vGauge G12P/G12S

User's Manual
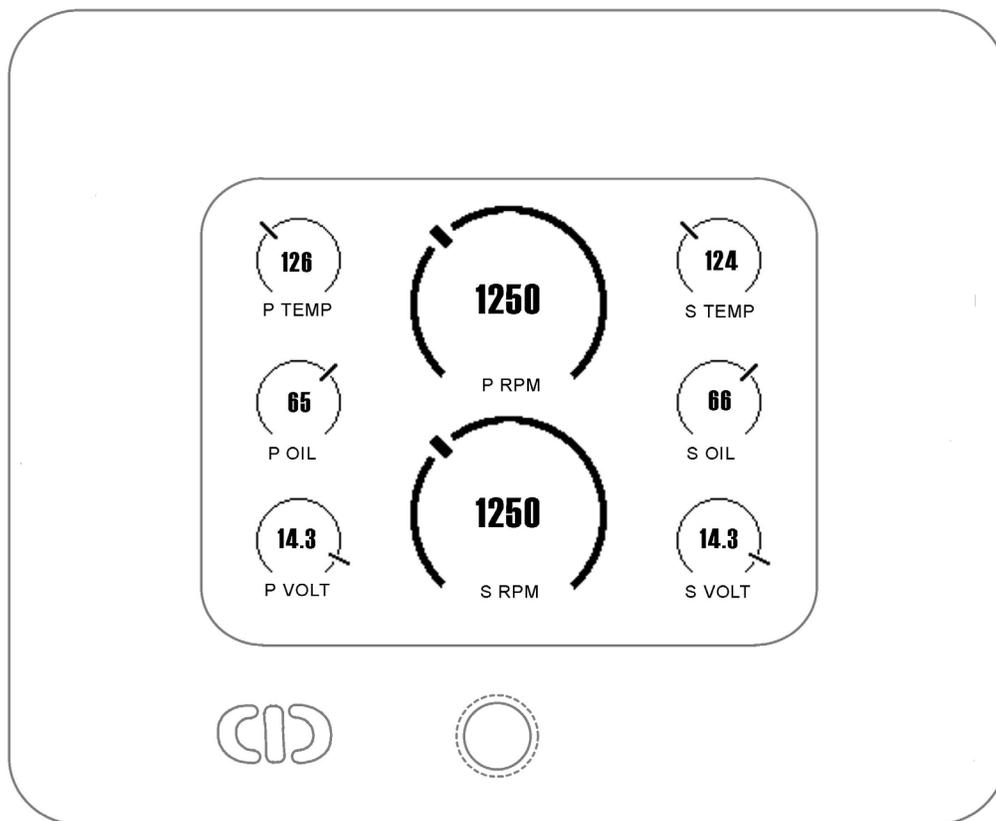
Chetco Digital Instruments

WARNING!

USE THIS UNIT ONLY AS AN AID TO MONITORING ENGINE PERFORMANCE INFORMATION.

CAUTION

When showing sensor data, this unit will only show information based on the sender used and its installed position.

The operating and storage temperature for your unit is from -4 degrees to+167 degrees Fahrenheit (-20 to +75 degrees Celsius). Extended storage temperatures higher or lower than specified will cause the liquid crystal display to fail. Neither this type of failure nor its consequences are covered by the warranty. For more information, consult the factory customer service department.

All features and specifications subject to change without notice.

Chetco Digital Instruments may find it necessary to change or end our policies, regulations, and special offers at any time. We reserve the right to do so without notice.

All screens in this manual are simulated.

NOTICE!

Free software upgrades will be available on our website at http://www.chetcodigital.com as they are released. Please check our website periodically for these and other information as they become available.

Thank you for choosing Chetco Digital Instruments

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.

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and receiver.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

• Consult the factory customer service department for help.

SPECIFICATIONS

CASE Dimensions: ....7.75" W x 6.5" H x 2.3" D

MODULE Dimensions: ....5.75" W x 4.6" H x 1.7" D

Input Voltage: ....4.5-5.6 vDC, 5-volt Nominal

Processor Frequency: .... 18.432 MHz

Maximum Current: ....800 mA

Display: .... 5.5"W x 4.5"H LCD 30 char H x 40 char W

Operating and Storage Temperature .... -4 to +167 degrees Fahrenheit
-20 to +75 degrees Celsius

Analog Conversion Accuracy : ....10 bits

Analog update rate : .... 2 per second (10 point average)

Sender voltage range: .... 0 -3.3 volts

Sender voltage resolution: .... 0.0128 volts

Pulse Count update rate: .... 1 per second

Maximum Pulse Count: .... 500 per second

Firmware Revision: G12R1.14

NMEA 2.0 Instrumentation Sentences $IIXDR,A $IIXDR,C $IIXDR,D $IIXDR,F $IIXDR,G $IIXDR,I $IIXDR,P $IIXDR,R $IIXDR,S $IIXDR,T $IIXDR,U $IIXDR,V $SDDBT, $SDMTW, $GPVTG,S $GPVTG,H

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Introduction

Welcome

Thank you for purchasing a Chetco Digital Instruments product. vGauge G12™ is a multi-function display head that provides custom instrumentation in a rugged compact design. Its menu driven functions allow it adapt to and monitor many different sensors from a single location. Optional built-in wireless capability allows display of real-time data from remote locations.

This manual covers the vGauge G12A/vGauge G12P/ vGauge G12i /vGauge G12S products. All are functionally the same except for screen sizes and enclosures.

vGauge G12A features 5.7" Sunlight viewable monochrome LCD screen and rugged Aluminum enclosure. NMEA 0183 input via USB/Serial

vGauge G12P features 5.7" Sunlight viewable monochrome LCD screen and sealed plastic enclosure. NMEA 0183 input via USB/Serial

vGauge G12i features 5.7" Sunlight viewable monochrome LCD screen and sealed plastic enclosure. NMEA 0183 input and 4 direct analog inputs with 1 Tachometer input.

vGauge G12S features 3.8" Sunlight viewable monochrome LCD screen and sealed plastic enclosure. NMEA 0183 input via USB/Serial

All products are designed to work with vGauge Remote sensor unit which provides interface to external sensors to create a virtual instrumentation system. The vGauge G12 display heads support both USB and Serial interfaces to vGauge Remote units or PC.

Display data is received in digital format conforming to the NMEA 0183 serial protocol. Up to 16 $IIXDR NMEA instrumentation sentences can be received and displayed using a variety of user specified graphic formats.

vGauge G12i models are available with 4 direct analog inputs and a single tachometer input. These models will have an additional 6-pin connector on the rear of the unit for receiving the additional analog inputs.

Anti-glare faceplate

The vGauge™ G12 display head is shipped with a protective film to prevent damage to the faceplate during shipping. Keep the protective film in place until finished with installation. It is easily removed by pealing off when ready for use.

The special anti-glare display window should only be cleaned with soap and water or window cleaner. A mild dish soap works well and then rinse with clean water. Do not wipe surface with a paper towel as it will mar the finish. A lens cleaning tissue used for eye glasses works best. Be sure it is safe for plastic lenses and anti-glare coatings.

What You Get

Unit

vGauge G12 head unit with power and data input. Unit constantly monitors the data inputs and updates the graphic LCD display two times per second. Digital data is received from vGauge Remote sensor unit via both serial (RS232) and USB protocols and is decoded for display based on user configured formats.

