



# MODEL P9224

FORM AND FIT REPLACEMENT  
FOR THE PRIME TECHNOLOGIES  
9224 MIL-SPEC BARGRAPH METER



- Anodized Aluminum Machined Housing
- 51 or 101 Segment Bargraph
- 4 (0.3"H) Digits with Decimal Points in Red, Amber or Green
- Choice of Power Input 9-36VDC or 90-265VAC
- NEMA 4X/IP68 Front Panel to 8 PSI (413 mmhg)
- DC and RMS Analog Inputs with support for Strain-Gage, RTD, Potentiometer Volts and Amps
- Programmable Excitation
- Communications of RS232C, RS422, or RS485
- High Density, Sealed D-SUB 15 Pin Gold Plated Male Connector
- Annealed Glass Front Lens
- EMI/RFI Front Panel Gasket
- Conformal Coated Boards
- Lead Free



## ORDERING INFORMATION

**A Display Style**

101 Segment Bar and 4 Digit Numeric ...	0
51 Segment Bar and 4 Digit Numeric.....	1
Reserved for future use.....	2
Special.....	S

**B Temperature Range**

Standard 0-60C.....	0
Extended -40 to +85C.....	E
Special.....	S

**C Power Input**

9-36VDC.....	0
90-265VAC.....	1
Special.....	S

**D Serial Interface (See note 1)**

RS232C Communications.....	232
RS422 Half Duplex Communications.....	422
RS485 Half Duplex Communications.....	485

**E Analog Input (See note 2)**

Not required.....	0
DC Volts and Amps, 1 Channel.....	DC1
DC Volts and Amps, 2 Channel.....	DC2
RMS Volts and Amps, 1 Channel.....	RMS1
RMS Volts and Amps, 2 Channel.....	RMS2

**F External Intensity Control**

Not required.....	0
PWM, TTL Level Signal.....	P
Voltage Input Intensity Control.....	V



**Part Number Example**

P9224-000-485-00 calls for a single 101 segment tri-color bargraph display with a 4 digit numeric, standard 0-60 deg C operating temperature range, 9-36VDC power input and RS485 half duplex communications. **Analog input and external intensity control are not included.**

**Note 1:**  
RS422 serial input version is receive only. Unit will not echo commands.

**Note 2:**  
DC analog inputs support ranges from mVDC to 300VDC and from 0.01mADC to 3 AMPS DC (including 1-5VDC, 4-20mADC) as well as RTD and Strain-Gage, Excitation is standard. RMS inputs only support True RMS with levels up to 300V and 3 AMPS RMS.

# SPECIFICATIONS

## POWER INPUTS

- 9-36VDC, Isolated to 500VDC, 3 Watts Maximum
- 90-265VAC Isolated to 500VDC, 3 Watts Maximum
- External fuse should be installed, Rated 4 Amps

## ENVIRONMENTAL

- Operating Temp 0 to 60 Degrees C Standard
- Operating Temp -40 to 85 Degrees C Optional
- Storage Temp -55 to 95 Degrees C
- Humidity to 95% Non-Condensing
- NEMA 4X / IP68 Front Panel to 8 PSI (413 mmhg)
- Lead Free ROHS Compliant

## DISPLAY

- 4 Full LED Digits with Decimal Point 8.8.8.8.
- Display Range: -1999 to 9999
- Choice of Red, Green or Amber Color
- Superb Visibility 7 Segment 0.30" High LEDs
- 51 or 101 Segment Tri-Color LED Bargraph
- Face Plate: Annealed Glass, 0.062" Thick

## EMI CHARACTERISTICS (Pending qualification)

### \*\* 9-36VDC power input version\*\*

- Radiated Emissions EN55022 Class B
- Radiated Susceptibility EN61000-4-3 Criteria A;10V/m
- Conducted Emissions EN55022 class B
- Conducted Susceptibility EN61000-4-6 Criteria A; 3VRMS
- EFT ; EN61000-4-4 +/- 4KV
- Surge ; EN61000-4-5 to +/- 2KV
- ESD ; EN61000-4-2 Criteria B +/- 4KV

# COMMAND SET

## Commands (General for Device)

Commands are not case sensitive and are always terminated by <cr> <lf> pair (enter key)

**CA** CHANGE ADDRESS (example 001ca123<cr> <lf>) new address is now 123

The address shall be 3 alpha-numeric characters in length

In addition to the units set address, the unit shall respond to an address of 000

**CB** CHANGE BAUD RATE (example 123cb19200<cr> <lf>) new baud rate is now 19200 baud

The baud rates supported are 1200, 2400, 4800, 9600, 19200, 38400

Use standard 8N1 (8 data bit, no parity, 1 stop bit)

**CD** DISPLAY STRING (example 123cd23.45<cr> <lf>) unit will display 23.45 on the LED's. The displayed range is -1999 to 9999 and is always right justified. All decimal points are able to be turned on.

