....229

Index 231

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See Also Limited Warranty

Canadian Emissions Requirements

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numérique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference; and (2) this device must accept any interference received, including interference that may cause undesired operation.

Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

WARNING CHANGES OR MODIFICATIONS TO THIS UNIT NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

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This equipment has been tested and found to comply with the limits for 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 operations 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 own expense.

Limited Warranty

Astro-Med, Inc. warrants all portions of the Dash 8 and Dash 8u against defects in materials or workmanship for a period of one year from the date of original purchase. If you discover a defect, Astro-Med will, at its option, repair or replace this product at no additional charge except as set forth below. Repair parts and replacement parts will be furnished on an exchange basis and will be either reconditioned or new. All replaced parts become the property of Astro-Med.

This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication; or has been modified without the written permission of Astro-Med, Inc.

To obtain warranty services, call 401-828-4000 for information. Astro-Med, Inc. is not responsible for your product if it is lost or damaged in transit.

Astro-Med, Inc. makes no warranty, either express or implied, with respect to this product's fitness for a particular purpose.

Year 2000

Data Acquisition Systems and application software for all instruments use only Windows 95 dates, which are Year 2000 Compliant. Standalone recorders use a two-digit year for reference only. The date is not used for time sorting or any calculations. Our Quality Assurance Department has verified that there are no anomalies associated with the turnover of the Year 2000.

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Chapter 1
Before You Get Started

Dash 8n/8u Differences in Functionality

Both the Dash 8n and Dash 8u models represent Astro-Med's third generation of compact, portable, 8-channel field recorders. Both allow you to:

- review data in real-time on the color display and/or in chart form
- record data to the hard drive for playback on the display later
- transfer data to the Zip™ drive and use your computer for further analysis or archiving

With its cast-aluminum chassis, compact size, and advanced signal processing, Dash 8n and 8u portable field recorders are ideal for use in demanding field and laboratory applications.

THE DASH 8N AND THE DASH 8U PORTABLE FIELD RECORDER ARE NEARLY IDENTICAL IN ALL RESPECTS, HOWEVER, THERE ARE SOME DIFFERENCES IN FUNCTIONALITY.

BECAUSE OF THE SIMILARITY BETWEEN MODELS, THIS OPERATIONS MANUAL IS PROVIDED FOR BOTH MODELS.

NOTE **TO MINIMIZE CONFUSION, AN ALERT SYMBOL ( ) APPEARS WHEN INFORMATION WITHIN A TOPIC IS SPECIFIC TO ONE MODEL AND DOES NOT APPLY TO THE OTHER – FOR EXAMPLE:**

The Dash 8u field recorder provides eight input channels which can be configured to operate in a variety of ways. This capability is the major difference between the Dash 8n model and the Dash 8u model.

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Dash 8n/8u Portable 8-Channel Field Recorder Identification

Congratulations. Your Astro-Med, Inc. purchase is an investment in the finest state-of-the-art technology. The software provided with your equipment is the most current available.

Record the model number, serial number, and software version installed on your equipment. Any upgrades to resident software should also be noted as they are installed.

IF FOR ANY REASON YOU NEED TO CONTACT ASTRO-MED, INC. REGARDING YOUR PURCHASE, YOU WILL BE ASKED TO REFER TO THIS INFORMATION.

MODEL NUMBER			
SERIAL NUMBER			
ORIGINAL SOFTWARE VERSION			
UPGRADED SOFTWARE VERSION	**DATE INSTALLED**	**/**	**/**
UPGRADED SOFTWARE VERSION	**DATE INSTALLED**	**/**	**/**
UPGRADED SOFTWARE VERSION	**DATE INSTALLED**	**/**	**/**
UPGRADED SOFTWARE VERSION	**DATE INSTALLED**	**/**	**/**

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Shipping Checklist

Ensure the items listed below were received with your shipment.

NOTE **ALERT SYMBOLS (!) IDENTIFY ITEMS SHIPPED WITH ONE MODEL ONLY.**

	ITEM	PART NO.
	6’ 6” AC power cord	21464-001
	Pack of Z-fold paper	41427-000
	Floppy disks which provide AstroVIEW™ C software with installer	12398-625
	Floppy disks which provide AstroSET™ software with installer	12398-889
	Blank Zip™ disk	13713-100
	Dash 8n/8u Operations Manual	22834-455
	Crossed Ethernet cable	25359-005
	Conn dsub 15-pin solder cup	10909-115
	Retaining clip	10909-776
	Carrying case	31765-508
!	Eight terminal block plugs (Dash 8u ONLY)	25460-106
!	Connector cable for calibration (Dash 8n ONLY)	24999-000
!	Calibration module (Dash 8u ONLY)	32604-000

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Before Real-time Recording

PRIOR TO SETTING UP FOR REAL-TIME RECORDING:

1. Unpack your recorder and review the Shipping Checklist to ensure your order is complete.

2. Be familiar with the exterior components and general operation of your unit.

   Front Panel Control Elements
   Front Panel Controls Explained
   Rear Panel Elements Dash 8u ONLY
   Right Side Panel
   Rear Panel Elements Dash 8n ONLY
   Portable Field Recorder Specifications

3. Proceed to Real-time Recording.

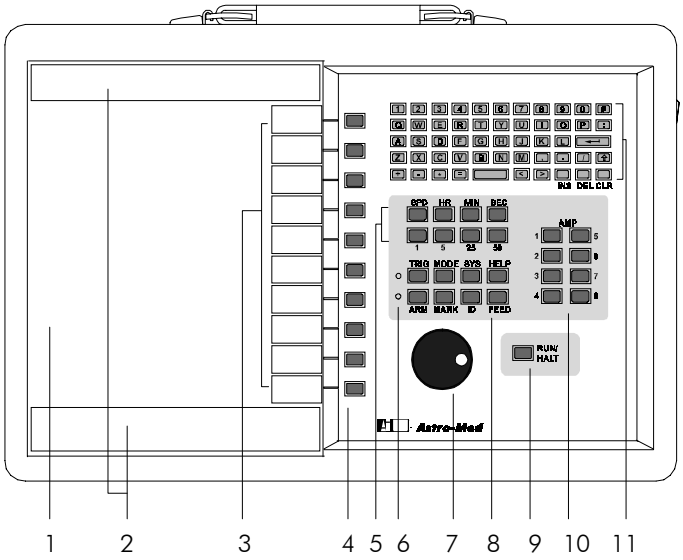
   Real-time Recording, Dash 8n ONLY
   Real-time Recording, Dash 8u ONLY

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Physical Overview

Front Panel Control Elements

All field recorder operations are controlled through the user interface elements found on the front panel. These elements were designed to provide clear and expedient access to menu commands and other unit features.



1 Waveform Display Area
2 Upper and Lower Text Areas
3 Menu Displays
4 Menu Display Keys
5 Chart Speed Keys NOTE
6 TRIG LED / ARM LED
7 Encoder Wheel
8 Operation Hotkeys NOTE
9 RUN/HALT Key
10 Amplifier Selection Hotkeys NOTE
11 Alphanumeric Keypad

Figure 1 - 1 , Dash 8n/8u Front Panel

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Front Panel Controls Explained

waveform display area	displays waveforms and grids in a choice of colors for menu, grid, background, alarms, cursors, event markers, and pen
upper text area	located on the display screen; text related to menu items sometimes displayed here
lower text area	located on the display screen; text and fields related to menu selections displayed here
menu displays	located to the right of the waveform display area; provides quick access to each control's menus and submenus
menu display keys	(menu softkeys); provide fast logical access to menus and submenus on the display
hotkeys	operational hotkeys which cause related menus to appear when pressed and provide instant access to controls and status information
encoder wheel	for making quick modifications to field selections presented in bottom text area
alphanumeric keypad	make text and numeric entries in bottom text area

Once system settings are specified, operation of the recorder is primarily menu-driven using the menu softkeys.

To operate the recorder, press a Hotkey (such as [SYS] or [MODE]), to bring up a menu of related settings. To make selections from the menu, press the softkeys to the right of each menu label.

All changes made during operation are effective immediately, including changes to chart and grid setups.

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Using the Encoder Wheel

The encoder wheel saves considerable time when making menu selections.

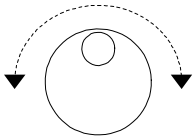


Figure 1 - 2, Encoder Wheel

When a menu item on the display is highlighted, options related to the item are selectable by turning the wheel left or right.

1. If the menu display includes a <<FIELD>> menu label, press the <<FIELD>> softkey to highlight the desired field in the lower text area.

2. If the menu display includes a highlighted label option, use the encoder wheel to make a selection by turning the wheel until the desired option is highlighted. Once it is highlighted, it is selected.

3. In some menus, it may be necessary to press the ACCEPT softkey after highlighting all selections.

NOTE **CHANGES TO THE WAVEFORM DISPLAY AREA WILL BE VISIBLE AS SOON AS THEY ARE SELECTED.**

See Also Using the Keypad to Make Entries

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Using the Keypad to Make Entries

In most cases, when a field in the menu label is highlighted, turning the encoder wheel will reveal all possible options. In some cases, however, you can make text or numeric entries using the keypad. Non-English overlays are available to provide local character support. Contact Astro-Med, Inc. at 401.828.4000 for additional information.

1. With the menu label field highlighted, enter text or numbers using the keypad shown in Figure 3, Front Panel Keypad. The entry will appear in the lower text area.

2. Press Enter to complete your selection.

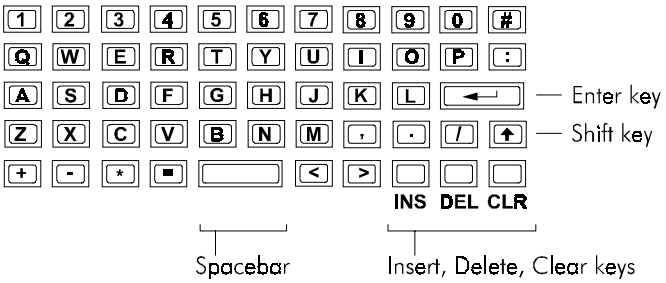


Figure 1 - 3, Front Panel Keypad

The [DEL] key clears the rightmost character entered. The [CLR] key clears the entire entry. The [SHIFT] key is used to capitalize alpha characters.

NOTE **CHANGES TO THE WAVEFORM DISPLAY AREA WILL BE VISIBLE AS SOON AS THEY ARE SELECTED.**

See Also Using the Encoder Wheel

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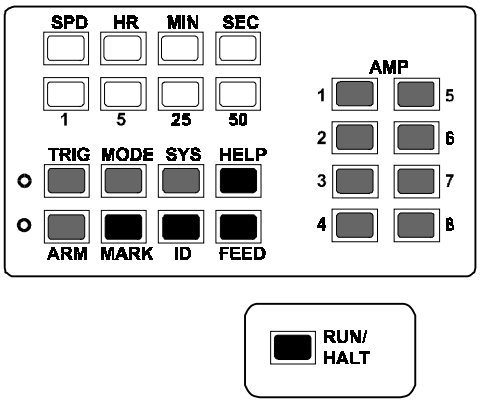
Operational Hotkeys

The Operational Hotkeys on the front panel are used to access the following menus:

SPD .....Set Speed Menu
MODE.....Mode Menu
SYS .....System Setup Menus
AMP.....Amplifier Settings Menu

See Also Pre-set Function Hotkeys
Quick Reference to Menus

Pre-set Function Hotkeys

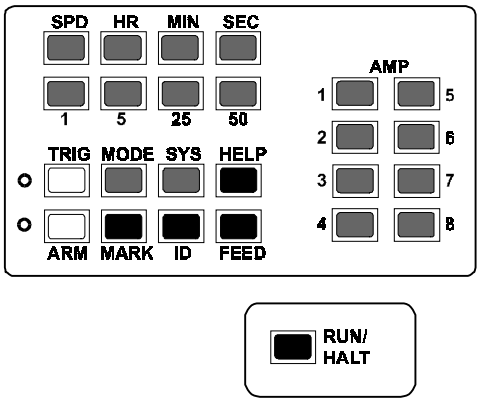


Pre-programmed chart recording speed keys are provided on the front panel for making quick and convenient modifications to chart speed.

Figure 1 - 4, Preset Speed Hotkeys

See Also Speed Functions

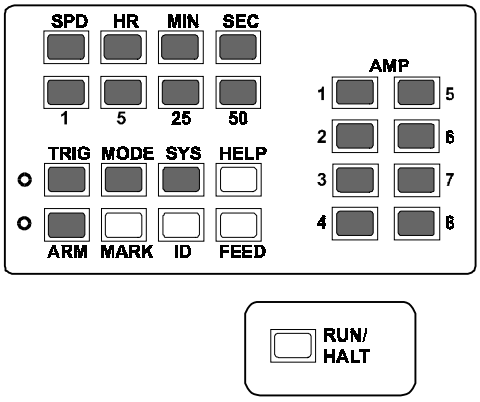
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Pre-programmed arm and trigger function hotkeys are provided for quick, manual arming or triggering of the system.

Figure 1 - 5, Preset Arm/Trigger Hotkeys (highlighted)

See Also
Arm The System
Trigger the System



Other pre-set functions are provided to simplify basic operation and real-time recording.

Figure 1 - 6, Preset Function Hotkeys (highlighted)

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The [HELP] function provides basic operational information and information regarding recorder settings. This information comes in the form of two reports:

1. The System Status report to provide Settings: amplifier, general recorder, and trigger, and Summaries: waveform trigger, data capture and review.

2. The Chart Information report provides a summary of settings for each chart: grid size/position/status, major divisions, minors/majors, pen lift (up/down), event marker position, text buffer (in mm).

If printing is ongoing when the front-panel [RUN/HALT] key is pressed, the chart paper stops. The built-in waveform monitor shows the base display and indicates that recording activity is halted. If printing is halted when the front-panel [RUN/HALT] key is pressed, printing resumes and the chart paper advances. The built-in waveform monitor shows the base display and indicates that real-time recording is ongoing.

Pressing the [MARK] key causes the system mark at the top of the chart to activate in the manner setup by its event style. This system event marker provides a convenient way to place a mark on the chart that can be used to mark the start or end at some particular change in the test.

Pressing the front-panel [ID] key will cause the recorder to print the channel number on each waveform.

Pressing the front-panel [FEED] key causes the chart paper to advance. The chart paper feeds through the recorder when the [FEED] key is pressed and stops when the key is released.

See Also System and Event Markers
Printing Channel Identification Numbers

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Rear Panel Elements, Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

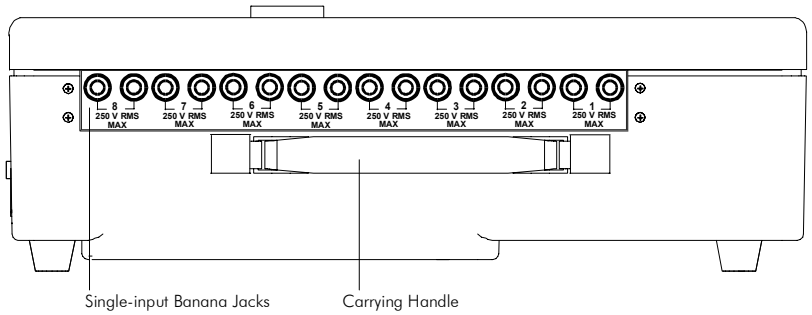


Figure 1 - 7, Rear Panel, Dash 8n ONLY

See Also Calibrating Channels, Dash 8n ONLY

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Rear Panel Elements, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

The Dash 8u terminal block can be configured in place on the rear panel or unseated from its header for easier handling.

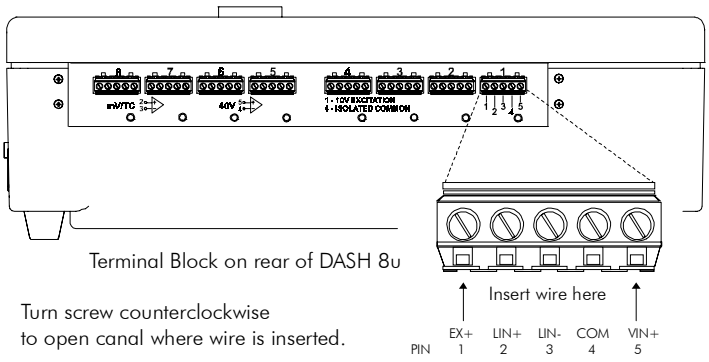
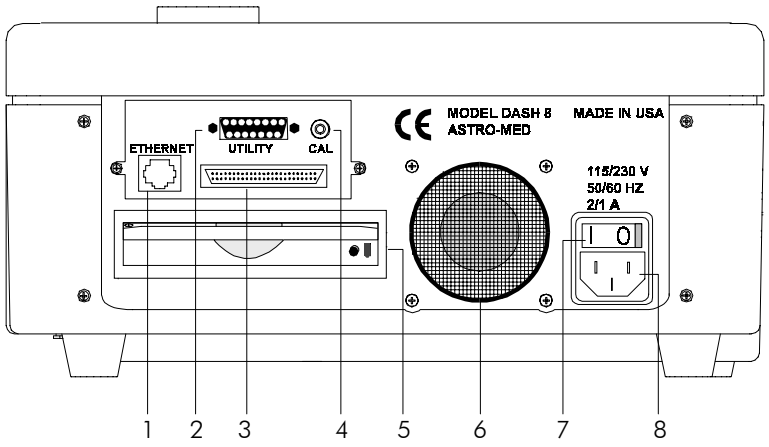


Figure 1 - 8, Rear Panel, Dash 8u ONLY

See Also Universal Input Channels, Dash 8u ONLY

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Right Side Panel



1 Ethernet connector
2 Utility port
3 SCSI port (50-pin D-shell connector)
4 calibration output connector (Dash 8 Model ONLY)
5 100 MB Zip drive
6 Ventilation fan cover
7 Power ON/OFF
8 AC power connector

Figure 1 - 9, Right Side Panel

NOTE **THE DASH 8N AND DASH 8U HAVE DIFFERENT REAR AND RIGHT-SIDE PANELS. THE RIGHT-SIDE PANEL OF THE DASH 8U DOES NOT HAVE A CAL JACK FOR PRECISE REFERENCE VOLTAGE.**

See Also
Calibrating Channels, Dash 8n ONLY
Verifying Calibration Output, Dash 8n ONLY
Analog Input, Dash 8n ONLY

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Utility Connector

Pin 13 can be used for on-demand buffer (ODB) print, remote ARM, remote ID, or remote key lockout.

Pin 9 is used to set up an external trigger source.

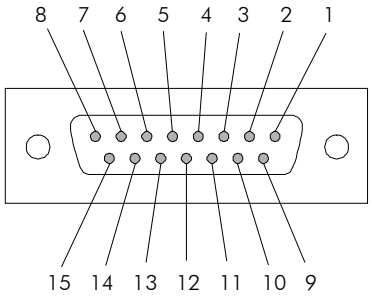


Figure 1 - 10, 15-pin D-shell Connector

Pin 1 .....Event 1
Pin 2 .....Event 2
Pin 3 .....Event 3
Pin 4 .....Event 4
Pin 5 .....Event 5
Pin 6 .....Event 6
Pin 7 .....Event 7
Pin 8 .....Event 8
Pin 9 .....External Trigger
Pin 10 .....External Speed
Pin 11 .....Remote Start/Stop
Pin 12 .....Ground
Pin 13 .....Configurable Input
Pin 14 .....Fused 5V Output
Pin 15 .....External Sameple Rate

See Also Using an External Trigger Source
System Setup - Setup Utility I/O

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Dash 8n/8u Features

MOST FEATURES LISTED APPLY TO BOTH THE DASH 8N AND TO THE DASH 8U MODELS. HOWEVER, SOME FEATURES ARE SPECIFIC TO ONE MODEL ONLY.

THESE ARE NOTED WITH AN ALERT SYMBOL ().

Color LCD Monitor

- monitor data in real-time on the 10.4" color monitor
- color code each waveform on the display for quick analysis
- view real-time waveform activity from a distance
- halt the chart paper and view data on the monitor only

See Also Real-time Display
System Setup - Setup Color

Internal Hard Drive and External Zip Drive

- record data to the 2 GB internal hard drive for playback and review later
- conveniently transfer data to the built-in removable Zip drive and use your computer for further analysis or archiving

See Also Data Review and Playback
Zip Disk Operations

Easy-access Front Panel Controls

- every significant recorder function is conveniently accessed through simple, straightforward controls on the front panel
- controls include hotkeys [SPD, MODE, SYS, HELP, AMP] for quick access to related menu selections

See Also Front Panel Control Elements

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Initial Operation in Last Recording Mode

When the recorder is turned ON, it automatically records in the last mode in which it was operating. If you change operating modes infrequently, this feature can save you considerable set-up time.

Convenient Side Panel Connections

- Utility Connector standard
- Ethernet™ connector (SCSI port on SCSI model only)
- Output for 2.5 V/10 V precision voltage reference to ensure precise chart calibration

See Also Right Side Panel
Utility Connector

Digital Signal Processing (DSP)

- each channel is supported by a dedicated digital signal processing circuit (DSP) and an analog-to-digital converter (ADC)
- each DSP processes ADC output for printing or data-capture memory
- allows low-pass filtering in 1 Hz increments

See Also Digital Signal Processing

High Performance Built-in Signal Conditioning

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

- standard built-in signal conditioners provide 2 kHz frequency response, zero suppression, and isolated inputs for 250 VDC or RMS

See Also Specifying Signal Conditioning Settings

Eight Flexible-format Recording Channels

- eight channels up to 200 mm wide can be placed anywhere on the chart in any combination of single-channel or overlapped formats

- grid sizes from 1 mm to 200 mm with complete control of minor division spacing

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- annotation includes:
  - system log printed automatically (time, date, speed)
  - one line of text (128 ASCII characters) for each grid
  - one 128-character on-demand text buffer
  - full-scale values of grid edges printed in either voltage or specified engineering units

- channel ID labels each channel with channel number; top and bottom grid values can be annotated

- time marking: tri-state (x1, x10, x100) mark on either chart edge; grid time lines can be synched to time mark; selectable time mark reference (0.02 to 1 second or external)

See Also Dash 8n/8u Differences in Functionality
Eight Universal Input Channels - Dash 8u Model ONLY
Printing Channel Identification Numbers

Eight Universal Input Channels - Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

The Dash 8u input board provides eight universal input channels which can each be configured to any of the following input types:

- Single-ended voltage
- Differential voltage
- Bridge
- Thermocouple

NOTE **THE DASH 8N AND DASH 8U HAVE DIFFERENT REAR AND RIGHT-SIDE PANELS. THE REAR PANEL OF THE DASH 8U INCLUDES EIGHT UNIVERSAL INPUT CHANNELS. THE RIGHT-SIDE PANEL OF THE DASH 8U DOES NOT HAVE A CAL JACK.**

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All inputs and excitation are isolated from the chassis and from other channels.

See Also Input Types, Dash 8u ONLY
External Input Modules, Dash 8u ONLY
Dash 8u Universal Input Channels

Chart Calibration in Engineering Units

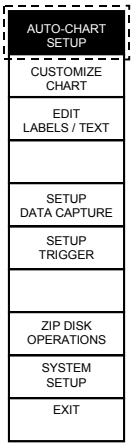
- print scale values directly in °C, °F, PSI, or any engineering units appropriate to your application
- all chart annotations and menu selections appear in the defined engineering units

See Also Setting User-defined Engineering Units

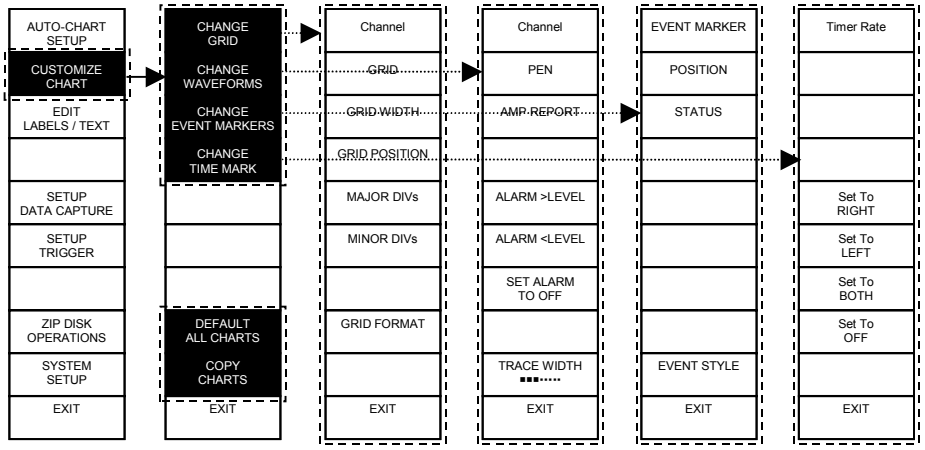
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Quick Reference to Menus & Commands

[SYS] Hotkey Menus

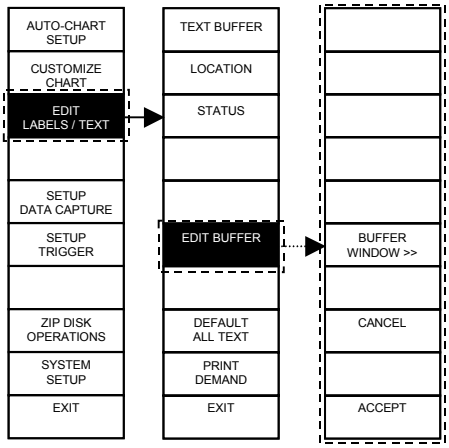


Auto-Chart Setup

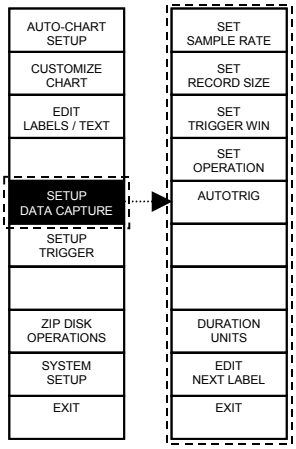


Custom Chart Setups | **Change Grid** | **Change Waveforms** | **Change Event Markers** | **Change Time Mark**

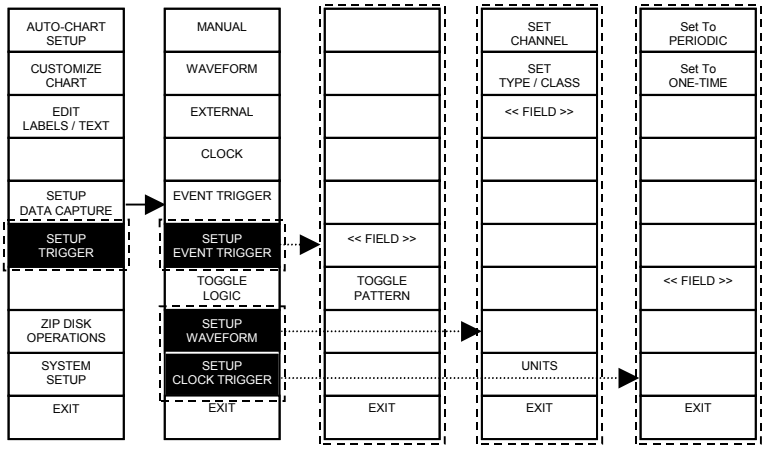
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Edit Labels / Text

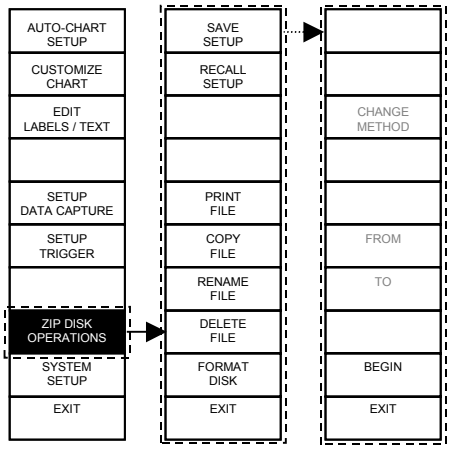


Setup Data Capture

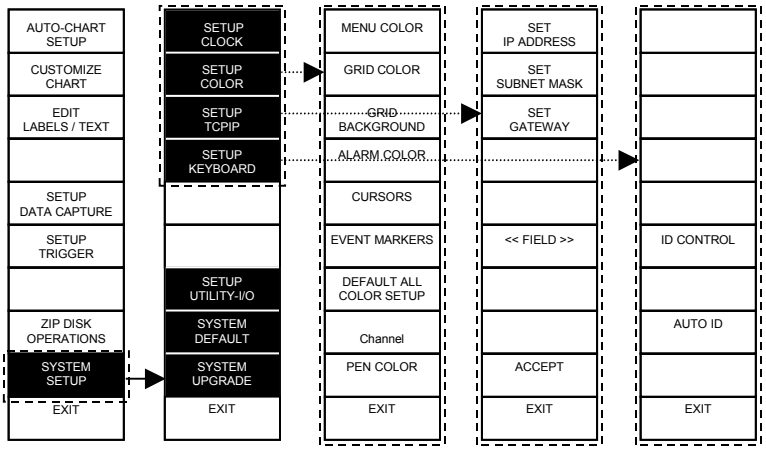


Triggering

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Zip Disk Operations

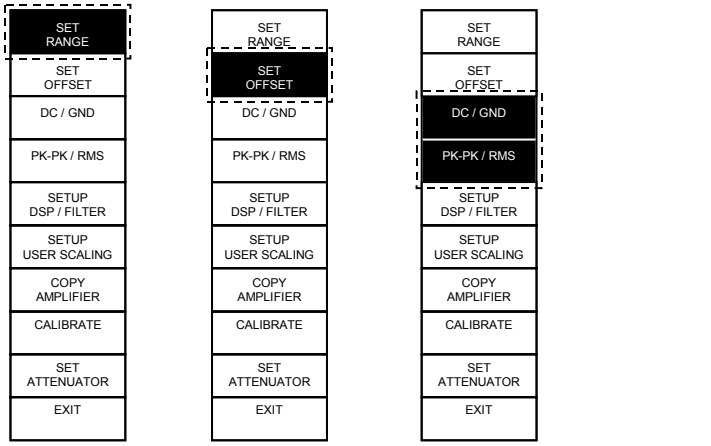


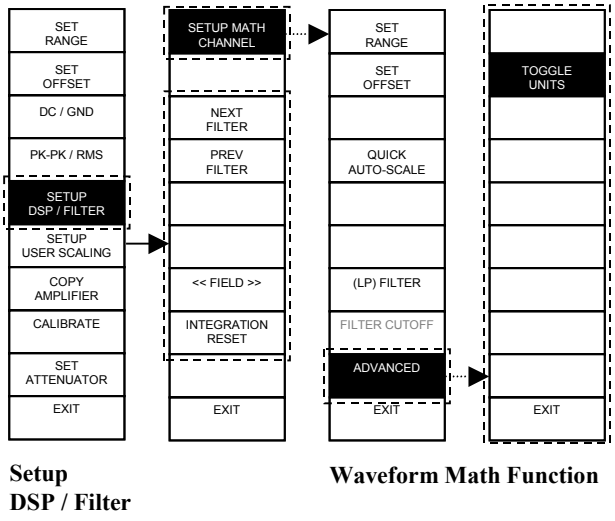
System Setups **Setup Color** **Setup TCPIP** **Setup Keyboard**

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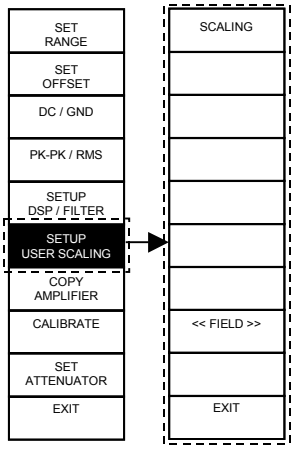
[AMP] Hotkey Menus for the Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

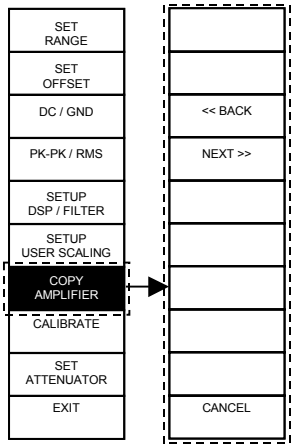




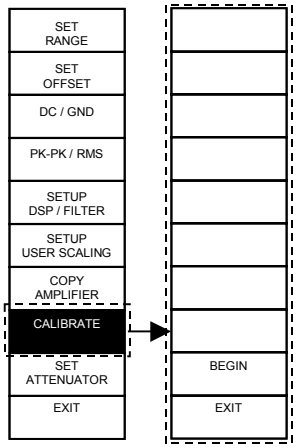
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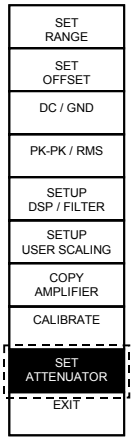
Setup User Scaling



Copy Amplifier



Calibrate

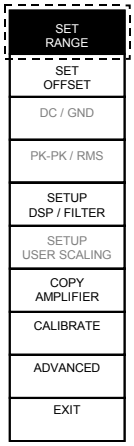


Set Attenuator

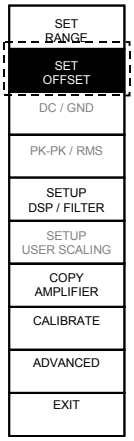
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[AMP] Hotkey Menus for the Dash 8u ONLY

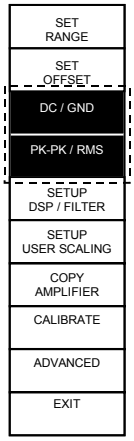
THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY



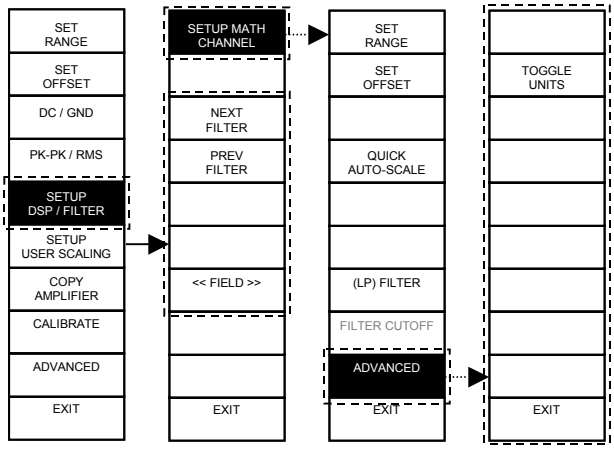
Set Range



Set Offset



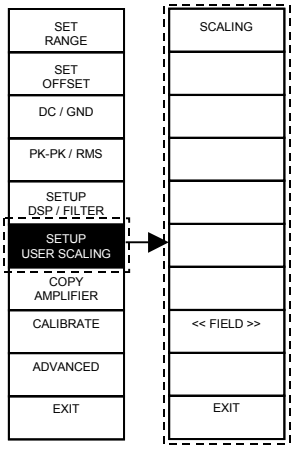
DC / GND & PK-PK / RMS



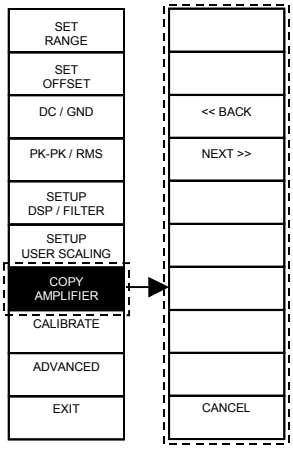
Setup DSP / Filter

Waveform Math Function

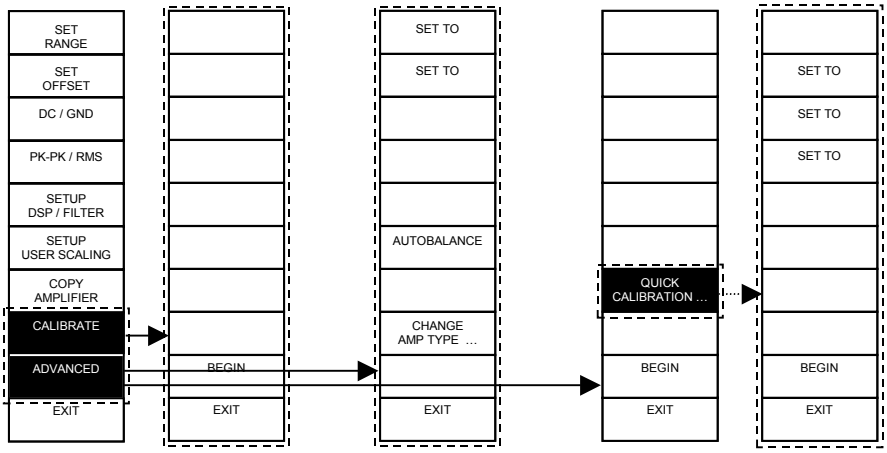
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Setup User Scaling



Copy Amplifier

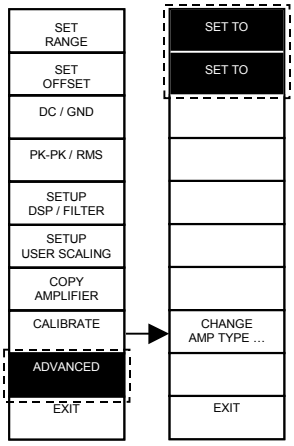


Calibrate Individual Channels

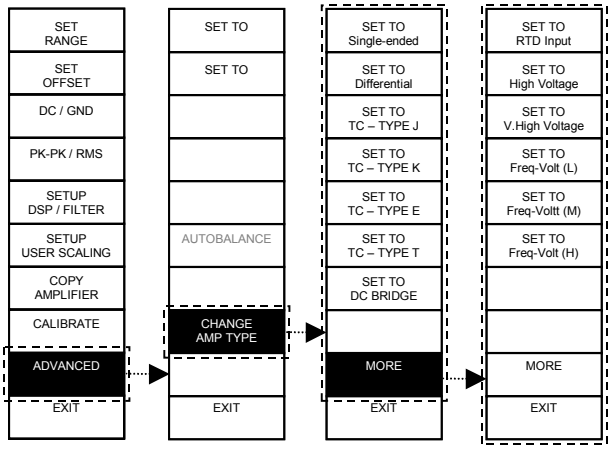
Calibrate Bridge Input

Calibrate Thermocouple Input

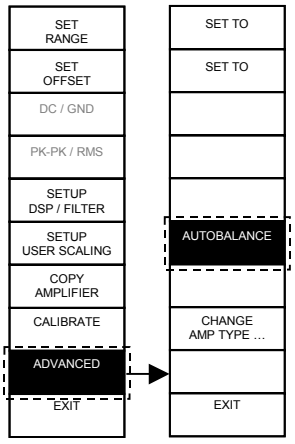
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Set Attenuator