Multiple instrumentation display can be configured and scrolled though using a sealed pushbutton on the unit. Custom configurations can be created using supplied **vDash** software on PC and downloaded to G12 display unit using the USB interface.

A single water-resist connector in the rear provides a quick disconnect for both power and data inputs. Unit can be powered directly from vGauge Remote sensor unit or USB.

Cables

Maximum distance using USB is 16 feet and up to 150 feet can be achieved using serial input. Custom interface cables are required to support both interface types

vGauge G12 is supplied with a standard USB interface cable with a maximum length of 16 feet. One end is type A USB connector and opposite end is custom 8-pin circular water-resist connector for attachment to unit.

For distances longer than 16 feet, a custom serial cable can be ordered up 150 feet. Please contact Chetco Digital Instruments if you need a longer cable.

Flash Programming cable – A custom USB interface cable is available for reprogramming the unit firmware. This cable is only used to reprogram the unit and is not required for normal operations including configuration via attached PC

Software

vGauge G12 units come with **vDash** instrumentation software for WindowsXP and Vista platforms. **vDash** allows creation of custom screen layouts and graphic elements for up to 8 user defined pages. These settings can be arranged on the host PC connected to vGauge Remote sensor unit and then transferred to attached vGauge G12 units via supplied USB cable.

Please consult **vDash** user manual for details on user configuration.

Operation

This manual covers operation for vGauge G12 Dash units and the vGauge G12 OEM Modules. Both units feature a 320X240 graphic LCD display. Operation of both units is the same with the exception of the location of the control buttons. On the vGauge G12 Dash unit, the sealed button is located on the front of the case while the vGauge G12 OEM module has a rear connector for attachment of control buttons. The single control button provides multiple functions based on how long it is pushed and released. Throughout the manual reference will be made to the button as:

- **BackLight On/OFF (hold and release less then 2 seconds)**
- **Screen Select (hold release for more then 2 seconds)**
- **Unit Reset (hold for more then 30 seconds)**

Control of the vGauge G12 unit is done using sealed pushbutton. The **Screen Select** function is used to scroll through different display pages. The **Backlight** function is used to toggle the backlight on or off.
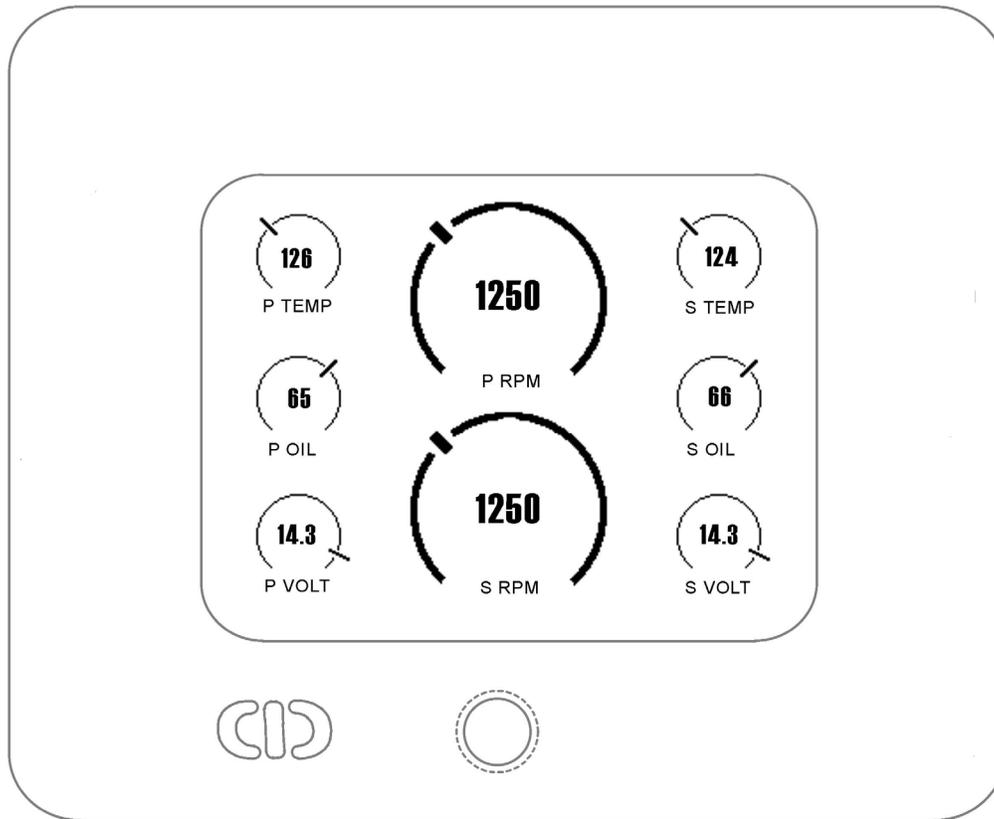
When you receive your unit it has been programmed to display gauge readings in groups with a maximum of eight groups. On power-up the unit will start to display the first group of gauge functions. Additional gauge display groups can be viewed by using the **Select** button. Push and hold the button for 2 seconds and then release to view the next page. Once the unit has shown all display groups it cycles over again from the first group.

The **Backlight** function performs two functions.

BACKLIGHT TOGGLE – Pressing during normal operation will toggle backlight. Press and release the Select Button for one second to toggle the backlight.

ALARM DISABLE – If alarm function is active, pressing button will deactivate alarm for 60 seconds after which alarm will resume.

Normal Operation

When the unit is powered up it will display the first group of display values. The vGauge G12 can display from 1 to 12 values per group and up to 8 groups. The total number of groups displayed is an option that can be changed in setup mode. For example if the number of groups is set to four – pressing the **Select** button will take you through the following possible displays.
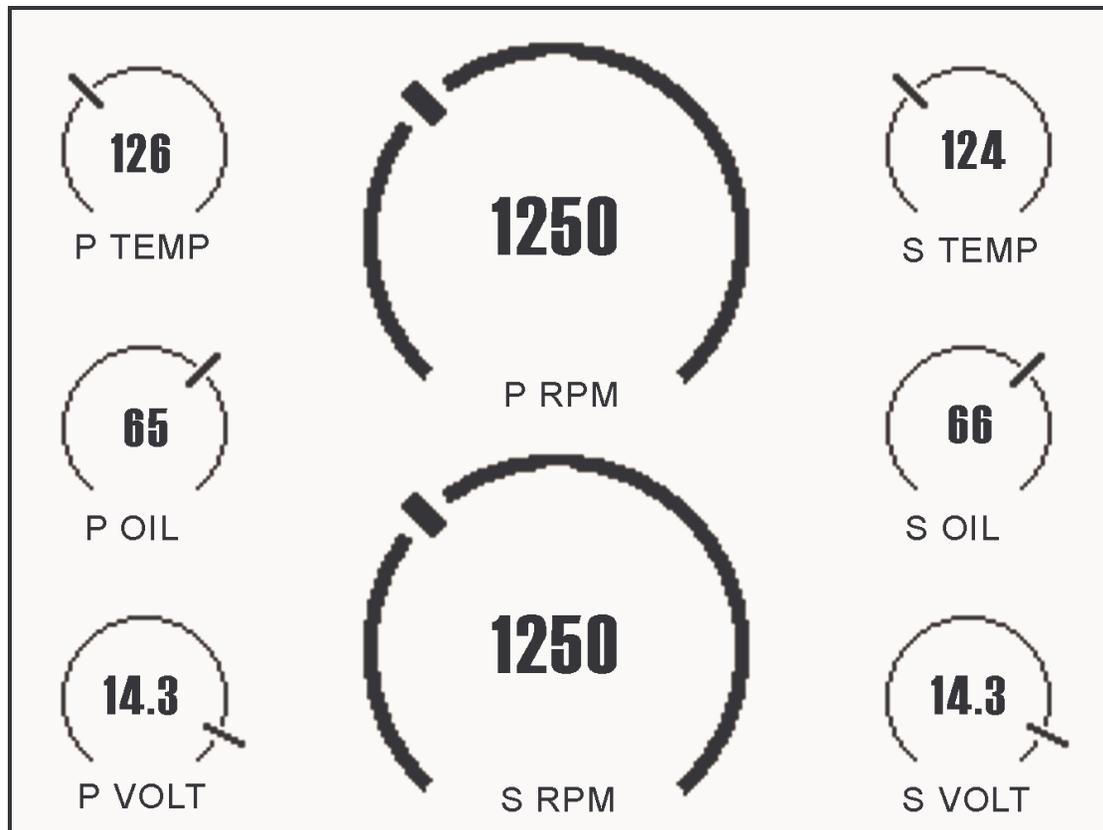
Figure 1 Display Group 1