**CI** CHANGE INTENSITY (example 123ci100<cr> <lf>) sets intensity to maximum brightness

The intensity range is 0 to 100 percent brightness 0=display off, 25=1/4 brightness, 50=1/2 brightness, 100=max brightness. Intensity is controlled through PWM from the micro-controller or from an external DC Voltage/TTL level, 10 KHz PWM input depending on part number specified

If ordered with the DC voltage input intensity control option, you can change between external or serial input control with the commands CIA and CIS. CIA sets external voltage control input and CIS sets serial input control. The DC Voltage input accepts levels up to 30VDC (minimum VDC input span is 4VDC) and can be calibrated to your specific range. Calibration is simple by following these 3 steps.

Send the CIA command (example 123cia<cr> <lf>) This places the unit in analog intensity control.

To calibrate the MINIMUM intensity level, apply your minimum voltage level and send the command CIL (example 123cil<cr> <lf>)

To calibrate the MAXIMUM intensity level, apply your maximum input voltage (do not exceed 30VDC) and send the command CIH (example 123cih<cr> <lf>)

Your display intensity level will now be calibrated to your voltage input. Remember to send the SC command to save your changes.

## COMMAND SET(cont'd)

**CR** TURN ON/OFF RETRANSMIT OF INCOMING DATA (example 123cr0<cr> <lf>) turns off retransmit Modes are 0 (off) and 1 (on). When turned on, the device will echo all incoming characters to the uart output

**SC** SAVES CHANGES and new checksum to eeprom (example 123sc<cr> <lf>)

**CT** CHANGE TIMEOUT VALUE (example 123ct0<cr> <lf>) sets timeout to off  
The timeout range is 5, 10, 15, 20 seconds. Set to 0 to turn off this function  
This timeout is used for loss of communications. If host device does not update this device with new data within the set timeout duration then print err2 on display until new data is received.

**DT** DISPLAY TYPE CONFIGURATION. We currently support two different display types.  
Type 9 is a single 4 digit numeric and a single 51 segment bargraph.  
Type 1 is a single 4 digit numeric and a single 101 segment bargraph  
(example 123dt1<cr> <lf>) sets device to display type 1 per above

### Commands (Specific for Display Control)

#### Numeric (digital) Display

**DPn** DISPLAYED PRECISION (decimal point) n=0-4, 0=xxxx., 1=xxx.x, 2=xx.xx, 3=x.xxx  
(example 123dp2 <cr> <lf>) sets the numeric display decimal point to xx.xx

#### Bargraph Settings

**BMn** n=E or C Bargraph mode, BME=End start, BMC=Center start. Commands bargraph to start at end (LED1) or at center (LED51) and fill accordingly.  
(example 123bmc<cr> <lf>) sets bargraph mode to center

**BSnnnnn** (nnnnn=numeric number) BARGRAPH START VALUE, number at which bargraph will begin to illuminate at (example 123bs50<cr> <lf>) sets bargraph to begin filling at a value of 50. Values below 50 will only have the very first bar illuminated and values between 50 and BE number (see below) will illuminate the bar accordingly.

**BEnnnnn** (nnnnn=numeric number) BARGRAPH END (full scale value), number at which bargraph will top off at (example 123be150<cr> <lf>) sets the bargraph end value to 150. Values above 150 will force the entire bar to be turned on. Setting BS to 50 and BE to 150, the bar will be 50% turned on with a value of 100

**BCn, n=(r,g,a)** BARGRAPH NORMAL COLOR, BCR (red), BCG (green), BCA (amber)  
(example 123bcg<cr> <lf>) sets bargraph color to green during normal operation

**BCn, n=(n,y)** BARGRAPH COLOR CHANGING. BCN=no color change, BCY=yes color change to limit color  
(example 123bcy<cr> <lf>) sets bargraph to change color when the limit has been reached. The entire illuminated portion of the bargraph will change to the programmed limit color per the command set A1-A4 detailed below

## COMMAND SET (cont'd)

**BO<sub>n</sub>, n=(r,g,a,d)** SETS THE COLOR of the off segments of the bargraph so the value being measured can be displayed as one color and the rest (background) in a separate color. Useful for displaying water/steam in boilers or pressure vessels. (Example 123bor<cr> <lf>) Once set, if the bargraph normal color (BC<sub>n</sub> above) is set to Green, the displayed value will turn on in green color, the remainder of the bargraph in red color. TO TURN OFF this feature, set BO to d.