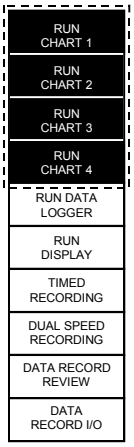
Change Amp Type



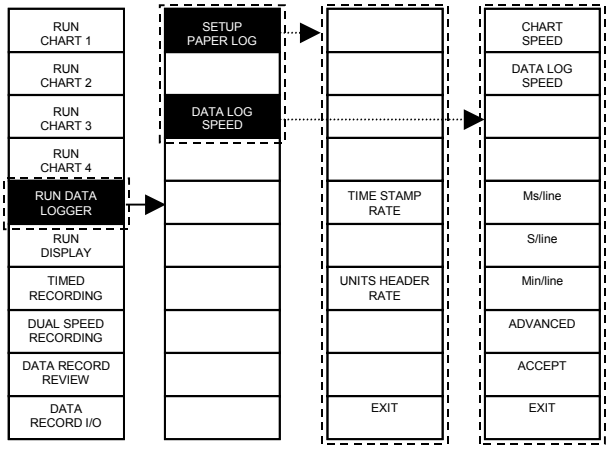
Set Autobalance

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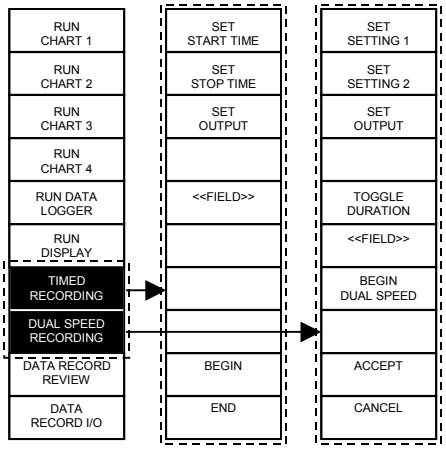
[MODE] Hotkey Menus



Run Chart

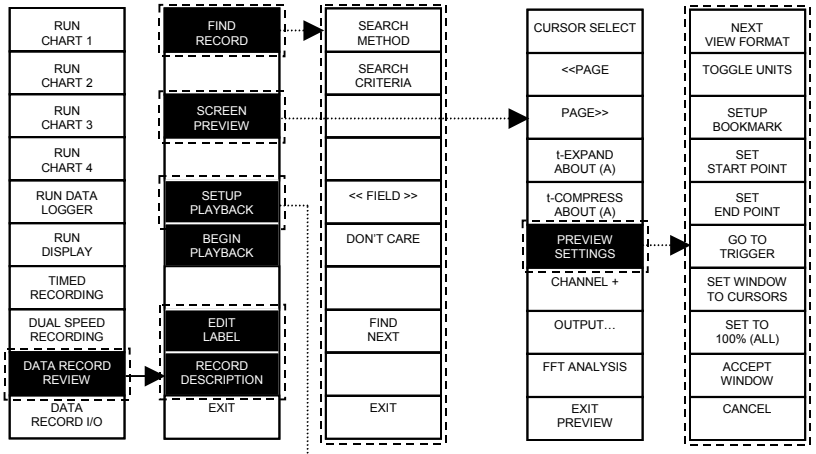


Data Logger



Advanced Real-time Recording

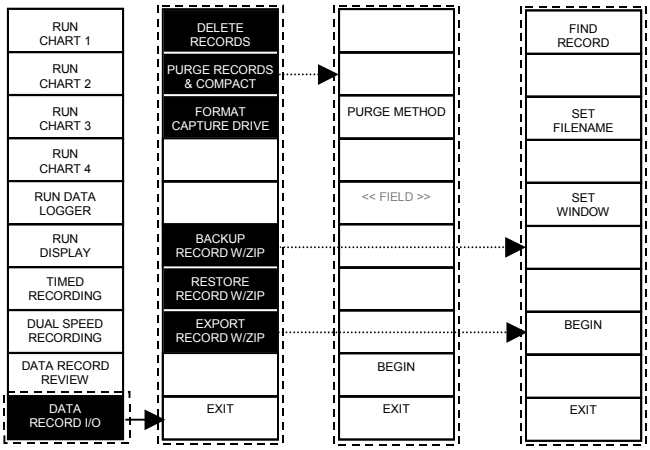
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Data Record Review **Find Record** **Screen Preview**

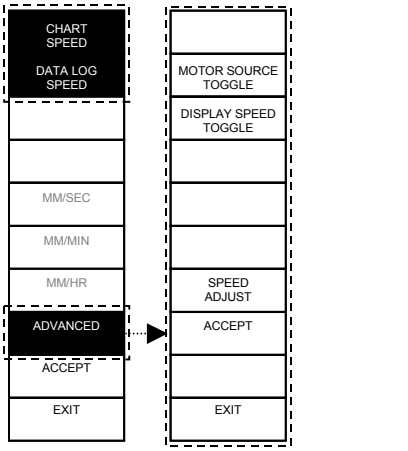
Setup Playback

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Data Record I/O **Purge Records & Compact** **Backup or Export Record w/Zip**

[SPD] Hotkey Menus



Speed Settings **Motor Clock Source & Display Speed**

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Detailed Command Instructions

[SYS] Hotkey Menu Commands

Auto-Chart Setup

[SYS]

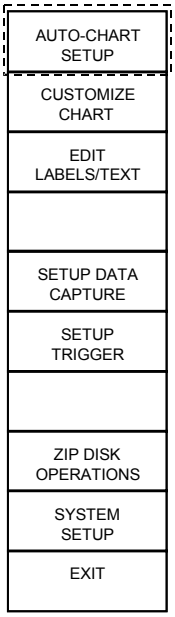


Figure 1 - 11, Auto Chart Setup Menu

TO MODIFY A DEFAULT CHART AND SAVE IT AS AN AUTO-CHART:

1. First, return the chart formats to their factory default settings by pressing the [SYS] hotkey, and the CUSTOMIZE CHART, DEFAULT ALL CHARTS softkeys. A "Verify…are you sure?" message will be displayed. To return all charts to the default format, press the YES softkey.

2. Modify a chart by pressing [SYS], AUTOCHART SETUP, and using the <<BACK and NEXT>> softkeys to access desired menu selections within the lower text area.

3. Use the encoder wheel to select options within each menu. Options are:

Channel format	overlap or individual
Number of channels	1-8
Interchannel info	w/channel text or none
Save to chart softkey	1-4

4. Press NEXT>> after the last selection to save this format to one of the four RUN CHART softkeys.

See Also Chart Setup Functions
Setup up an Auto-chart

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Customize Chart

[SYS]

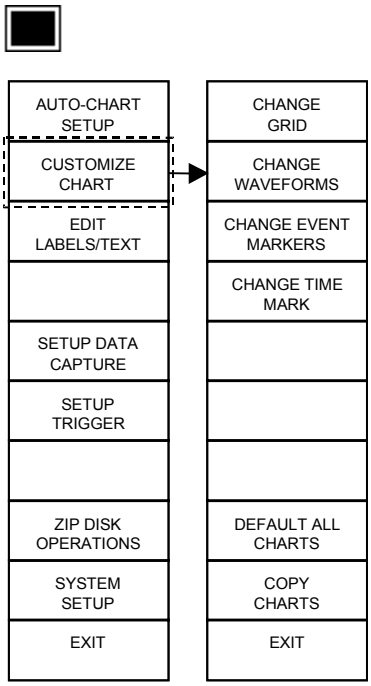


Figure 1 - 12, Customize Chart Menu

TO CUSTOMIZE CHART:

1. First, run the chart you wish to modify by pressing [MODE], and selecting one of the RUN CHART softkeys (CHART 1-4).

2. To customize your selection, press [SYS], then select the CUSTOMIZE CHART softkey to access advanced chart setup options.

See Also
- CHANGE GRID
- CHANGE TIME MARK
- CHANGE WAVEFORMS
- CHANGE EVENT MARKERS
- AUTO-CHART SETUP
- DEFAULT ALL CHARTS
- ZIP DISK OPERATIONS
- Chart Setup Functions

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Change Grid

[SYS]

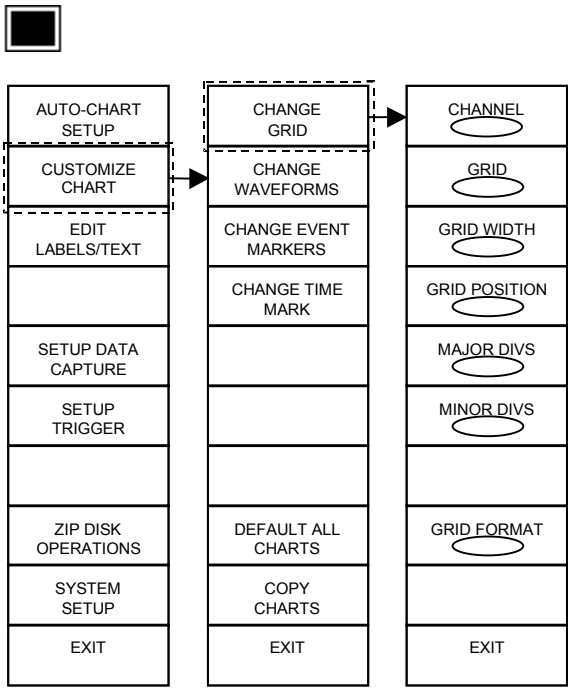


Figure 1 - 13, Customize Chart Menu

TO MODIFY GRID DISPLAY PARAMETERS FROM THE CUSTOMIZE CHART MENU:

1. First, run the chart you wish to modify by pressing [MODE], and selecting one of the RUN CHART softkeys (CHART 1-4).

2. Press the [SYS] hotkey, then select the CUSTOMIZE CHART, CHANGE GRID softkeys and specify: on/off, grid width, position, format, major/minor divisions.

3. Use the alphanumeric keypad to enter values for each field, then press Enter; or, rotate the encoder wheel right to increase value and shift waveform toward the top of the chart, left to decrease value and shift waveform toward bottom of chart.

See Also Customize Chart - Change Grid
Chart Setup Functions

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Change Waveforms

[SYS]



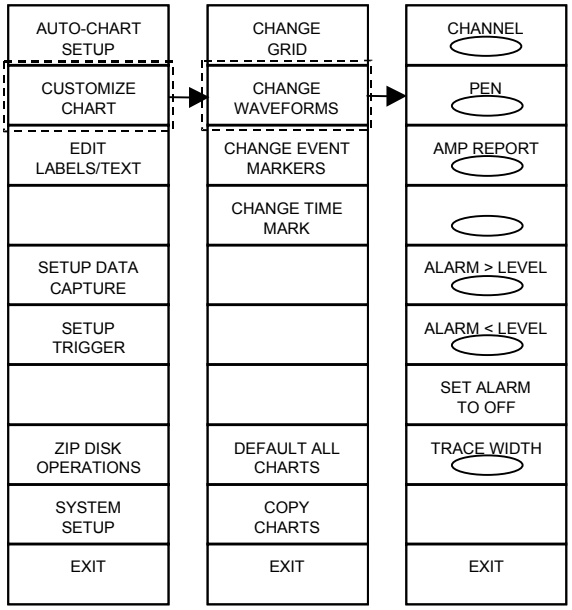


Figure 1 - 14, Customize Chart Menu

TO MODIFY WAVEFORM PARAMETERS FROM THE CUSTOMIZE CHART MENU:

1. Run the chart you wish to modify by pressing [MODE], and selecting one of the RUN CHART softkeys (1-4).
2. Press the [SYS] hotkey, then select the CUSTOMIZE CHART, CHANGE WAVEFORMS and specify channel, pen, amp report, alarms, and trace thickness.
3. Rotate the encoder wheel to select CHANNEL, change UPPER AND LOWER ALARM LEVELS and to adjust TRACE THICKNESS.
4. Toggle the softkeys for: PEN, AMP REPORT, AND SET ALARM TO OFF to change the setting for each.

TO PRINT AMPLIFIER SETTINGS ON THE CHART:

1. Press the [SYS] hotkey, then select the CUSTOMIZE CHART, CHANGE WAVEFORMS, and toggle the AMP REPORT softkey ON.

See Also Customize Chart - Change Waveforms
Printing Amplifier Settings
Chart Setup Functions

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Change Event Markers

[SYS]

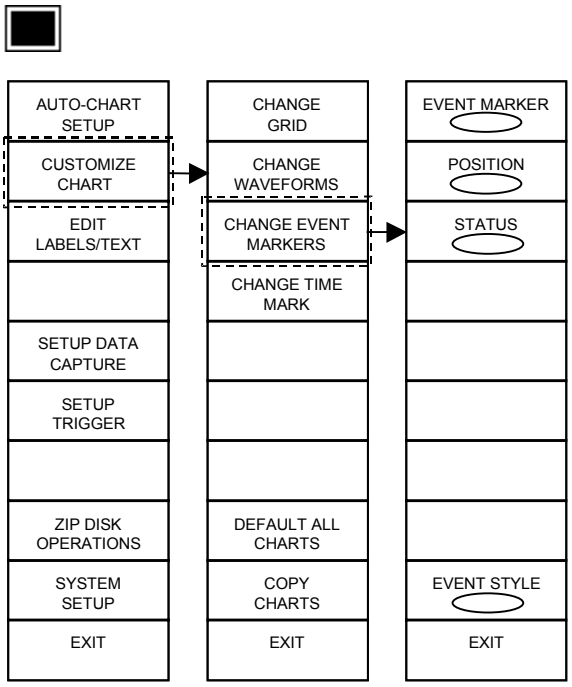


Figure 1 - 15, Customize Chart Menu

TO TURN PRINTING OF EVENT MARKERS ON/OFF, OR TO SELECT THE PRINT POSITION (LOCATION) OF THE EVENT MARKER, OR TO SELECT A GLOBAL STYLE FOR ALL EVENT MARKERS:

1. Press the [SYS] hotkey, then select the CUSTOMIZE CHART, CHANGE EVENT MARKERS softkeys to access advanced menu options.
2. Use the encoder wheel to select the EVENT MARKER to be changed (1-8), and the POSITION of the marker on the chart (from 2 mm - near the bottom, to 210 mm - near the top).
3. Turn STATUS on to print event markers on the chart.
4. Use the encoder wheel to select EVENT STYLE from: standard, tick mark, block/line, block/off.

See Also Customize Chart - Change Event Markers
Chart Setup Functions

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Change Time Mark

[SYS]

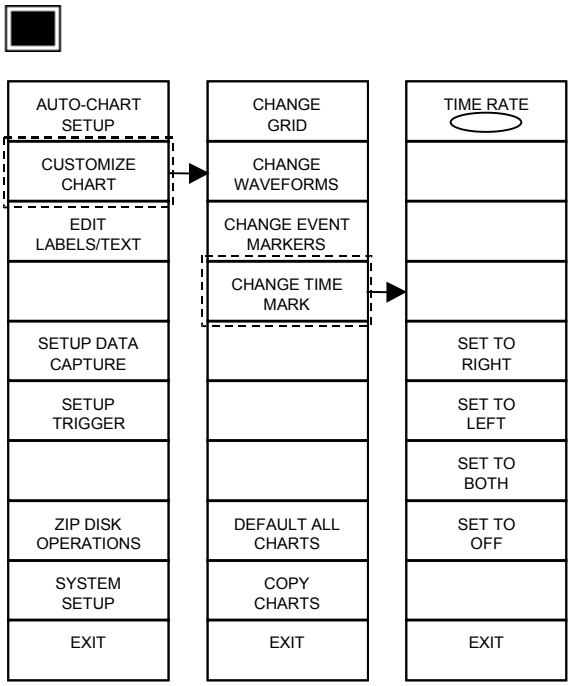


Figure 1 - 16, Customize Chart Menu

TO SELECT THE TIMER RATE FOR TRI-LEVEL TIMING MARKS:

1. Press the [SYS] hotkey, then select the CUSTOMIZE CHART, CHANGE TIME MARK, and TIMER RATE softkeys.

2. Use the encoder wheel to select a timer rate from 0.2 seconds to 1.0 seconds in 0.2 increments.

TO TURN PRINTING OF TIMER MARK ON AND OFF, AND TO SELECT WHETHER THE TIMING MARK WILL BE PRINTED ON THE CHART'S LEFT, RIGHT, OR BOTH EDGES:

1. Press the [SYS] hotkey, then select the CUSTOMIZE CHART, CHANGE TIME MARK.

2. Select SET TO RIGHT, SET TO LEFT, SET TO BOTH, or SET TO OFF to modify printing of the timing mark on the chart.

See Also Customize Chart Change Time Mark
Chart Setup Functions

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Default All Charts

[SYS]

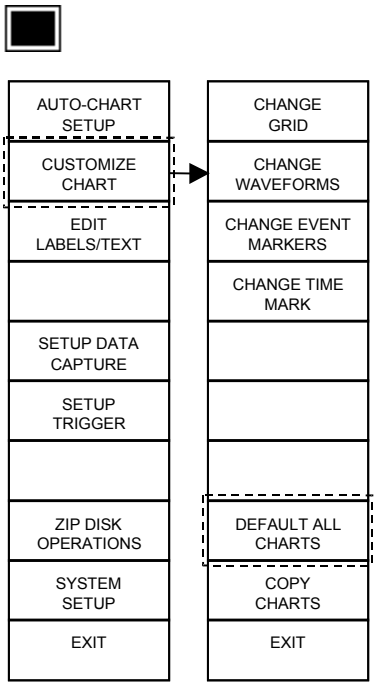


Figure 1 - 17, Customize Chart Menu, Default All Charts

TO RETURN ALL CHARTS TO THE FOUR FACTORY-DEFAULT LAYOUT FORMATS:

1. Press [SYS].
2. Select the CUSTOMIZE CHART, DEFAULT ALL CHARTS softkeys to return the chart formats to their factory default settings.

TO USE THE LAYOUT SELECTED:

1. Press [MODE], then select one of the RUN CHART softkeys (CHART 1-4).

See Also
- Chart Setup Functions
- Default Chart 1 Layout
- Default Chart 2 Layout
- Default Chart 3 Layout
- Default Chart 4 Layout

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Copy Charts

[SYS]

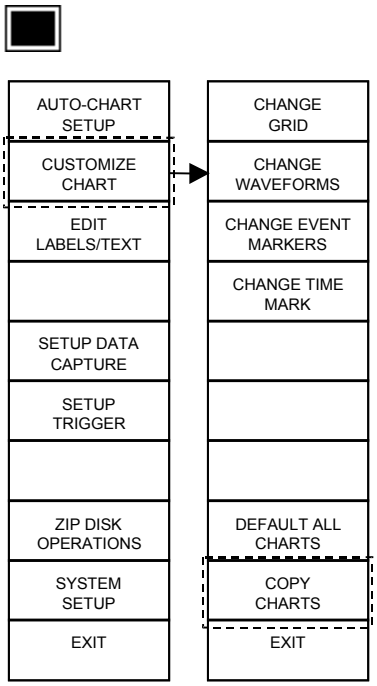


Figure 1 - 18, Customize Chart Menu, Copy Charts

TO COPY A CHART FORMAT:

1. Select the [SYS] hotkey, then press CUSTOMIZE CHART, COPY CHARTS.
2. You will be prompted to select a source chart (from which to copy).
3. Use the encoder wheel to select a chart to copy, then press the ACCEPT softkey.
4. Press the <<FIELD>> softkey to access the copy "to Chart:" field (chart you wish to copy overwrite). Use the encoder wheel to select a chart to overwrite.
5. Press the ACCEPT softkey.
6. To run the new chart format, press the [MODE] hotkey, then the RUN CHART softkey (1-4) for the chart you have overwritten.

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Edit Labels/Text

[SYS]

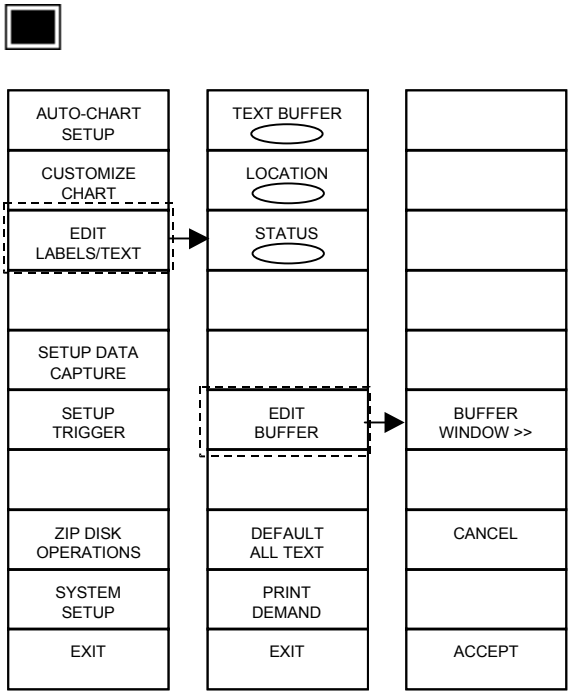


Figure 1 - 19, Edit Labels/Text Menu

NOTE **THE TEXT BUFFER CAN BE POSITIONED AND ENABLED THROUGH OTHER MENUS.**

See Also
- Utility Connector
- Editing Text Buffers
- Customize Chart - Change Grid

TO EDIT LABELS/TEXT:

1. Press the [SYS] hotkey, then select the EDIT LABELS/TEXT softkey.
2. Press the STATUS softkey to toggle between ON and OFF.

TO SELECT A BUFFER TO EDIT:

1. Select TEXT BUFFER . Use the encoder wheel to select a text buffer.
2. Select EDIT BUFFER, and use the BUFFER WINDOW >> softkey to edit fields.

TO SELECT A TEXT POSITION:

1. Press LOCATION and use the encoder wheel to select.

TO PRINT THE TEXT BUFFER:

1. Press PRINT DEMAND. Printing of the on-demand text buffer can also be activated through the UTILITY port.

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Setup Data Capture

[SYS]

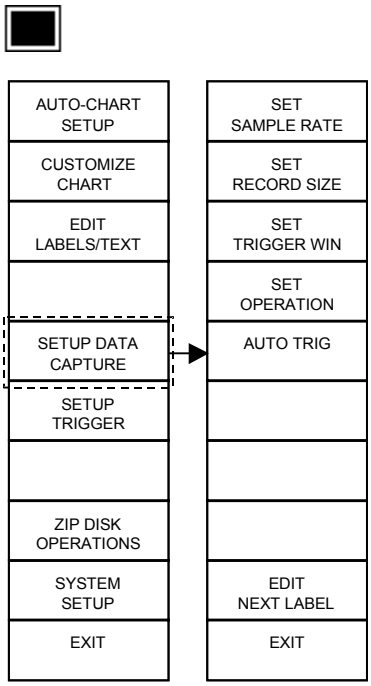


Figure 1 - 20, Setup Data Capture Menu

TO SETUP DATA CAPTURE:

1. Set up the trigger conditions desired and arm the system to respond to triggers.
2. Press [SYS], then select the SETUP DATA CAPTURE softkey. Press a SET… softkey and use the encoder wheel to select from setting options in the lower text area.
3. Press SET SAMPLE RATE to select from available options in the lower text area.
4. Press SET RECORD SIZE to specify the size of the next data capture record.
5. Press SET TRIGGER WIN, to define the trigger/window relationship for all records. Select the percentage desired.
6. Press SET OPERATION (automating capture) to select from methods of data capture and playback.
7. Press AUTOTRIG and toggle to on/off.
8. To create a text label for the next record, press EDIT NEXT LABEL and type the label text using the keypad. Press ACCEPT to complete.
9. Press DURATION UNITS and use the encoder wheel to specify duration of the data capture.

See Also Setting up Data Capture
Data Capture

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Setup Trigger

[SYS]

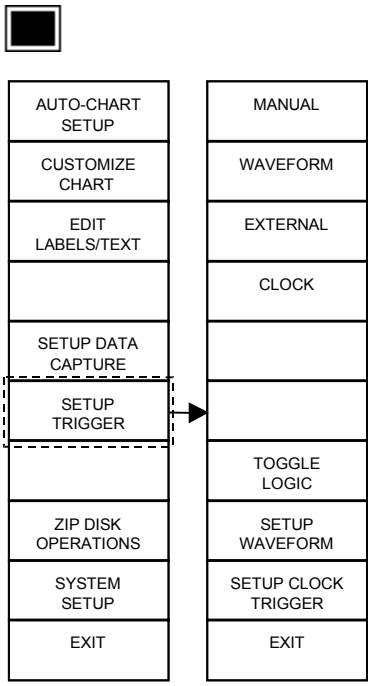


Figure 1 - 21, Setup Trigger Menu, Toggle Logic

TO GROUP WAVEFORMS AS TRIGGER SOURCES:

1. Press the [SYS] hotkey, then select the SETUP TRIGGER and TOGGLE LOGIC softkeys.

2. Use the encoder wheel to make a selection in the bottom text area and create AND or OR triggering combinations. This convenient design feature means that there is no need to make keyboard entries when making selections in the TOGGLE LOGIC command.

See Also Setting Up and Enabling Triggers

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Setup Waveform

[SYS]

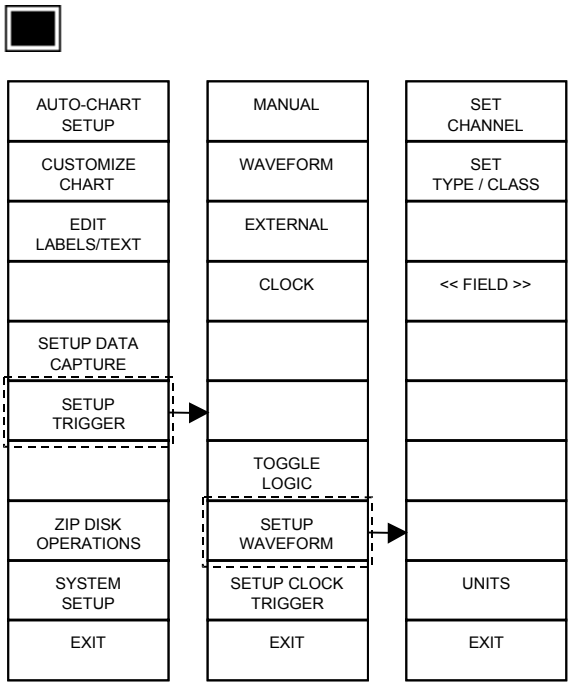


Figure 1 - 22, Setup Trigger Menu, Setup Waveform

TO DEFINE THE SIGNAL CONDITIONS FOR EACH CHANNEL TO BE USED AS A TRIGGER SOURCE:

1. Press the [SYS] hotkey, then select the SETUP TRIGGER softkey.
2. Press SETUP WAVEFORM to display parameters.
3. Press SET CHANNEL and use the encoder wheel to select a channel from 1-8 for which you will define signal parameters.
4. Press SET TYPE/CLASS and define the type of signal activity (slope, level, window, or slew) and set the levels at which that activity must occur in order to generate a trigger.
5. Press the <<FIELD>> softkey to move among active fields.
6. Press the UNITS softkey and use the encoder wheel to select percentage or engineering units.

See Also Setting up Waveform Triggers

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Setup Clock Trigger

[SYS]

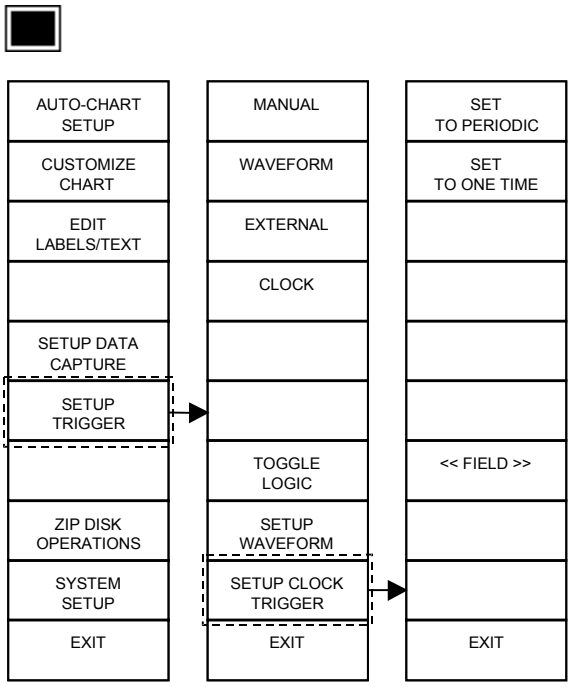


Figure 1 - 23, Setup Clock Trigger

TO ESTABLISH A TRIGGER TO BE ACTIVATED AT A SET TIME OR AT A SPECIFIC DATE AND TIME:

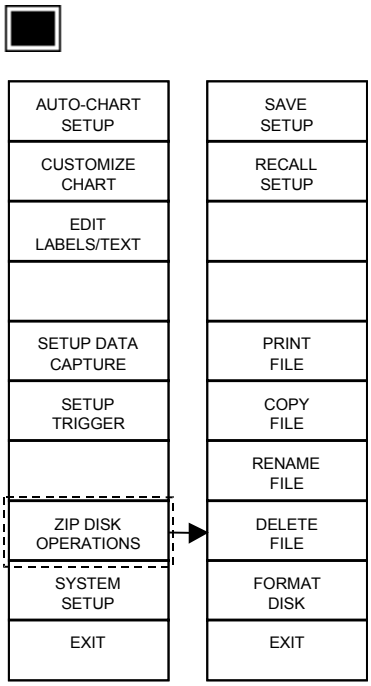
1. Press the [SYS] hotkey, then press the SETUP TRIGGER and SETUP CLOCK TRIG softkeys.
2. Use the <<FIELD>> softkey to highlight increments to be defined.
3. Press the SET TO PERIODIC softkey to input a time during the 24-hour period for trigger activation (XX.XX.XX – hour.minute.second – for example 16:23:32).
4. Press the SET TO ONE-TIME softkey to input a specific date and time for trigger activation (XX.xxx.XX – day.month.year – for example 01.JAN.99).

See Also Setting a Clock Trigger

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Zip Disk Operations

[SYS]



TO SAVE SETUPS SUCH AS AUTO CHARTS OR CUSTOMIZED CHARTS TO A FILE ON THE ZIP DISK, OR TO RECALL PREVIOUSLY-SAVED SETTINGS:

1. Insert a Zip disk into the drive.
2. Press [SYS], then select the ZIP DISK OPERATIONS, SAVE SETUP (to save a new setup), or RECALL SETUP (to recall settings from disk).
3. Use the keypad to name the file using the short, DOS filename format (i.e. xxxxxxxx.xxx).

TO PRINT AN ASCII TEXT FILE TO PAPER:

1. Press the [SYS] hotkey, then select the ZIP DISK OPERATIONS and PRINT FILE softkeys.
2. Use the encoder wheel or keypad to select a file to print.

Figure 1 - 24, Zip Disk Operations Menu

NOTE **CHART FORMATS YOU HAVE CREATED IN AUTO-CHART SETUP OR CUSTOMIZE CHART ARE STORED IN RUN CHART (1-4) UNTIL YOU REPLACE THEM WITH A NEW FORMAT.**

NOTE **WHEN THE RECALL SETUP SOFTKEY IS PRESSED, PRESENT RECORDER SETTINGS ARE IMMEDIATELY OVERRIDDEN AND REPLACED WITH STORED SETTINGS.**

See Also Zip Disk Operations

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Setup Clock

[SYS]



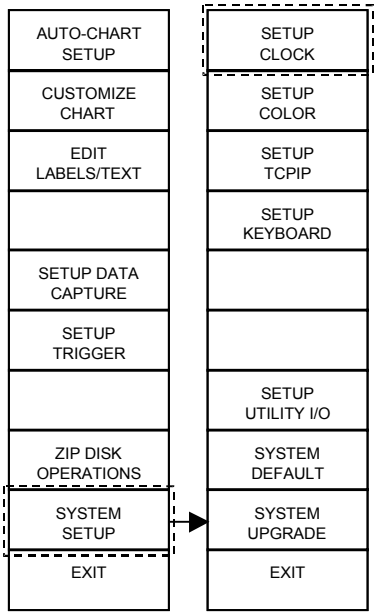


Figure 1 - 25, System Setup Menu, Setup Clock

TO SET THE SYSTEM DATE AND TIME:

1. Press the [SYS] hotkey to access the System Menu.
2. Press the SETUP CLOCK softkey.
3. Use the <<FIELD>> softkey and the encoder wheel to make changes.

See Also System Setup Functions
System Setup - Setup Clock

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Setup Color

[SYS]

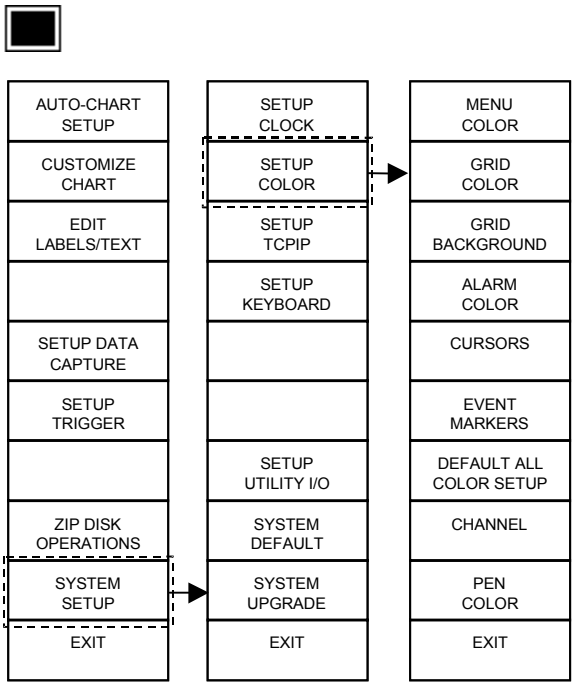


Figure 1 - 26, System Setup Menu, Setup Color

TO MAKE CHANGES TO THE DISPLAY COLORS:

1. Press the [SYS] hotkey, then the SYSTEM SETUP and SETUP COLOR softkeys.
2. Select from the MENU COLOR, GRID COLOR, GRID BACKGROUND, ALARM COLOR, CURSORS, EVENT MARKERS, CHANNEL, and PEN COLOR softkeys. Use the encoder wheel to modify the color of display elements.

TO RESTORE ALL COLORS TO THE FACTORY DEFAULTS:

1. Press the DEFAULT ALL COLOR SETUP softkey.

See Also System Setup Functions
System Setup - Setup Color

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Setup TCP/IP

[SYS]

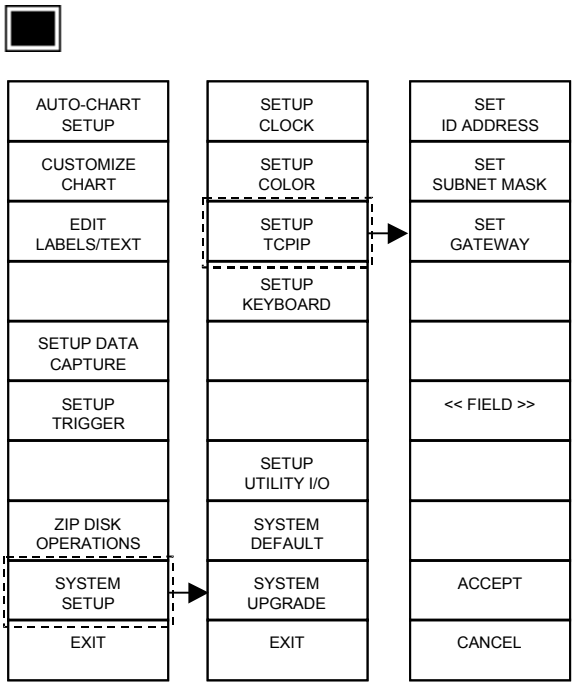


Figure 1 - 27, System Setup Menu, Setup TCP/IP

TO SETUP THE RECORDER FOR COMMUNICATION WITH YOUR COMPUTER SYSTEM:

1. Press the [SYS] hotkey and select the SYSTEM SETUP and SETUP TCPIP softkeys.
2. Select from the SET IP ADDRESS, SET SUBNET MASK, SET GATEWAY softkeys to modify parameters.
3. Press the <<FIELD>> softkey to highlight each field in the lower text area. To make a setup selection, use encoder wheel.
4. Press ACCEPT to apply changes.

See Also Host Computer Interface
Setup TCP/IP

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Setup Keyboard

[SYS]

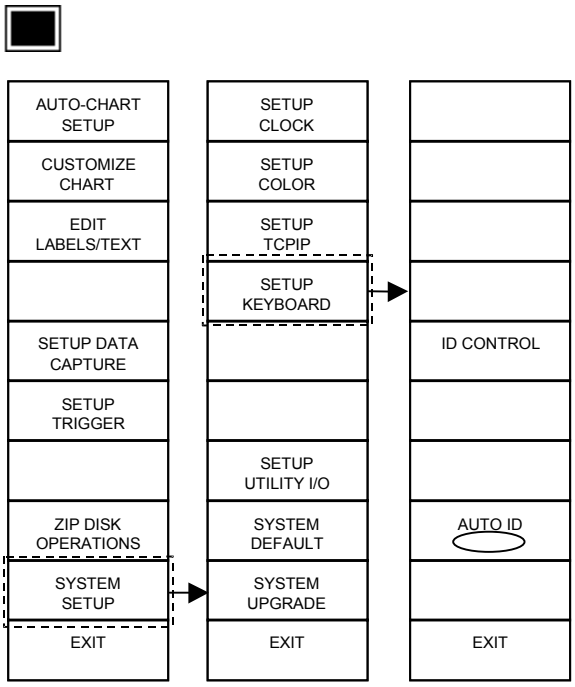


Figure 1 - 28, System Setup Menu, Setup Keyboard

TO ENABLE/DISABLE CONTINUOUS AUTOMATIC PRINTING OF THE CHANNEL ID NUMBER OF EACH WAVEFORM:

1. Press the [SYS] hotkey, then select the SYSTEM SETUP, SETUP KEYBOARD softkeys.

2. Select the AUTO ID softkey to toggle the Auto ID function on/off. Use the encoder wheel to select a label type (wave/edge or simple waveform ID) in the lower text area.