206 P Temp	**210** S Temp	
67 P OIL	**64** S OIL	
12.8 P Volt	**12.5** S Volt	
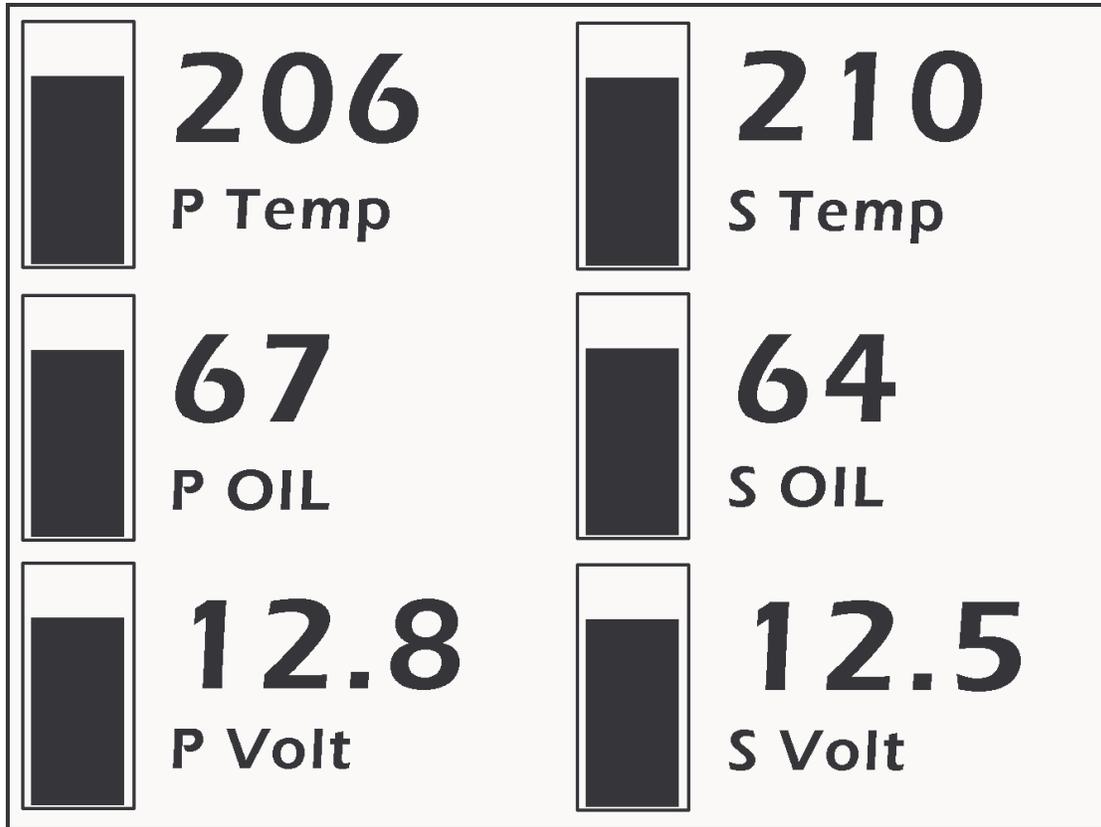
Figure 2 Display Group 2