**AC<sub>n</sub>, n=(n,y)** ALARM COLOR CHANGING. ACN=no color change, ACY=yes color change.  
(example 123acy<cr> <lf>) sets bargraph to change color at the preprogrammed alarm values. Similar to BC<sub>n</sub> command above except only the portion of the bargraph beyond the alarm value changes color, not the entire bargraph.

**BA<sub>nn</sub>** TURN BARGRAPH ALARM ON OR OFF (limit) markers BA<sub>on</sub>, BA<sub>off</sub>  
(example 123baon<cr> <lf>) turns on the alarm markers for the bargraph. When enabled, the appropriate bargraph segment will be turned on to indicate the alarm value location on the bargraph

### Alarm (Limit) Color for Bar

SETS COLOR OF LIMIT MARKERS on bargraph display

**AC<sub>n</sub>x**, n=1, 2, 3, 4, x=R, G, A, D. Change limit 1-4 color to Red, Green, Amber or off (D)  
(example 123ac4r<cr> <lf>) sets bargraph alarm color for limit A4 (hi-hi limit) to red

### Limits (Color Changing)

**A<sub>nyyyy</sub>** A= Alarm limit command, n=Alarm limit number (1-4), yyyy=value of limit

**A4**=Hi-Hi limit

**A3**=Hi limit

**A2**=Low limit

**A1**=Low low limit

(example 123a4140<cr> <lf>) sets alarm limit #4 to a value of 140. If displayed value is equal or greater than 140 then bargraph may change color if bc command is set to y. Note order of operation for alarms; A4>A3, A3>A2, A2>A1. Unit will not allow an A1 value greater than an A2 value

## TABLE OF COMMANDS

Command	Arguments	Description
A<n><m>	n = 1-4, m = floating point value	Sets Alarm 1 through Alarm 4 value
AC<n><c>	n = 1-4, c = r, g, a, d	Sets Alarm limit color to red, green, amber or none
AC<y/n>	yes or no	Alarm limit color changing
BA<on/off>	on or off	Alarm limit markers on or off
BB<m>	m = floating point value	Sets value at which bar will go up or down when in BMC (center) mode. <m> must be between BS and BE value
BC<c>	c = r, g, a, d	Changes the bargraph color
BC<y/n>	Y or N	Bargraph change to limit color on or off
BE<m>	m = floating point value	Bargraph end value
BM<n>	n = e, c, t	Bargraph mode of bottom to top, top to bottom or bidirectional
BO<c>	c = r, g, a, d	The color of the unlit segments of the bargraph
BS<m>	m = floating point value	Bargraph start value
CA<s>	S = 3 byte ASCII string	Changes the address
CB<n>	N = 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Changes the baud rate
CD<m>	m = floating point value or ASCII string	Changes displayed value
CI<n>	n = 0 - 100	Display Intensity
CM<n>	n = 1	1 = PI communications mode
CR<n>	n = 0, 1	0 = unit does not echo, 1 = unit will echo incoming characters
CT<n>	n = 0 - 250	Timeout value in seconds before display error occurs
DP<n>	n = 0 - 4	Decimal location
DT<n>	n = 0, 1, 2, 9, P	Display type
RS	none	Resets unit to last SC command saved state
RD	none	Resets unit to Default mode as if eeprom read was bad and lights up all the decimal points only, no ERR1 on the numeric display. Note: This will erase all of your current settings if you follow with an SC command. To undo, cycle power to the unit.
SC	none	Saves user parameters to EEPROM