TO MODIFY THE ID CONTROL PARAMETER:

3. Press the ID CONTROL softkey and select CHART+DISP (chart and display) or CHART ONLY.

See Also Printing Channel Identification Numbers
Specifying Text
Editing Text Buffers

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Setup Utility I/O

MOST OF THE INSTRUCTIONS LISTED APPLY TO BOTH THE DASH 8N AND TO THE DASH 8U MODELS. HOWEVER, SOME INSTRUCTIONS ARE SPECIFIC TO ONE MODEL ONLY.

THESE ARE NOTED WITH AN ALERT SYMBOL (!).

[SYS]

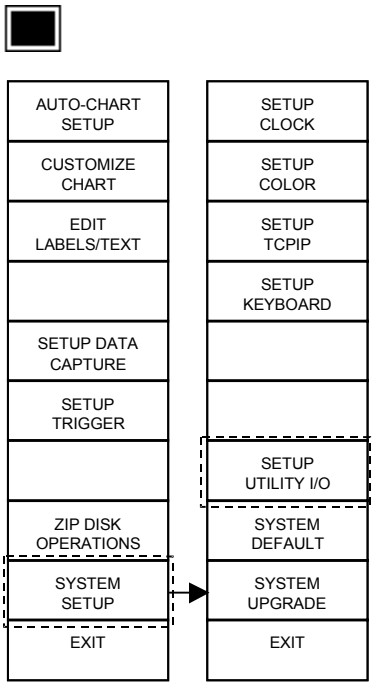


Figure 1 - 29, System Setup Menu, Setup Utility I/O

TO CONFIGURE PIN 13 (CONFIGURABLE INPUT) OF THE UTILITY CONNECTOR:

1. Press the [SYS] hotkey and select the SYSTEM SETUP, SETUP UTILITY I/O softkeys.
2. Select the <<FIELD>> softkey to highlight the field UTILITY I/O PIN #13.
3. Use the encoder wheel to select from the following changes in the lower text area:
   - ODB print (on-demand)
   - remote ARM
   - remote ID
   - remote KEY LOCKOUT

See Also System Setup Functions
System Setup - Setup Utility I/O
Utility Connector
Verifying Calibration Output, Dash 8n ONLY

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TO CONFIGURE PIN 9 OF THE UTILITY CONNECTOR AND USE AN EXTERNAL TRIGGER SOURCE:

1. Connect pin 9 of the UTILITY connector to the external source.
2. Press the [SYS] hotkey, then press the SYSTEM SETUP and SETUP UTILITY I/O softkeys.
3. Use the <<FIELD>> softkey to highlight the TRIGGER I/O PIN field in the lower text area and select INPUT with the encoder wheel.
4. Press EXIT to access the SETUP TRIGGER menu and set the EXTERNAL trigger source to ON. When EXTERNAL is selected as a trigger source, closing a switch or applying a TTL low to pin 9 will generate a trigger.

TO TROUBLESHOOT CALIBRATION OUTPUT ON DASH 8N MODEL ONLY 

1. Press the [SYS] hotkey, then select the SYSTEM SETUP and SETUP UTILITY I/O softkeys.
2. Press the <<FIELD>> softkey to highlight the CAL REF OUTPUT field in the lower text area. Use the encoder wheel to select from: 2.5 V or 10 V.

See Also
Using an External Trigger Source
System Setup Functions
System Setup - Setup Utility I/O
Utility Connector
Calibrating Channels, Dash 8n ONLY

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System Default

[SYS]

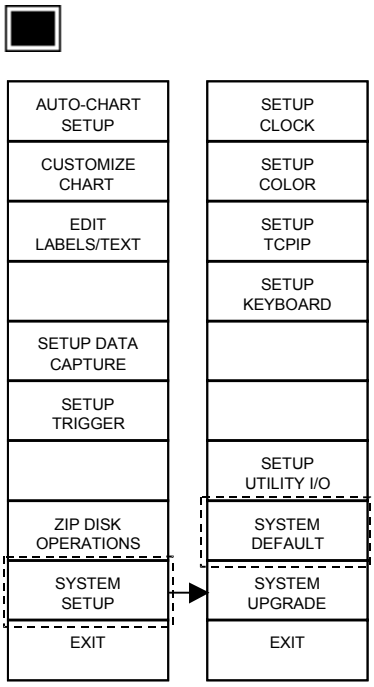


Figure 1 - 30, System Setup Menu, System Default

TO RETURN ALL SYSTEM SETTINGS TO FACTORY DEFAULT SETTINGS:

1. Press the [SYS] hotkey, then select the SYSTEM SETUP and SYSTEM DEFAULT softkeys.

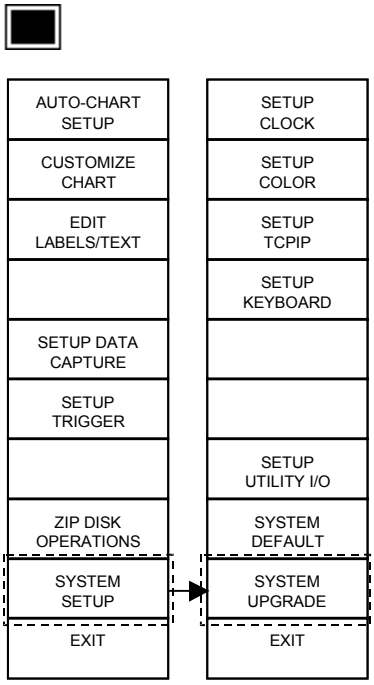
See Also System Setup Functions
System Setup - System Default

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System Upgrade

WARNING **IF YOU DO NOT SAVE THE ACTIVE RECORDER SETUP, IT WILL BE LOST DURING THE UPGRADE PROCEDURE AND WILL NOT BE RECOVERABLE. TO SAVE THE ACTIVE RECORDER SETUP TO DISK, SEE ZIP DISK OPERATIONS.**

[SYS]



TO PERFORM A SYSTEM SOFTWARE UPGRADE:

1. Insert the system software installation disk into the recorder's Zip™ drive.
2. Press the [SYS] hotkey and select the SYSTEM SETUP softkey.
3. Press the SYSTEM UPGRADE softkey. The bottom text area will display the software version.
4. At the "Verify?" prompt, press the YES softkey.
5. Press any key on the front panel to re-boot the system with the new system software.

Figure 1 - 31, System Setup Menu, System Upgrade

See Also System Setup Functions
Performing a System Software Upgrade

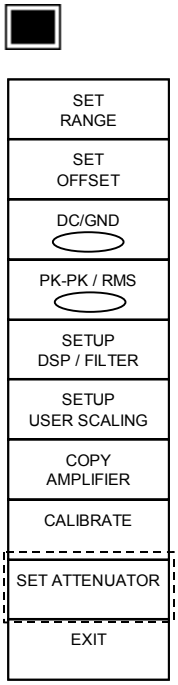
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[AMP] Hotkey Menu Commands

Set Attenuator, Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

[AMP]



COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED, DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER MAKING THESE SETTINGS.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO SET ATTENUATOR ON THE DASH 8N ONLY

1. Press the [AMP] hotkey, then select the SET ATTENUATOR softkey.
2. Highlight SET ATTENUATOR in the lower text area and select attenuator setting.

Figure 1 - 32, Set Attenuator Menu, Dash 8n ONLY

See Also Input Range and Zero Suppression
Setting Attenuation

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Set Attenuator, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

[AMP]

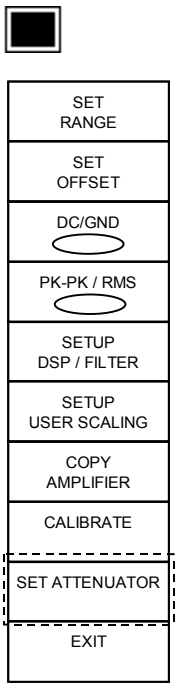


Figure 1 - 33, Set Attenuator Menu, Dash 8u ONLY

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED, DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER MAKING THESE SETTINGS.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO SET THE ATTENUATOR ON THE DASH 8U MODEL ONLY

1. Press the [AMP] hotkey. The AMP menu appears. The bottom text area indicates the channel's input type.
2. To modify the input type , press ADVANCED, CHANGE AMP TYPE, and select the correct type.
3. Press MORE for additional selections. Users of the Thermocouple and RTD types may also choose whether to operate in °F or °C at this time.
4. Press EXIT and select one of the SET TO… settings displayed.

See Also Input Range and Zero Suppression
Setting Attenuation

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Set Range, Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

[AMP]

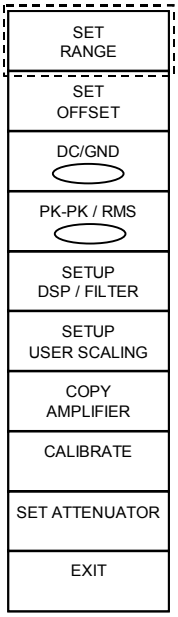


Figure 1 - 34, Set Range Menu, Dash 8n ONLY

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO DETERMINE THE MEASUREMENT SPAN AT FULL SCALE ON THE DASH 8N MODEL ONLY

1. Press the [AMP] hotkey, then select the SET RANGE softkey.

2. Highlight SET RANGE in the lower text area using the encoder wheel, and make a selection from available parameters. Positive (clockwise) movement of wheel will move signal in an upward direction on the chart. This corresponds numerically to a negative voltage on the display. This allows the number to be used as the value at the center of the channel (or measurement range).

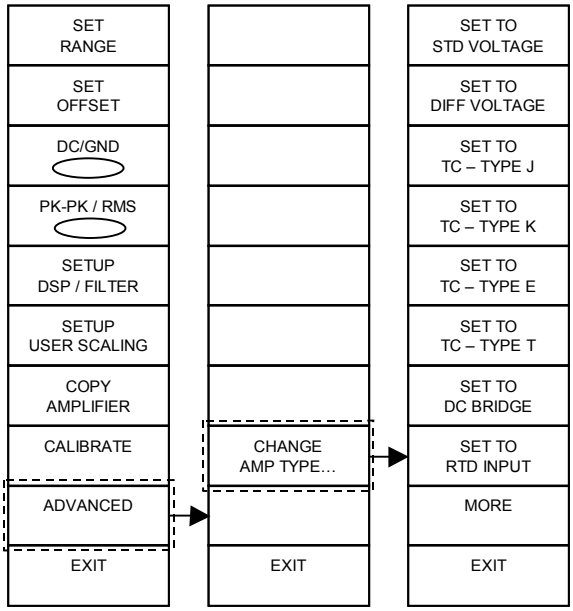
See Also Setting Range
Input Range and Zero Suppression

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Set Range, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

[AMP]



COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

NOTE **FOR EACH INPUT TYPE, A SPECIFIC MENU WILL BE DISPLAYED.**

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TO DETERMINE SPAN AT FULL SCALE ON THE DASH 8U MODEL ONLY

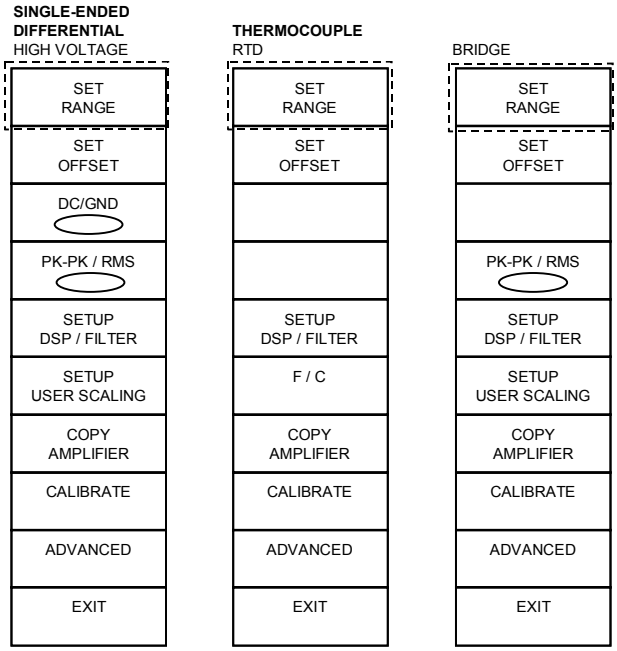


Figure 1 - 35, Set Range Menu, Dash 8u ONLY

1. Press the [AMP] hotkey, then select the ADVANCED softkey. When you press the AMP hotkey for one of the eight channels, the AMP menu appears. The bottom text area indicates the channel's designated input type:

   DV (differential)
   TC (thermocouple, type)
   BR (bridge)
   TD (RTD)
   HV (high voltage)
   no designation (single-ended).

2. To modify the input type shown, press ADVANCED, CHANGE AMP TYPE, and select the correct type. Press MORE for additional selections.

3. To return to the AMP menu, press EXIT until the AMP menu appears.

4. Press the SET RANGE softkey. Use the encoder wheel or the keypad to select a range in the lower text area. Positive (clockwise) movement of wheel will move signal in an upward direction on the chart. This corresponds numerically to a negative voltage on the display. This allows the number to be used as the value at the center of the channel (or measurement range).

5. Press EXIT to exit the AMP menu.

See Also Setting Range
Input Range and Zero Suppression

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Set Offset, Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

[AMP]

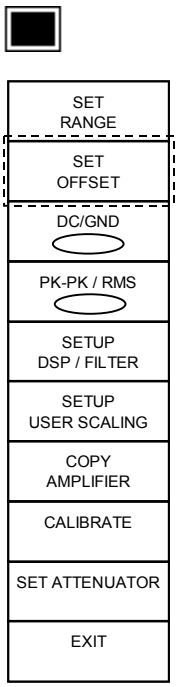


Figure 1 - 36, Set Offset Menu, Dash 8n ONLY

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO SPECIFY THE CENTER POINT OF THE GRID ON THE DASH 8N ONLY

1. Press the [AMP] hotkey, then select SET OFFSET.
2. Rotate the encoder wheel to the right to shift the waveform toward the top of the chart (positive values). Rotate the encoder wheel to the left (negative values) to shift the waveform toward the bottom of the chart.

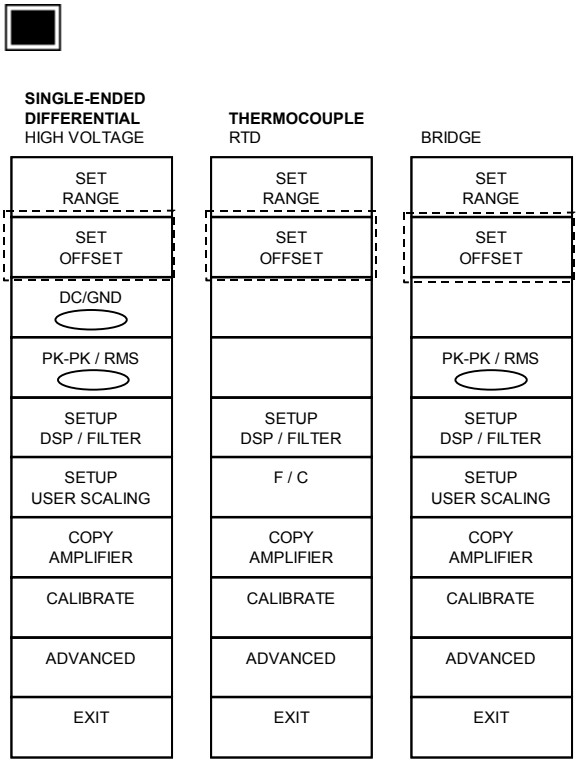
See Also Input Range and Zero Suppression
Customize Chart - Change Grid
Setting Offset

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Set Offset, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

[AMP]



COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

Figure 1 - 37, Set Offset Menu, Dash 8u ONLY

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TO SPECIFY THE GRID CENTER POINT ON THE DASH 8U ONLY

1. Press the [AMP] hotkey. The bottom text area indicates the channel's designated input type:

   DV (differential)

   TC (thermocouple followed by type)

   BR (bridge)

   TD (RTD)

   HV (high voltage)

   no designation (single-ended).

2. To modify the input type shown, press ADVANCED, CHANGE AMP TYPE, and select the correct type. Press MORE for further selections. Based on your entry, the menu shown will vary.
3. To return to the AMP menu, press EXIT until the AMP menu appears.
4. Press SET OFFSET and select an offset value by using the encoder wheel or keypad to enter a selection in the lower text area.

See Also Setting Offset
Input Range and Zero Suppression

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DC / GND

[AMP]

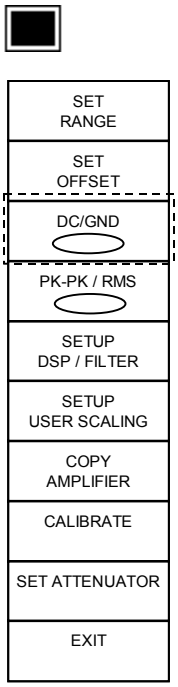


Figure 1 - 38, DC/GND Command

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO GROUND OR TO ENABLE THE CHANNEL'S INPUT SIGNAL:

1. Press the [AMP] hotkey, then select the DC/GND softkey to toggle between selections.

See Also Setting DC or GND
Specifying Signal Conditioning Settings

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PK-PK / RMS

[AMP]

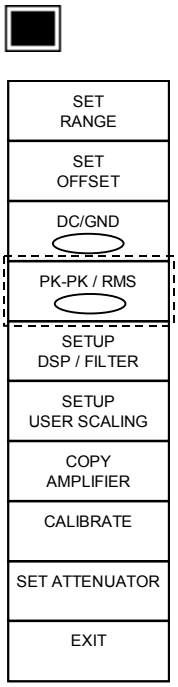


Figure 1 - 39, PK-PK/RMS Command

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO ENABLE THE CHANNEL'S INPUT SIGNAL TO PERFORM ROOT-MEAN-SQUARE:

1. Press the [AMP] hotkey, then select the PK-PK/RMS softkey to toggle between selections.

See Also Setting Peak-to-Peak RMS

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Setup DSP/Filter

[AMP]

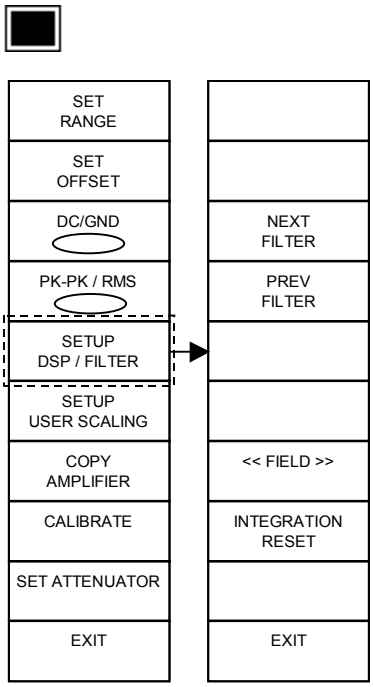


Figure 1 - 40, Setup DSP/Filter Menu

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED, DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER MAKING THESE SETTINGS.

THESE INITIAL STEPS CONTROL THE OPERATION OF AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO SETUP DSP/FILTER:

1. Press [AMP], then SETUP DSP/FILTER.
2. Use the <<NEXT FILTER>> and <<PREV FILTER>> softkeys to move forward to the next filter setting or return to the previous.
3. Use the <<FIELD>> softkey to highlight desired field in bottom text area of display.

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TO SPECIFY DIFFERENTIATION FOR THE DSP OPTION:

1. Press [AMP], then SETUP DSP / FILTER. In the SETUP DSP/FILTER menu, select:

    - d/dt
    - time constant between 50 msec and 2000 msec
    - a suitable low-pass filter to attenuate high-frequency noise

    See Also Setting Peak-to-Peak RMS
    Specifying DSP / FILTER Settings
    Specifying Differentiation

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Setup User Scaling

[AMP]

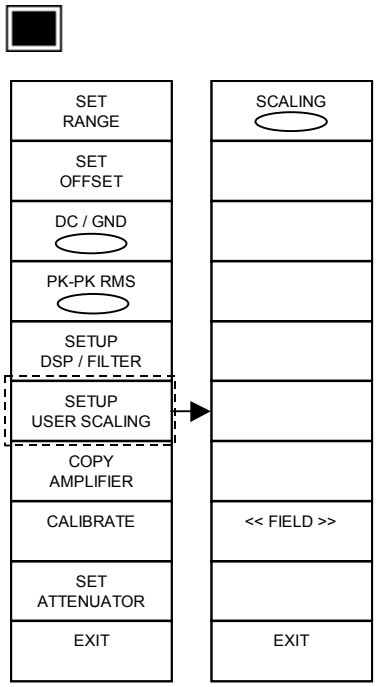


Figure 1 - 41, Setup User Scaling Menu

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED, DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER MAKING THESE SETTINGS.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO SCALE OUTPUTS TO TRUE V/SEC READINGS BY ENTERING A USER-DEFINABLE SCALE FACTOR:

1. Press [AMP], and select the SETUP USER SCALING softkey.
2. Select the SCALING hotkey and toggle to CUSTOM user scaling.
3. Use <<FIELD>> to set scale to 1.000, set span to scale factor, and set user units to "V/sec".

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TO IMPLEMENT THE INTEGRATION DSP OPTION AND USER SCALING:

1. Depending on the application, the DC Block can be turned on. In the SETUP DSP/FILTER menu, first select:

    - integrate
    - time constant between 1 msec and 1000 msec

    See Also Setting User-defined Engineering Units
    Specifying DSP / FILTER Settings

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Autobalance, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO, DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

[AMP]

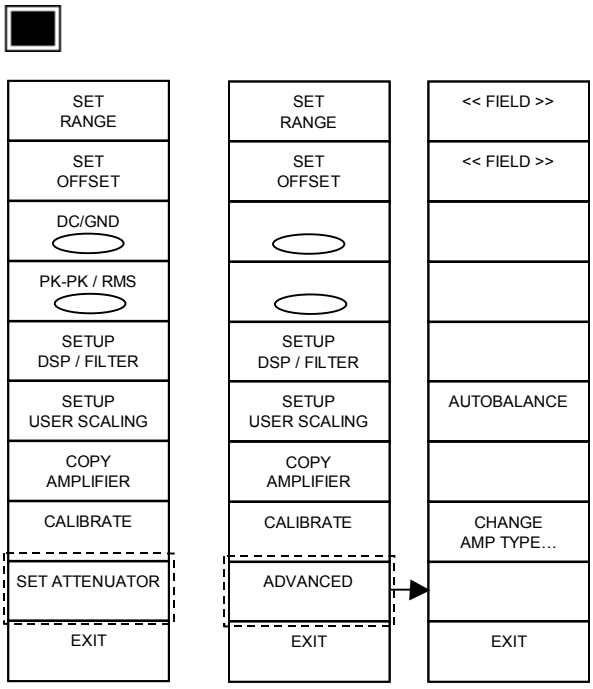


Figure 1 - 42, Autobalance Command, Bridge Input Type, Dash 8u ONLY

THESE STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

TO ADD A FACTOR TO THE INPUT LEVEL SO THAT THE RESULT IS ZERO.

1. Ensure the transducer is in a zero condition (i.e. remove the load from the load cell).
2. Press the [AMP] hotkey, then use the encoder wheel or keypad to select one of the SET TO… attenuator settings displayed in the SET ATTENUATOR menu.
3. Select the ADVANCED softkey, then press AUTOBALANCE. Operation status is displayed in the lower text area.

See Also Setting Autobalance for the Bridge Input Type, Dash 8u Model ONLY

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Setup Math Channel

[AMP]

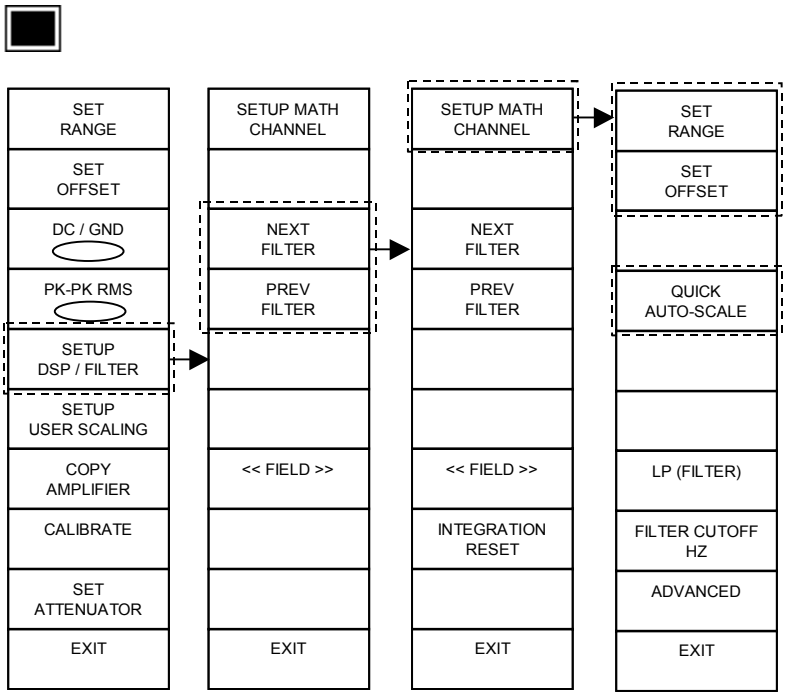


Figure 1 - 43, Setup Math Channel Menu

COMPLETE AMPLIFER CONFIGURATION BEFORE SETTING UP CHANNELS. THIS INCLUDES DEFINING THE AMPLIFIER TYPES IN USE, THE OPERATING SUBSTAGE (ATTENUATION), AND IF USER SCALING IS USED ALSO DEFINE THE RATIOS OF USER UNITS TO VOLTS. RANGE, OFFSET , ETC. CAN BE ADJUSTED AFTER THESE SETTINGS ARE MADE.

THESE INITIAL STEPS CONTROL THE OPERATION OF THE AMPLIFIERS, RESOLUTION OF UNITS, AND CHARACTERISTICS FOR ALL ENSUING OPERATION.

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TO PERFORM ADDITION, SUBTRACTION, MULTIPLICATION OR DIVISION:

1. Press the [AMP] hotkey and select the SETUP DSP/FILTER softkey.

2. Select either NEXT FILTER or PREV FILTER until the desired math function (addition, subtraction, multiply, division) appears in the lower text area in the "DSP/Filter:" field.

3. Press the <<FIELD>> softkey and use the encoder wheel to define sources A and B. Source selection is limited to the following pairs of channels in tandem: 1 and 2; 3 and 4; 5 and 6; 7 and 8. Ensure that sources A and B are specified correctly when performing subtraction and division.

4. Press the SETUP MATH CHANNEL softkey. The "Math #" designation at the top of the menu indicates the input channel selected for the waveform math function. The resulting output signal will appear on this channel. The math channel replaces the channel it occupies.

5. SET RANGE and SET OFFSET for the math channel *OR* use QUICK AUTO-SCALE to set the nominal output range automatically. If QUICK AUTO-SCALE is selected, the recorder will select a best guess. The span or range result may be slightly larger than required to get edge to edge stripchart operation or best resolution.

NOTE **MATH FUNCTION LIMITS ARE DICTATED BY THE OPERATIONAL INPUTS (OR CHANNELS) USED FOR MATH.**

See Also
Waveform Math Function
Waveform Math Specifications
Addition and Subtraction
Multiplication and Division

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Copy Amplifier

[AMP]

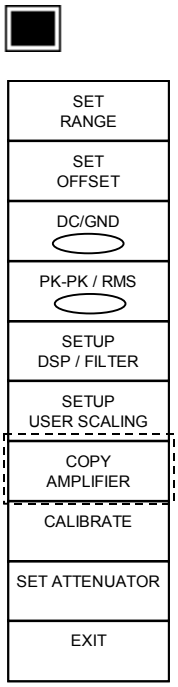


Figure 1 - 44, Copy Amplifier Command

TO COPY SIGNAL CONDITIONER SETTINGS FROM ONE CHANNEL TO ANOTHER, OR TO ALL CHANNELS:

1. Press the [AMP] hotkey, then select the COPY AMPLIFIER softkey.
2. Use the <<BACK and NEXT>> softkeys to access selections for:
   - Source channel
   - Destination channel
   - Copy what… (full amplifier, range & offset, DC/GND setting, filter setup)
3. If you select YES at the "Verify . . . are you sure?" prompt, by pressing the NEXT>> softkey, all selections you have made in the various fields will be specified.
4. Press CANCEL before leaving the menu if you wish to cancel any selections you have made.

See Also Copying Amplifier Settings

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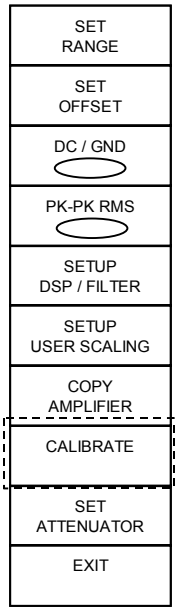
Calibrate, Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

NOTE **CALIBRATION SHOULD BE PERFORMED AFTER A SOFTWARE UPGRADE.**

[AMP]

TO CALIBRATE THE DASH 8N MODEL ONLY



1. Turn on the recorder and allow it to warm up at least 15 minutes.
2. Locate the CAL connector on the right side of the Dash 8n.
3. Run the connector cable shipped with the Dash 8n from the CAL BNC connector to the signal input of any of the recorder's eight channels on the rear panel of the recorder.
4. Press the [AMP] hotkey, then select CALIBRATE.

Figure 1 - 45, Calibrate Command, Dash 8n ONLY

See Also Calibrating Channels, Dash 8n ONLY
Right Side Panel
Rear Panel Elements, Dash 8n ONLY

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Calibrate, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

[AMP]

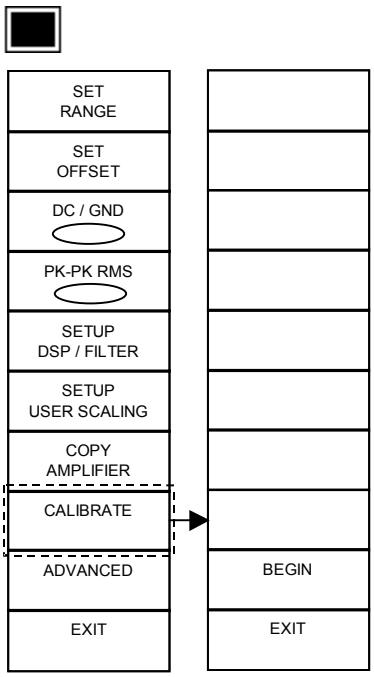


Figure 1 - 46, Calibrate Menu, Dash 8u ONLY

TO CALIBRATE INDIVIDUAL CHANNELS ON THE DASH 8U MODEL ONLY

1. Allow the Dash 8u to warm up at least 15 min.
2. If you have not already done so, ensure the [AMP] selections for the input type are set correctly. To do this, press [AMP] for the designated channel, and make related amplifier setting in the AMP menus.
3. Set the switch on the front of the calibration module to GROUND (0 volts).
4. Install the calibration module into the channel to be calibrated. Press the AMP hotkey, then select the CALIBRATE softkey.
5. Press BEGIN to apply 0 volts to the input. Status of calibration is displayed in the lower text area. If a "fail" message appears, be sure the switch on the calibration module is set to GROUND and press BEGIN again.
6. Set the switch on the front of the external calibration module to CAL, then press BEGIN in the [AMP] menu to apply the calibration reference to the input
7. A 2.5 volt reference is applied to RTD, single-ended, and high-voltage input types; a 250 millivolt reference is applied to the differential, bridge, and thermocouple input types. Status of calibration is displayed in the lower text area. If a "fail" message appears, reset the switch on the calibration module to GROUND and repeat steps 4 through 7.

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See Also Input Range and Zero Suppression
Calibrating Channels, Dash 8u ONLY

TO CALIBRATE BRIDGE INPUT TYPES ON THE DASH 8U ONLY

8. Perform the calibration procedure steps 1 through 7 above, and continue as follows.
9. Remove the calibration module from the Dash 8u. Ensure the channel is wired for the bridge input type.
10. Confirm that selections for the input type are set correctly.
11. Confirm that amplifier settings are correct.
12. Press the ADVANCED softkey in the AMP menu and select an attenuator setting.
13. Press AUTOBALANCE. Status of the calibration will be displayed in the text area. If a fail message appears, ensure that the correct attenuator setting has been selected and press AUTOBALANCE again.

See Also Setting Autobalance for the Bridge Input Type, Dash 8u ONLY
Input Range and Zero Suppression
Calibrating Channels, Dash 8u ONLY

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TO CALIBRATE THERMOCOUPLE INPUT TYPES ON THE DASH 8U ONLY

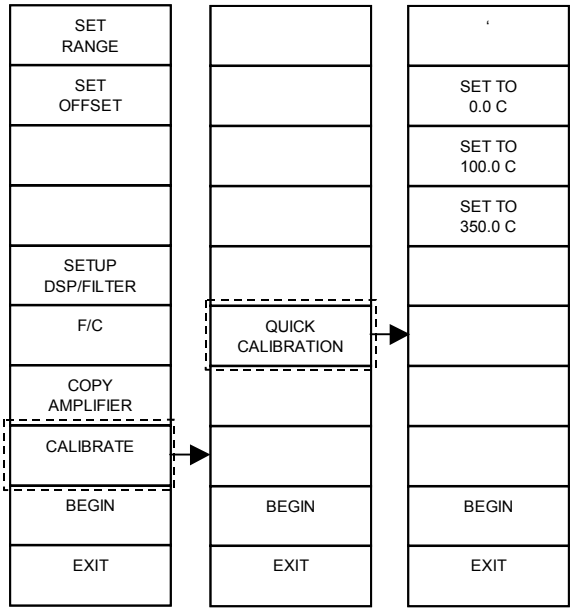


Figure 1 - 47, Quick Calibration Command, Dash 8u ONLY

8. Perform calibration steps 1 through 7 above, and continue as follows.
9. Remove the calibration module from the Dash 8u.
10. Confirm that the channel is wired for the thermocouple input type.
11. Confirm that the selections for the input type are set correctly.
12. Confirm that related amplifier settings are correct before proceeding.
13. Press CALIBRATE in the AMP menu, then select QUICK CALIBRATION.
14. Select a temperature reference: 0 °C, 100 °C, or 350 °C.
15. Apply the known temperature to the thermocouple input.
16. Press BEGIN to apply the temperature reference to the input. Status of the calibration will be displayed in the text area. If a "fail" message appears, ensure that the correct temperature reference has been selected and repeat steps 16 and 17.

See Also Input Range and Zero Suppression
Calibrating Channels, Dash 8u ONLY

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[MODE] Hotkey Menu Commands

Run Chart

[MODE]



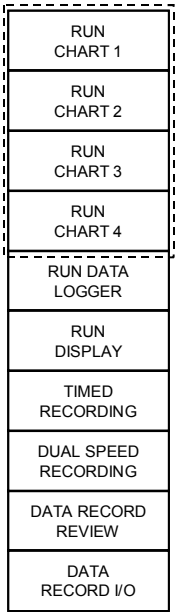


Figure 1 - 48, Run Chart Commands

TO RUN A CHART:

1. Press [MODE], then select one of the RUN CHART softkeys (CHART 1-4).

See Also
Chart Setup Functions
DEFAULT ALL CHARTS

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Run Data Logger

[MODE]

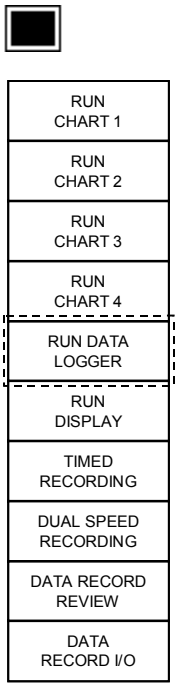


Figure 1 - 49, Run Data Logger Command

TO DISPLAY THE DATA LOGGER:

1. Press the [MODE] hotkey, then select the RUN DATA LOGGER softkey.

TO SET THE DATA LOGGER PRINT SPEED:

1. Press the [MODE] hotkey, then select the RUN DATA LOGGER and DATA LOG SPEED softkeys.

OR

1. Press the [SPD] hotkey and select CHART SPEED to display available real-time recording speed types.
2. Press one of the speed type softkeys (mm/second [SEC], mm/minute [MIN], or mm/hour [HR]) to define the speed type.
3. Use encoder wheel to select a speed value from the ranges presented in the bottom text area.
4. Press ACCEPT to effect the change.

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Timed Recording

[MODE]

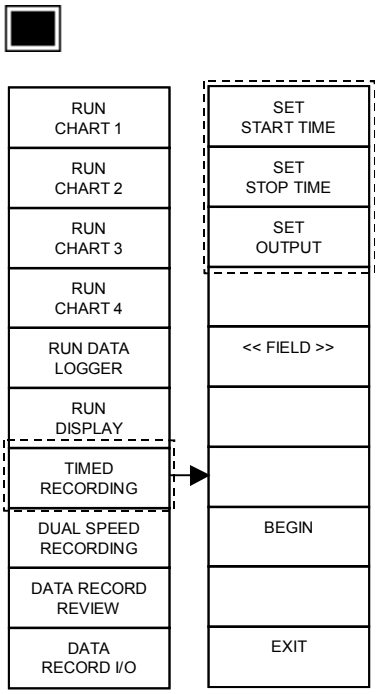


Figure 1 - 50, Timed Recording Command

TO SETUP A TIMED RECORDING:

1. Press the [MODE] hotkey, and select the TIMED RECORDING softkey.
2. Press a SET… softkey and use the <<FIELD>> softkey and encoder wheel to set:
   - Start time and date
   - Stop time and date
   - Output to chart (1-4)
3. Press BEGIN to activate timed recording. Date/Time formats date and time in bottom text area, and select a chart output layout.