P TEMP	126	████████░░░░░░░░░░
S TEMP	124	████████░░░░░░░░░░
P OIL	66	█████████████████
S OIL	65	█████████████████
P VOLT	14.3	███████████░░░░░░
S VOLT	14.3	███████████░░░░░░
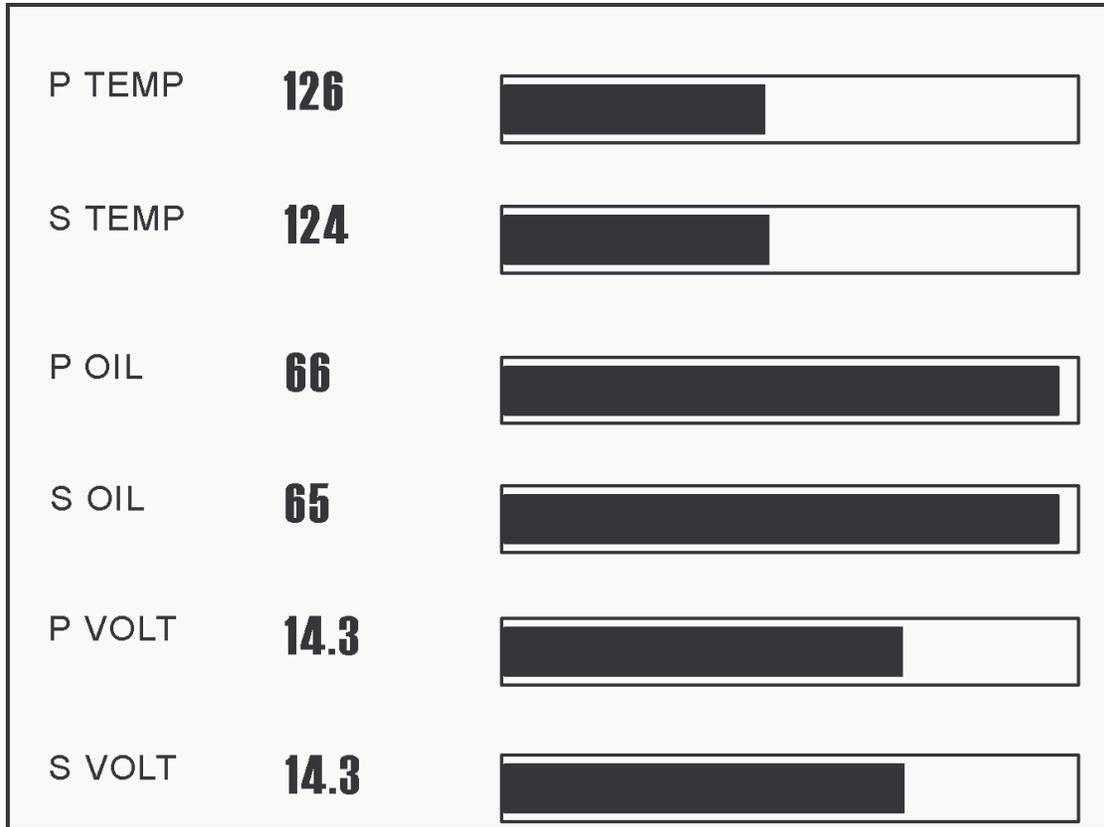
Figure 3 Display Group 3
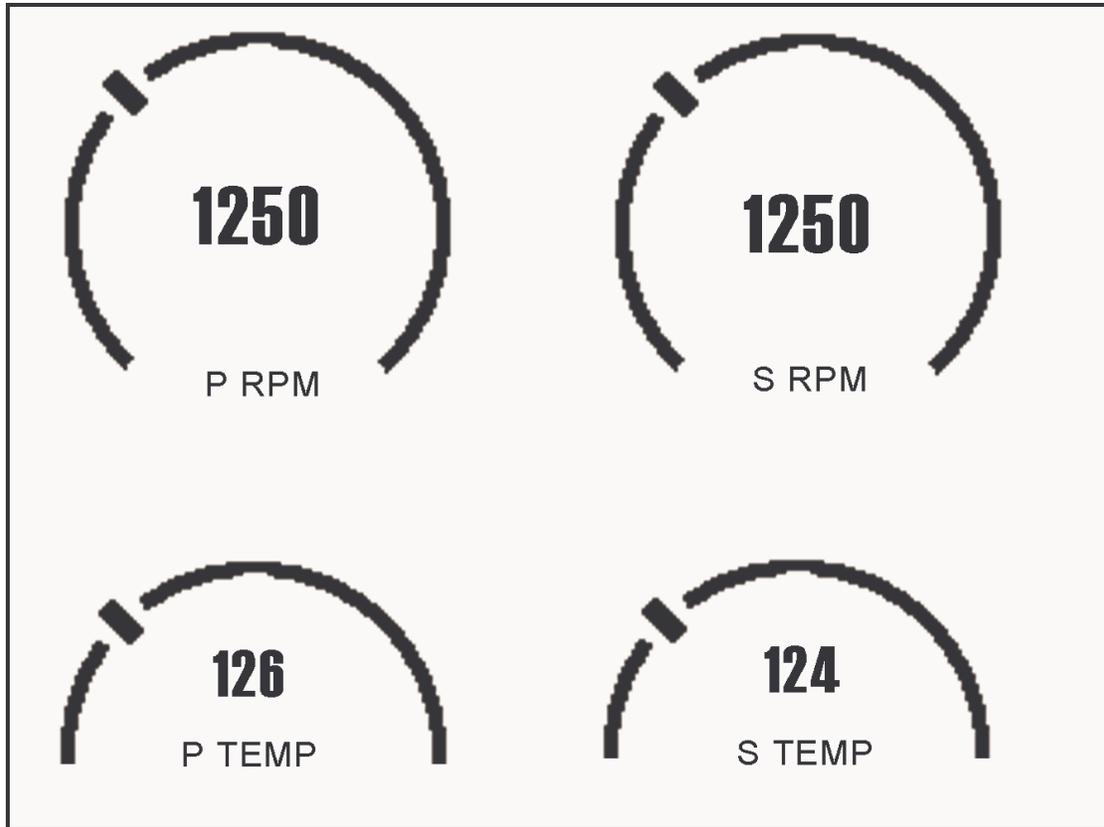
Figure 4 Display Group 4.

Once you cycle through all display groups they start over. You can change the group assignment and position for any of the display values using the setup modes.

Graphic Modes

vGauge G12 supports ten graphics modes to display digital data. The modes can be selected dependent on the type of desired display format.

- **Digital Data Display (1)**
- **Histogram (2)**
- **Horizontal Bar Graph (4)**
- **Small Gauge Dial (6)**
- **Large Gauge Dial (8)**
- **Large Half Dial (9)**
- **Large Digital Data Display (10)**
- **Vertical Bar Graph (11)**
- **Small Digital Data Display (12)**
- **Huge Text Graph (13)**

Graphic display modes can be combined with digital data display in each display group. Graphic display modes are available for the analog inputs and NMEA $IIXDR inputs. Non - NMEA $IIXDR data can be displayed using Digital Data Display (D) only.

Graphic display modes are assigned during group configuration. As specific gauge values are being assigned to each of the eight possible groups there is an option to choose which display mode to use for that sensor input.

Digital Data – An 8 character text label followed by a 6 character digital readout. The characters are 16 X 8 for a total of 12 readouts (6 rows by 2 columns) per display page. Digital data display modes can be mixed with other graphic display modes

P TEMP   126

Figure 5 Digital Data Element

Bar Graph – 24 segment Bar graph used to show relative signal level with low values to the left and high values to the right. Each segment contains represents 1/10th of full scale value. As sensor signal increases, the graph will grow to the right in real time.

Figure 6 Bar Graph Element

Sensor text label and digital value are displayed on the left of the graph. One Bar Graph can be assigned to each row of the display for a total of 6 per display page.

NO OTHER GRAPHIC ELEMENTS CAN BE ASSIGNED TO THE SAME ROW WITH THE BAR GRAPH

Histogram Graph – A 40 bar Histogram graph shows the relative strength of sensor input over a user configured time interval. Recent time values are on the left and oldest time values on the right. As new values arrive - the graph scrolls to the right adding the newest value and dropping the oldest. Signal strength is depicted by a 64 segment bar with lowest strength at the bottom and highest at the top. Histograms show signal trends over time.
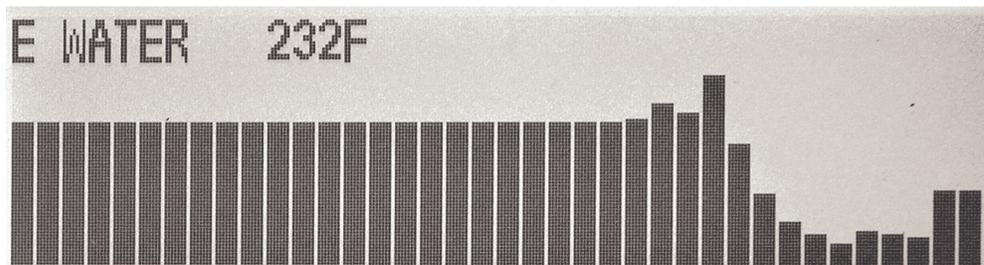
Figure 7 Histogram Graphic Element

Sensor text label and digital value are displayed on top of the graph. One Histogram Graph uses 10 rows of the display. There can be three Histograms per group.