# POWER ON SEQUENCE

## Power on

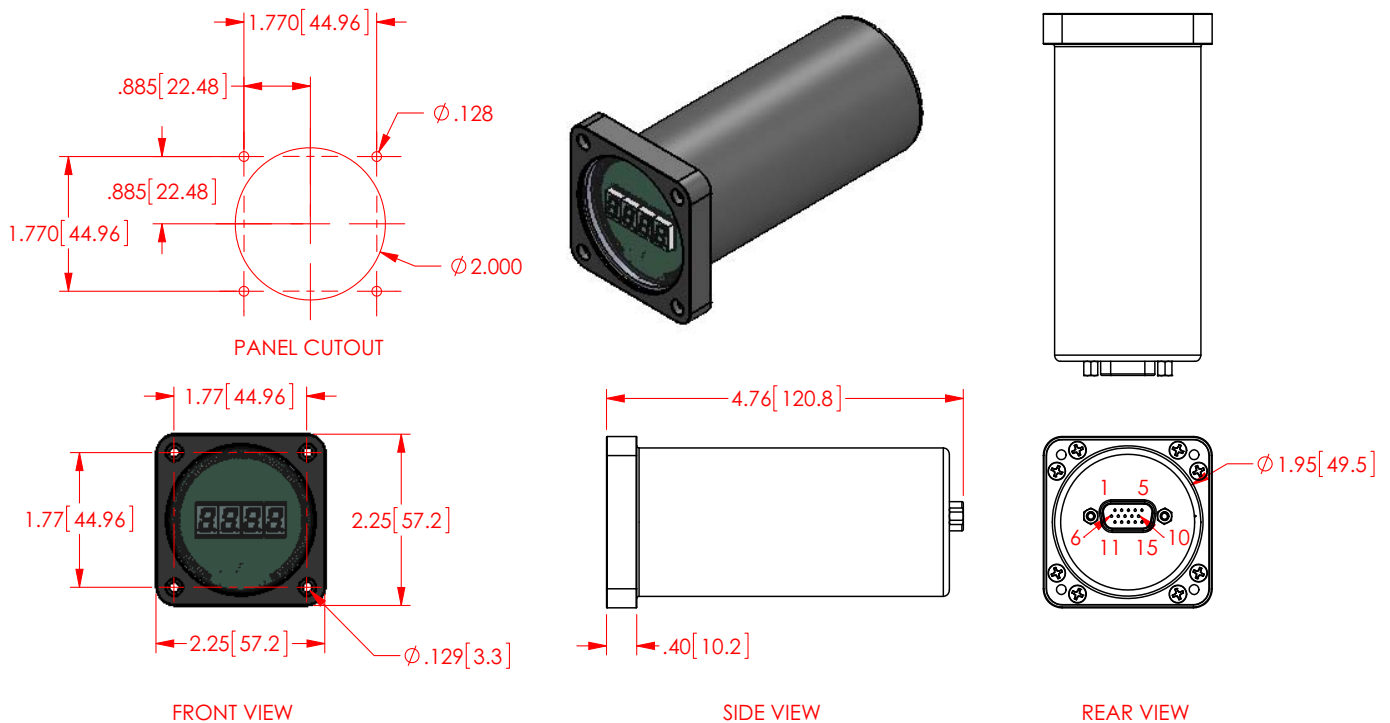
Perform lamp test (all segments on) and read eeprom data/checksum, compare. If good then use stored settings. If not good, retry read up to 3 times to insure corruption

After 4 unsuccessful reads force unit to default mode CA=001, CB=9600, CI=100, mode PI bus, CR=OFF, CT=0 then display Err1 on numeric LED's. For the Bargraph settings, DT=1, DP=3, BM=E, BS=0, BE=0.1, BC=A, BC=N, BA=OFF, BO=D, AC=N, ACn=A for all four alarms and A1-A4 values are all set to 0.

If checksum match is successful, turn on all DP's to indicate a power on state. Note this will be affected by the CT command if no data is received within the timeout period

## MECHANICAL

All dimensions in Inches [mm]



## D15 PIN DESCRIPTION

Unit is shipped with the male connector installed CONEC P/N 15-002193 or equal

1. NC	6. NC	11. NC
2. NC	7. TXD / DO-	12. Intensity Ctrl (PWM or VDC) + Input
3. Intensity Ctrl GND	8. RXD / DO+	13. +VDC or AC HOT Power (not fused internally)
4. NC	9. Comm GND	14. -VDC or AC Neutral Power
5. NC	10. NC	15. NC

Note: Add terminating resistors to last unit if applicable

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