DATE FORMAT EXAMPLE: 01 FEB 94

TIME FORMAT EXAMPLE: 01:30:00 (24-HOUR PERIOD)

See Also Setup a Timed Recording

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Dual Speed Recording

[MODE]

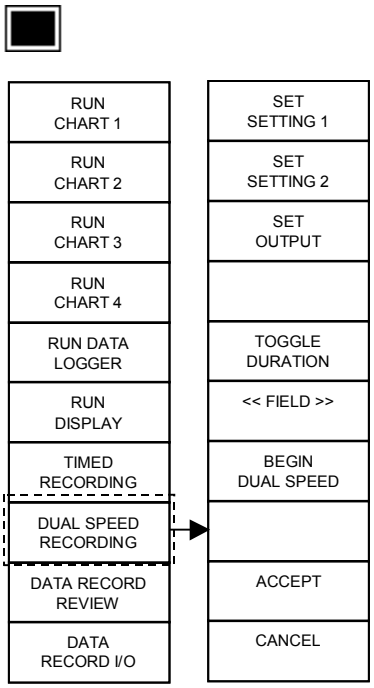


Figure 1 - 51, Dual Speed Recording Menu

TO ENABLE DUAL-SPEED RECORDING:

1. Press the [MODE] hotkey, then select DUAL SPEED RECORDING softkey.
2. Press a SET SETTING… softkey, and in the lower text area, make a selection for Speed #1 using the encoder wheel and the << FIELD >> softkey:
3. Select a chart format by pressing the SET OUTPUT softkey and using the encoder wheel to select chart 1-4.
4. Select TOGGLE DURATION to establish a timed or triggered DUAL SPEED recording.
5. Press the ACCEPT softkey to activate dual speed recording. Status of the recording is displayed in the lower text area.

See Also Setup Dual Speed Recording

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Find Record

[MODE]

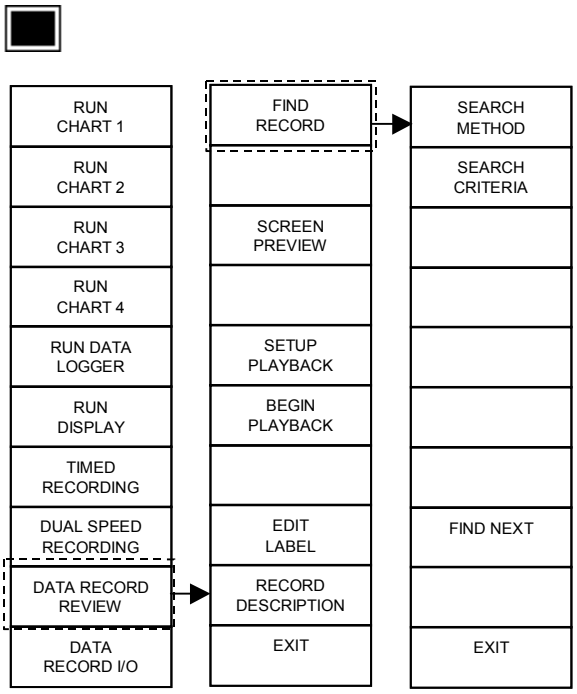


Figure 1 - 52, Data Record Review Menu, Find Record

TO FIND A RECORD USING THE DATA RECORD REVIEW MENU:

1. Press the [MODE] hotkey, then select the DATA RECORD REVIEW softkey. To access FIND RECORD advanced menu options, press FIND RECORD.
2. Press the SEARCH METHOD softkey and select from record label, number, time (00.00.00) and record date (MM/DD/YY) using the encoder wheel.
3. Press SEARCH CRITERIA to specify the parameters related to the SEARCH METHOD you have already defined.
4. Press FIND NEXT to execute the search.
5. Press the [RUN/HALT] hotkey to display the record.

See Also Finding a Record

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Screen Preview

[MODE]

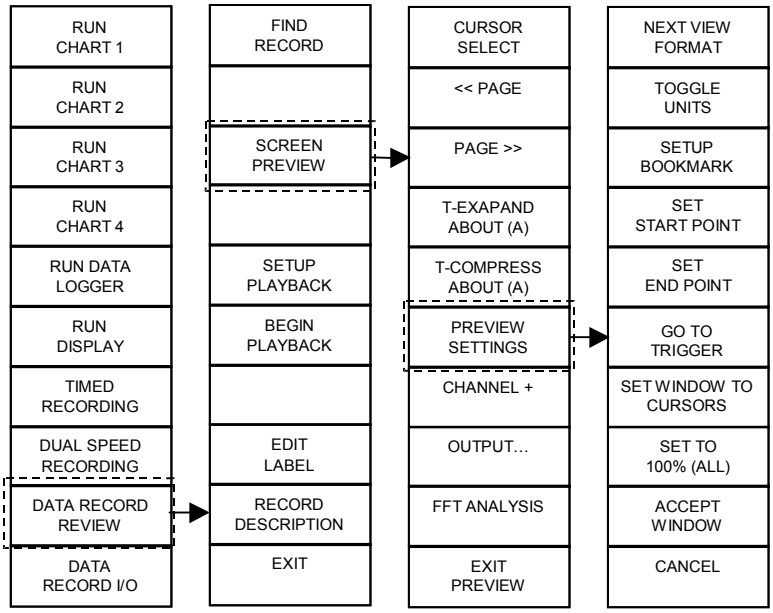


Figure 1 - 53, Data Record Review Menu, Screen Preview/Preview Settings

TO REVIEW A RECORD ON THE DISPLAY AND/OR PLAYBACK TO PAPER:

1. Use the FIND RECORD command to locate the data record you want to review.
2. Press [MODE], then the DATA RECORD REVIEW and SCREEN PREVIEW.
3. If the record covers more than one screen, use PAGE to move to the portion you wish to measure. If the record contains a trigger, it will be indicated by a dashed

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line. To locate a trigger on the record quickly, press the GO TO TRIGGER softkey in the PREVIEW SETTINGS menu.

4. Press CURSOR SELECT and select cursor A, B, or both. An arrow will appear at the top and bottom of the selected cursor(s) when it is selected. Rotate the encoder wheel to place cursors over the desired point in the record.

TO ACCESS ADVANCED SCREEN PREVIEW FEATURES:

1. Press the PREVIEW SETTINGS softkey.
2. Press NEXT VIEW FORMAT to toggle the chart layout in the lower text area.
3. Press TOGGLE UNITS to toggle the display from samples (pt) to time.
4. Press SET START POINT/SET END POINT and use the encoder wheel or keypad to define the starting and end samples of the display.
5. To locate the trigger within a record, press GO TO TRIGGER.
6. When the record is compressed, press SET WINDOW TO CURSORS to view the region of the record displayed between cursors.
7. To set a bookmark, press SETUP BOOKMARK, and toggle BOOKMARK STATE to ON. Press SAVE BOOKMARK AND EXIT.
8. Press SET TO 100% (ALL) to show the entire record on one screen display.
9. Press ACCEPT to apply the selections made. Press CANCEL to cancel all selections and return to the SCREEN PREVIEW menu.
10. Records can be expanded or compressed around cursor A. Use T-EXPAND/T-COMPRESS to bring the desired portion into view. The lower text area indicates which channel is measured, compression rate, and time measurement information.
11. Use the encoder wheel to position the cursor(s) where desired.
12. To select a different channel for measurement, use the CHANNEL+ key.
13. To view output options, including printing the screen to paper or saving it to Zip disk, press the OUTPUT key and make a selection.

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Setup Playback

[MODE]

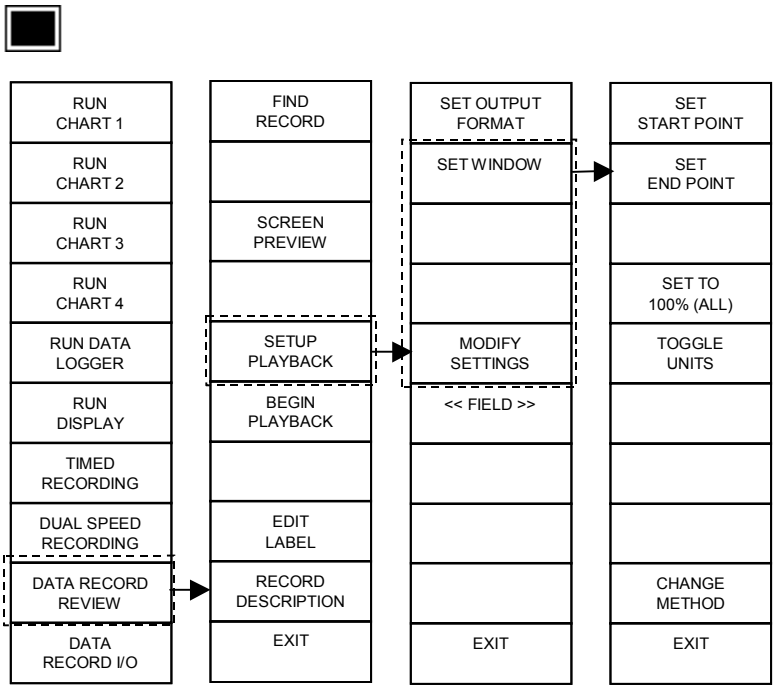


Figure 1 - 54, Data Record Review Menu, Setup Playback/Set Window

TO EXPAND OR COMPRESS A DATA-CAPTURE RECORD, PLAYBACK ALONG THE TIME AXIS, SELECT A CHART FORMAT FOR PLAYBACK (PRINTING TO PAPER), OR TURN ON THE PRINT HEADER:

1. Press the MODE hotkey, then select SETUP PLAYBACK, SET OUTPUT FORMAT to select from: Y-T Chart 1 though Chart 4; numeric log; PLOT X-Y; PLOT X-YY chart formats using the encoder wheel and the <<FIELD>> softkey.

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2. Press SET WINDOW to set the start and end sample points of playback. Press EXIT.

3. Press MODIFY SETTINGS and use the encoder wheel and <<FIELD>> key to select a t-expansion value from: x1, x2, x4, x8, x1/2, x1/4, x1/8 and to turn the print header on/off.

TO SET START AND END SAMPLE POINTS OF PLAYBACK (TO PAPER).

1. Press the [MODE] hotkey, then select the DATA RECORD REVIEW, SETUP PLAYBACK, and SET WINDOW softkeys.

2. Press SET START POINT/SET END POINT and use the encoder wheel or keypad to define the starting an end samples of the display.

3. Press SET TO 100%(ALL) to show the entire record on one screen display.

4. Press TOGGLE UNITS to set the record to be displayed in samples (pt) or units.

5. Press CHANGE METHOD to select a method of review.

See Also Setup Playback to Paper
Data Review and Playback
Begin Playback

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FFT Analysis

[MODE]



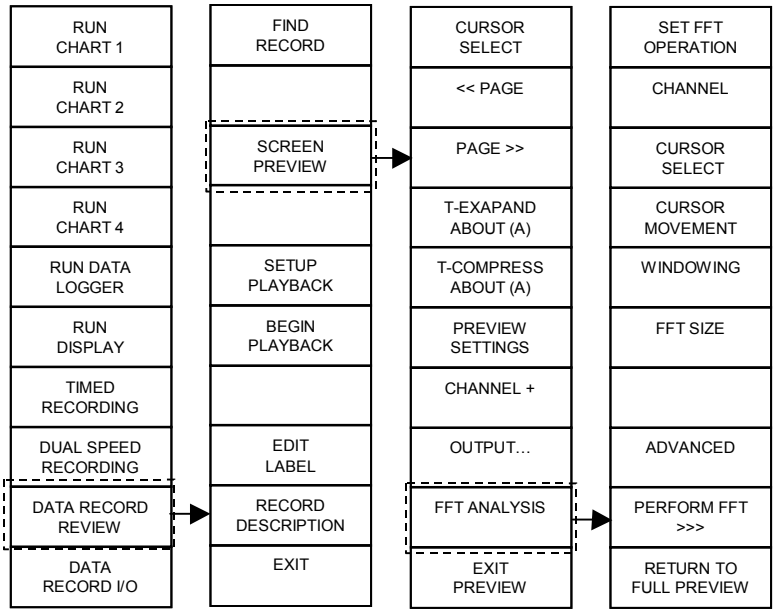


Figure 1 - 55, FFT Analysis Menu

TO CONVERT DATA INFORMATION WHICH IS IN THE TIME DOMAIN INTO THE FREQUENCY DOMAIN:

1. First, preview the record desired using the SCREEN PREVIEW command.
2. Use T-EXPAND, T-COMPRESS, and/or CURSOR SELECT to bring the desired portion of the record into view and perform a Y-T preview. Statistics and measurements within the area of general interest on the record can now be gathered.

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3. The units of measurement for some fields are controllable and can be displayed as Samples or Time. To alter the units of measurement displayed, toggle the units used for the display from the SCREEN PREVIEW menu.

4. After using SCREEN PREVIEW to zero in on the area of interest, the FFT utility may be used to narrow selection of the exact data area for FFT from the data currently displayed using the cursors, or a reference point may be used.

5. Press SET FFT OPERATION to select a Transform Operation in the lower text area.

6. To toggle among channels, select the CHANNEL softkey and use the encoder wheel to select a channel.

7. The CURSOR SELECT softkey may not be visible, depending on the Transform Operation chosen. This softkey allows independent cursor control.

8. The WINDOWING softkey may not be visible, depending on the Transform Operation Chosen. Select WINDOWING to select among windowing options using the encoder wheel. The FFT window area to be used in FFT should be completely shown on the screen unless the REFERENCE N SIZE mode is used for FFT window selection.

9. Press the FFTSize softkey and use the encoder wheel to select an FFTSize up to 2048.

10. To define plot analysis type, press the ADVANCED softkey, set Y-AUTOSCALE to ON/OFF, or toggle Y-T plot ON/OFF. Press the EXIT softkey.

11. To execute the FFT transform based on the settings selected, press PERFORM FFT. The lower text are will indicate which channel is being measured, the compression rate, and the related units of measurement information.

NOTE **ADVANCED FFT SUPPORT IS FOUND UNDER DATA RECORD REVIEW AND PREVIEW SUPPORT. ADVANCED SUPPORT IS AN ADDED UTILITY TO BE USED AS-NEEDED TO FIT THE APPLICATION.**

See Also
Fast Fourier Transform Utility
SCREEN PREVIEW
FFT Analysis Output Definition

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Edit Label

[MODE]

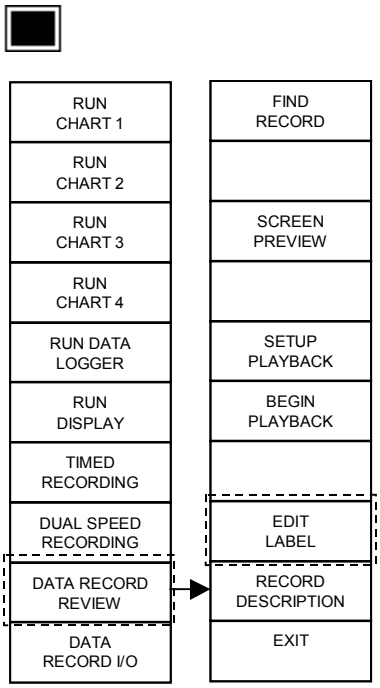


Figure 1 - 56, Data Record Review Menu, Edit Label Command

TO ASSIGN A RECORD LABEL:

1. Press the [MODE] hotkey, then select the DATA RECORD REVIEW softkey.
2. Press EDIT LABEL and enter a new label for the record using the alphanumeric keypad.
3. Press ACCEPT to activate the change.

NOTE **RECORDS DEFAULT TO THE TIMESTAMP FOR THEIR LABEL. FORMAT IS MMMDDYYTTTT : I.E. NOV12991200**

See Also Labeling Records

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Record Description

[MODE]

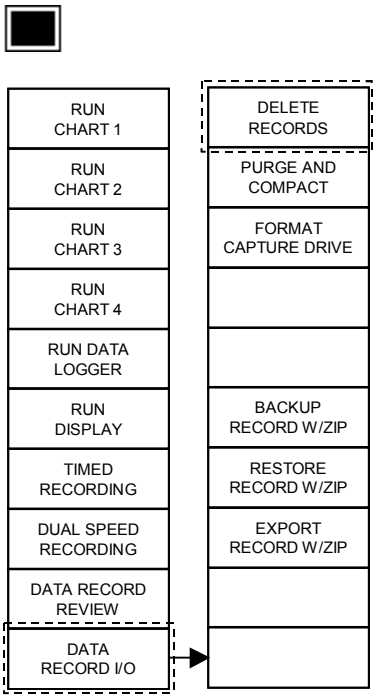


Figure 1 - 57, Data Record Review Menu, Record Description

TO DETERMINE THE CONTENT OF A FIELD IN THE BOTTOM TEXT AREA - TIME STAMP OR LABEL:

1. Press the [MODE] hotkey, then select the DATA RECORD REVIEW softkey.
2. Press the RECORD DESCRIPTION softkey to toggle between Time Stamp and Label of Record in the lower text area. Use the encoder wheel to make selections from available parameters.

NOTE **RECORDS DEFAULT TO THE TIMESTAMP FOR THEIR LABEL. FORMAT IS MMMDDYYTTTT : I.E. NOV12991200**

See Also Describing Records

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Delete Records

[MODE]

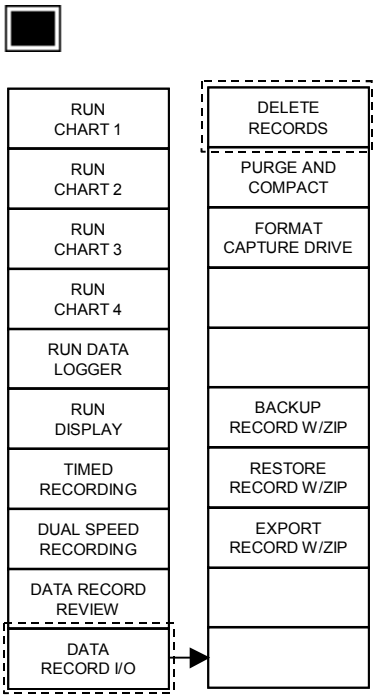


Figure 1 - 58, Data Record I/O Menu, Delete Records

TO DELETE ONE OR MORE RECORDS STORED ON THE SYSTEM'S HARD DRIVE:

1. Press the [MODE] hotkey, then press the DATA RECORD I/O and DELETE RECORDS softkeys.
2. Use the encoder wheel to select record(s) to be deleted. Then press BEGIN. To learn the number of the last record, turn the encoder wheel to the right until the highest record number (last record) is listed.
3. Press EXIT to leave the menu without deleting records.

See Also Deleting Records

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Purge Records and Compact

[MODE]

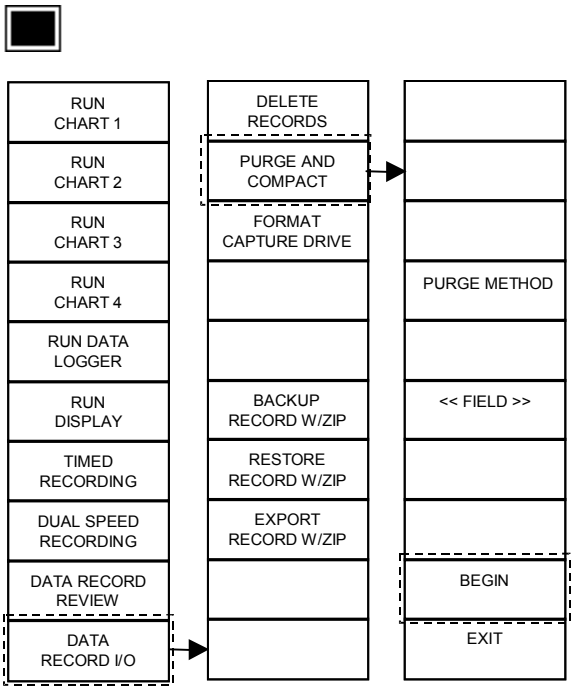


Figure 1 - 59, Data Record I/O Menu, Purge Records and Compact

TO PURGE (DELETE) RECORDS AND AUTOMATICALLY COMPRESS THE EMPTY DISK SPACE ON THE HARD DRIVE:

1. Press [MODE] and select the DATA RECORD I/O and PURGE RECORDS AND COMPACT softkeys.
2. Select the PURGE METHOD softkey to toggle between Series and Single (record) purge.
3. Use the encoder wheel and <<FIELD>> softkey to select a record or a range of records to be purged. Press BEGIN.

See Also Purging Records and Compacting Drive Space

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Format Capture Drive

[MODE]



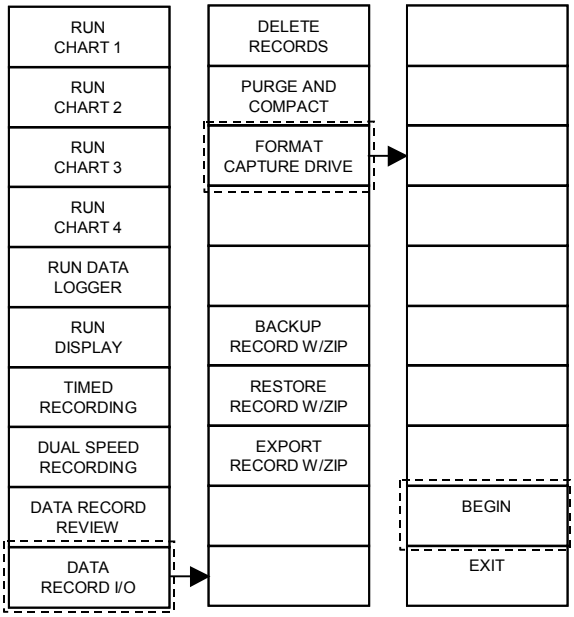


Figure 1 - 60, Data Record I/O Menu, Format Capture Drive

TO REFORMAT THE HARD DRIVE:

1. Press the [MODE] hotkey, then select the DATA RECORD I/O and FORMAT CAPTURE DRIVE softkeys.
2. To begin reformatting, press BEGIN. An "Are you sure . . . verify?" prompt will appear.
3. To cancel the command, press EXIT.

See Also Formatting the Hard Drive

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Backup/Export Record w/Zip

[MODE]

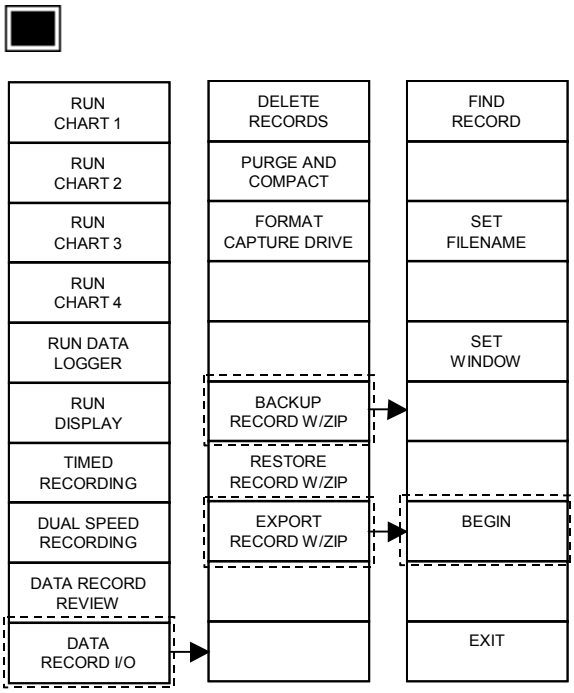


Figure 1 - 61, Data Record I/O Menu, Backup/Export Record

TO BACKUP A RECORD TO THE ZIP™ DRIVE:

1. Press the [MODE] hotkey, then select the DATA RECORD I/O and BACKUP RECORD W/ZIP softkeys.
2. To locate the record you wish to backup, use the FIND RECORD command.
3. To give the backup record a filename, press SET FILENAME and use the keypad to enter a filename.
4. To activate file backup, press BEGIN.

TO EXPORT A RECORD TO THE ZIP™ DRIVE:

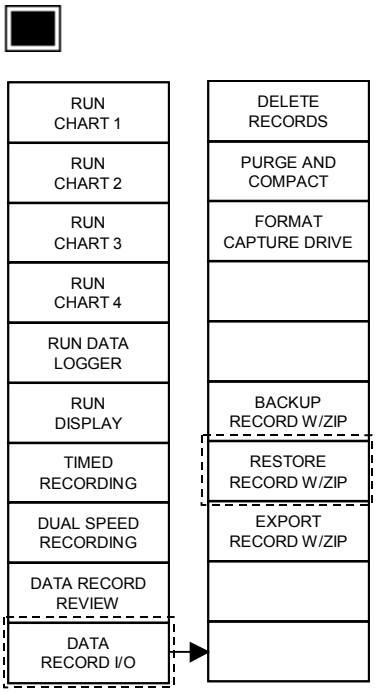
1. Press the [MODE] hotkey, then select the DATA RECORD I/O and EXPORT RECORD W/ZIP softkeys. Follow directions 2-4 under 'To BACKUP a record to the Zip drive'.

See Also Backing Up Records
Exporting Records
FIND RECORD

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Restore Record w/Zip

[MODE]



TO RESTORE DATA RECORD(S):

1. Press the [MODE] hotkey, then select the DATA RECORD I/O and RESTORE RECORD W/ZIP softkeys.

2. Use the encoder wheel to select file(s) or key in a filename using the keypad.

Figure 1 - 62, Data Record I/O Menu, Restore Record

See Also Restoring Records

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[SPD] Hotkey Menu Commands

Set Chart Speed

[SPD]

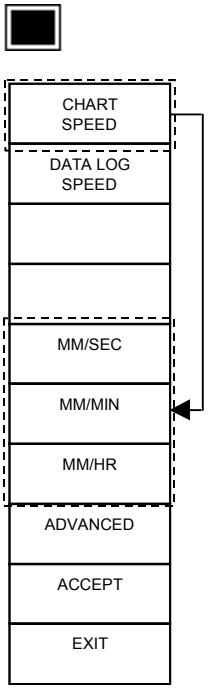


Figure 1 - 63, Set Speed Menu, Chart Speed

TO MODIFY CHART SPEED USING THE SET SPEED MENU:

1. Press the [SPD] hotkey and select CHART SPEED to display available real-time recording speed types.
2. Press one of the speed type softkeys (mm/second [SEC], mm/minute [MIN], or mm/hour [HR]) to define the speed type.
3. Use encoder wheel to select a speed value from the ranges presented in the bottom text area.
4. Press ACCEPT to effect the change.

TO MODIFY SPEED DIRECTLY FROM THE FRONT PANEL PRESET SPEED HOTKEYS:

1. Press one of the speed value hotkeys ([1] , [5] , [25] , or [50]) to immediately slow down (lower value) or speed up (higher value) recording and continue to measure speed in the present speed type ([SEC], [MIN], or [HR]).
2. To change the speed type ([SEC], [MIN], or [HR]), you must first select a new type before entering a new speed value. Press the [HR], [MIN], or [SEC] key to select a new speed type, then press one of the speed value hotkeys.

See Also Speed Functions
Set Speed - Chart Speed

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Data Log Speed

[SPD]

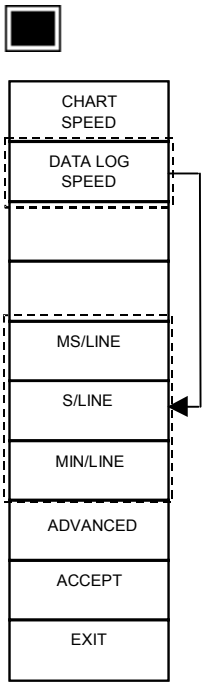


Figure 1 - 64, Data Log Speed Menu

TO DETERMINE HOW FREQUENTLY WAVEFORM DATA IS SAMPLED AND PRINTED TO PAPER:

1. Press the [SPD] hotkey, then select the DATA LOG SPEED softkey to access softkeys for the recording speeds available.
2. Press one of these softkeys to define the measure of speed: line every "x" milliseconds, seconds, or minutes – for example, selection of 2 s/line means that a line of data is printed every two seconds.
3. Use encoder wheel to select a speed value from the ranges presented in the bottom text area.
4. Press ACCEPT to complete the selection.

See Also Set Data Log Speed

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Set Display Speed

[SPD]

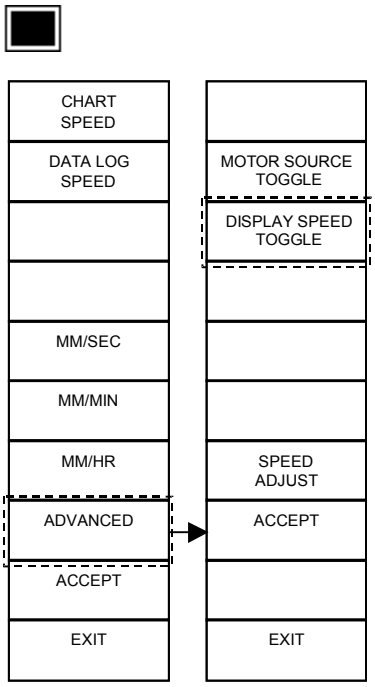


Figure 1 - 65, Set Speed Menu, Display Speed

TO MODIFY DISPLAY SPEED:

1. Press the [SPD] hotkey, then select the ADVANCED softkey.
2. Press DISPLAY SPEED TOGGLE to select from NORMAL or TREND in the lower text area.
3. Press ACCEPT to effect the change.

TO MODIFY INTERNAL SPEED

1. Press SPEED ADJUST and use the encoder wheel to modify the percentage displayed in the lower text area.
2. Press ACCEPT to effect the change.

See Also Speed Functions
Set Speed - Display Speed

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Motor Source Toggle

[SPD]

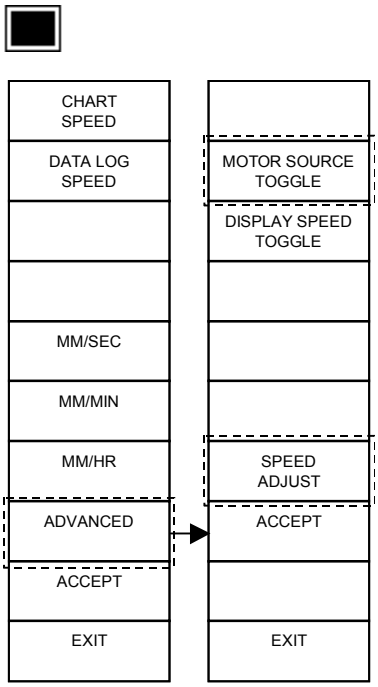


Figure 1 - 66, Set Speed Menu, Motor Source Toggle

TO CONFIGURE AN EXTERNAL STEPPER-MOTOR TIMING SOURCE TO BE REFERENCED IN PLACE OF THE INTERNAL CLOCK:

1. Connect your input stepper-motor clock source to pin 10 of the rear-panel UTILITY connector.
2. Connect the associated ground to pin 12 of the UTILITY connector.
3. Press the [SPD] hotkey and select the ADVANCED softkey.
4. Press MOTOR SOURCE TOGGLE until EXTERNAL is displayed in the lower text area.
5. To increase motor accuracy, select SPEED ADJUST and specify the desired percentage.
6. Press ACCEPT to complete the selection.

See Also Speed Functions
Set Speed - Motor Source Toggle
Utility Connector

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[HELP] Hotkey Menu Commands

Print Information/Status Reports

[HELP]



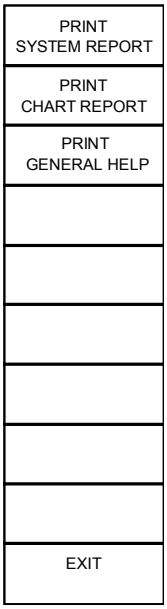


Figure 1 - 67, Print Reports

TO PRINT INFORMATION/STATUS REPORTS:

1. Press the [HELP] hotkey, then select one of the PRINT REPORT softkeys.

See Also Pre-set Function Hotkeys

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Dash 8n/8u Specifications

MOST OF THE SPECIFICATIONS LISTED APPLY TO BOTH THE DASH 8N AND TO THE DASH 8U MODELS. HOWEVER, SOME SPECIFICATIONS LISTED ARE SPECIFIC TO ONE MODEL ONLY.

THESE ARE NOTED WITH AN ALERT SYMBOL ( ).

Chart Recorder

recording method ..... direct thermal

chart size ..... mm: 216 mm W x 139 mm L
in: 8.5 W x 5.5 L (Z-fold, 300 sheets, 137.5 ft)

resolution ..... 8 dpm (200 dpi) amp. axis, 10 dpm time axis

chart speed ..... 1 mm/hr to 100 mm/s; ±2% accuracy

dual speed ..... automatic change of speed with trigger or time

remote start/stop ..... TTL level or switch closure

external speed control..... TTL pulse to 25 mm/s (250 Hz)

text printing ..... print ASCII files from Zip disk

max waveform size ..... 200 mm

amplitude grids ..... 8 independent grids up to 200 mm wide; grid placement automatic or user-defined

time marking ..... tri-state (x1, x10, x100) mark on either chart edge; grid time lines can be synched to time mark; selectable time mark reference (0.02 to 1 second)

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annotation.....system log printed automatically (time, date, speed); each grid has one line of text (128 ASCII characters); an on-demand text buffer is available (128 characters)

signal conditioner.....auto-annotation

channel ID .....each channel labeled with channel number; top and bottom grid values can be annotated

trace thickness.....user-adjustable

Physical

case material .....aluminum

dimensions .....inches: 16.4" L x 11.2" W x 5.2" H
centimeters: 41.65 L x 28.44 W x 13.20 H

weight .....20 lbs. (9.09 kg.)

Power

input voltage (auto select).....105 to 130 VAC at 60 Hz
210 to 260 VAC at 50 Hz

power consumption .....100 W typical, 250 W maximum

Zip Drive

format .....MS-DOS¨ format

function.....setup files, software upgrades and data transfer/archive

menu functions .....format, rename, delete, copy, print (ASCII)

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Front Panel Display

type	active matrix color LCD
viewing area	10.4" (diag); resolution 640 x 480
functions	control menus, waveform monitoring, capture review

Data Capture

sample rate	From 0.0167 Hz to 20 kHz per channel. The rate at which data will be sampled from chosen channels. (1 sample per minute)
external sample rate	external TTL sample clock to 1 kHz 300 micro-second minimum pulse width
set record size	From 4 Ks to 1024 Ms. Size of the next data capture record. Record Size options are: 4, 8, 16, 32, 64, 128, 256, 512 Ks 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024 Ms
disk capacity	1 billion samples, 1000 records
maximum record	1 billion samples
time stamp	time and date automatically saved with data
header	information on units, range, sample rates, etc., saved with data
events	all external event inputs captured with waveforms

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set trigger win	Trigger/window relationship for all records; window equates to record size. The trigger/window relationship describes the placement of the trigger within the window thereby determining the percentages of pre-trigger and post-trigger data captured. Choices can be any percentage between 0% (beginning of window) and 100% (end of window).
set operation	(automating capture) methods of data capture and playback: single acquisition single acquisition with automatic playback multiple acquisitions with auto re-arming multiple acquisitions with auto re-arming and automatic playback
autotrig	Can be on/off as desired. With auto-triggering turned ON, data is continually captured upon the system being armed. The SETUP TRIGGER settings are ignored. With auto-triggering turned OFF, the recorder awaits the next trigger after being armed before capturing data. The next trigger will occur according to the criteria established via the SETUP TRIGGER settings.
trigger point location	pre- and post-trigger %, user adjustable
auto arm	allows automatic stacking of captures
edit next label	Creates a label for the next data capture record. Each data capture record is automatically numbered in sequence. The label you specify carries over to subsequent records.

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duration units ..... Specifies duration of the data capture. To determine the duration of a data capture, consider the relationship between the size of the data-capture record and the selected sample rate. The following applies:

Size .....the larger the record, the longer the data capture time

Sample Rate.....the slower the sample rate, the longer the data capture time

auto playback..... yes

Data Logger

data logger..... numerical printout of waveform data in user-specified engineering units: up to 500 milliseconds/line

Digital Signal Processing

filter choices.....

low-pass .....filters out frequencies above a specified cutoff; stops from 1 Hz to 1000 Hz

high-pass.....filters out frequencies below a specified cutoff; starts from 0.1 Hz to 100 Hz

notch.....filters the 50 or 60 Hz frequency component out of the input signal; 50 or 60 Hz center

band-pass.....filters out frequencies below the start and above the stop to allow only a selected band of frequencies to pass; starts from 0.1 Hz to 100 Hz , stops from 1 Hz to 1000 Hz

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NOTE **IF RMS IS ENABLED, THE FILTER SETTINGS DO NOT APPLY, AND TIME CONSTANT CAN BE ADJUSTED IN THE BOTTOM TEXT AREA.**

RMS time constant .....selectable (in seconds): 0.02 / 0.2 / 2.0

waveform math .....addition, subtraction, multiplication, division.

sample rate.....20 kHz

ADC resolution 16-bit

functions .....filter, RMS, integration, differentiation w/filter

integrate.....

time constant.....from 1 ms to 1000 ms

integration reset level.....full scale or off

zero-crossing.....on or off. Resets output to zero each time the input signal crosses the zero baseline. This corrects for the continuous tendency to accumulate error inherent in integration processing. Zero crossing can be enabled when DC block and level reset are enabled.

DC block.....on or off. Turn on DC block if the signal rides a DC offset voltage that you want to suppress during integration processing. DC block acts as a high-pass filter to remove the DC component of the waveform signal. This corrects for the continuous drift that always results when DC offset is present in a signal that is undergoing integration processing.

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d/dt.....

time constant.....from 50 µs to 2000 µs
low-pass frequency.....from 1 Hz to 2000 Hz

Environmental

operating temperature..... 5° C to 40° C (40° F to 105° F)

non-operating temp..... -15° C to 60° C (0° F to 140° F)

operating humidity..... 10% to 95%, non-condensing

Waveform Math

math definitions..... add, subtract, multiply, divide - found in [AMP] menu under SETUP DSP/FILTER

math channels ..... eight

channel selectivity..... limited to the following pairs of channels in tandem: 1 and 2; 3 and 4; 5 and 6; 7 and 8

placement ..... Each math channel replaces the channel to which it is assigned; no new channels are added. For example, "math 1" replaces channel 1; "math 2" replaces channel 2, etc., through channel 8.