NO OTHER GRAPHIC ELEMENTS CAN BE ASSIGNED TO THE SAME ROWS WITH THE HISTOGRAM

Digital Gauge Dial Graph – A 15 segment digital dial shows the relative signal strength using a analog style gauge display.
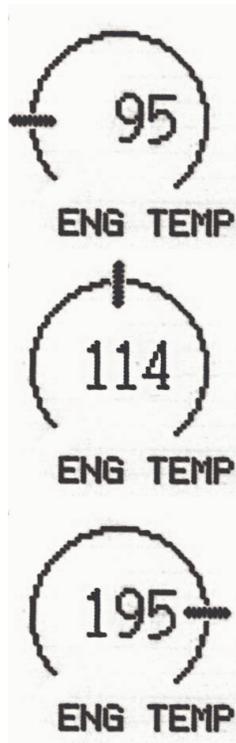
The needle at the 9:00 O'clock position represents low signal

The needle at the 12:00 O'clock represent Mid-strength

The needle at the 3:00 O'clock represents Max strength

The needle moves in real-time in a clockwise direction to represent the relative strength of the analog signal.

Sensor text label is displayed in small text under the dial and digital sensor readout is display in center of dial using larger text.

Each display page can have up to 12 digital dial elements arranged as 3 rows of 4 elements. Other graphic elements can be mixed with digital dial displays.

Large Half Digital Dial – This graphic mode shows relative signal strength using a familiar dial display with a 14 element needle around the other edge. As sensor value increases, the needle moves in a clockwise direction This graph is an instantaneous display of signal strength.

Figure 8 Large Half Dial Display Mode

Sensor text label is display in small text below dial and digital readout of sensor is shown in the middle using large text.

Six Large Half Digital Dials can be used on a single display page arranged as three rows and two columns. A Large Half Digital Dial can be combined with other graphic elements as long as they do not overlap the dial position.

Large Full Digital Dial – This graphic mode shows relative signal strength using a familiar dial display with a 24 element needle around the other edge. As sensor value increases, the needle moves in a clockwise direction This graph is an instantaneous display of signal strength.
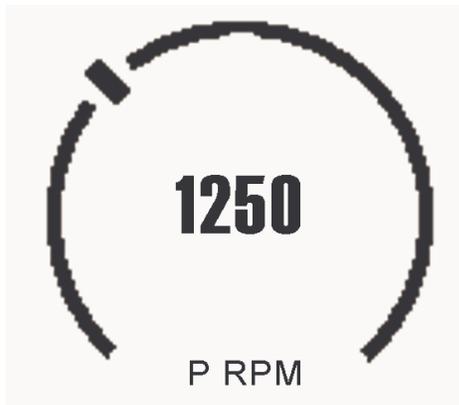
Figure 9 Large Full Dial Display Mode

Sensor text label is display in small text below dial and digital readout of sensor is shown in the middle using large text.

Four Large Digital Dials can be used on a single display page arranged as two rows and two columns. A Large Digital Dial can be combined with other graphic elements as long as they do not overlap the dial position.

Big Vertical Bar – This graphic mode shows relative signal strength using a vertical bar display with a 20 elements and a large digital readout. As sensor value increases, the bars fill in from bottom to top. When bar fill in, the signal is at maximum strength. Up to 6 Vertical Bar graphs can be shown on one screen. This graph is an instantaneous display of signal strength.
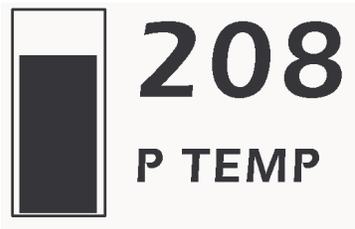
Figure 10 Big Vertical Bar Display Mode

Sensor text label is display in small text below dial and digital readout of sensor is shown on top using large text.

Huge Text Bar – This graphic mode shows large digital readout. Text shows instantaneous readout of sensor values in a large banner across the screen. Up to 3 Huge Text displays can be shown on one screen. This graph is an instantaneous display of signal strength.

Figure 11 Huge Text Display Mode

Sensor text label is displayed on Left side and a huge numerical readout of sensor value is on the right. No other items can be placed on the same row and the mode fills all 4 columns of the display

NO OTHER GRAPHIC ELEMENTS CAN BE ASSIGNED TO THE SAME ROW WITH THE HUGE TEXT BAR GRAPH

Small Digital Data – An 8 character text label followed by a 6 character digital readout. The characters are 8 X 6 for a total of 24 readouts (12 rows by 2 columns) per display page. Digital data display modes can be mixed with other graphic display modes
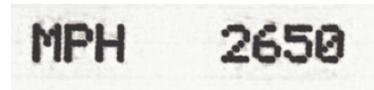
Figure 9 Small Digital Data Element

All Display pages are configurable to use any of the graphic display formats for each sensor input. It is possible to mix some graphic display formats on the same page. For example –
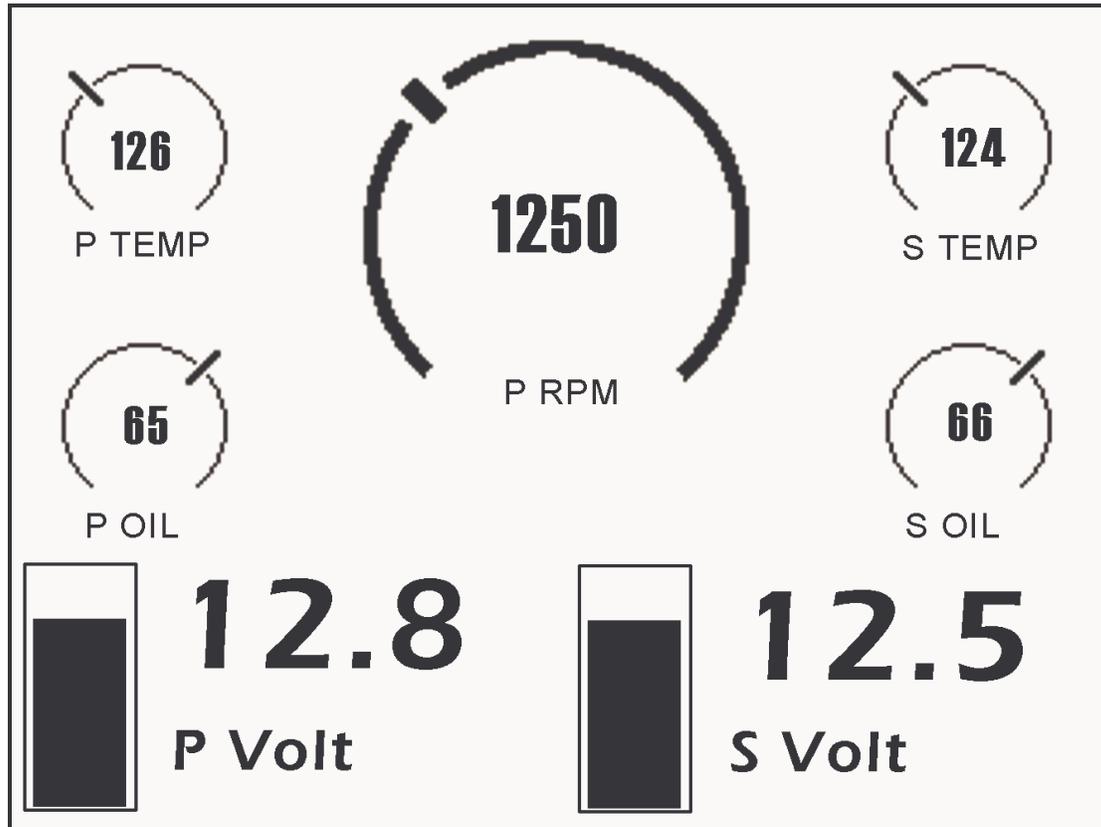
Figure 10 Mixed Display modes

These can be configured by using the display setup options in the SETUP MODE entered by pressing the **Option Set** button

System Configuration

System configuration consists of:

- **Disable Alarms**
- **Turn Backlight ON/OFF (LCD ONLY)**
- **Enter Screen Contrast**
- **Enter Display Labels**
- **Enter NMEA TAGS**
- **Select Display Graphics Modes**
- **Select Display Groups**
- **ENTER Alarm values**

These functions can be performed by using supplied **vDash** software on a Windows PC and then download configurations to unit via USB cable.