If desired, the input channel which is replaced by the math channel can be reassigned to another channel operating under identical conditions.

output range..... selectable by user in the Setup Math Channel menu, with limits based on capability of input channels and math performed

output offset..... selectable by user in the Setup Math Channel, may be interpreted as the value at the center of the channel (range)

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automatic setup	DASH 8n and DASH 8u provide automatic selection of output range (Quick auto-scale) and offset in order to provide the most optimum viewing results.
recorder level required	SCN 11.3 or greater (Dash 8n), 21.3 or greater (Dash 8u)
filter support	low-pass only for an output channel

Event Inputs

number of inputs	eight external event markers
input type	TTL with pull-up
input range	0 to 5 V
protection	current-limited (PTC fuse) and clamped
response	detects if duration > 0.05 msec

Miscellaneous

utility port	connections for remote start/stop, remote drive,trigger and events
indicators	trigger, arm
controls	full alpha-numeric keypad, soft keys, encoder wheel
real-time clock	battery-backed time and date
built-in help/reports	general, system status, chart information

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Record Review

formats ..... strip chart, numeric tabular, XY-plot

display ..... use cursors to select sections and make measurements

chart ..... playback all or any section at x1/8 to x8

Zip archive ..... up to 45 million samples

ASCII conversion ..... direct conversion to PC/ASCII/Excel format

Trigger Acquisition Sources

window ..... all active waveform channels simultaneously

special ..... slew rate or slope/level

event ..... binary combination of active event states

clock ..... time of day or periodic

other sources ..... both manual and hard-wire trigger inputs

Waveform Inputs, Dash 8n ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8N MODEL ONLY 

number of channels ..... eight

input type ..... isolated, single-ended

connector ..... two guarded banana jacks

UL-rated input ..... 250 Vrms

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measuring range.....50 mV to 500 V full scale

accuracy (25°C).....<±1% of full scale

bandwidth .....2 kHz (-3 dB)

input coupling .....DC

input impedance .....1 Megohm

IMR at 60 Hz.....> 90 dB

IMV 500V

NMR at 60 Hz .....> 60 dB

max intrinsic noise .....±0.5% of full scale (filters off)

baseline drift w/temp.....<0.1% full scale per degree C

isolation .....1500 Vrms (iso common to chassis and other iso commons)

calibration .....semi-automated using internal voltage reference

zero suppression .....yes

engineering units .....yes

NOTE **UL RATED INPUT - THE 250 VRMS LIMIT MEANS THAT CONTINUOUS VOLTAGES ABOVE 250 VOLTS MAY CAUSE DAMAGE. FOR EXAMPLE, A 700 VOLT PEAK-TO-PEAK SINE WAVE RESULTS IN 247 VRMS AND IS THEREFORE A SAFE INPUT. CONVERSELY, 400 VOLTS DC HAS AN RMS VALUE OF 400 AND IS NOT ACCEPTABLE.**

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Voltage Measurements, Dash 8u ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8U MODEL ONLY

NOTE **THE DASH 8U SUPPORTS EXTERNAL PLUG-IN MODULES TO PROVIDE ADDITIONAL INPUT TYPES. UNLIKE DASH 8U UNIVERSAL INPUTS, EACH PLUG-IN MODULE IS DEDICATED TO A SPECIFIC INPUT TYPE. EXTERNAL MODULES SUPPORTED INCLUDE RTD, HIGH VOLTAGE, VERY HIGH VOLTAGE, AND FREQUENCY TO VOLTAGE.**

number of channels ..... eight

input types .....
- single-ended voltage .....isolated single-ended
- differential.....isolated, differential
- external RTD (Dash 8u ONLY)
- external HV (Dash 8u ONLY)
- external VHV (Dash 8u ONLY)
- external FTV (Dash 8u ONLY)

Absolute maximum input.....
- single-ended voltage .....±40 V VIN+ to COM
- differential.....±40 V LIN+ to LIN-

specified ranges.....
- single-ended voltage .....400 mV to 40 V full scale
- differential.....5 mV to 500 mV

accuracy (25 °C)..... ±0.5% of full scale ± 50 µV

bandwidth ..... 2 kHz (-3 dB)

input coupling..... DC

minimum input impedance ..... 1 Megohm

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IMR at 60 Hz.....>90 dB (shorted inputs to chassis)
CMR at 60 Hz.....>60 dB (differential only)

Intrinsic noise.....
single-ended voltage .....± 0.1% of attenuator setting (filters off)
differential.....± 0.1% of attenuator setting (100 Hz low pass)

baseline drift w/temp.....0.1% full scale per °C

CMV (differential only) .....10 V referenced to iso common

isolation .....250 VRMS (to chassis and other iso commons)

calibration .....semi-automated

zero suppression .....yes (limited by maximum span)

user engineering units .....yes

Thermocouple Measurements, Dash 8u ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8U MODEL ONLY

number of channels .....eight

absolute maximum input.....
Single-ended voltage .....± 40 V LIN+ to LIN-

accuracy (25 °C).....0.5% of measurement + 1 °C

compensation error.....± 1 °C

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specified ranges

Type J.....0 °C to 760 °C
Type K.....0 °C to 1370 °C
Type T .....-100 °C to 400 °C
Type E .....-100 °C to 750 °C

bandwidth ..... 10 Hz (-3 dB)

intrinsic noise ..... 0.5 °C

isolation..... 250 VRMS (to chassis and other iso commons)

calibration ..... semi-automated using external reference

user engineering units..... °C or °F

NOTE **ACCURACY SPECIFICATIONS HOLD ONLY OVER THE SPECIFIED RANGE EVEN THOUGH MENUS MAY ALLOW OPERATION OUTSIDE OF THE SPECIFIED RANGE.**

DC Bridge, Dash 8u ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8U MODEL ONLY

number of channels ..... eight

input type ..... isolated, full bridge

absolute maximum input..... ± 40 V LIN+ to LIN-

excitation..... isolated 10 V @ 30 mA

measuring range..... 5 to 500 mVFS

accuracy (25 °C)..... ± 0.5% of full scale

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excitation accuracy .....± 1%

bandwidth .....2 kHz (-3 dB)

CMR at 60 Hz .....> 60 dB

intrinsic noise.....± 0.5% of full scale (100 Hz low pass)

baseline drift w/temp.....0.1% full scale per °C

isolation .....250 VRMS (to chassis and other iso commons)

autobalance.....yes (limited by maximum span)

user engineering units .....yes

RTD Module, Dash 8u ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8U MODEL ONLY

Connector.....screw terminals (4-wire)

Absolute maximum input .....± 10 V

Specified range.....-100 °C to 450 °C

Menu limits .....-100 °C to 600 °C

Minimum span .....50 °C

Maximum span .....500 °C

Excitation type .....current

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Accuracy (25 °C)..... ±0.5% of measurement ±0.5 °C

Bandwidth ..... 10 Hz (-3 dB)

Intrinsic noise..... 0.5 °C (with 10 Hz low pass filter)

Baseline drift w/temp..... 0.035

Cold start drift ..... -0.5 °C (16 minutes)

Isolation ..... 250 VRMS (to chassis and other iso commons)

Calibration..... factory calibrated

User engineering units ..... °C or °F

NOTE **ACCURACY SPECIFICATIONS HOLD ONLY OVER THE SPECIFIED RANGE EVEN THOUGH MENUS MAY ALLOW OPERATION OUTSIDE THE SPECIFIED RANGE.**

HV Module, Dash 8u ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8U MODEL ONLY

Connector ..... guarded banana (sig/ref)

Accuracy (25 °C)..... ± 1.0% of full scale

Bandwidth ..... 800 Hz (-1 dB)

Minimum input impedance ..... 10 Megohm

Maximum range ..... 40 to 400 VFS

Maximum span ..... 800 VFS

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Minimum Span.....4 VFS

Intrinsic noise.....0.5% of attenuator setting (filters off)

Baseline drift w/temp .....0.01% full scale per °C

Isolation .....250 VRMS (to chassis and other iso commons)

User engineering units.....yes

VHV Module, Dash 8u ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8U MODEL ONLY

Connector.....two guarded banana

Accuracy (25 °C) .....± 1.0% of full scale

Bandwidth.....-3 dB @ 2 KHz

Minimum input impedance.....10 Megohm

Maximum range.....2000 VFS

Maximum span .....2000 VFS

Minimum span .....8 VFS

Intrinsic noise.....0.5% of attenuator setting (filters off)

Baseline drift w/temp .....0.1% full scale per °C

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FTV Module, Dash 8u ONLY

THESE SPECIFICATIONS APPLY TO THE DASH 8U MODEL ONLY

Frequency Ranges.....
- Range 1.....10 to 200 Hz
- Range 2.....100 to 2000 Hz
- Range 3.....1000 to 20000 Hz
- Jumper Change

Accuracy (25 °C)
- Range 1.....± 1.0% of full scale or within 2 Hz
- Range 2.....± 0.5% of full scale or within 10 Hz
- Range 3.....± 0.5% of full scale or within 100 Hz

Maximum input ..... ±10 V peak

Minimum input impedance ..... 0.1 Megohm

Hysteresis ..... ±200 mV about trigger level

Trigger level adjust..... 0 V to 2 V

Intrinsic noise..... 0.5% of attenuator setting (filters off)

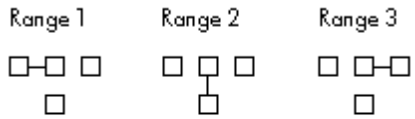
Baseline drift
w/temp (25 °C)..... 0.1% full scale per °C

NOTE ACCURACY SPECIFICATION MAY BE IMPROVED:

- **RANGE 1 TO 0.5% OF FULL SCALE ±50HZ AROUND CAL PT.**
- **RANGE 2 TO 0.1% OF FULL SCALE ±500 HZ AROUND CAL PT.**
- **RANGE 3 TO 0.1% OF FULL SCALE ±5000 HZ AROUND CAL PT.**

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NOTE **RANGE ADJUSTMENTS CAN BE MADE BY RECONNECTING THE JUMPERS, AS SHOWN IN FIGURE 10, DASH 8U FREQUENCY TO VOLTAGE MODULE JUMPER ADJUSTMENT.**



Range 1 10 Hz to 200 Hz (L)
Range 2 100 Hz to 2000 Hz (M)
Range 3 1000 Hz to 20000 Hz (H)

Figure 1 - 68, Dash 8u Frequency to Voltage Module Jumper Adjustment

Fast Fourier Transform (FFT)

output formats.....linear magnitude plot (Engneering Units)
log. magnitude plot (dB)
magnitude squared

number of channels .....any one channel

input data.....real input data from a captured record

input window selection.....three cursor-based methods to fit FFT tests

FFTsize (minimum).....256

FFTsize (maximum).....2048 (nominal is 1024)

Windowing .....yes

Window types .....rectangle, triangle, hamming

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FFT results..... on display

Cursor measurement ..... yes, on-screen

Hardcopy results..... yes

Algorithm..... power-of-2 DFT

Analog Input, Dash 8n ONLY

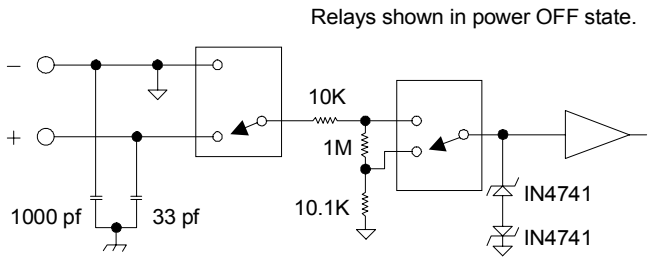


Figure 1 - 69, Analog Input, Dash 8n ONLY

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Differential Input, Dash 8u ONLY

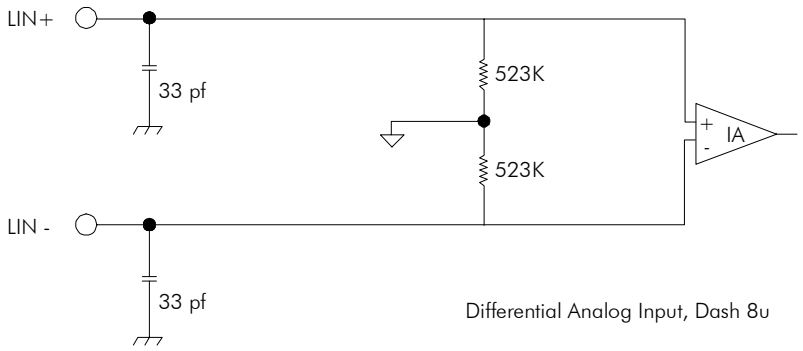


Figure 1 - 70, Differential Input, Dash 8u ONLY

Single-ended Input, Dash 8u ONLY

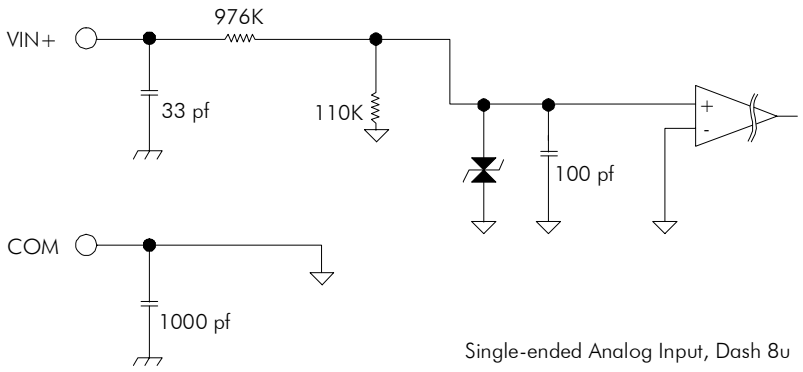


Figure 1 - 71, Single-ended Analog Input, Dash 8u ONLY

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Chapter 2
Set Up for Real-time Operation

Real-time Recording, Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

TO SET UP YOUR DASH 8N MODEL PORTABLE FIELD RECORDER FOR REAL-TIME RECORDING:

1. Examine the recorder's condition and verify that no obvious shipping damage has occurred.

2. Before connecting your recorder to any line-power outlet, **verify that the input line voltage is between 85 and 250 VAC at 50 or 60 Hz**. The appropriate voltage is automatically selected and requires no adjustment.

3. Connect the AC power cord first to the rear panel power input receptacle, and then to a power outlet.

4. Load the recorder with a pack of Astro-Med Z-fold thermal paper.

5. Push the power switch on. Recording automatically begins in the format and mode used during the last recording activity. If an error message is displayed, call Astro-Med Service at 401-828-4000.

6. Set the input type by connecting one or more signal sources to the rear-panel analog-input banana-jack connectors.

7. To define the type of input channel to be used, set the amplifier type from a list of choices. Press the front-panel [AMP] key; select channel (1 - 8) and verify signal conditioner settings. This will allow the amplifier to properly operate and report data in the correct engineering units. This setting will be remembered after power down.

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8. Calibrate the input channel.

9. Select range and offset settings for the channel. Range (or span) is quantity of units from edge to edge and offset is most easily understood as the center reading of this span.

See Also
- Shipping Checklist
- Loading Z-Fold Thermal Paper
- Specifying Signal Conditioning Settings

TO BEGIN RECORDING:

1. Press the front-panel [MODE] hotkey and select a RUN CHART softkey to begin recording.

2. Use the front-panel [RUN/HALT] key to start/stop recording.

3. Press the [MODE] key and select the RUN DISPLAY menu item to activate the display in real-time monitoring in the active format.

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Real-time Recording, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

TO SET UP YOUR FIELD RECORDER FOR REAL-TIME RECORDING:

1. Examine the recorder's condition and verify that no obvious shipping damage has occurred.
2. Connect the AC power cord first to the rear panel power input receptacle, and then to a power outlet.
3. Before connecting your recorder to any line-power outlet, **verify that the input line voltage is between 85 and 250 VAC at 50 or 60 Hz.** The appropriate voltage is automatically selected and requires no adjustment.
4. Load the recorder with a pack of Astro-Med Z-fold thermal paper.

See Also Shipping Checklist
Loading Z-Fold Thermal Paper

TO CONFIGURE THE INPUT CHANNEL FOR A SPECIFIED TYPE ON THE DASH 8U ONLY

1. Select from available input types. This allows the amplifier to properly operate and report data in the correct engineering units. This setting will be retained after power down. Four input types are supported by the Dash 8u:
   - Single-ended voltage
   - Differential voltage
   - Bridge
   - Thermocouple

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2. Consult Table 1, Configuring Dash 8u Input Channels to determine the pin connections required for the desired input type.

INPUT TYPE	PIN CONNECTIONS	UNIT	RANGE
Single-ended voltage	4 COM 5 VIN+	volt (V)	0.4 to 40 VFS
Differential voltage and thermocouple	2 LIN+ 3 LIN-	DIFFERENTIAL VOLTAGE millivolt (mV) THERMOCOUPLE degree (C or F)	5 to 500 mV J, K, T, or E
Bridge	1 EX+ 2 LIN+ 3 LIN- 4 COM	millivolt (mV)	5 to 500 Mv

Table 2 - 1, Configuring Input Channels, Dash 8u ONLY

3. Insert the screwdriver in the screw of the designated pin connection on the Dash 8u terminal block. Turn the screw counterclockwise to open the wire canal. Insert the wire into the wire canal of the pin designation and turn the screw clockwise until the wire is securely in place.

4. Set attenuation from the ADVANCED menu for the channel. Users of the thermocouple and RTD input types may select degrees F or C prior to completing amplifier setup.

5. Calibrate the input channel. If an external module input type is in use, the channel should be calibrated as a voltage channel following the applicable voltage calibration procedure in use for the plug-in module. In most cases this is the standard voltage amplifier and the on-board reference may be used. External plug-in modules must first be removed to perform this procedure and then re-installed for use.

6. Select range and offset settings for the channel. Range (or span) is quantity of units from edge to edge and offset is most easily understood as the center reading of this span.

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NOTE **EXTERNAL PLUG-IN MODULES MAY HAVE A CALIBRATION PROCEDURE TO BE IMPLEMENTED AFTER THE UNIVERSAL INPUT IS CALIBRATED AS A VOLTAGE AMPLIFIER. CALIBRATION TYPICALLY INVOLVES ADJUSTMENT TO TRIMPOTS ON THE MODULE.**

NOTE **ON THE DASH 8U THE CONFIGURATION OF A CHANNEL AFFECTS BOTH SETUP MENUS AND PHYSICAL CONNECTIONS.**

See Also
Rear Panel Elements, Dash 8u ONLY
Input Types, Dash 8u ONLY
Universal Input Channels, Dash 8u ONLY
Specifying Signal Conditioning Settings
Input Range and Zero Suppression
External Input Modules, Dash 8u ONLY

TO BEGIN RECORDING:

1. Press the front-panel [MODE] hotkey and select a RUN CHART softkey to begin recording.
2. Use the front-panel [RUN/HALT] key to start/stop recording.
3. Press the [MODE] key and select the RUN DISPLAY menu item to activate the display in real-time monitoring in the active format.

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Specifying System Setups

System Setup Functions

System setup functions include menu selections for:

- setting the system clock
- specifying color
- keyboard
- utility I/O
- trigger I/O
- verifying the accuracy of internal precision voltage reference
- performing a system software upgrade
- configuring Utility I/O pin 13 function
- configuring Trigger I/O pin 9 function

These functions are defined using the SYSTEM SETUP command options in the System Menu.

See Also
SETUP CLOCK
SETUP COLOR
SETUP TCP/IP
SETUP UTILITY I/O
SYSTEM DEFAULT
SETUP TRIGGER
SYSTEM UPGRADE

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System Setup - Setup Clock

The SETUP CLOCK function is used to set the system date and time.

NOTE **DATE IS EXPRESSED AS DAY, MONTH, YEAR (I.E., 01 FEB 97).**

TIME IS EXPRESSED AS HOUR, MINUTE, SECOND (I.E., 23:05:03) WITHIN A 24-HOUR DAY (I.E. 01:00:00 IS 1 A.M.; 12:00:00 IS NOON; 24:00:00 IS MIDNIGHT).

See Also System Setup Functions
SETUP CLOCK

System Setup - Setup Color

The SETUP COLOR function is used to make changes to display colors. The use of color in the waveform display area can significantly improve visibility of important data. For example, black grid lines on a white background with a magenta pen (trace) provide a sharp contrast.

COLORS CAN BE SPECIFIED FOR:	DEFAULT COLORS ARE:
menu background	blue
grid lines	white
grid background	black
alarms	red
cursors	yellow
event markers	white
pen (trace)	Assorted

Color options include: blue, green, cyan, red, magenta, yellow, black, white.

The Menu text color is fixed as white to provide a stable contrast to the Menu Display region.

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NOTE **A DIFFERENT COLOR FOR THE PORTION OF THE WAVEFORM IN ALARM PROVIDES A CLEAR VIEW OF THE WAVEFORM'S ALARM READOUT.**

See Also
System Setup Functions
SETUP COLOR
Customize Chart Setups

System Setup - Setup TCP/IP

The SETUP TCPIP command is used to setup the IP address, IP subnet mask, and IP default gateway.

See Also
SETUP TCP/IP
System Setup Functions
Host Computer Interface

System Setup - Setup Utility I/O

MOST OF THE INFORMATION IN THIS SECTION APPLIES TO BOTH THE DASH 8N AND TO THE DASH 8U MODELS. HOWEVER, SOME INFORMATION IS SPECIFIC TO ONE MODEL ONLY.

THIS INFORMATION IS NOTED WITH AN ALERT SYMBOL ().

The SETUP UTILITY I/O function is used to set up Pin 13 (configurable input) of the Utility connector for any of the following I/O:

- on-demand buffer (ODB) print
- remote ARM
- remote ID

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The SETUP UTILITY I/O command is also used to verify the system calibration reference output on the Dash 8n model ONLY.

See Also
System Setup Functions
SETUP UTILITY I/O
Utility Connector
Using an External Trigger Source
Verifying Calibration Output, Dash 8n ONLY

System Setup - System Default

The SYSTEM DEFAULT function is used to return all system settings to factory default settings. SYSTEM DEFAULT provides an easy way to quickly clear undesirable settings and replace them with useable pre-programmed settings.

See Also
System Setup Functions
SYSTEM DEFAULT

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Specifying Speed

Speed Functions

Pre-programmed chart recording speed keys are provided on the front panel for making quick and convenient modifications.

The front-panel [SPD] hotkeys allow you to instantly effect faster/slower chart speeds of [1] , [5] , [25] , or [50] mm/second [SEC], mm/minute [MIN], or mm/hour [HR].

Speed modifications can also be made through the SET SPEED, ADVANCED menu command to select a real-time recording speed other than those which are preset, and also to:

- Select the motor clock source: INTERNAL or EXTERNAL.
- Select the display speed: NORMAL or TREND.
- Increase motor accuracy by compensating for physical characteristics of the drive roller (maximum error without compensation is ±2**%**).

NOTE **THE MAXIMUM ALLOWABLE SPEED IS 100 MM/SEC. THREE SPEED SETTINGS ARE AVAILABLE. 1-100 MM PER: SECOND, MINUTE, OR HOUR**

See Also
Set Speed - Motor Source Toggle
Set Speed - Set Display Speed
Set Speed - Chart Speed
Set Data Log Speed

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Set Speed - Chart Speed

The SET SPEED, CHART SPEED menu command is used to select a real-time recording speed other than a pre-set speed. The maximum allowable speed is 100 mm/sec.

NOTE **SPD HOTKEYS ON THE FRONT PANEL PERMIT QUICK SPEED CHANGES WITHOUT THE NEED TO ACCESS THIS MENU.**

See Also
Speed Functions
SET CHART SPEED

Set Speed - Display Speed

Two methods of DISPLAY SPEED control are supported from the SET SPEED menu:

NORMAL (default) ..... When the DISPLAY SPEED command is set to NORMAL, the display will run at the fastest possible display speed (about 100 mm/second), regardless of chart speed.

Selecting NORMAL breaks the connection between the data shown on the display and that presented on the printed chart and causes each display to be refreshed at its maximum rate.

TREND ..... When the DISPLAY SPEED command is set to TREND, waveform data presented on the display can be made to closely approximate the speed and appearance of the printed chart to a maximum of 100 mm/second.

See Also
Speed Functions
SET DISPLAY SPEED
Real-time Display

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Set Speed - Motor Source Toggle

The MOTOR SOURCE TOGGLE command on the SET SPEED menu allows configuration of an external stepper-motor timing source to be referenced in place of the internal clock.

Typically, the print rate of the stepper motor is referenced to a dedicated internal clock specifically tasked with stepper-motor timing control.

Under internal control during real-time recording, the stepper motor moves the chart to a maximum rate of 10 steps per millimeter of distance on the chart.

For certain recording applications, it may be convenient to reference the speed of the stepper motor to an external motor-clock source that you supply. This is especially useful when you want the stepper motor speed to be controlled by a variable other than time. For example, it might be more meaningful to monitor railroad measurements as functions of distance rather than time.

max external
motor clock frequency..... 250 Hz (25 mm/s)

Motor accuracy can be increased by using SPEED ADJUST to compensate for physical characteristics of the drive roller (maximum error without compensation is ±2%).

See Also
- Speed Functions
- MOTOR SOURCE TOGGLE
- Utility Connector

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Specifying Chart Setups

Chart Setup Functions

There are several ways to set up a chart format.

SETUP AUTO-CHART

Any of the default chart formats can also be modified and saved to a RUN CHART softkey using AUTO-CHART.

See Also AUTO-CHART SETUP

CUSTOMIZE CHART SETUPS

In many operating situations, customization of chart setups is unnecessary. Before customizing charts unnecessarily, try using the four default chart formats, or make modifications with AUTO-CHART SETUP command. If a more sophisticated option is required, use the CUSTOMIZE CHART command.

See Also CUSTOMIZE CHART

RUN A DEFAULT FORMAT

The simplest way is to run one of the four Astro-Med default formats, using the DEFAULT ALL CHARTS command.

See Also DEFAULT ALL CHARTS

NOTE **THE DEFAULT ALL CHARTS COMMAND WILL IMMEDIATELY CLEAR PRESENT CHART SETTINGS AND REPLACE THEM WITH THE FACTORY DEFAULTS, PROVIDING A CONVENIENT WAY TO CLEAR EXISTING LAYOUTS.**

See Also Specifying Text

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Default Chart 1 Layout

8 grids, 4 major divisions per grid

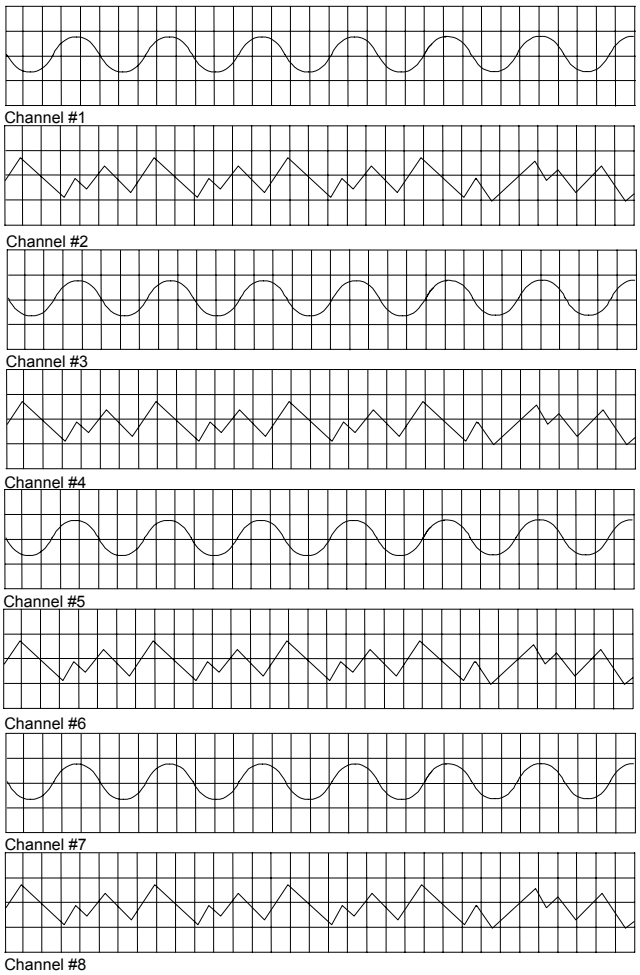


Figure 2 - 1, Default Chart 1 Layout

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Default Chart 2 Layout

4 grids, 8 major divisions, 40 minor divisions

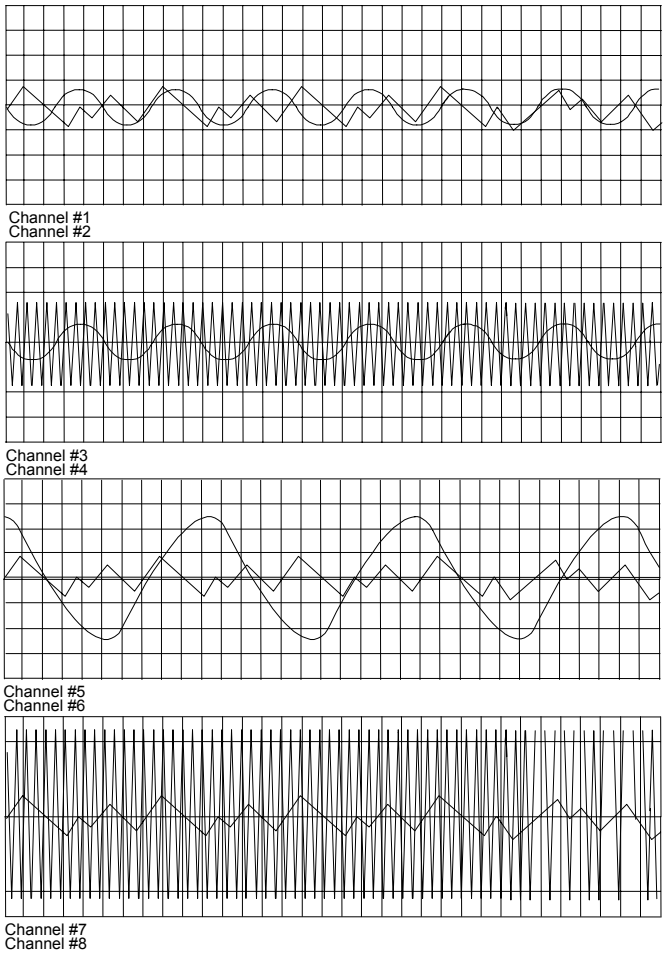


Figure 2 - 2, Default Chart 2 Layout

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Default Chart 3 Layout

2 grids, 16 major divisions, 80 minor divisions

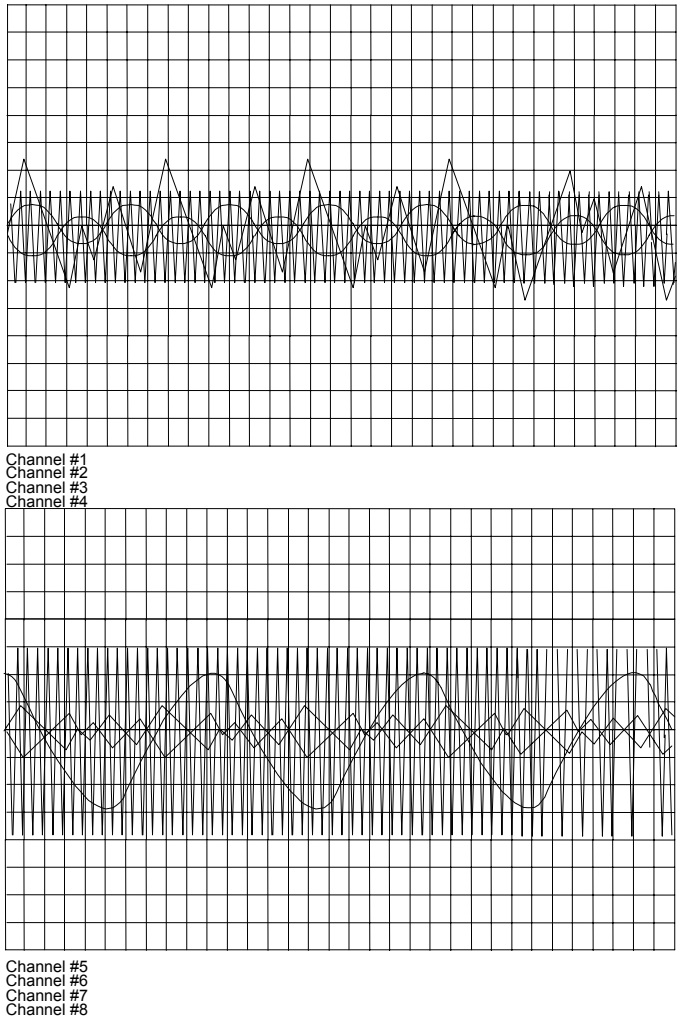


Figure 2 - 3, Default Chart 3 Layout

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Default Chart 4 Layout

1 grid, 36 major divisions, 180 minor divisions

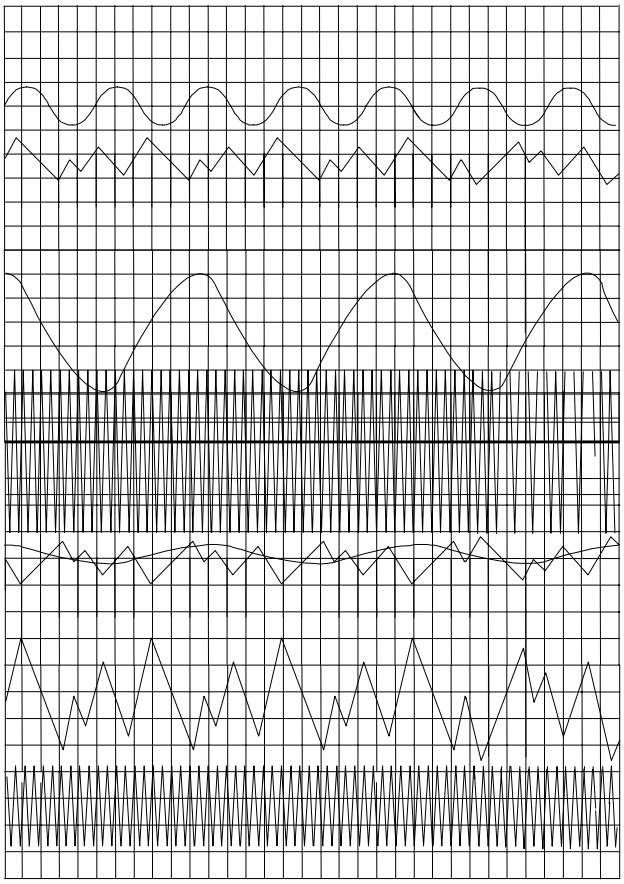


Figure 2 - 4, Default Chart 4 Layout

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Setup up an Auto-Chart

Any of the default formats may be modified and saved to a RUN CHART softkey.

NOTE **ANY CHART FORMATS CREATED IN AUTO-CHART SETUP OR CUSTOMIZE CHART ARE STORED IN RUN CHART (1-4) UNTIL YOU REPLACE THEM WITH A NEW FORMAT.**

See Also
AUTO-CHART SETUP
Customize Chart Setups
Chart Setup Functions

Customize Chart Setups

The four default chart formats and related modifications that can be made using the AUTO-CHART SETUP command are sufficient for most operating situations. However, a more sophisticated option is also provided.

CUSTOMIZE CHART allows you to customize any of the setups you have saved in AUTO-CHART SETUP.

Using the CUSTOMIZE CHART MENU, the grid, waveforms, event markers, and time marks can be modified to create a chart that is suited to your unique requirements by selecting CHANGE GRID, CHANGE EVENT MARKERS, or CHANGE TIME MARK on the menu.

See Also
Customize Chart - Default All Charts
AUTO-CHART SETUP
Chart Setup Functions
CUSTOMIZE CHART
Customize Chart - Change Event Markers
Customize Chart - Change Grid
Customize Chart - Change Time Mark
Customize Chart - Change Waveforms

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Customized settings can also be saved to a file on the Zip disk, or previously-saved settings can be recalled.

See Also ZIP DISK OPERATIONS

Customize Chart - Change Grid

When using the CUSTOMIZE CHART, CHANGE GRID option or when editing TEXT BUFFERS, note:

- Chart locations are measured across the chart from 1 mm near the bottom of the chart to 120 mm near the top of the chart paper.
- The right edge of the grid will move dynamically to each chart location as you turn the encoder wheel or enter a value in the alphanumeric keypad.

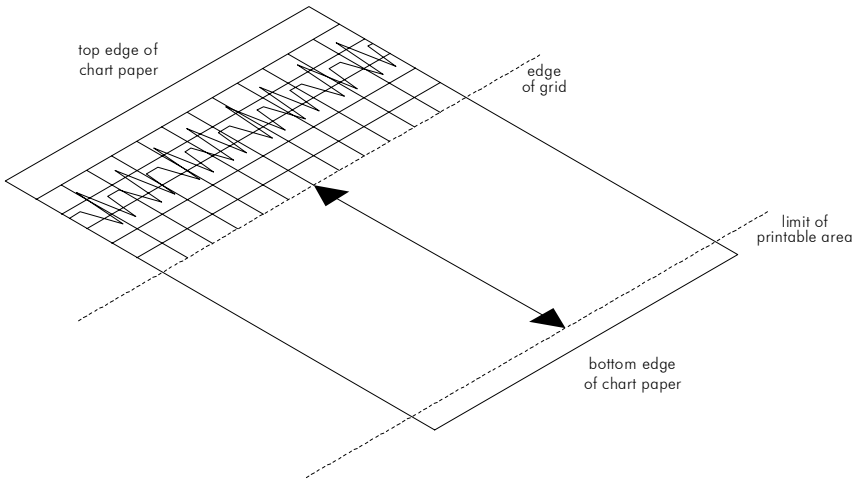


Figure 2 - 5, Grid Layout Example

See Also Customize Chart Setups
CHANGE GRID

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Customize Chart - Change Waveforms

When changing waveform parameters, be aware that adjustments to trace thickness affect all waveforms, but only on the paper recording.

- Selections for the PEN are: UP (hide waveform) DOWN (show waveform).
- Signal conditioner settings are printed in the last 40 character spaces of the annotation buffer.

Chart formats created in AUTO-CHART SETUP or CUSTOMIZE CHART are stored in RUN CHART (1-4) until they are replaced with a new format. When the RECALL SETUP softkey is pressed, present settings are immediately overridden and replaced with stored settings.

See Also Chart Setup Functions
CHANGE WAVEFORMS

Customize Chart - Change Event Markers

Use the CHANGE EVENT MARKERS command to turn printing of the event marker on/off, select print position of the event marker, or select a style for event markers.

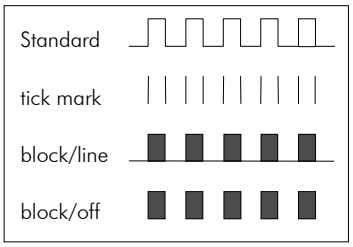


Figure 2 - 6, Event Marker Styles

NOTE **EVENT STYLE SELECTIONS ARE GLOBAL, THEY APPLY TO ALL EVENTS.**

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Pressing the [MARK] hotkey causes the system mark at the top of the chart to activate in the manner setup by its event style. This system event marker provides a convenient way to place a mark on the chart to identify the start or end of some particular change in a test.

See Also
CHANGE EVENT MARKERS
Chart Setup Functions
System and Event Markers

Customize Chart - Change Time Mark

Use CHANGE TIME MARK to select the timer rate for tri-level timing marks, turn printing of timer mark on and off, and to select whether the timing mark will be printed on the chart's left, right, or both edges.

See Also
CHANGE TIME MARK
Chart Setup Functions

Customize Chart - Default All Charts

The DEFAULT ALL CHARTS command immediately clears present chart settings and replaces them with the four factory default formats.

See Also
Default Chart 1 Layout, 8 grids (8 individual channels) 4 major and 20 minor divisions per grid

Default Chart 2 Layout 4 grids (each grid showing two overlapping channels) 8 major and 40 minor divisions per grid

Default Chart 3 Layout 2 grids (each grid showing four overlapping channels) 16 major and 80 minor divisions per grid

Default Chart 4 Layout 1 grid (eight overlapping channels) 36 major and 180 minor divisions on grid

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Customize Chart - Copy Charts

The COPY CHARTS command is used to copy one chart layout setup to another. This is convenient for copying an existing format stored in RUN CHART and making minor modifications to it, to create a new layout.

Both customized and default layout formats can be copied using COPY CHARTS.

See Also
- Customize Chart - Default All Charts
- Setup up an Auto-chart
- Customize Chart Setups
- COPY CHARTS

Specifying Text

There are a variety of annotation tools available for adding text to charts. Your portable field recorder is equipped with:

- Eight 128-character annotation buffers, each of which is movable to any of 127 positions across the chart
- one on-demand buffer that can be printed in any of 127 locations across the chart in response to a menu key or the UTILITY port multi-purpose input
- one system log buffer fixed near the top of the chart
- capacity to print channel identification numbers either on-demand or automatically and continuously

See Also
- EDIT LABELS/TEXT
- Editing Text Buffers
- Printing Channel Identification Numbers
- Utility Connector

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Editing Text Buffers

The EDIT LABELS/TEXT command is used to edit any of the system's 10 text buffers.

- channels 1-8
- on-demand buffer
- system log (printed at top of chart)

The EDIT LABELS/TEXT command provides one-time printing of the full 128 characters in the selected text buffer. The menu allows you to position the channel text buffer or on-demand text buffer anywhere on the chart.

See Also Specifying Text
EDIT LABELS/TEXT
Printing Channel Identification Numbers

Printing Channel Identification Numbers

Channel ID numbers provide a simple way of quickly identifying and locating each waveform channel on the chart. They are especially useful when waveforms overlap during recording as shown in Figure 7, Channel Identification on Waveforms.

Use the SETUP KEYBOARD command to enable/disable continuous automatic printing of channel ID numbers.

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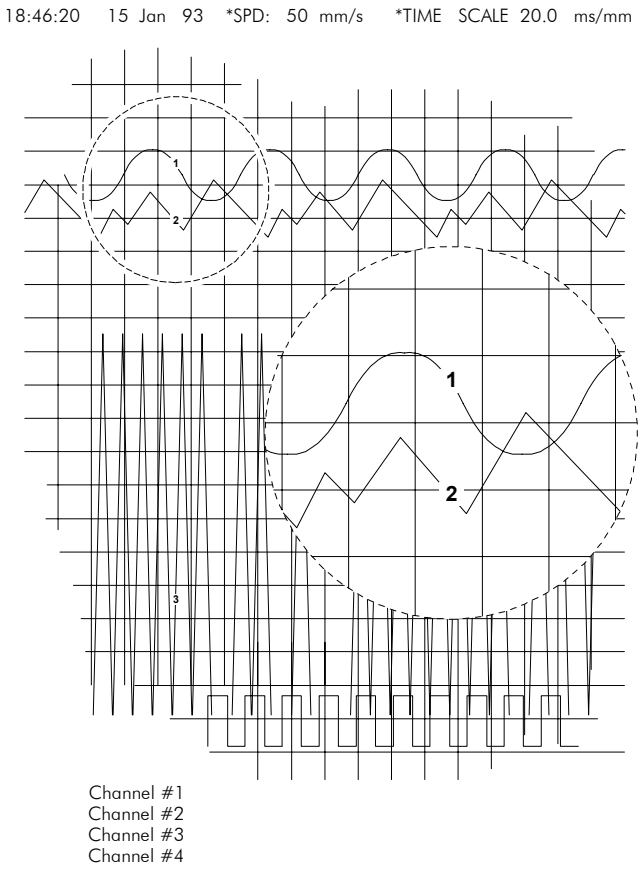


Figure 2 - 7, Channel Identification on Waveforms

The Channel ID Number is repeated every 128 characters (in synch with the text buffers) or once about every two pages.

The [ID] hotkey can also be used to enable printing of the channel ID number on each waveform when desired.

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The label type (wave/edge labels or waveform ID) is then selected through the SETUP KEYBOARD command.

LABEL TYPES

wave/edge .....label printed close to the waveform
simple waveform id.....label overprinted directly on the waveform

See Also
- Specifying Text
- Editing Text Buffers
- SETUP KEYBOARD
- Pre-set Function Hotkeys

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Configuring Dash 8u External Input Modules

External Input Modules, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

The Dash 8u model supports external plug-in modules to provide additional input types. Unlike the universal inputs of the Dash 8u, each plug-in module is dedicated to a specific input type. External module offerings include the following input types:

- Resistance Temperature Detector (RTD)
- High Voltage (HV)
- Very High Voltage (VHV)
- Frequency to Voltage (FTV)

The modules are designed to provide a linear voltage to the Dash 8u input so that only offset and scaling are performed by the Dash 8u DSP. When the user selects the input type from the setup menu, the Dash 8u automatically selects the optimum voltage range (if appropriate) and provides applicable units.

In some cases, a sub-menu will be provided which allows the user to calibrate the input using an external source.

Each external input module is 3.6" high and 1.1" wide. Modules may be passive or active, with power taken from the 10V excitation voltage.

See Also
Resistance Temperature Detector Module Dash 8u ONLY
High Voltage Module Dash 8u ONLY
Very High Voltage Module Dash 8u ONLY
Frequency to Voltage Module Dash 8u ONLY
Installing External Input Modules, Dash 8u ONLY

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Installing External Input Modules, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

The Dash 8u supports an installed base of up to eight external plug-in modules.

The faceplate of each module includes a mounting screw, secured to the rear chassis of the Dash 8u to hold the module in place. A five-pin terminal at the back of the module is plugged into the channel slot's header to provide necessary pin connections. See Figure 1, Installing External Input Modules Dash 8u ONLY.

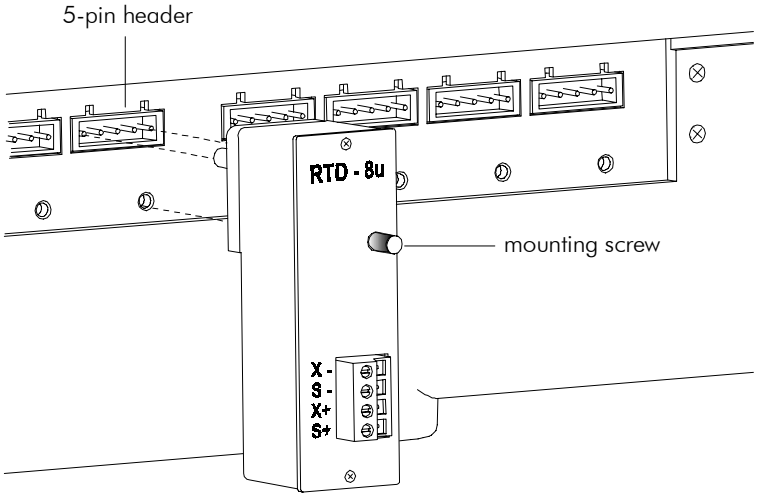


Figure 2 - 8, Installing External Input Modules, Dash 8u ONLY

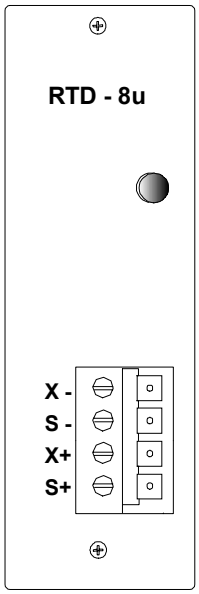
See Also External Input Modules, Dash 8u ONLY
Rear Panel Elements, Dash 8u ONLY

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Resistance Temperature Detector, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

The Dash 8u Resistance Temperature Detector (RTD) module is designed to support direct connection of a platinum RTD. The connecting RTD must be a 100-ohm device in accord with DIN 43760 (known at a PT100). The connecting device is used to measure temperatures.



Current excitation is used with support for a 4-wire measurement. A 4-wire measurement is most accurate because it minimizes the effect of lead resistance.Because a 2-wire measurement is simpler, the module is shipped configured for a 2-wire measurement.

Connections are: X+, X- (excitation), S+ and S- (signal). The module is shipped to support 2-wire measurement, with X+ internally connected to S+ and X- internally connected to S-. To configure for 4-wire measurement, remove shorting resistors R11 and R4 or contact Astro-Med, Inc. Technical Support.

When the module is used in its 2-wire configuration, leaving inputs open may affect the accuracy of neighboring channels. To avoid this, connect a 100-ohm resistor to inputs when an RTD is not being used.

Module circuitry includes linearization which is optimized for a temperature range from –100 □C to 450 □C. The module will handle temperatures as high as 600 □C but with reduced accuracy.

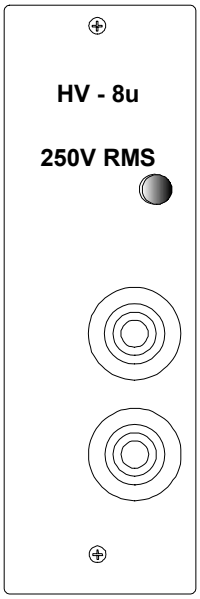
Figure 2 - 9, Resistance Temperature Detector Module, Dash 8u ONLY

See Also RTD Module, Dash 8u ONLY
External Input Modules, Dash 8u ONLY
Contacting Technical Support

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High Voltage Module, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY



The Dash 8u high voltage module is designed to support direct connection to voltages with transient amplitudes up to 400 volts. Inputs must be limited to an RMS value of 250 volts – essentially a 10-to-1 divider in front of the VIN+ input.

No offset adjustment is available for ranges greater than 400 VFS. This allows a user to monitor bi-polar signals such as line voltage without violating the maximum input specification. Full offset control is available for ranges less than 400 VFS.

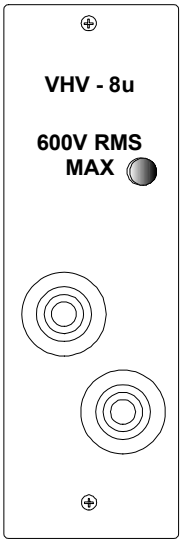
Figure 2 - 10, High Voltage Module, Dash 8u ONLY

NOTE **50 HZ / 60 HZ INTERFERENCE MAY BE MINIMIZED BY CONNECTING THE INPUT SIGNAL GROUND TO EARTH; HOWEVER, THE INPUT WILL NO LONGER BE ISOLATED.**

See Also HV Module D8u ONLY
External Input Modules, Dash 8u ONLY

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Very High Voltage Module, Dash 8u ONLY



THIS SECTION APPLIES TO THE DASH 8U ONLY

The Dash 8u very high voltage module is designed to support direct connection to voltages with transient amplitudes up to 2000 volts. Features of the very high voltage module include IMR suppression and high input capability.

Figure 2 - 11 , Very High Voltage Module, Dash 8u ONLY

Attenuator ranges available in the very high voltage module are:

Dash 8u ATTENUATOR	Dash 8u HIGH READING	Dash 8u LOW READING	Dash 8u ALLOWABLE ERROR
200 V	0.17 V	0.03 V	± 1.0 V
2000 V	0.53 V	-0.62 V	± 10 V

Table 2 - 2, VHV Module Attenuator Ranges, Dash 8u ONLY

See Also VHV Module, Dash 8u ONLY
External Input Modules, Dash 8u ONLY

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Frequency to Voltage Module Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

The Dash 8u frequency to voltage module is designed to count the frequency of a signal and convert it to a static, measurable level. The module has three settings and is set to a specific range before shipping. Features include triple frequency range and trigger level adjust.

See Also FTV Module, Dash 8u ONLY
External Input Modules, Dash 8u ONLY

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Amplifier & Channel Settings

Specifying Signal Conditioning Settings

Recorder sensitivity and signal conditioning settings are specified in the menus accessed through the [AMP] hotkeys. These settings, specified by channel, include:

- RANGE
- OFFSET
- DC / GND (single-ended, differential, high voltage)
- PEAK-TO-PEAK / RMS (single-ended, differential, high voltage, bridge only)
- DSP / FILTER (including the waveform math function)
- USER SCALING (single-ended, differential, high voltage, bridge only)
- CALIBRATION (set differently per model)
- ATTENUATION (set differently per model)

Built-in signal conditioners automatically report their gain and position settings in the last forty spaces of the channel's annotation buffer.

NOTE **CALIBRATION AND ATTENUATION ARE SET DIFFERENTLY DEPENDING ON THE HARDWARE MODEL.**

Input Range and Zero Suppression

IF MARKED WITH AN ALERT SYMBOL ( ), THE DESCRIPTION IS SPECIFIC TO THE DASH 8N OR 8U ONLY. IF NOT MARKED, THE DESCRIPTION APPLIES TO BOTH MODELS.

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Signal amplification is specified in terms of the full-scale chart recording. Additionally, a signal offset is specified which defines the value assigned to the center of the grid.

For example, on the Dash 8n model, specifying 100 mV full scale and an offset of 200 mV produces a signal range of 150 mV to 250 mV.

All entries can be specified in either voltage or derived user engineering units.

Measurement range is specified by three user settings. Settings are generally given in Volts, but can be specified in User Engineering Units if this feature is active. Entries can be made using the encoder wheel or through the alphanumeric keypad.

Attenuator.....Determines the input attenuator setting which limits the maximum input and sensitivity. This choice also determines the amount of available zero suppression.

This choice also determines the amount of available offset (on the Dash 8u).

Range.....Determines the measurement span at full scale. Can be specified by turning the encoder wheel or making entries through the alphanumeric keypad. Numeric entry for range has greater resolution than offered through the wheel options. Available choices for range are determined by the attenuator settings.

Dash 8 ATTENUATOR	Dash 8 RANGE
5 V	200 Mv to 5000 mV
50 V	2 V to 50 V
500 V	20 V to 500 V
500 mV	50 mV to 500 mV

Table 2 - 3, Attenuator/Range Choices, Dash 8n ONLY

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Dash 8u INPUT TYPE	Dash 8u ATTENUATOR	Dash 8u RANGE	Dash 8u WHEEL STEP
Single-ended (STD) Voltage	40 V 4 V	2 V to 40 V 0.2 V to 4 V	0.1 V 0.010 V
Differential Voltage	500 mV 50 mV	20 mV to 500 mV 2 mV to 50 mV	10 mV 1 mV
Bridge	400 mV 40 mV	20 mV to 400 mV 2 mV to 40 mV	10 mV 1 mV
Thermocouple All integer values from:		20 °C to 800 °C (Type J) 20 °C to 1400 °C (Type K) 20 °C to 1100 °C (Type E) 20 °C to 800 °C (Type T)	
NOTE If degrees are specified in Fahrenheit (°F), the selections for °C shown in the menu will double in value.			
NOTE If using the thermocouple input type, specify the type as J, K, T, or E. the choice of type determines menu choices for span and offset. Settings are specified in either degrees Celsius or degrees Fahrenheit. The user engineering units feature is not available. Some menu choices for measurement range may exceed th specified ranges, but accuracy specifications apply only to specified ranges.			

Table 2 - 4, Attenuator/Range Choices, Dash 8u ONLY

Offset ..... Specifies the center point of the grid. Offset can be specified by turning the encoder wheel or making entries through the alphanumeric keypad. The available choices are limited by the attenuator settings. The offset parameter combines zero suppression and baseline offset into a single adjustment.

Dash 8 ATTENUATOR	Dash 8 OFFSET
5 V	2750 mV to 2750 mV
50 V	27.5 V to 27.5 V
500 V	275 V to 275 V
500 mV	275 mV to 275 mV

Table 2 - 5, Offset Choices, Dash 8n ONLY

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See Also Real-time Recording, Dash 8u ONLY
Real-time Recording, Dash 8n ONLY
Specifying Signal Conditioning Settings

Universal Input Channels, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

Input channels are located on the rear panel of the Dash 8u. Each input channel includes a 5-pin terminal block with the following pin (signal) designations:

- excitation (EX+)
- low voltage input (LIN+)
- low voltage input (LIN-)
- common (COM)
- voltage input (VIN+)

The Dash 8u terminal block permits direct connection of bare wire to configure the channel to an input type. Each Dash 8u channel has two physically separate input paths. The differential input consists of LIN+ and LIN- and is used to connect low-level differential signals and thermocouples. The voltage input (VIN+), is used for single-ended voltages up to 40 volts with reference to COM (isolated common).

Isolation .....All inputs and excitation (EX+) are isolated to 250 volts, as DC or RMS, from chassis and other channels. EX+ is not considered an input and should never be connected to a voltage source.

This isolation specification applies to all measurements with the Dash 8u, including thermocouple and bridge.

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Single-ended
voltage measurements..... Voltages up to 40 volts can be measured by connecting them to VIN+ ad COM. Performance, including bandwidth, is similar to the single-ended Dash 8n model, but the available ranges are limited to a maximum span of 40 VFS and a minimum span of 0.2 VFS.

DC bridge..... Each channel configured to a DC bridge input type provides an isolated 10 volt excitation which can source up to 30 mA, referenced to COM. This permits direct support of single-ended full bridge transducers with the outputs wired to LIN+ and LIN-. The Dash 8u is designed to support transducers rated at 1, 2, and 3 mV/v. A limited auto balance is provided. Other bridge measurements are possible, but external completion resistors may be required. Specifications are given in mV. Divide by 10 to convert to mV/V.

Thermocouple..... Thermocouples are connected directly to LIN+ and LIN-, with types J,K, T, and E supported. An independent temperature sensor is used to provide cold junction compensation; all types are linearized by the DSP. Linearization is based on the NIST polynomial which determines the specified ranges for each type. Thermocouple bandwidth is much lower than other measurements (sample rate = 1kHz). Break detect is not provided.

DSP capability..... Except for thermocouple measurements, DSP capability is equivalent to the single-ended Dash 8n model, including filtering and RMS. Thermocouple DSP is restricted to low pass filtering.

See Also Rear Panel Elements, Dash 8u ONLY
Input Types, Dash 8u ONLY
Specifying DSP Filter Settings

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Input Types, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

The Dash 8u supports the following input types:

Single-ended voltage.....The single-ended voltage input type is used to record voltages applied between the VIN_ and COM pins. This input is single-ended, but is isolated from chassis common and other channel inputs. Channel settings are generally specified in volts but can be specified in user engineering units if this feature is active.

Differential voltage.....The differential voltage input type is used to record differential voltages applied between the LIN+ and LIN- pins. This input is isolated from chassis common and other channel inputs. Channel settings are specified in millivolts but can be specified in user engineering units if this feature is active.

Bridge .....The bridge input type is used to record ROM transducers that are wired as a full bridge. Excitation is connected to EX+ and COM while the signal is connected to LIN+ and LIN-. All connections are isolated from chassis common and other channel inputs. Channel settings are specified in millivolts but can be specified in user engineering units if this feature is active. Excitation is always 10 volts, so conversion to mV/V is simple.

Thermocouple.....The thermocouple input type is used to record the output of single-ended thermocouple probes. The thermocouple is applied between the LIN+ and LIN- pins. This input is isolated from chassis common and other channel inputs.

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External..... The Dash 8u model also supports external plug-in modules to provide additional input types. Unlike the universal inputs of the Dash 8u, each plug-in module is dedicated to a specific input type.

Define the type of input channel to be used by setting the amplifier type to properly operate and report in the correct engineering units. This setting will be remembered after power down.

See Also External Input Modules, Dash 8u ONLY
Real-time Recording, Dash 8u ONLY

Setting Attenuation

An attenuator determines the input attenuator setting, which limits the maximum input and sensitivity of the amplifier, particularly the range (full scale span), as well as the amount of available offset.

NOTE **ON A DASH 8U MODEL ONLY - FULL SCALE OUTPUT OF THE TRANSDUCER WITH 10 V EXCITATION IS 20 OR 30 MV.**

See Also Input Range and Zero Suppression
SET ATTENUATOR, Dash 8n ONLY
SET ATTENUATOR Dash 8u ONLY

Setting Range

Use the SET RANGE command to determine measurement span at full scale.

NOTE **RANGE OPTIONS ARE DETERMINED BY ATTENUATOR SETTINGS.**

See Also Input Range and Zero Suppression
SET RANGE Dash 8n ONLY
SET RANGE Dash 8u ONLY

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Setting Offset

The SET OFFSET command is used to specify the center point of the grid.

NOTE **OFFSET OPTIONS ARE DETERMINED BY ATTENUATOR SETTINGS.**

The waveform's zero baseline can be positioned using the offset setting. When positioning the waveform in the channel, the center of the grid is used as the reference location.

Some waveform input signals may contain an unwanted direct-current (DC) component. The signal's DC component may make it difficult to bring the waveform data of interest onto the chart. In these cases, offset is used to remove from 5 V to 250 V of a waveform's DC component and bring the data of interest onto the chart for recording and analysis.

The offset parameter can be thought of as either zero suppression or baseline offset, depending on the application.

See Also Input Range and Zero Suppression
Customize Chart - Change Grid
SET OFFSET Dash 8n ONLY
SET OFFSET Dash 8u ONLY

Setting DC or GND

DC/GND is used to enable (DC) or to ground (GND) the channel's input signal.

See Also DC / GND

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Specifying DSP / FILTER Settings

The following DSP functions are provided:

- low-pass
- notch
- waveform math
- d/dt
- high-pass
- band-pass
- integrate

Peak-to-peak and RMS recording modes can be selected for any specified channel.

The setup for MATH, if used, is found under DSP / FILTER SETUP. If the math DSP task is selected, the additional setup parameters required are accessible by the MATH hotkeys on the front panel. Math signals can be viewed in Y-T or numeric format.

NOTE **IF RMS IS ENABLED, FILTER SETTINGS DO NOT APPLY.**

See Also
Digital Signal Processing
SETUP DSP / FILTER
Waveform Math Function

Specifying Differentiation

The following are guidelines for implementing the differentiation DSP option and USER SCALING. With a known time constant, outputs can be scaled to true V/sec readings by entering a user-definable scale factor.

$$\text{output [V/sec]} = \text{scale factor [1/sec]} \times \text{output [V]}$$

$$\text{where scale factor is: } \frac{1}{\text{T.C.[sec]}} \times \frac{1}{10}$$

The 1/10 takes into account an additional resolution factor added to recorder software.

Equation 2 - 1, Output Scale Factor

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See Also
Specifying DSP / FILTER Settings
SETUP DSP / FILTER
SETUP USER SCALING

Specifying Integration

The following are guidelines for implementing Integration DSP option and USER SCALING. Time constant for the user-definable scale factor:

output [V·sec] = output [V] x time constant [sec]

Equation 2 - 2, Time Constant for Scale Factor

See Also
SETUP DSP / FILTER
SETUP USER SCALING

Setting Peak-to-Peak RMS

Peak-to-Peak / RMS, implemented in the digital signal processor (DSP), is used to direct the DSP to take the input signal of the channel and perform root-mean-square (RMS) so that what gets recorded, displayed, and captured is the RMS of the signal.

NOTE THE END RESULT IS A TRUE RMS CALCULATION.

Peak-to-peak and RMS recording modes can be selected for any specified channel.

- When RMS is enabled, the time constant can be adjusted in the SETUP DSP FILTER menu.

See Also
PK-PK / RMS
Specifying DSP / FILTER Settings

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Copying Amplifier Settings

The COPY AMPLIFIER command is convenient for speeding up the process of setting up similar channels. The command is used to copy the signal conditioner settings of one channel (source channel) to another channel or to all channels.

AstroSET™ C can also be used to to copy the amplifier settings of one channel to all channels.

See Also COPY AMPLIFIER
What is AstroSET

Printing Amplifier Settings

Built-in signal conditioners automatically report their gain and position settings in the last forty spaces of the channel's annotation buffer. Use the AMP REPORT ON command to print AMP settings on the chart.

See Also CHANGE WAVEFORMS

Autobalance for the Bridge Input Type, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

AUTOBALANCE is used to add a factor to the input level so the result is zero.

Dash 8u ATTENUATOR	Dash 8u BALANCE FROM
400 mV	-100 mV to 100 mV
40 mV	-10 mV to 10 mV

Table 2 - 6, Autobalance Range, Dash 8u ONLY

See Also AUTOBALANCE Dash 8u ONLY
Input Range and Zero Suppression

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Math Functions

Waveform Math Function

The waveform math function is used to find the sum of, difference between, product of, or ratio of two channels and view the output signal or measurements in any of the chart formats.

Math signals can be viewed in either Y-T or numeric format. The math channel can be recorded in real time or logged numerically.

Each math channel replaces an input channel - no new channels are added. To view an input channel, use another channel under similar conditions as the input channel. Input signals must lie within the range specified to avoid pegging or overload. Input signals that are over-range cannot perform math properly.

The channel designated as the math channel will log or record the results of the waveform math function.

In one sense, the MATH implementation is best thought of as another DSP task that can be selected from list of FILTER/TASKS found in the product for the channels.

NOTE **THE MATH FUNCTION CANNOT BE USED AT THE SAME TIME AS THE EXISTING FILTER CAPABILITY.**

NOTE **MATH IS AN OPTIONAL FEATURE. YOUR EQUIPMENT MAY NOT PROVIDE THIS FUNCTIONALITY**

See Also
Addition and Subtraction
Multiplication and Division
SETUP MATH CHANNEL
Setting User-defined Engineering Units
Specifying DSP / FILTER Settings

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Addition and Subtraction

Addition and subtraction functions provide the ability to add or subtract input source channels of like terms (or units). Examples may include finding difference or sum of voltages, temperatures or user units for 2 channels.

Amplifier types for input channels A and B must be similar. Use the CHANGE AMP TYPE... selection in the [AMP] menu to select the correct input types.

The engineering units you define in the SETUP USER SCALING menu must be the same for both input channels, A and B. For example, you cannot set one of the channels to Celsius and the other to Fahrenheit - both channels must be set to the same unit. The engineering units you have defined for the input channel will be the same in the output result of the math channel (e.g., voltage, degrees).

If input channel A or B has external user units enabled (due to the use of an external conditioner), the user scaling setup, or ratios, should be the same for both channels to ensure that the amplifiers appear as similar channels. The range and offset in use on those input channels can be different.

The results may be represented with defined output scaling limits similar to the input range. Output range and offset limits are generally one-half or twice the limits of the input amplifier. If math results are degraded or signal pegging occurs, check these output parameters.

EXAMPLE:

TO FIND THE DIFFERENCE BETWEEN TWO VOLTAGE CHANNELS SET UP AS STD VOLTAGE, EACH OF WHICH MAY HAVE A DIFFERENT INPUT RANGE SPECIFICATION:

1. Set both channels to STD VOLTAGE
2. Define Channel 1 to become A-B.
3. Select A-B and specify A, B Channels.

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4. Under SETUP MATH CHANNEL, select an output range and offset (easiest by set default).

5. Channel 1 will record A-B results.

See Also Waveform Math Function
Multiplication and Division

Multiplication and Division

The multiplication function is used to find the product of two input channels; the division function is used to find the ratio of two input channels. The input channels need not have like engineering units.

WARNING IF USER SCALING IS ENABLED, THE FIRST TWO CHARACTERS YOU SPECIFY AS THE NAME OF THE ENGINEERING UNIT WILL BE USED IN EXPRESSING THE RESULT OF THE PRODUCT OR RATIO. THEREFORE, IT IS ADVISABLE TO LIMIT THE NAME OF THE ENGINEERING UNIT USED FOR EACH INPUT CHANNEL TO ONE OR TWO CHARACTERS.

In multiplication and division math ONLY, a menu option is provided which allows you to override the user scaling setup and assign a six-character name to the result of the product or ratio. For example, you could re-specify the result of a product expressed as A*A to "watts."

EXAMPLE:

TO FIND INSTANTANEOUS POWER FROM A VOLTAGE CHANNEL AND A CURRENT CHANNEL THAT USES A CURRENT PROBE OR SHUNT:

1. For the current channel, specify the name of the engineering unit to be "A" (for amps) under SETUP USER SCALING (custom).

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2. Specify 1 V = 20 A. No engineering units would be specified for the voltage channel.

3. The product will be instantaneous power expressed as "V*A." If the engineering unit for amps is defined as "AM" under SETUP USER SCALING, the result of the product will be "V*AM."

For application tips on power monitoring with portable field recorders, contact Astro-Med Technical Support at (800) 343-4039.

See Also Waveform Math Function
Addition and Subtraction

Setting User-defined Engineering Units

The SETUP USER SCALING option in the AMP menu applies only to voltage input types. SETUP USER SCALING is used to select a scaling value used to convert voltage values into user-defined engineering units.

When recording changes in temperature, pressure, or any other quantity that is not specifically voltage, it may be useful to print your data as numeric engineering units rather than waveforms on a grid.

All signal information enters the recorder as an electrical voltage. User scaling selects a scaling value used to convert voltage values into user-defined engineering units (e.g., pressure, temperature) that you wish to monitor.

Numeric scaling begins with selecting the voltage sensitivity of the channel full scale. The user scaling parameter is used to redefine the voltage sensitivity in terms of the engineering units desired. The recorder will then convert all of the signal voltage data into the engineering units specified.

When user scaling is used, all appropriate menus will be displayed in the engineering units that you define. The SETUP USER SCALING menu is used to define two values:

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V span .....voltage increment that will be defined as equaling one engineering-unit increment

six-letter name .....engineering-unit increment that will be defined as equaling one voltage increment (i.e., PSI, mmHg)

Engineering units are determined by using the first (2) characters of each of the input sources' engineering units along with a mathematical indicator.

In multiplication and division math ONLY, a menu option is provided which allows you to override the user scaling setup and assign a six-character name to the result of the product or ratio. For example, you could re-specify the result of a product expressed as A*A to "watts."

See Also
SETUP USER SCALING
SETUP MATH CHANNEL
Waveform Math Function
Multiplication and Division
Addition and Subtraction

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Calibrating Channels

Calibrating Channels, Dash 8n ONLY

THIS SECTION APPLIES TO THE DASH 8N MODEL ONLY

Calibration should be performed after a software upgrade. Use the CALIBRATE softkey on the [AMP] menu to calibrate each channel to the Dash 8n model's precision voltage references. For the purpose of system calibration, the Dash 8n is equipped with two internal voltage references: 2.5 V and 10 V.

See Also CALIBRATE, Dash 8n ONLY

Calibrating Channels, Dash 8u ONLY

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

To simplify calibration of individual channels, a calibration module is shipped with your Dash 8u. When the module is installed, CALIBRATE can be selected from the [AMP] menu to perform calibration of the channel to precision voltage references.

The calibration module includes both a 2.5 volt reference and a 250 millivolt reference.

If you prefer not to use the calibration module provided by Astro-Med, Inc., calibration can be performed using calibration equipment provided by other vendors. Contact Technical Support for further information.

See Also CALIBRATE, Dash 8u ONLY
Calibrating the VHV Module
Calibrating the FTV Module
Contacting Technical Support

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Calibrating the FTV Module

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

TO CALIBRATE THE FREQUENCY TO VOLTAGE EXTERNAL PLUG-IN MODULE:

1. First, set up the channel by changing the AMP type to Frequency to Voltage. There are three types of frequency to voltage modules. The type is determined by the jumper setting.
   - If T2 is connected to T1, the range is low.
   - If T2 is connected to T4, the range is medium
   - If T2 is connected to T3, the range is high.
2. Set the full scale range to maximum.
   - If the range is low maximum is 200 Hz
   - If the range is medium, maximum is 2000 Hz
   - If the range is high, maximum is 20000 Hz
3. Set offset to half of the full sale range so that the bottom grid edge is 0 Hz and the top is max.
4. Apply a low pass filter to the signal. The cutoff frequency should be set as follows:
   - If the range is low, cutoff should be 1 Hz.
   - If the range is medium, cutoff should be 3 Hz.
   - If the range is high, cutoff should be 5 Hz.
5. Run DATA LOGGER.

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6. Connect the output of a waveform generator to the module under CAL and a high accuracy counter.
7. Set the wave type to sine and the amplitude to about 5 V.
8. Set the frequency of the generator to the desired CAL point. The module is most accurate around the cal pint.
   - If the range is low, the high accuracy ban is ±50 Hz.
   - If the range is medium, the high accuracy band is ± 500 Hz.
   - If the range is high the high accuracy band is ±5000 Hz.
9. Make sure the frequency is as close as possible to the desired cal point.
10. Adjust the CAL trim-pot on the module until the data logger reading matches the frequency counter reading.

See Also Frequency to Voltage Module Dash 8u ONLY

Calibrating the VHV Module

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

TO CALIBRATE THE VERY HIGH VOLTAGE EXTERNAL PLUG-IN MODULE:

1. First, set up the channel by changing the amp type to Very High Voltage.
2. Set range to 80V full scale
3. Set offset to 0 V.
4. Turn all filters off.
5. Run the unit for at least fifteen minutes before calibration.
6. Using the external calibration module, calibrate the channel.

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7. Set up display so that the waveform is shown on the largest possible grid (180 mm). While each channel is measured, all other channels should be off (pen lifted).

8. Short the inputs of the module under test.

9. Connect the positive lead of a hi-pot to the shorted inputs of the module under test.

10. Connect the negative lead of the hi-pot to the chassis of the recorder.

11. Make sure the voltage adjustment knob on the hi-pot is on the lowest voltage.

12. Turn on the hi-pot.

13. Slowly turn the voltage up to about 175 Vrms.

14. Run the display.

15. Carefully adjust the trim-pot on the module until the amplitude of the waveform is as small as possible.

See Also Very High Voltage Module, Dash 8u ONLY

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Chapter 3
Real-time Operation

Timed & Dual-Speed Recording

Setup Dual Speed Recording

The DUAL-SPEED RECORDING command allows you to toggle between two recording speeds – either as a result of a trigger or the passage of time.

Timed.....Toggles the recorder between two different chart speeds continuously and automatically after operating at each speed for a specified time.

Triggered .....Toggles the recorder between two different chart speeds continuously and automatically each time a trigger is used.

NOTE **MAXIMUM ALLOWABLE SPEED IS 100 MM/SEC. THREE SPEED SETTINGS ARE AVAILABLE. 1-100 MM PER: SEC, MIN, OR HOUR.**

See also DUAL SPEED RECORDING
Set Speed - Motor Source Toggle

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Setup a Timed Recording

TIMED RECORDING is used to specify a time to begin automatic recording.

NOTE **DATE IS EXPRESSED AS DAY, MONTH, YEAR (I.E., 01 FEB 97). TIME IS EXPRESSED AS HOUR, MINUTE, SECOND (I.E., 23:05:03) WITHIN A 24-HOUR DAY (I.E. 01:00:00 IS 1 A.M.; 12:00:00 IS NOON; 24:00:00 IS MIDNIGHT).**

See Also TIMED RECORDING

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Data Log

Data Log

The RUN DATA LOGGER command is used to display the data log.

NOTE **THE ACCURACY OF DATA LOGGER OUTPUT DEPENDS ON THE SIGNAL CONDITIONER SETTINGS.**

See Also
Set Data Log Speed
DATA LOG SPEED
RUN DATA LOGGER
Specifying Signal Conditioning Settings

Set Data Log Speed

The DATA LOG SPEED command is used to determine how frequently waveform data is sampled and printed to paper. This command does not affect the display.

NOTE **MAXIMUM SPEED IS 2 LINES PER SECOND.**

See Also
DATA LOG SPEED
Data Log

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Data Capture

Data Capture

Data capture is the acquisition and storage of real-time waveform and event data that can be played back or analyzed at any time. In many circumstances, it is desirable to have data captures occur in response to a triggering event. Triggering events can be a user-initiated command, a defined waveform activity, a condition of time, or activity from an external source.

All data capture occurs in the background – meaning that ongoing, active real-time mode is not interrupted and no real-time data is lost. Data capture can occur either during real-time operation or while the recorder is in an idle state.