Please refer to the **vDash** User's Manual for detailed information on how to configure your vGauge display unit.

NO ADJUSTMENTS CAN BE MADE DIRECTLY TO UNIT WITOUT PC INTERFACE.

The most common task is configuration of display labels and choosing display graphics modes. It is always important to set Display Labels first as other operations use them. Having incorrect display labels will make other steps confusing and difficult. There are 12 analog sensor inputs, 6-12 NMEA inputs, and 0-2 Pulse Inputs for a total of 16 possible Display Labels

Once Display Labels are chosen the next step is to decide where to place them on the display. Most graphic modes have only a few options while Digital Data can be placed almost anywhere. The most common problem is placing two or more values on the same location or on overlapping locations. Take care to map out all possible combinations to avoid overlap.

The final step is assigning gauge readings to groups and picking the graphic display modes to best view the data. A group is collection of information presented on the main display. vGauge G12 can have up to 8 groups or pages. Any Display Label and associated sensor can be assigned to any of the 8 groups. Most groups hold from 1 to 12 gauge readings depending on the chosen graphics display format.

Options File

Most vGauge G12 configurations are contained in a separate Options file created by the **vDash** Program and transferred to flash memory from a PC using a USB or Serial cable.

Use the vDash configuration program to edit any vGauge12 settings.

The options file is used to configure each unit

- **Disable Alarms**
- **Set alarm parameters**
- **Set number of display pages**
- **Set data input ports and rates**
- **Set screen contrast (select models)**
- **Turn Start up Backlight ON/OFF**
- **Set NMEA input modes**

While it is not necessary to create or edit the options file directly, it can be useful to understand its format. Not all values in the options file are used for the vGauge G12 since the options file may be shared with vGauge Remote and other vGauge products.

Value	Description	Index
db %05	Number of display pages	0
db %00	NOT USED	1
db %04	NOT USED	2
db %00	Number of analog inputs (select models only)	3
db %00	Number of NMEA inputs	4
db %00	NOT USED	5
db %08	DISPLAY TYPE	6
db %26	Screen Contrast	7
db %1E	P0 Scale factor (select models only)	8
db %4B	P0 Time constant(select models only)	9

db %00	Pulse0 Enable(select models only)	10
db %01	P0 Edge(select models only)	11
db %1E	P1 Scale factor (not used)	12
db %4B	P1 Time (not used)	13
db %00	Pulse1 Enable (not used)	14
db %01	P1 Edge (not used)	15
db %03	Data input ports 0=Serial 1=USB 2=Both	16
db %00	Data Out (not used)	17
db %00	NOT USED	18
db %1E	Serial Baud Rate 120 = 9600 30=38600 20=57400	19
db %00	NOT USED	20
db %00	NOT USED	21
db %01	Display Labels 0=Master mode (Uses local labels) 1=Slave mode (uses remote labels)	22
db %00	NOT USED	23
db %01	Alarm Enable 0=disable 1=enable	24
db %00	NOT USED	25
db %00	Invert Display 1=invert	26
db %E3	Backlight POWER ON (greater then %80)	27
db %04	Scroll Button NOT USED	28
db %02	Set Button NOT USED	29
db %10	Pulse0 Dial Scale factor (select models only)	30
db %10	Pulse1 Dial Scale factor NOT USED	31
db %86	Input Channel 0 (< then %80 is NMEA, >%80 Analog)	32
db %85	Input Channel 1 (< then %80 is NMEA, >%80 Analog)	33
db %84	Input Channel 2 (< then %80 is NMEA, >%80 Analog)	34
db %83	Input Channel 3 (< then %80 is NMEA, >%80 Analog)	35
db %82	Input Channel 4 (< then %80 is NMEA, >%80 Analog)	36
db %81	Input Channel 5 (< then %80 is NMEA, >%80 Analog)	37
db %80	Input Channel 6 (< then %80 is	38

	NMEA, >%80 Analog)	
db %87	Input Channel 7 (< then %80 is NMEA, >%80 Analog)	39
db %88	Input Channel 8 (< then %80 is NMEA, >%80 Analog)	40
db %89	Input Channel 9 (< then %80 is NMEA, >%80 Analog)	41
db %CC	Input Channel 10 (< then %80 is NMEA, >%80 Analog)	42
db %8B	Input Channel 11 (< then %80 is NMEA, >%80 Analog)	43
db %8C	Input Channel 12 (< then %80 is NMEA, >%80 Analog)	44
db %8D	Input Channel 13 (< then %80 is NMEA, >%80 Analog)	45
db %8E	Input Channel 14 (< then %80 is NMEA, >%80 Analog)	46
db %8F	Input Channel 15 (< then %80 is NMEA, >%80 Analog)	47
db %00	Output Channel 0 Map	48
db %01	Output Channel 1 Map	49
db %02	Output Channel 2 Map	50
db %03	Output Channel 3 Map	51
db %04	Output Channel 4 Map	52
db %05	Output Channel 5 Map	53
db %06	Output Channel 6 Map	54
db %07	Output Channel 7 Map	55
db %08	Output Channel 8 Map	56
db %09	Output Channel 9 Map	57
db %0A	Output Channel 10 Map	58
db %0B	Output Channel 11 Map	59
db %0C	Output Channel 12 Map	60
db %0D	Output Channel 13 Map	61
db %0E	Output Channel 14 Map	62
db %0F	Output Channel 15 Map	63
db %25	ALARM 0 LOW VALUE	64
db %FF	ALARM 0 HIGH VALUE	65
db %00	ALARM 1 LOW VALUE	66
db %FF	ALARM 1 HIGH VALUE	67
db %00	ALARM 2 LOW VALUE	68
db %FF	ALARM 2 HIGH VALUE	69

db %00	ALARM 3 LOW VALUE	70
db %FF	ALARM 3 HIGH VALUE	71
db %00	ALARM 4 LOW VALUE	72
db %FF	ALARM 4 HIGH VALUE	73
db %00	ALARM 5 LOW VALUE	74
db %FF	ALARM 5 HIGH VALUE	75
db %00	ALARM 6 LOW VALUE	76
db %FF	ALARM 6 HIGH VALUE	77
db %00	ALARM 7 LOW VALUE	78
db %FF	ALARM 7 HIGH VALUE	79
db %00	ALARM 8 LOW VALUE	80
db %FF	ALARM 8 HIGH VALUE	81
db %00	ALARM 9 LOW VALUE	82
db %FF	ALARM 9 HIGH VALUE	83
db %00	ALARM 10 LOW VALUE	84
db %FF	ALARM 10 HIGH VALUE	85
db %00	ALARM 11 LOW VALUE	86
db %FF	ALARM 11 HIGH VALUE	87
db %00	ALARM 12 LOW VALUE	88
db %00	ALARM 12 HIGH VALUE	89
db %00	ALARM 13 LOW VALUE	90
db %FF	ALARM 13 HIGH VALUE	91
db %00	ALARM 14 LOW VALUE	92
db %FF	ALARM 14 HIGH VALUE	93
db %00	ALARM 15 LOW VALUE	94
db %FF	ALARM 15 HIGH VALUE	95
db %00	NOT USED	96
db %00	NOT USED	97
db %00	NOT USED	98
db %00	NOT USED	99
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db %00	NOT USED	104
db %00	NOT USED	105
db %00	NOT USED	106
db %00	NOT USED	107
db %00	NOT USED	108
db %00	NOT USED	109

db %00	NOT USED	110
db %00	NOT USED	111
db %00	NOT USED	112
db %00	NOT USED	113
db %00	NOT USED	114
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db %00	NOT USED	117
db %00	NOT USED	118
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db %00	NOT USED	121
db %00	NOT USED	122
db %00	NOT USED	123
db %00	NOT USED	124
db %00	NOT USED	125
db %00	NOT USED	126
db %00	NOT USED	127
db %01	INVERT FLAG Channel 0	128
db %00	INVERT FLAG Channel 0	129
db %01	INVERT FLAG Channel 1	130
db %00	INVERT FLAG Channel 1	131
db %00	INVERT FLAG Channel 2	132
db %01	INVERT FLAG Channel 2	133
db %00	INVERT FLAG Channel 3	134
db %01	INVERT FLAG Channel 3	135
db %00	INVERT FLAG Channel 4	136
db %01	INVERT FLAG Channel 4	137
db %00	INVERT FLAG Channel 5	138
db %01	INVERT FLAG Channel 5	139
db %00	INVERT FLAG Channel 6	140
db %01	INVERT FLAG Channel 6	141
db %00	INVERT FLAG Channel 7	142
db %01	INVERT FLAG Channel 7	143
db %01	INVERT FLAG Channel 8	144
db %00	INVERT FLAG Channel 8	145
db %01	INVERT FLAG Channel 9	146
db %00	INVERT FLAG Channel 9	147
db %00	INVERT FLAG Channel 10	148
db %01	INVERT FLAG Channel 10	149

db %01	INVERT FLAG Channel 11	150
db %00	INVERT FLAG Channel 11	151
db %00	INVERT FLAG Channel 12	152
db %00	INVERT FLAG Channel 12	153
db %00	INVERT FLAG Channel 13	154
db %00	INVERT FLAG Channel 13	155
db %00	INVERT FLAG Channel 14	156
db %00	INVERT FLAG Channel 14	157
db %00	INVERT FLAG Channel 15	158
db %00	INVERT FLAG Channel 15	159
db %00	NOT USED	160
db %00	NOT USED	161
db %00	NOT USED	162
db %00	NOT USED	163
db %00	NOT USED	164
db %00	NOT USED	165
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db %00	NOT USED	175
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db %00	NOT USED	177
db %00	NOT USED	178
db %00	NOT USED	179
db %00	NOT USED	180
db %00	NOT USED	181
db %00	NOT USED	182
db %00	NOT USED	183
db %00	NOT USED	184
db %00	NOT USED	185
db %00	NOT USED	186
db %00	NOT USED	187
db %00	NOT USED	188
db %00	NOT USED	189

db %00	NOT USED	190
db %00	NOT USED	191
db %00	USB AUTODET(Not Used)	192
db %00	USB 1 ENABLE (Not Used)	193
db %00	USB 2 ENABLE (Not Used)	194
db %00	USB STATUS (Not Used)	195
db %00	SIO0 ENABLE (Not Used)	196
db %00	SIO1 ENABLE (Not Used)	197
db %03	USB BAUDRATE 1=9600 2=1800 3=38400 4=57600	198
db %00	(Not Used)	199
db %1F	OPTIONS RPM2 SCALE(Not Used)	200
db %4B	OPTIONS RPM2 TIME(Not Used)	201
db %04	OPTIONS RPM2 ENABLE(Not Used)	202
db %01	OPTIONS RPM2 EDGE(Not Used)	203
db %01	OPTIONS P2 DIAL SCAL (Not Used)	204
db %00	OPTIONS RPM3 TIME 205	205
db %00	OPTIONS RPM3 ENABLE 206	206
db %00	OPTIONS RPM3 EDGE 207	207
db %01	OPTIONS TIMER0ENABLE 208	208
db %01	OPTIONS TIMER1ENABLE 209	209
db %01	OPTIONS TIMER2ENABLE (must be %01)	210
db %01	OPTIONS TIMER3ENABLE 211	211
db %00	OPTIONS TIMER0 HB 212	212
db %01	OPTIONS TIMER0 LB 213	213
db %00	OPTIONS TIMER1 HB 214	214
db %01	OPTIONS TIMER1 LB 215	215
db %FF	OPTIONS TIMER2 HB	216
db %FF	OPTIONS TIMER2 LB	217
db %FF	OPTIONS TIMER3 HB 218	218
db %FF	OPTIONS TIMER3 LB 219	219
db %02	OPTIONS BASE TIMMER (must be %02)	220
db %00	(Not Used)	221
db %FF	OPTIONS LCD TEMP ADJ 222	222
db %00	(Not Used)	223
db %00	(Not Used)	224
db %00	(Not Used)	225

db %00	(Not Used)	226
db %00	(Not Used)	227
db %00	(Not Used)	228
db %00	(Not Used)	229
db %00	(Not Used)	230
db %00	(Not Used)	231
db %00	(Not Used)	232
db %00	(Not Used)	233
db %00	(Not Used)	234
db %00	(Not Used)	235
db %00	(Not Used)	236
db %00	(Not Used)	237
db %00	(Not Used)	238
db %00	(Not Used)	239
db %00	(Not Used)	240
db %00	(Not Used)	241
db %00	(Not Used)	242
db %00	(Not Used)	243
db %00	(Not Used)	244
db %00	(Not Used)	245
db %00	(Not Used)	246
db %00	(Not Used)	247
db %00	(Not Used)	248
db %00	(Not Used)	249
db %00	(Not Used)	250
db %00	(Not Used)	251
db %00	(Not Used)	252
db %00	(Not Used)	253
db %00	(Not Used)	254
db %00	(Not Used)	255
db %00	**LCD TEMPERATURE ADJUST Table (Select Models)**	256