Four methods of automated data capture (SET OPERATION) are provided:

single acquisition..... (single capture) Single acquisitions are individually added to the inventory of records in system memory.

single acquisition with automatic playback ..... (single capture and playback) Captured data record is played out automatically after capture completes. Real-time recording is aborted during playback and the record is retained in the inventory of records in system memory.

multiple acquisitions ..... (multi-stacking) Automatic system arming and data acquisition with automatic "stacking" of the resulting records to system memory.

multiple acquisitions with automatic playback ..... Automatic system arming and data acquisition with automatic playback and stacking of the resulting records to system memory. Real-time recording is aborted during playback and the record is retained in the inventory of records in system memory.

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When used in conjunction with AUTOTRIG, the automated data capture options allow you to tailor activities to a wide range of purposes.

Captured data is saved to the hard drive for subsequent analysis. In addition, you can archive (save) the data to Zip media or to a PC after uploading the data through an Ethernet connection.

To perform data capture, first Set up and Enable Triggers, Setup Data Capture, Arm the system, then Trigger the system.

CAUTION **IT IS IMPORTANT THAT THE RECORDER OPERATE ON A *RELIABLE AC POWER* SOURCE AT ALL TIMES DURING DATA CAPTURE. IF THE POWER FAILS OR THE RECORDER IS TURNED OFF DURING A DATA CAPTURE, THE *ENTIRE DATA CAPTURE* COULD BE LOST.**

IN THE EVENT A RECORD ACCESS ERROR – CORRUPTED RECORD ERROR IS DISPLAYED, AN INDIVIDUAL DATA CAPTURE RECORD HAS BEEN CORRUPTED.

See Also
Setting up Data Capture
Setting Up and Enabling Triggers
Arm The System
Trigger the System

Setting Up and Enabling Triggers

This section explains how to establish the conditions that must be met to generate a trigger.

In many circumstances, it is desirable to have data captures occur in response to a triggering event. Triggering events can be a user-initiated command, a defined waveform activity, a condition of time, or activity from an external source.

Although data captures can be set up to occur without a trigger, triggers are a frequently-used and useful way to define data record creation. Though triggers

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are used primarily with data capture, they may also be used to trigger a change in speed during dual-speed recording.

A trigger source must be enabled for the recorder to recognize any triggers the source may generate. The trigger can be generated by any of four sources:

manual	triggers generated when the [TRIG] hotkey is pressed on the front panel
wave	waveform-generated triggers occurring when a signal exceeds or falls below user-defined limits, leaves a pre-defined limit range, or experiences a change in slew rate
clock	periodic triggers generated automatically and continuously at specified time intervals; one-time triggers generated automatically at a specific date and time
external	externally generated triggers communicated through the UTILITY D-shell connector

Waveform triggers can be combined in AND or OR relationships to create a large number of trigger options.

Triggers are defined using the SETUP TRIGGER command. Related commands are used to turn trigger sources on or off, define OR or AND trigger combinations, and to define the conditions and signal levels at which an input signal will cause a trigger. When a valid trigger occurs, the associated front-panel LED illuminates.

See Also
- Dual Speed Recording
- SETUP TRIGGER
- Turning on Trigger Sources
- Using an External Trigger Source
- Data Capture

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Turning on Trigger Sources

Use the SETUP TRIGGER command to set up and enable triggers generated:

manually (through [TRIG] key)

by a waveform

by the clock

externally

On the SETUP TRIGGER menu, the top four softkeys turn each source on/off. The lower three keys access menus allowing definition of parameters for the waveform and periodic trigger sources. Trigger sources must be turned on in order for triggers to be generated.

NOTE **THE WAVEFORM TRIGGER IS AUTOMATICALLY ON WHEN ANY WAVEFORM IS SELECTED AS A TRIGGER SOURCE**

See Also Dual Speed Recording
SETUP TRIGGER

Setting up Waveform Triggers

The SETUP WAVEFORM command is used to define the signal conditions for each channel to be used as a trigger source.

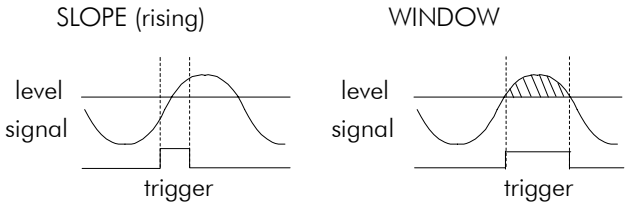


Figure 3 - 1, Waveform Trigger

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The following types of signal activity can generate a trigger. Select a type using the SET TYPE/CLASS command.

Slope/Level ..... Rising, falling, or either. Use to set a signal level and specify whether the trigger will occur if the signal rises above level, falls below level, or either. Avoid trying to AND channels when each is set up for slope. Field requires one value.

Window ..... Set the signal levels (window) within or without which a trigger will occur. This window is specified as a high and low percentage of full scale, where the bottom of the grid is 0% and the top of the grid is 100%. Select whether the trigger is to occur when the signal is inside or outside of this window. Field requires two values.

Slew ..... Used to trigger on transients – distortions in the waveform that would be missed by other trigger types (noise, sudden changes in frequency, drop-out, or cessation of activity). Slew rate is a measure of how fast waveforms change as a function of time.

Slew rate is established by using two parameters: amplitude range (in full-scale percentage, and a time period in milliseconds from 1 to 5000. The trigger can be generated when the amplitude change is above (span>) or below (<span) to specified percentage. Field requires two values. A waveform set to trigger with a change in the slew rate should not be included in AND combinations.

NOTE **UNIT PERCENTAGES ARE SELECTED AS 0.1% INCREMENTS OF A CHANNEL'S FULL-SCALE RANGE. ENGINEERING UNITS ARE SPECIFIED IN UNITS APPLICABLE TO CHANNEL TYPE.**

See Also Setting Up and Enabling Triggers
SETUP WAVEFORM

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Setting Trigger Levels on the FTV Module

THIS SECTION APPLIES TO THE DASH 8U MODEL ONLY

TO SET TRIGGER LEVELS ON THE FREQUENCY TO VOLTAGE MODULE:

1. First, set up the channel by setting the amplifier type to the appropriate Frequency to Voltage external plug-in module, running data logger, then setting the range to full scale and offset to half of full scale.

2. To adjust the trigger level, set up a waveform generator to output a sine wave with a 2 V amplitude and a frequency that is around half of full scale.

3. If the recorder doesn't read something close to the right frequency, adjust the TRIG trim-pot until it does. If the module has not been calibrated yet, the frequency may be considerably off. However, if the waveform is not triggering, the output will be either a negative frequency, a very small frequency, or an out of range frequency.

ALTERNATE METHOD:

The easiest and most straightforward way to set the trigger level of the frequency to voltage module is to measure the voltage at the center pin of the TRIG trim-pot.

That voltage varies from 3 to 5 Volts. Three corresponds to a 2 V trigger level and five corresponds to a 0 V trigger level. The TRIG trim-pot can be adjusted to make the voltage at the middle pin range from 3 to 5 volts which corresponds to a trigger level from 2 to 0 volts. More simply, the trigger level is equal to 5 subtract the voltage at the middle pin.

See Also Calibrating the FTV Module

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Combining Waveforms in Logical (and/or) Relationships

The TOGGLE LOGIC command is used to apply AND/OR logic to waveform triggers.

The AND function allows you to specify groups, containing from one to eight channels, as a collective trigger source. Channels grouped in this manner must `all` satisfy a condition in order for a trigger to occur.

An AND trigger group allows you to combine waveform trigger sources so that a trigger is generated when valid trigger conditions are detected at the same time in all waveforms of the AND group.

The OR function allows you to select from one to eight channels, any one of which can cause a trigger. Channels related in this manner can `individually` satisfy a condition in order for a trigger to occur. An OR trigger group allows you to combine one or more trigger sources so that a valid trigger in any one source generates a trigger.

See Also Setup Trigger

Setting a Clock Trigger

The SETUP CLOCK TRIGGER command is used to establish a trigger to be activated at a set time within a 24-hour period, or at a specific date and time.

NOTE **DATE IS EXPRESSED AS DAY, MONTH, YEAR (I.E., 01 FEB 97).**

TIME IS EXPRESSED AS HOUR, MINUTE, SECOND (I.E., 23:05:03) WITHIN A 24-HOUR DAY (I.E. 01:00:00 IS 1 A.M.; 12:00:00 IS NOON; 24:00:00 IS MIDNIGHT).

See Also SETUP CLOCK TRIGGER
Setting Up and Enabling Triggers

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Using an External Trigger Source

Externally generated triggers communicate through the UTILITY connector When a valid trigger occurs, the associated front-panel LED illuminates.

NOTE **OUTPUT RELIES ON THE RECORDER'S ABILITY TO TRIGGER TO AN EXTERNAL SOURCE. IT IS OFTEN USED TO CONNECT TO EXTERNAL EQUIPMENT AND MONITOR AN EXTERNAL TRIGGER.**

See Also
Setting Up and Enabling Triggers
SETUP TRIGGER
SETUP UTILITY I/O
Utility Connector

Setting up Data Capture

Data capture is the acquisition and storage of real-time waveform data as a result of either a command or the occurrence of an initiating trigger.

The SETUP DATA CAPTURE command allows you to establish how data will be captured once specified triggering conditions are met.

NOTE **BEFORE YOU SETUP DATA CAPTURE, FIRST SET UP THE TRIGGER CONDITIONS THAT YOU WANT AND ARM THE SYSTEM TO RESPOND TO TRIGGERS.**

NOTE **THE PARAMETERS DEFINED UNDER SETUP DATA CAPTURE APPLY TO ALL RECORDING CHANNELS.**

See Also
Data Capture
Turning on Trigger Sources
Arm The System
SETUP DATA CAPTURE
SETUP TRIGGER

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Arm The System

To begin data capture under the active mode and according to the data capture parameters defined for that mode, you must first Arm the system. The system can be armed manually or automatically.

How and when data capture records are created and saved is determined by the setup you establish using the SETUP DATA CAPTURE and SETUP TRIGGER menus. Options for arming and triggering are:

Automatically	Choose one of the automatic re-arming options under SET OPERATION in the SETUP DATA CAPTURE menu. The recorder will be armed each time a capture completes.
Manually	Press the front-panel [ARM] key.
Externally	If you wish to be able to arm the system from an external source, use pin 13 of the Utility D-shell connector to connect an external source, and set pin 13 from the SYSTEM SETUP menu, SETUP UTILITY I/O command.

TO ARM THE RECORDER MANUALLY:

1. Press the [ARM] hotkey on the front panel:

If the recorder is set up for automatic re-arming (AUTOTRIG = On), the system will re-arm automatically, immediately upon completion of the previous data capture (or playback if data playback is also set to automatic).

See Also Setting up Data Capture
Data Review and Playback

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Trigger the System

Once armed for data capture, the system will capture data according to the setup you have established.

A data capture is triggered with:

AUTOTRIG turned OFF.....The system captures data only in response to the criteria established via SETUP TRIGGER settings.

If auto-triggering is turned off and the trigger/window relationship is set to "start," the recorder will wait for a trigger before beginning to capture data. If the trigger/window relationship is set to any other setting, the recorder will capture pre-trigger data in the specified amount. When the pre-trigger amount of data has been stored, the oldest sample is replaced by the most recent, creating a circular buffer. This continues until a valid trigger is detected and the post-trigger phase begins. In the post-trigger phase, data is acquired and stored until the user-specified amount of samples is collected.

AUTOTRIG turned ON.....The system will create a data record upon the system being armed. All records will save only post-trigger data. With the AUTOTRIG option on, the moment of arming acts as a trigger.

See Also Turning on Trigger Sources
Data Capture

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Data Review and Playback

Data Review and Playback

The DATA RECORD REVIEW menu is used to replay captured data for examination and analysis.

- locate a record on the hard drive
- preview a selected record on the display (without the need to print to paper)
- adjust settings for playback to paper
- playback to paper
- edit the label attached to the active record
- perform Fast Fourier Transform on the record

NOTE **WHEN YOU BRING UP A RECORD FOR REVIEW, NOMINAL COMPRESSION IS APPLIED AUTOMATICALLY TO THE DATA TO PRESENT AS MUCH OF THE RECORD ON THE DISPLAY AS POSSIBLE.**

LARGE COMPRESSION FACTORS WILL RESULT IN SLOWER DISPLAY UPDATES.

See Also
DATA RECORD REVIEW
Finding a Record
Previewing a Record
Setup Playback to Paper
Inserting a Bookmark
Labeling Records
Describing Records
Real-time Display
System and Event Markers
Fast Fourier Transform Utility

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Finding a Record

The DATA RECORD REVIEW menu is used to replay captured data for examination and analysis. There are a variety of search methods provided in the DATA RECORD REVIEW, FIND RECORD menu.

Searches can be performed on partial date and time information. Entry of HH, MM, and SS is not required. A wildcard (*) can be substituted for unknown characters.

NOTE **A RECORD'S TIME IS ITS TIME STAMP. A RECORD'S TIME STAMP IS DEFINED AS:**

- **IF A TRIGGER OCCURRED, THE TRIGGER POINT.**
- **IF NO TRIGGER OCCURRED, THE POINT AT WHICH THE CAPTURE ENDED.**

See Also FIND RECORD
Data Review and Playback

Previewing a Record

The most useful and innovative feature of the DATA RECORD REVIEW menu is the SCREEN PREVIEW option.

NOTE **THE WORD “PREVIEW" IMPLIES REVIEW OF A RECORD ON THE DISPLAY ONLY, “PLAYBACK” IMPLIES PRINTING TO PAPER.**

SCREEN PREVIEW represents a highly flexible way to review data records on the display and then, if desired, play back selected screens to paper or save the record to Zip disk. Advantages include the ability to perform a complete review of any data record in different chart formats and without paper if desired.

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Advanced preview features are provided in the PREVIEW SETTINGS menu.

NOTE **WHEN YOU BRING UP A RECORD FOR REVIEW, NOMINAL COMPRESSION IS APPLIED AUTOMATICALLY TO THE DATA TO PRESENT AS MUCH OF THE RECORD ON THE DISPLAY AS POSSIBLE.**

LARGE COMPRESSION FACTORS WILL RESULT IN SLOWER DISPLAY UPDATES.

See Also
Data Review and Playback
Preview Settings
SCREEN PREVIEW

Preview Settings

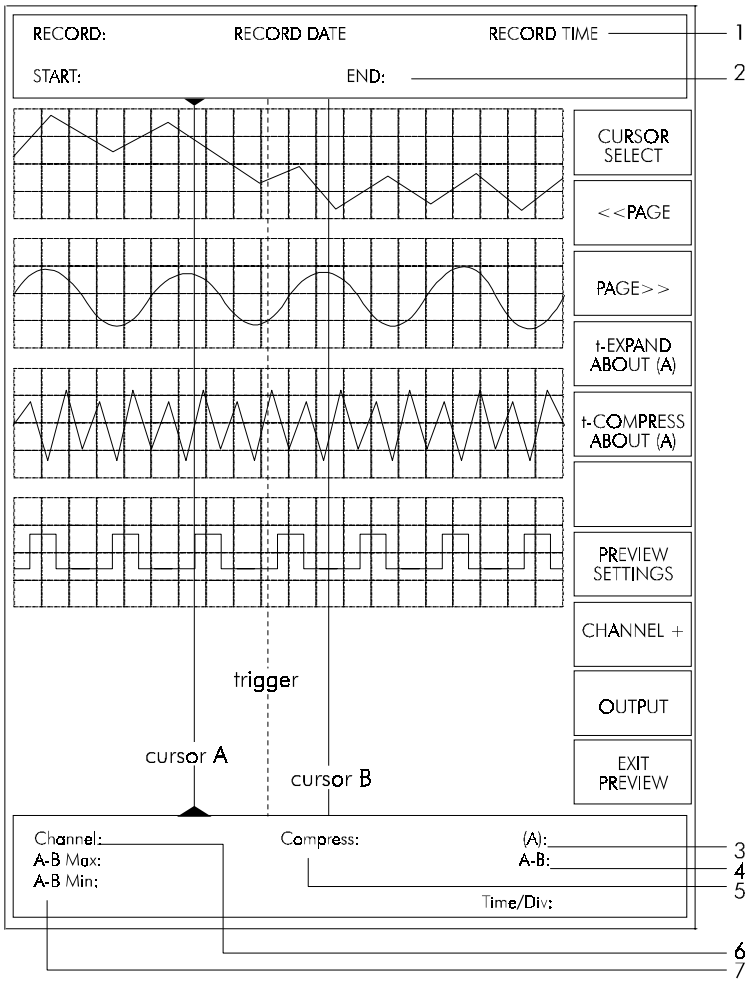
The advanced preview features provided in the PREVIEW SETTINGS menu allow you to:

- view the record in any one of four stored chart formats
- in samples (points) or in time
- determine the portion of the record being displayed
- go directly to the trigger point
- show the entire record on one screen

See Also
Previewing a Record
SCREEN PREVIEW

Illustration Key: ..... y = amplitude
T = time
(t) = trigger
pt = sample points

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1 number, date, and time of record being recorded
2 start/end of the portion of the record currently on the monitor
3 time measurement at selected cursor
4 time measurement between cursor A and cursor B
5 rate of compression being applied to the record being measured
6 channel being measured
7 amplitude measurement (maximum and minimum) between cursors A and B

Figure 3 - 2, Screen Preview Display

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Setup Playback to Paper

Use SETUP PLAYBACK to expand or compress a data-capture record playback along the time axis, select a chart format for playback (printing to paper), or turn on the print header.

NOTE **THE WORD “PLAYBACK" IMPLIES PRINTING TO PAPER; "PREVIEW" IMPLIES REVIEW OF A RECORD ON THE DISPLAY ONLY.**

Review methods (CHANGE METHOD command options) are:

Around trigger point ..... Allows playback region to be set around trigger point.

Based on capture window..... Allows playback region to be set based on capture window as a percentage.

These two options are most useful in automated or unattended operation. The settings of the manual selection of the playback window are record-dependent and adjustable.

Use the SET WINDOW command to set start and end sample points of playback (to paper).

See Also SETUP PLAYBACK
Data Review and Playback
Begin Playback

Inserting a Bookmark

A bookmark, or reference point, (noted as X) can be set on a data record using the SCREEN PREVIEW menu. Once set, the bookmark is saved as a part of the record for later use and recall.

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Bookmarks are handy for:

- setting a look-up point during initial review
- returning precisely to an area of interest
- attaching notes about this particular point (sample interval) in the record
- referring to from another page within the same record
- using as a reference point (on another page) which can be used in combination with the A cursor

To delimit this area to fit on one page of review, use the SET WINDOW to BOOKMARK to A command.

See Also Data Review and Playback
SETUP PLAYBACK

Begin Playback

BEGIN PLAYBACK is used to activate playback mode to begin paper output.

See Also SETUP PLAYBACK
Data Review and Playback

Labeling Records

The EDIT LABEL command is used to make changes to record label, even after the record is captured.

NOTE **THE LABEL YOU ASSIGN TO A RECORD CAN BE USED AS A SEARCH TOOL WHEN FINDING A RECORD. IT WILL SIMPLIFY RECORD RECALL IF YOU ASSIGN A NAME WHICH IS EASILY IDENTIFIABLE.**

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If no label is defined by the user, a default label is automatically assigned to the record. The default label is the date/time of record capture in MONDDYYMMSS format: i.e. DEC01991103.

See Also Data Review and Playback
EDIT LABEL

Describing Records

RECORD DESCRIPTION, a user preference command, is used to determine the content of a field in the bottom text area - time stamp or label.

See Also Data Review and Playback
RECORD DESCRIPTION

Real-time Display

A live monitor provides real-time presentation of waveform data simultaneous with the paper recording. The time base of the monitor is synchronized proportionally with the time base and chart speed of the recorder.

The display may also be frozen to allow the taking of time and signal measurements using the cursors.

NOTE **AS THE DISPLAY SCROLLS BY, IT DOES NOT AUTOMATICALLY CLEAR WHEN SPEED CHANGES ARE INITIATED. IT IS POSSIBLE THEREFORE, THAT THE MONITOR WILL ACCUMULATE MULTIPLE TIME BASES AND AMPLIFIER SETTINGS ON ONE SCREEN.**

Use the SETUP COLOR command to initiate waveform display with or without paper printing.

See Also SETUP COLOR
System Setup - Setup Color

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System and Event Markers

A System Mark is a single mark printed at fixed position on the top of chart representative of front panel button input only. The system mark is primarily used for real-time recording, but if required to be captured, a System Mark can be stored on event marker 1 of the event group and reviewed similarly.

Event Markers are a group of eight TTL inputs on the CAL jack for bi-level, discrete input. These signals are recorded in real-time and captured as a group when performing data acquisition.

NOTE **A SYSTEM MARK IS COMBINED INTO EVENT #1 AND THUS EVENT #1 WILL INDICATE ANY ACTIVITY ON EITHER LINE, ALTHOUGH TYPICAL USE IS FROM THE REAR PANEL ONLY.**

See Also Customize Charts - Change Event Markers

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Fast Fourier Transform Utility

Fast Fourier Transform (FFT) Utility

Fast Fourier Transform (FFT) converts data information in the time domain to the frequency domain. It is a convenient tool for determining various frequency components in a time series waveform for any single channel.

See Also
- Fast Fourier Transform (FFT)
- Specifying FFT Window
- Input Data Averaging
- Input Data Interpolation to Fit Algorithm
- FFT Windowing Processes
- Performing FFT Transform
- FFT Analysis Output Definition

Specifying FFT Window

There are three ways of specifying the FFT Transform desired. Use Y-T review methods including cursor manipulation and supported compression factors to select a window according to the FFT Operation method selected.

NOTE **MAXFFT SIZE = 2048**

See Also
- Fixed End Point FFT Operation
- Variable End-Point FFT Operation
- N-Size/Referenced FFT Operation

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Fixed End Point FFT Operation

There are several ways to specify the FFT Transform desired. When using FIXED END POINTS, the cursor(s) represent a fixed window of points to be used in the FFT. The compression factor in use at the time and the fixed cursor positions determine the FFTSize and, as needed, the degree of up-front averaging that may be performed upon the original input signal.

NOTE **FIXED CURSOR WINDOW IS K=256 DISPLAY PIXELS.**

Low, binary compression factors are conducive to an FFT without averaging up to a size of MaxFFTSize (2048 points). Windowing support is available for this operational mode.

NOTE **THE FFT WINDOW TO BE USED IN FFT SHOULD BE COMPLETELY VISIBLE ON-SCREEN UNLESS N-SIZE/REFERENCED OPERATION IS PERFORMED.**

Dash 8/8u Y-T REVIEW COMPRESSION	Dash 8/8u LG POWER-OF-2 IN COMPRESSION (1)	Dash 8/8u EXTRA AVERAGING	Dash 8/8u NO. POINTS AVERAGED	Dash 8/8u FFT INPUT SIZE
1	1	1	1	256
2	2	1	1	512
4	4	1	1	1024
8	8	1	1	2048
16	8 (16 actual)	2	1	2048
Bin.choices>16	MaxFFTsize/K=8	Comp/16	(N/2048)	2048
32	8 (32 actual)	4	1 * 4 = 4	2048

Figure 3 - 3, FFT Transformation Process Summary

- FFTSize is effectively chosen to also yield an integer averaging factor.
- Using binary Y-T compression causes FFT to yield minimal input averaging effects.

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- For compressions where largest power-of-2 correlates to exceeding MaxFFTSize, up front averaging is performed.
- Interpolation is used as-needed to fit algorithm to N power if there is not enough data selected (present under cursors).

See Also
Variable End Point FFT Operation
N/Size Referenced FFT Operation
Specifying FFT Window
Fast Fourier Transform Utility

Variable End-Point FFT Operation

There are several ways to specify the FFT Transform desired. When using VARIABLE END POINTS, variable cursor movement is supported. This allows the user to closely "slice" off the input data for FFT transform.

Variable end point FFT operation reduces leakage without the need to use a windowing process on raw data – or self-windowing. This is done automatically and more accurately than can be done with FIXED-END POINT mode. Similar to FIXED-END POINT mode, the compression, as well as cursor placement, will play a part in the chosen FFT window size.

Using larger compression and cursor differences results in multiple acquired points in each displayed point making precise end point placement more difficult. In cases where compression and averaging is to be more closely controlled, consider N-SIZE/REFERENCED FFT operation.

If a window selection is short of a power-of-2 specification, the recorder will interpolate the signal to fit the algorithm in use as-needed.

NOTE EXAMPLE ASSUMES SAME 237 PIXELS BETWEEN CURSORS.

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Dash 8/8u Y-T REVIEW COMPRESSION	Dash 8/8u LG POWER-OF-2 IN COMPRESSION (1)	Dash 8/8u EXTRA AVERAGING	Dash 8/8u NO. POINTS PRIOR TO INTERPOLATION	Dash 8/8u FFT INPUT SIZE
1	1	1	237	256
2	2	1	474	512
4	4	1	948	1024
8	8	1	1896	2048
16	8 (16 actual)	1	3792 (237*16)	2048
Bin.choices>16	MaxFFTsize/K=8	(N/2048)		2048
32	16 (32 actual)	1 * 4 = 4	3792	2048
Odd factors	na/	=compression	237	256

Figure 3 - 4, FFT Interpolation Process Summary

As the number of data points specified by the compression and cursor difference exceeds maximum FFT size, further input averaging will be used.

Interpolation is used as-needed to fit algorithm to N power as not enough data selected (present) under cursors. This typically will only be by a factor of less than 2 and will require minimal additional processing time.

See Also Fixed End Point FFT Operation
N/Size Referenced FFT Operation
Specifying FFT Window
Fast Fourier Transform Utility

N-Size/Referenced FFT Operation

There are several ways to specify the FFT Transform desired. To closely control the FFTSize and specify a starting reference use N-SIZE/REFERENCED FFT operation.

The input waveform need not be completely viewed on the screen. The data included in the FFT will be based on the cursor, the size selected, and

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compression factor applied. The compression factor in use will be used and directly represents the amount of averaging performed.

To disable averaging, use a compression of 1. The size of the FFT is specified explicitly and a cursor is placed over the (start) reference point, which must be on the screen. Remaining data used to fit the specified window may or may not be visible on the screen.

NOTE **SIZES: 256 – MAXFFTSIZE**

To disable averaging and reduce raw data input selection to one variable instead of two, set the compression to x1 and find the reference list. Then, return to FFT SETUP, specify FFT WINDOW SIZE, and perform FFT.

Interpolation is used as-needed to fit the algorithm to N power as not enough data may be selected (present) after reference. This is usually due to being close o the end of the record.

Paging support is accessed through advanced Y-T review (parent) menus.

See Also
Fixed End Point FFT Operation
Variable End-Point FFT Operation
Specifying FFT Window
Fast Fourier Transform Utility

Input Data Averaging

Averaging can be useful when a signal is known to be well over-sampled in relationship to the frequencies being captured and therefore, more data window can be compressed into FFT sizes.

Averaging can be minimized by controlling compression or the factors that dictate what compression is used. X-axis (frequency) labeling will impact compression usage. Input data averaging techniques, used as required, will cause a direct impact on FFT results. Since multiple data points with a time between samples of (Δt) will be combined by averaging – yielding a larger (Δt).

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The result is similar to undersampling during data capture. The ability to resolve frequencies degrades accordingly.

See Also Fast Fourier Transform Utility
Input Data Interpolation to Fit Algorithm

Input Data Interpolation to Fit Algorithm

Data interpolation is used to fit the FFT algorithm in use. Use input data interpolation after up-front input averaging is performed. Input data interpolation allows a selected window, particularly one created with variable cursors to be input into the FFT to prevent leakage.

The data set (smaller than a power-of-2) is replaced with a new data set with a new adjusted time base. This allows data to begin and end at the same level.

Removing these discontinuities does not eliminate leakage but does help reduce it. The interpolation used is linear interpolation. In many cases such as FIXED END POINT and complete data set under cursors, there is no interpolation required.

See Also Fast Fourier Transform Utility
Input Data Averaging

FFT Windowing Processes

Another way or reducing leakage due to discontinuities at the window edges is to use a modified window that does not have abrupt edges. This is achieved by multiplying the raw signal by a window function.

Leakage is seen as energy leaking out of one of the resolution lines of the FFT into all other lines. The examples of each window function shown below are applied to a full scale square waveform signal input.

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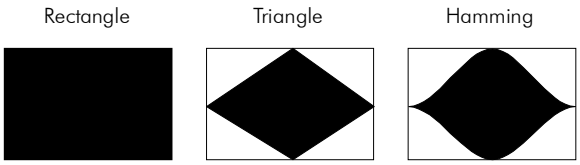


Figure 3 - 5, FFT Windowing Processes

Windowing is performed upon the data set after it has met the size requirements of the algorithm. In other words it happens after the up front input averaging and any required interpolation of the signal has been performed.

NOTE **CENTER THE TIME AREA SELECTED FOR BEST RESULTS.**

	Dash 8/8u MAJOR LOBE HEIGHT RELATIVE TO RECTANGLE	Dash 8/8u HIGHEST SIDELOBE (Ref to Major)	Dash 8/8u FREQUENCY RESOLUTION	Dash 8/8u USES
Rectangle	T	-13 dB	Good	Self-Windowing
Triangle	0.5 T	-27 dB	Fair	General Purpose
Hamming	0/54 T	-41 dB	Fair	General Purpose

Figure 3 - 6, FFT Window Summary

See Also
Input Data Averaging
Input Data Interpolation to Fit Algorithm
Specifying FFT Window
Fast Fourier Transform Utility

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Performing FFT Transform

The PERFORM FFT function actually performs the transform into complex data. The results can then be seen in various forms without performing FFT again. Returning to FFT SETUP should not be necessary. When FFT is performed, the display will include full results shown in one screen (compressed as-needed).

The units used for specific fields in the setup menu can be used to display samples or units of time – similar to the Y-T PREVIEW menu. To alter the terms, toggle units used for the display from the Y-T PREVIEW menu.

FFTSize field .....Field is not always selectable. When selectable, represents the size of the FFT process and numer of points (power-of-2) used in the process.

FFT window field .....A summary of the amount of raw time or samples used in the FFT process. It will reflect actual amount used unless:

Cursor(s) are outside the data area displayed on screen, or not enough data remains in the record. If not enough data remains in the record, a smaller amount may be used and will be interpolated by the FFT. As needed averaging will occur on raw data.

FFT averaging field.....Indicates the input averaging that will take place based on window selection modes and Y-T compression then in effect. Field will indicate 'auto' if averaging will be determined by the FFT process.

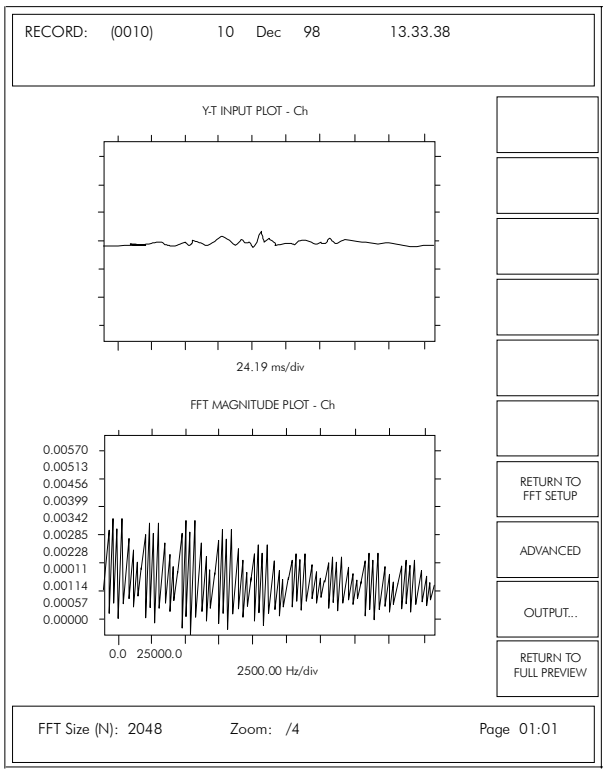
NOTE **OPTIONAL FFT ANALYSIS AND WINDOW SETUPS MUST BE INVOKED OR INITIATED WHILE IN A NON-EXPANDED Y-T PREVIEW WINDOW.**

See Also Fast Fourier Transform Utility
FFT ANALYSIS

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FFT Analysis Output Definition

The analysis results for an FFT display as a magnitude plot of the polar form. Results of the transform when shown are the positive frequencies through the Nyquist frequency, unless the EXPAND+ feature is active, in which case, it will be a subset.



The cursor, when placed on a resulting plot, can be used for measurement reference. As the cursor is moved across a plot, the corresponding magnitude and frequency measurements will be shown. This is useful for quickly viewing peak readings.

Statistics applicable to the FFT will also be shown on the display and in some cases are computed in connection with the cursor.

Figure 3 - 7, Perform FFT Result

See Also
- Post Zoom Support
- Y-T Data Plot as an FFT Indicator
- Hard Copy of FFT Output
- FFT Analysis Timing

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FFT Output Cursor

The (1) cursor which is placed on the resulting plot is used for measurement reference As the cursor is moved across the resulting plot, the corresponding magnitude and frequency measurements will be shown.

See Also FFT Analysis Output Definition

Axis Labeling

Power Spectrum Amplitude units (Y-Axis)

Magnitude Plot ..... units defaults to 0-RANGE (full scale) for measurement

Log magnitude (dB) ..... shows decibels. Is a result of the following: dB = 20* log (Magnitude/ Range) The log magnitude is set to (min) dB reading if the magnitude result of the FFT is not greater than 0.11% of full scale. This helps avoid noisy floor and pk/pk noise implications which occur on other output presentations and limits dB output to -59 dB rather than -71 dB theoretical limit. This limit can be bypassed if Y-autoscale is on and will provide full dB range.

Range ..... full scale range from captured input signal constitutes the reference for the ratio. This is the reason for normal negative results in comparison to largest in ratio. The magnitude from each bin point is the top number of ratio.

Y Autoscale Feature ..... If enabled, causes output Y-axis scaling to be adjusted so the plot will utilize the maximum amplitude points to plot size. The magnitude plot handles this by enabling or disabling full dB range presentation.

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X-Axis scaling ..... The X-axis is the frequency axis. Some post FFT manipulation may be performed in order to zoom or magnify the results of an FFT. This is useful for FFts which have more resolution or bins than display pixels for the output plot. Page or pan through the available output plots to view desired information.

See Also FFT Analysis Output Definition

Post Zoom Support

When FFT output plot reflects a compression factor of >1, there is more FFT frequency resolution resolvable simply by expanding the FFT output plot. Expansion allows user to expand to at least a 1:1 presentation.

See Also FFT Analysis Output Definition

Y-T Data Plot as an FFT Indicator

A visual plot of the data selected for the FFT plot which can be added to an FFT analysis output on the same screen. It represents the raw data after all FFT processing, but before the actual FFT process. Since this is a full and comprehensive window, it may be very compressed and not allow much signal differentiation. Statistics and measurements should be gathered under full PREVIEW operation.

NOTE **TO AVOID CONFUSION BETWEEN TWO PLOTS WITH ONE CURSOR SET, CURSOR AND PLOT EXPANSION CONTROLS ARE UNAVAILABLE WITH THIS INDICATOR ON.**

See Also FFT Analysis Output Definition

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Hard Copy of FFT Output

A screen copy of output may be performed by pressing the OUTPUT… keystroke sequence while viewing the FFT results.

See Also FFT Analysis Output Definition

FFT Analysis Timing

The major factors that impact analysis timing are:

- Amount of raw data selected for FFT process from data record.

  Select a predictable amount of raw data by careful use of variables including cursors, compression in use, and method of selection. Simply selecting a heavily compressed window for FFT will result in slower timing and potentially degraded results, since extensive averaging will occur on data, thus timing will be slower.

- FFTSize selected for process. As is the case with DFT processing, the time to do larger sizes increases dramatically.

  If selectable, use the smallest size to meet requirements.

- Any needed interpolation of data set to fit power-of-2 FFT requirements.

  Interpolation is required when cursor window is not power-of-2 (often the case in variable cursor mode). Time is generally a negligible amount.

- Windowing, selected non-rectangle causes signal (array) to be multiplied by another function prior to FFT and accounts for analysis timing.

- Any secondary plot, such as the Y-T plot combined with FFT will also take time to process. This time is generally a negligible amount of time.

See Also FFT Analysis Output Definition

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Data Record I/O

Data Record Input/Output

The DATA RECORD I/O menu makes it possible to backup a data record to a Zip disk, restore a record from a Zip disk, or to export measurement and record information in a portable text format.

See Also
- Deleting Records
- Purging Records and Compacting Drive Space
- Formatting the Hard Drive
- Backing Up Records
- Exporting Records
- Restoring Records

Deleting Records

The DELETE RECORDS command is used to delete one or more records stored on the recorder's hard drive.

Using DELETE RECORDS is faster than the PURGE RECORDS AND COMPACT command, because deleting records does not require defragmentation of the hard disk. DELETE RECORDS is also the most efficient way to discard unused records quickly at the end of the day. The record number of each existing record will remain unchanged.

CAUTION **IT IS IMPORTANT THAT THE RECORDER OPERATE ON A RELIABLE AC POWER SOURCE AT ALL TIMES WHEN DELETING RECORDS. IF THE POWER FAILS OR THE RECORDER IS TURNED OFF DURING THIS FUNCTION, A RECORD(S) COULD BECOME INACCESSIBLE.**

NOTE **IF, DURING INITIALIZATION OR OPERATION, THE RECORDER DETECTS CORRUPTED DATA ON THE INTERNAL HARD DRIVE, A "RECORD ACCESS ERROR" MESSAGE WILL APPEAR**

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IN THE RECORD DESCRIPTION OR RECORD INVENTORY. THIS MESSAGE INDICATES THAT ONE OR MORE DATA CAPTURE RECORDS HAVE BEEN CORRUPTED DUE TO ONE OF THE FOLLOWING:

- **POWER LOSS BEFORE COMPLETION OF A PURGE OR DELETE ACTION**
- **POWER LOSS DURING THE CONCLUDING STAGE OF A DATA CAPTURE**

THE CORRUPTED RECORD(S) ARE NO LONGER ACCESSIBLE. TO REMOVE A CORRUPTED RECORD(S), SIMPLY LOCATE THE RECORD(S) AND USE THE DELETE RECORDS COMMAND TO REMOVE IT AND ITS ALLOCATED STORAGE SPACE FROM THE DRIVE.

To delete records from a Zip disk, use the ZIP DISK OPERATIONS menu, DELETE FILE command.

See Also Data Record Input/Output
DELETE RECORDS

Purging Records and Compacting Drive Space

The PURGE RECORDS AND COMPACT command is used to delete a record, or a range of records, and automatically compress the empty disk space on the hard drive.

PURGE RECORDS AND COMPACT will defragment the hard drive to optimize disk space, therefore, this command takes more time to execute than the DELETE RECORDS command.

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NOTE **IF YOU ARE IN THE HABIT OF RECALLING A RECORD BY ITS RECORD NUMBER, BE AWARE THAT THE PURGE RECORDS AND COMPACT COMMAND MAY RENUMBER RECORDS THAT ARE LOCATED AFTER THE PURGED RECORD(S). HOWEVER, THE RECORD'S TIME STAMP AND DESCRIPTION WILL NOT CHANGE.**

CAUTION **IT IS IMPORTANT THAT THE RECORDER OPERATE ON A RELIABLE AC POWER SOURCE AT ALL TIMES WHEN PURGING RECORDS. IF THE POWER FAILS OR THE RECORDER IS TURNED OFF DURING THIS FUNCTION, RECORD(S) COULD BECOME INACCESSIBLE.**

NOTE **IF, DURING INITIALIZATION OR OPERATION, THE RECORDER DETECTS CORRUPTED DATA ON THE INTERNAL HARD DRIVE, A "RECORD ACCESS ERROR" MESSAGE WILL APPEAR IN THE RECORD DESCRIPTION OR RECORD INVENTORY. THIS MESSAGE INDICATES THAT ONE OR MORE DATA CAPTURE RECORDS HAVE BEEN CORRUPTED DUE TO ONE OF THE FOLLOWING ACTIONS:**

- **POWER LOSS BEFORE COMPLETION OF A PURGE OR DELETE ACTION**
- **POWER LOSS DURING THE CONCLUDING STAGE OF A DATA CAPTURE**

THE CORRUPTED RECORD(S) ARE NO LONGER ACCESSIBLE. TO REMOVE A CORRUPTED RECORD(S), SIMPLY LOCATE THE RECORD(S) AND USE THE DELETE RECORDS COMMAND TO REMOVE IT AND ITS ALLOCATED STORAGE SPACE FROM THE DRIVE.

To delete records from a Zip disk, use the ZIP DISK OPERATIONS menu, DELETE FILE command.

See Also Data Record Input/Output
PURGE RECORDS AND COMPACT

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Formatting the Hard Drive

FORMAT CAPTURE DRIVE is used to reformat the recorder's hard drive.

CAUTION **THIS COMMAND WILL ERASE ALL STORED DATA ON HARD DRIVE.**

To reformat a Zip disk, use the ZIP DISK OPERATIONS menu, FORMAT DISK command.

See Also Data Record Input/Output
FORMAT CAPTURE DRIVE

Backing Up Records

BACKUP RECORD W/ZIP is used to provide efficient binary backup of the internal data capture record to a Zip disk. It is also a convenient way to port records to a PC system that includes a Zip™ drive.

Astro-Med supplies a PC program, AstroVIEW™, which provides the ability to fully review archived files. Records are stored in a binary file format, DCR (data capture record), specific to Astro-Med.

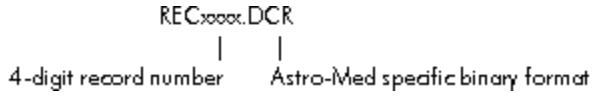


Figure 3 - 8, .dcr Record Format

Records of 32 megasamples or less in size can be fully archived to the Zip drive. Larger records can only be proportionally backed up to one file.

See Also Data Record Input/Output
BACKUP/EXPORT RECORD W/ZIP

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Exporting Records

EXPORT RECORD W/ZIP is used to export measurement and record information in a portable text format (ASCII) to a Zip disk. Exported records can be viewed with an editor or can be imported into Microsoft Excel or similar software.

Exported files are saved in .csv (comma-separated variable) file format.

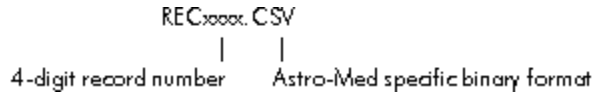


Figure 3 - 9, .csv Record Format

See Also Data Record Input/Output
BACKUP/EXPORT RECORD W/ZIP

Restoring Records

RESTORE RECORD W/ZIP is used to copy an archived file from the Zip disk to the hard drive. The data record can be reviewed and analyzed using DATA RECORD REVIEW.

When the RESTORE RECORD W/ZIP command is used, the recorder adds the record to end of the inventory (as the last record). Records are stored in a binary file format, DCR (data capture record), specific to Astro-Med. See Figure 1, .dcr Record Format.

See Also Data Record Input/Output
RESTORE RECORD W/ZIP

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Zip Disk Operations

Zip Disk Operations

A basic set of Zip functions and input/output features, including BACKUP and RESTORE, are supported. The ZIP DISK OPERATIONS command menu allows you to:

- save all active recorder setups to disk, including those specified in AstroSET
- recall saved recorder setups from disk
- print, copy, and rename, files on disk
- delete files from disk
- format a disk

NOTE **ANY FILE RESIDING ON A ZIP DISK IS SUBJECT TO DOS FILE FORMAT CONVENTIONS. UP TO EIGHT CHARACTERS, PLUS A THREE-CHARACTER FILE EXTENSION, ARE SUPPORTED.**

No sub-directory support is provided. The recorder supports one active Zip drive partition – the one currently set as active.

The recorder does not support the ability to in-system modify the read/write protection of data on the Zip disk. Protection may be enabled using the Zip Tools program on your PC – available from Iomega Corporation. For maintenance and technical information related to your Zip disk, refer to the documentation provided by Iomega Corporation.

Saving Setups

The SAVE SETUP command is used to save real-time recording setups, including those specified in AstroSET.

See Also ZIP DISK OPERATIONS
Zip Disk Operations

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Recalling Setups

The RECALL SETUP command is used to recall settings from AstroSET that were saved on the Zip disk previously.

See Also ZIP DISK OPERATIONS
Zip Disk Operations

Printing Files

PRINT FILE is used to print an ASCII text file to paper. The PRINT FILE command provides a convenient way to store and print test instructions. Simply create text on your PC with any text editor. Then save the file on a Zip disk and print it to chart paper using the PRINT FILE command.

See Also ZIP DISK OPERATIONS
Zip Disk Operations

Copying Files

COPY FILE is used to make a copy of a file on a Zip disk.

See Also ZIP DISK OPERATIONS
Zip Disk Operations

Renaming Files

RENAME FILE is used to rename any file stored on the Zip disk.

See Also ZIP DISK OPERATIONS
Zip Disk Operations

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Deleting Files

DELETE FILE is used to delete any file stored on the Zip disk.

See Also ZIP DISK OPERATIONS
Zip Disk Operations

Formatting a Zip Disk

The FORMAT DISK command is used to format a Zip disk.

See Also ZIP DISK OPERATIONS
Zip Disk Operations

Drive Orientation

The internal Zip drive can be used when in a horizontal or vertical orientation with the right side of the drive down.

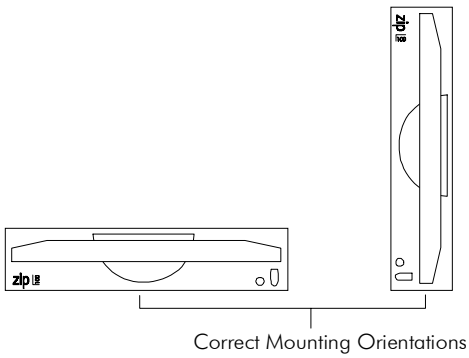


Figure 3 - 10, Correct Ways to Orient Internal Zip Drive

WARNING THE DRIVE MUST NOT BE MOUNTED OR USED WHEN VERTICAL (LEFT SIDE DOWN). WHETHER THE DRIVE IS MOUNTED HORIZONTALLY OR VERTICALLY, THE FRONT TO BACK AXIS OF THE DRIVE MUST BE HORIZONTAL.

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Using a PC with your Recorder

Host Computer Interface

An Ethernet™ connector and a SCSI port are located on the right-side panel of the recorder. The host computer interface provided through either of these connections is used to retrieve large data records but does not offer control functions. The purpose of the direct SCSI port or the Ethernet connector is to provide efficient and complete access to data records on the recorder from a remote PC.

NOTE **THE SCSI CONNECTION, USED ONLY FOR SHORT DISTANCES, IS FASTER THAN ETHERNET. UNLESS SPEED IS CRITICAL, ASTRO-MED RECOMMENDS USING ETHERNET.**

Ethernet is slower than a direct SCSI connection, but it provides a more friendly and efficient method of data retrieval in all other respects. For example, most PCs are shipped Ethernet-ready, while a special SCSI board in the PC is required to use the SCSI connection.

Astro-Med provides two Windows-based utility programs for use with your recorder: AstroSET™ and AstroVIEW™. AstroVIEW is used to retrieve data through the SCSI board or Ethernet connection; the program also includes complete Help information for setting up either connection.

Ethernet connections are made through a 10-Mbit/sec CSMA/CD port. End-to-end communication is accomplished using the transmission control protocol (TCP) transport of the TCP/IP protocol suite. The address resolution protocol (ARP) is used to translate physical addresses (48-bit Ethernet address) to IP addresses (32-bit internet or IP address).

The [SYS] hotkey is used to access the TCP/IP menu for connecting to Ethernet.

See Also
System Setup - Setup TCP/IP
SETUP TCP/IP
Uploading to PC via Ethernet
Uploading to PC via SCSI

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AstroVIEW C

What is AstroVIEW C

AstroVIEW™ C is the next generation of AstroVIEW. AstroVIEW C uses data capture record files (.dcr's) generated by your hardware, to allow viewing of historical record information in an easy-to-use format.

With AstroVIEW C, you can review acquired waveforms, make measurements, and save portions of the data in ASCII format for use by other applications. It is designed to run under Windows 95 and Windows NT as a true 32-bit application.

Release 1.4 (current as of this edition) supports data upload from the following Astro-Med instruments:

ETHERNET UPLOAD CAPABILITY	SCSI UPLOAD CAPABILITY	CLUSTER CAPTURES (CREATED BY ASTROLINK C)	SNEAKERNET (FLOPPY OR ZIP)
Dash 4u	Dash 4u	AstroDAQ	Dash 2
Dash 8n	Dash 8n	AstroDAQ 2	Dash 4u
Dash 8u	Dash 8u		Dash 8n
Dash 16u	MT95K2		Dash 8u
			Dash 10
			Dash 16u

See Also Uploading to PC via Ethernet
Uploading to PC via SCSI
New Features, AstroVIEW C V 1.4

Installing AstroVIEW C

AstroVIEW C is a Windows-based utility program that must be installed on a PC running either the Window 95 or Windows NT operating system.

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TO INSTALL ASTROVIEW C:

1. Insert the installation disk into the floppy drive on your PC. Run Setup.exe and follow the on-screen instructions.

2. Select a destination directory for the program. AstroVIEW will be installed to the directory you select.

3. Launch AstroVIEW now or run the **AstroVIEW.exe** file later.

AstroVIEW offers ample online help to simplify the process of specifying recorder settings.

Each AstroVIEW menu contains a Help button at the bottom of the screen. When you click the Help button, the AstroVIEW Help window appears. In the Help window, each menu item includes a hotspot that provides related information. Where appropriate, the hotspot offers a jump to other AstroVIEW menus (e.g., data capture, chart setup) within Help. The menu bar at the top of the window provides further options, including a Help Contents selection to locate other topics of interest.

SCSI Compatibility

Astro-Med, Inc. has verified operation of your recorder with the following SCSI products:

- Adaptec AHA-1520 ISA-to-Fast SCSI-2 Host Adapter (Astro-Med part number 13340-xxx)

- Iomega internal drive connection product with a custom cable extension.

AstroVIEW C may support other SCSI drivers. Contact Technical Support for additional information.

See Also Contacting Technical Support
Setting Up a SCSI Link

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Setting Up a SCSI Link

PRIOR TO SETTING UP THE LINK:

1. Confirm **SCSI Option** is installed on the recorder.
2. The recorder is operating at system software level **SCN 11.0** or higher.
3. PC is running **Windows** 95 or Windows NT and has a **SCSI adapter** and **connector(s).**
4. Astro-Med support software **AstroVIEW C version 1.1** or later is installed on the PC.
5. The **SCSI cable** for linking the recorder to remote PC adapter interconnection (typically a SCSI-2 to SCSI-2 male/male cable is connected.

NOTE **THE RECORDER'S 50-PIN SCSI DEVICE CONNECTOR (HIGH-DENSITY, SINGLE-ENDED) IS LOCATED ON THE INSTRUMENT'S RIGHT-SIDE PANEL. A CABLE IS NOT SUPPLIED AND MAY VARY BASED ON THE ADAPTER PURCHASED FOR THE PC.**

TO SET UP A SCSI CONNECTION FROM THE RECORDER TO THE PC:

1. Turn **Off** the PC.
2. Turn **Off** the recorder.
3. Turn **On** PC. Allow PC to fully initialize.
4. Turn **On** the recorder and allow it fully initialize.
5. Right-click **My Computer**.
6. Select **Properties > Device Manager**.
7. Select **Refresh**. Allow Refresh to complete.

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8. Double-click **Disk Drives**.

9. Double-click the **Internal Capture Drive**. (The drive should be similar to the one under RECORD I/O on the instrument, e.g. Western Digital.)

10. Select **Settings** to access detailed settings.

11. Select **Removable** and **Int 13** unit. (In some cases these settings may not be selectable.)

12. If selected, **deselect Disconnect** and **Sync Data Transfer**.

13. Select **any unused drive letter** to use as your newly connected drive.

14. Select **Ok** to accept input to dialog boxes. ***Do not restart the computer when prompted to do so.***

15. Turn **Off** the recorder.

16. Restart the **PC**.

17. Repeat steps **2-7**, then select **Ok**.

18. Select **Ok** again.

The recorder's internal hard drive SCSI address is 0 (fixed and not selectable). If this address is in conflict with another PC SCSI resource, the PC resource should be adjusted to an unused address. The maximum number of SCSI connections is 1. Since the internal drive is at a fixed address, it is not configurable to support multiple connections.

Two recorders can be connected to the PC by establishing a SCSI link for one, and an Ethernet connection for the other. AstroVIEW C will not allow simultaneous Upload of both instruments. One upload choice and sequence at a time will be allowed.

Upload performance has been measured routinely from 300-900 Kb/sec with various factors impacting it, including PC platform (most important), background and system tasks, SCSI driver and adapter, and record size.

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IF CONNECTION PERFORMANCE IS POOR:

- Improve the PC platform.
- Minimize background tasks during Upload.

Once you complete the initial setup procedure detailed above and shut down both the PC and the recorder, it is necessary to follow the boot sequence of the recorder and then the PC to ensure that neither boot simultaneously. If problems arise, recheck settings, especially if drive changes were made.

If The PC has been properly configured and operated before, but a new connection to the recorder's drive will not occur, this is most likely a result of improper boot sequence. Power up the PC after the recorder. All hardware devices connected to the PC must be powered up and ready for detection by the operating system during boot up for a connection to be established.

If a connection to the recorder will not occur and this is a first-time connection, there may be other, adapter-specific setups that need to be performed. Refer to the instructions for your chosen SCSI adapter.

Uploading to PC via SCSI

Prior to successful connection of AstroVIEW C to the recorder's SCSI port, the PC must be configured with a SCSI host adapter and the Windows operating system must be configured properly. See Setting Up a SCSI Link. **If the recorder is powered ON completely and IDLE (not capturing a record or being used) establish connection. Do not allow the recorder to be used during connection.**

The purpose of a direct SCSI link is to provide accessibility to recorder data records from a PC. Using the SCSI port with AstroVIEW C allows a PC access to all records on the recorder's internal hard drive and allows import as .dcr files (see Data Capture Records). It is sometimes advisable to use SCSI Upload to backup the internal hard drive rather than the Zip drive due to the Zip drive's limitation of record size (~50 Msamples).

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TO UPLOAD FROM THE RECORDER TO A PC VIA SCSI:

1. Select **Upload Utilities**, **SCSI Upload - Dash 8...** from the AstroVIEW C main menu to initiate the operation.

2. Click on the record to see its **Statistics**. Proceed to **Upload** if desired. Enough space must be present on the destination drive to support expected size of files indicated on display.

3. Select **Close** when complete.

Uploading to PC via Ethernet

Prior to Upload, an Ethernet adapter and the Windows TCP-IP stack must be properly configured. For details, consult your network Systems Administrator.

TO UPLOAD FROM THE RECORDER TO A PC VIA ETHERNET:

1. Select **Upload Utilities, Ethernet upload - Dash 8...** from the AstroVIEW C Main Menu.

2. Specify the **IP address of the recorder** from which you wish to retrieve data record files. Connection will occur.

3. Click to **select the record** you want to upload. Ctrl-click to select multiple records. Record information applicable to individually-selected records will be shown. Selecting multiple records will cause the record information section to disappear. To select a block of records, click on the first record, hold down Shift, and click on the last record. All the records in between will be selected.

4. Select **Upload** to begin the transfer process. Type in a **filename**. Long filenames are supported locally to AstroVIEW C, but short filenames (8.3 format, eight characters or less) should be used if the file will be moved manually back to the recorder. If uploading multiple records, the new file names will have an index attached (e.g. name1.dcr, name192.dcr ...).

5. Select **Close** when complete.

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AstroSET

What is AstroSET

Once you are familiar with recorder operations, AstroSET provides a convenient way to specify modes of operation while offline – using your PC.

The settings are saved to a Zip disk and are recalled through the recorder's Zip drive. In the same way, settings saved to your recorder's hard drive can be saved on the Zip disk and retrieved on your PC.

The AstroSET program consists of the following seven menus:

- zero and gain
- data capture
- chart setup
- text setup
- monitor setup
- trigger setup
- miscellaneous

NOTE **A ZIP DRIVE IS LOCATED ON THE RIGHT SIDE OF THE RECORDER. FILES CREATED IN ASTROSET ON THE PC MUST BE SAVED TO A ZIP DISK AND THEN TRANSFERRED TO THE RECORDER.**

AstroSET is a Windows-based utility program supplied on two 3.5-inch floppy disks and must be installed on a PC running either the Window 95 or Windows NT operating system.

See Also Installing AstroSET
Zip Disk Operations
Setting Up a PC to SCSI Link

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Installing AstroSET

AstroSET is a Windows-based utility program that must be installed on a PC running either the Window 95 or Windows NT operating system.

TO INSTALL ASTROSET:

1. Insert the installation disk into the floppy drive on your PC. Run Setup.exe and follow the on-screen instructions.

2. Select a destination directory for the program. AstroSET will be installed to the directory you select.

3. Launch AstroSET now or run the **AstroSET.exe** file later.

AstroSET offers ample online help to simplify the process of specifying recorder settings.

Each AstroSET menu contains a Help button at the bottom of the screen. When you click the Help button, the AstroSET HELP window appears. In the HELP window, each menu item includes a hotspot that provides related information.

Where appropriate, the hotspot offers a jump to other AstroSET menus (e.g., data capture, chart setup) within Help. The menu bar at the top of the window provides further options, including a Help Contents selection to locate other topics of interest.

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Chapter 4
Maintenance

Contacting Technical Support

To reach Astro-Med Technical Support, call **1-800-343-4039** or visit www.astro-med.com.

Loading Z-Fold Thermal Paper

Astro-Med, Inc. chart paper is manufactured by Astro-Med, Inc. to exacting standards that eliminate the potential problems of residue build-up on thermal print heads and abrasion of thermal print heads. For best results, and to ensure that the print head warranty remains valid, always use Astro-Med, Inc. or Astro-Med, Inc. approved chart paper.

1. Unwrap a pack of Astro-Med, Inc. Part No. 41427000, paper. Be sure to discard the cardboard at the top and bottom of the pack.
2. Lay down the paper-chamber door located at the left side of the unit.
3. Place the paper pack near the paper-chamber door. Position the top sheet (labeled "THIS SIDE UP AND IN FIRST") with the arrows pointing toward the paper chamber.
4. Lift up the top sheet and a short leader of the paper. Place the paper pack inside the paper chamber, keeping the top sheet and leader outside the door.
5. Feed the top sheet into the opening immediately below the black bar (beneath the drive roller).
6. Carefully push the paper through the paper-feed channel until the paper exits the recorder above the drive roller.
7. Close the paper chamber door.

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NOTE **IF A PAPER OUT MESSAGE IS DISPLAYED IN THE BOTTOM TEXT AREA AFTER PERFORMING THIS PROCEDURE: 1) REVIEW THE PROCEDURE AND ENSURE THE PAPER IS LOADED PROPERLY; 2) MAKE CERTAIN A SUFFICIENT LENGTH OF PAPER IS EXITING THE CHUTE.**

IF THE ERROR PERSISTS, IT MAY BE NECESSARY TO VERIFY CALIBRATION OF THE INTERLOCK DETECTOR.

NOTE **VERIFYING CALIBRATION OF THE INTERLOCK DETECTOR AND ALL SERVICE PROCEDURES, SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.**

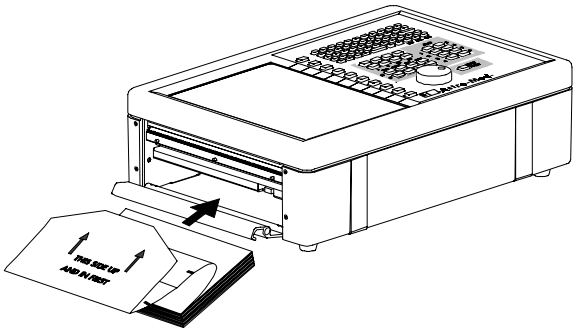


Figure 4 - 1, Loading Paper, Step 1

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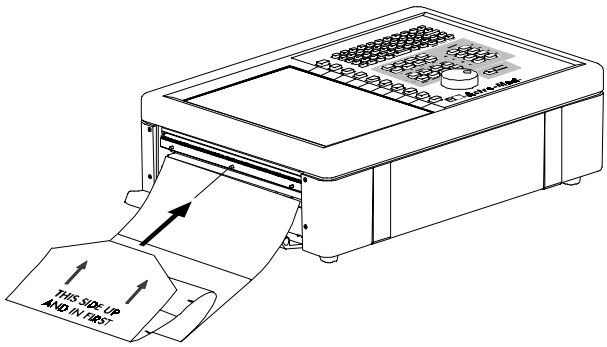


Figure 4 - 2, Loading Paper, Step 2

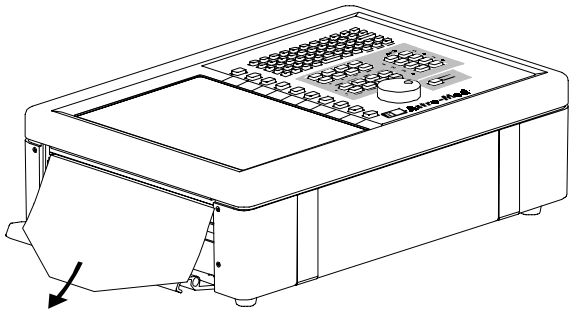


Figure 4 - 3, Loading Paper, Step 3

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Cleaning the Printhead

For optimum performance, the print elements must be kept free of any debris or residue build-up. Cleaning the printhead refers to cleaning the hairline row of print elements that run across the top of the printhead.

NOTE **REGULAR CLEANING WILL NOT HARM THE PRINTHEAD. AT A MINIMUM, CLEAN THE PRINTHEAD AFTER EVERY TEN HOURS OF OPERATION.**

TO CLEAN THE PRINTHEAD:

1. Turn off power to the printer and open the paper-chamber door.
2. To prevent alcohol from staining the paper, remove the pack of paper loaded in your recorder before performing the procedure described below.
3. Locate the drive roller and the printhead. The printhead is located directly behind the static brush and above the drive roller.
4. Position your fingers under the bar that runs above the printhead (just above where the paper exits).
5. Lift the bar up to expose more of the printhead area.

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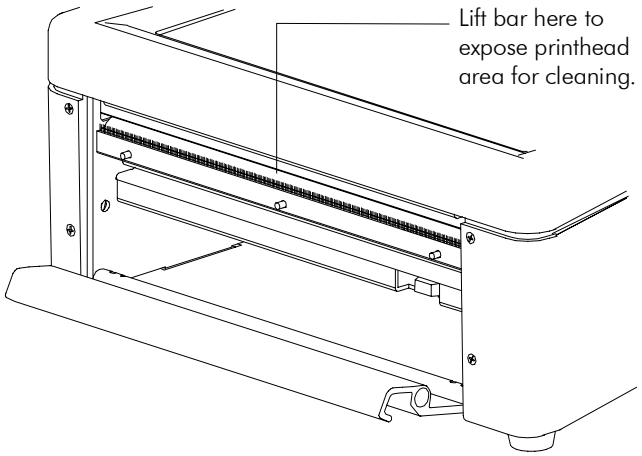


Figure 4 - 4, Printhead Area

6. Hold the bar up while running the alcohol-dipped swab down the length of the crest of the drive roller (between the drive roller and the printhead).

7. Wipe any excess alcohol from the drive roller with a clean cotton cloth.

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Performing a System Software Upgrade

Contact Astro-Med, Inc. to acquire software upgrades.

WARNING **IF YOU DO NOT SAVE THE ACTIVE RECORDER SETUP, IT WILL BE LOST DURING THE UPGRADE PROCEDURE AND WILL NOT BE RECOVERABLE. TO SAVE THE ACTIVE RECORDER SETUP TO DISK, SEE ZIP DISK OPERATIONS.**

See Also
Contacting Technical Support
SYSTEM UPGRADE

Verifying Calibration Output, Dash 8n ONLY

THIS SECTION IS APPLIES TO THE DASH 8N MODEL ONLY 

The SETUP UTILITY I/O command is used to verify the system calibration reference output on the Dash 8n Model. This command also allows a user to force the output to one of the two voltage levels so that it can be measured (verified).

Calibration output is a precision voltage generated by the Dash 8n model for the purpose of calibration. It is available at the CAL jack located on the recorder's right side panel. A special cable (Part no. 24999-000) to be used for this purpose was shipped with your Dash 8n.

During a channel calibration, this voltage is connected to the channel input and switches between 2.5V and 10V under Dash 8n control.

The CAL REF OUTPUT command is not a part of normal calibration. The command is provided as a convenient troubleshooting tool.

See Also
Calibrating Channels, Dash 8n ONLY
CALIBRATE Dash 8n ONLY
SETUP UTILITY I/O

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Verifying Calibration of the Interlock Detector

If an 'out of paper' error appears when paper is in place and properly loaded, the interlock detector may be out of adjustment. The procedure for verifying calibration of the interlock detector SHOULD BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY.

The interlock circuit is located on the analog-to-digital (A/D) board under the top cover of the unit.

WARNING **THIS PROCEDURE IS TO BE PERFORMED BY QUALIFIED SERVICE PERSONNEL ONLY.**

NOTE **ENSURE THAT STANDARD ANTI-STATIC MEASURES ARE TAKEN WHENEVER PERFORMING SERVICE PROCEDURES. ELECTRONIC COMPONENTS CAN BE DAMAGED BY THE DISCHARGE OF STATIC ELECTRICITY.**

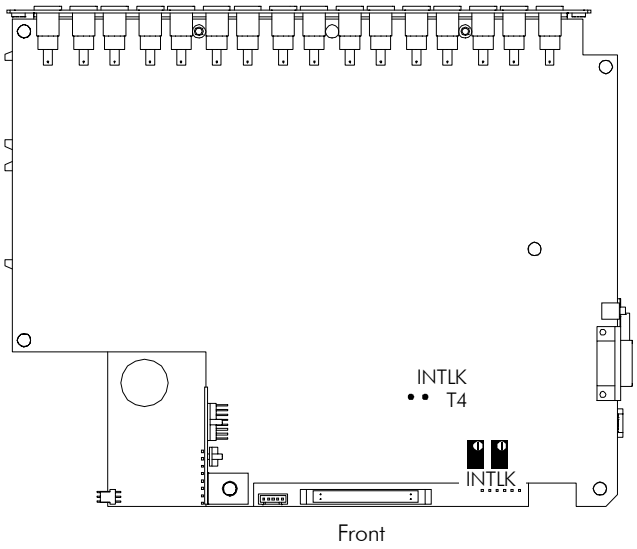


Figure 4 - 5, Location of the Interlock Trimpot and T4 Pin

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TO ADJUST THE INTLK TRIMPOT:

1. Turn off the recorder and unplug it.
2. Carefully rest the recorder on its top or bottom side.
3. Using a Philips-head screwdriver, remove the four recessed screws located underneath the unit.
4. Rest the recorder back on its feet.
5. Lift the cover off the top of the unit, ensuring that its cables remain connected.
6. Rest the cover near the unit; be sure that the cover is positioned to avoid an electrical short.
7. Locate the INTLK trimpot on the front right-side of the A/D board.
8. Locate the INTLK T4 pin (behind the trimpot).
9. Ensure that paper is properly loaded with a sufficient leader exiting the paper chamber and the paper-chamber door is closed
10. Using a very small flathead screwdriver, set the voltage of the interlock detector while monitoring the INTLK T4 pin and ground.
11. Adjust voltage to: <250 mV ± 125 mV
12. Monitor voltage without paper installed. Voltage should rise to 2.5 VDC or greater.

See Also Contacting Technical Support

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Index

ADC resolution 105
addition 106, 163, 164
alarm 128
alphanumeric keypad 8
AMP
  copy settings 162
  Dash 8n ONLY 25
  Dash 8u ONLY 27
  operational hotkeys 11
  print settings 162
amplitude grids 100
AND/OR logic applied to waveform triggers 182
annotation 101
ARM
  auto arm 103
  options for 184
  remotely 17
ASCII conversion 108, 214
AstroSET 214, 221
  part number 5
  recall settings from 212
AstroVIEW 214
  part number 5
AstroVIEW C 215
attenuator 55, 56, 153, 154, 158
  Dash 8u model 56
  Dash 8n model 55
auto playback 104
autobalance 113, 162
auto-chart 33, 138
automating capture 102, 108, 179, 183, 185
autotrig 103, 177, 179, 183, 185
averaging 198
backing up 209
baseline drift 109
baseline offset 154
begin playback 191
binary backup 209
Bridge 20, 157
  input type 157
  setting autobalance on 162
CAL jack 16, 228
calibration 5, 16, 229
  Dash 8n model 73, 108, 168, 228
  Dash 8u model 74, 168
center point of the grid 154
changes made during operation 8
channel 3, 143, 144
  Dash 8n model 19, 57, 60, 73, 121, 168, 228, 55
Dash 8u model 3, 20, 56, 58, 59, 61, 123, 155, 168
chart 21, 100, 133, 138, 139, 141
  factory default 1 134
  factory default 2 135
  factory default 3 136
  factory default 4 137
clock 47
Cluster Captures 215
Color control 18
compacting drive space 207
compression 186, 204
computer interface 214
connections 19
controlling compression 198
converting data from time to frequency 194
copying a file 212
copying signal settings 162
copyright information 1
d/dt 106
data capture
  setting up 183
Data capture 13, 176, 177
  how to trigger 185
Data Capture Record (dcr) 215
Data interpolation 199
data log 96, 104, 175
  set speed 175
date and time 47
DC bridge input type 156
DC/GND command 63
defragmentation of the hard disk 206
DELETE RECORDS command 206, 207
deleting a file 213
deleting a record 206
Differential Input 119
Differential voltage 20, 157
differential voltage input type 157
differentiation 160
  specifying on D8 model 160
Digital Signal Processing 19
dimensions 101

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direct SCSI port 214
disk capacity 18, 102
display screen 18
display speed 131
division 165
documentation 5
  part number 5
DSP 19
DSP capability 156
DSP functions 160
dual speed 100
dual-speed recording 80, 174
duration units 104
EDIT LABEL command 191
edit next label 103
encoder wheel 8
  using 9
engineering units 21, 109
establish a trigger to activate at set time 182
Ethernet 215
Ethernet connector 19, 214
Ethernet Upload 215
events 102
excitation 112, 113, 155, 156
expand or compress a data-capture 190
exporting a record 210
external clock source 132
external input modules 146
  Frequency to Voltage 151
  High Voltage 149
  Resistance Temperature Detector 148
  Very High Voltage 150
external sample rate 102
external speed control 100
externally generated triggers 17, 178
Fast Fourier Transform 117, 194
FCC compliance 1
FEED 11
FFT averaging 201
FFT N-size referenced operation 197
FFT specifications 117
FFT window 195, 201, 202
FFTSize 201
filter choices 104
finding a record 187
fixed end points 195
formatting a Zip disk 213
formatting the hard disk 92, 209
frequency components 194
frequency resolution 204
frequency to voltage 146
front-panel LED 178
gain and position settings 152
grid sizes 19
hard drive 18
header 102
HELP 11
High Voltage 146
hotkeys 8, 11, 12
ID 11
input 108, 109, 121, 122, 155, 156, 198, 199
input line voltage 121
integration 161
interlock detector 229, 230
INTLK trimpot 230
intrinsic noise 109
isolation 109
keypad 10
limiting max input 158
Log magnitude 203
low voltage input 155
lower text area 8
low-pass frequency 106
magnitude plot 202, 203
MARK 13
Math 163
  addition and subtraction 164
  multiplication and division 165
max waveform size 100
maximum record 102
measurement 108, 152, 153
menus 8
  [HELP] 13
  display keys and displays 8
model number 3, 4
monitor
  specifications 102
motor accuracy 130
noise emissions 1, 2
non-operating temp 106
n-size referenced FFT 196, 197
Nyquist frequency 202
ODB print 17
offline operation 221
Offset 153, 154, 159
On-demand buffer (ODB) print 17
operating humidity 106
operating temperature 106
operational hotkeys 8
optimizing timing 205

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Paper
loading....223
part number....5
part numbers....5
peak-to-peak/RMS....64, 161
DSP/FILTER....160
playback....190
playback region....190
playback to paper....191
position the channel text....11
power consumption....101
preset functions....11, 19
preview features....188
print
AMP settings on chart....152
channel ID numbers....143
files....212
status reports....99
text....100, 101
PSI....21
purging records....208
range....158
setting on D8 model....57
setting on D8u model....58
read and write protection....211
real-time clock....107
real-time recording....121, 123, 176
record access error....206
record size options....176
recorder sensitivity....152
recording method....100
recording speed....173
reducing leakage....199
reformat the recorder's hard drive....209
remote access to data....214
remote ARM....17
remote ID....17
remote start/stop....100
renaming a file....212
reports....11, 107
chart information....13
system status....13
Resistance Temperature Detector....146, 148
resolution....100
restoring records....94
review records on the display....187
RMS recording mode....160
RMS time constant....105
RTD module....146, 148
run display....122, 125
RUN/HALT....11
sample rate....102, 104, 105, 175
save recording setups....211
screen copy of output....205
screen display....18
screen preview....82, 83
SCSI....215
drivers supported....216
SCSI Compatibility....216
SCSI port....19, 214
SCSI Upload....215
serial/model numbers....4
set date and time....47
SET RANGE command....158
set record size....102
set trigger win....103
set up and enable triggers....179
SET WINDOW command....190
Setting Up a PC Link via SCSI....217
setting up similar channels....162
SETUP CLOCK....47
SETUP COLOR....48
SETUP UTILITY I/O command....228
signal amplification....153
signal conditioners....19, 100
signal conditioning settings....152
signal offset....153
single acquisition....176
single acquisition with....176
single-ended input....119
single-ended voltage....20, 157
Slope/Level....180
software upgrades....228
software version....4
specifications....100
chart recorder....100
data capture....102, 103, 104
data logger....104
DC bridge input type
D8u ONLY....112
Digital Signal Processing....104
digital signal processing (DSP)....19
display....102
DSP/Filter....160
environmental....106
event inputs....107
Frequency to Voltage module D8u....116
high voltage module D8u....114
Miscellaneous....107
monitor....18

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physical ... 101
power ... 101
record review ... 108
RTD module ... 148
thermocouple measurements D8u ... 111
trigger acquisition ... 108
very high voltage external input D8u ... 115
voltage measurements D8u ... 110
waveform inputs D8 model ... 108
Zip drive ... 18, 46, 101
Specified ranges ... 112
specify time to automatically record ... 174
speed ... 130
adjusting chart ... 131
adjusting display ... 131
menu ... 11
strip chart ... 108
subtraction ... 164
system defaults ... 39
system log ... 11, 20
system log buffer ... 11
system setup ... 11
system status report ... 11, 13
TCP/IP communications ... 128
technical support ... 4, 223
terminal block ... 123, 155
text buffers ... 11, 19, 142
thermocouple ... 20, 155, 156, 157
time
conversion to frequency ... 194
time constant ... 161
time marking ... 19, 100
time stamp ... 102
toggle between two recording speeds ... 173
trace thickness ... 101
Trend display speed setting ... 131
TRIG ... 177
trigger ... 177, 178
activating ... 179
dual-speed recording ... 173
on clock ... 182
on waveform distortions ... 179
options for ... 184
playback region to be set around ... 190
point location ... 103
use an external ... 183
UL-rated input ... 108
universal input channels ... 20, 155
upgrading system software ... 228
Uploading to PC via Ethernet ... 220
Uploading via SCSI ... 219
upper text area ... 8
user engineering units ... 113, 166
input range and zero suppression ... 152
user scaling ... 67
utility connector ... 19
illustration and pinout table ... 17
setup utility I/O ... 128, 129
utility port ... 107
variable cursor movement ... 196
variable end points ... 196
very high voltage ... 146, 150
voltage conversion ... 166
voltage input ... 155
warranty information ... 2
waveform
combining with AND/OR ... 182
waveform display area ... 8
waveform math ... 105, 163
waveform-generated triggers ... 178
weight ... 101
What is AstroVIEW C ... 215
X-Axis scaling ... 204
XY-plot ... 108
Y Autoscale ... 203
zero suppression ... 109, 153, 154
Zip disk ... 46
part number ... 5

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