The **vDash** configuration program is used to set or change any options and will construct the correct OPTIONS File to be loaded into vGauge G12 Flash memory. The options settings are very similar to vGauge Remote sensor units with a few exceptions.
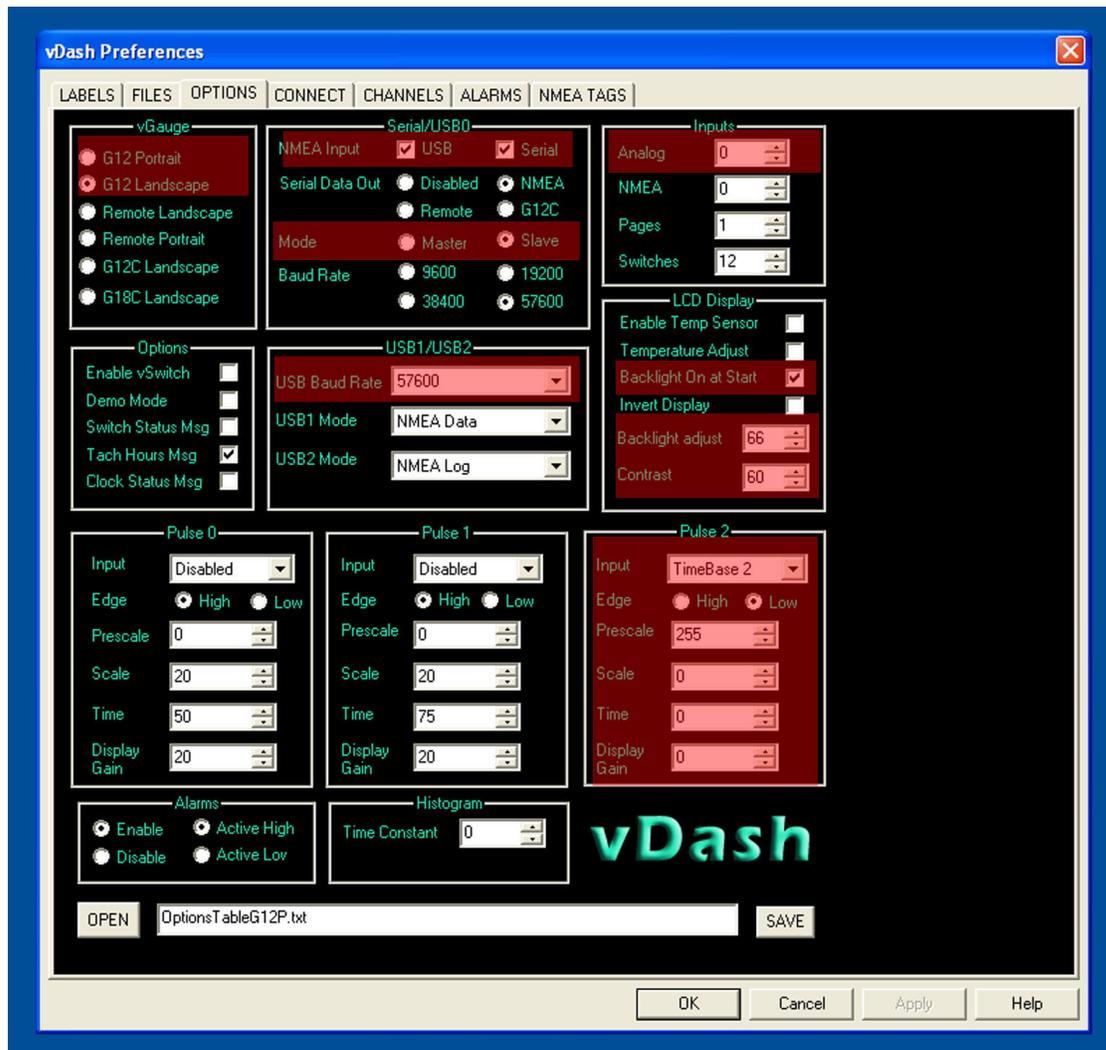
vGauge Section

Be sure the unit type is set to G12 Landscape (320 X 240) or G12 Portrait (240 X 320). The display can be configured with either orientation

Serial/USB0 Section

The NMEA inputs need to be enabled (checked) to receive any data from a vGauge Remote Sensor unit. NMEA data can be received from both USB and Serial ports. It is best to keep both ports enabled.

The Mode should be set to SLAVE to allow vGauge G12 to display sensor labels and calibrated readings from a vGauge Remote sensor unit. Setting Mode to MASTER will instruct the vGauge G12 to ignore the sensor labels from the NMEA data and use the matching labels stored internally (LABELS tab). This could be useful when using multiple display heads and wishing to have different senor names at different locations (engine room or helm station)

USB1/USB2 Section

Set the Baud rate to match the source of the NMEA data (default is 57600)

Input Section

Set Analog to 0 (default) if being used as a display head for vGauge Remote. If unit is configured for direct analog inputs, set to 4 channels.

Pages value determines the number of display screens that can be scrolled through using the SELECT button. Once the limit is reached, the pages reset to and start over.

Pulse 2 Section

vGauge G12 uses an internal timer to perform pulse rate calculations and output NMEA data. The Setting default is TimeBase2 and should not be changed. There is no advantage to selecting other values and doing so could result in instability.

LCD Display Section

Various display options can be set depending on the particular model and screen.

The Backlight On at Start turns the backlight on when the unit powers up. Backlight can still be toggled by press and release of SELECT button for 2

seconds. For best viewing in day and low conditions, the backlight should be left on.

The Backlight Adjust setting sets the brightness of the backlight. Minimum value is 0 (off) and maximum value is 100 (full on).

The Contrast setting will lighten or darken the display. Maximum value is 255 (lightest) and minimum value is 0 (darkest). Not all units support contrast adjustment. Some screens have built-in temperature compensated features and require no adjustment under normal operating conditions.

When making contrast adjustment on enabled units, it is possible to choose a setting that is too dark or light to see anything. If this happens, revert to previous value and reload Options file. Be careful to only make small adjustments and record previous settings. Also, **when making contrast adjustments – only change one value (contrast).**

Some units have an option to perform temperature based contrast adjustments outside of the normal operating conditions. This should only be used when operating under extreme temperature conditions (less then 10F or over 120 F). Under normal conditions, built-in temperature compensation of screen contrast will be sufficient.

Page Format file

The Page Format file is created by the **vDash** application and downloaded into non-volatile memory (FLASH) and does not need to be directly edited.

The file allows display graphic elements to be assigned to each possible channel for each of 8 display page groups

 The ten display mode symbols are:

- |0| - not assigned to the group
- |1| - Digital Data Display Mode
- |2| - Histogram Graph
- |4| - Bar Graph
- |6| - Digital Gauge
- |8| - Large Half Dial Gauge
- |9| - Large Full Dial Gauge
- |10| - Large Digital Text
- |11| - Vertical Bar Graph
- |12| -Small Digital Text
- |13| - Huge Digital Text

For example the following entry would assign 6 small dials and 2 large dials to the first display page group

db %06	DISPLAY CHANNEL 00-PAGE 00
db %06	DISPLAY CHANNEL 01-PAGE 00
db %00	DISPLAY CHANNEL 02-PAGE 00
db %06	DISPLAY CHANNEL 03-PAGE 00
db %06	DISPLAY CHANNEL 04-PAGE 00
db %00	DISPLAY CHANNEL 05-PAGE 00
db %06	DISPLAY CHANNEL 06-PAGE 00
db %06	DISPLAY CHANNEL 07-PAGE 00
db %00	DISPLAY CHANNEL 08-PAGE 00
db %00	DISPLAY CHANNEL 09-PAGE 00
db %00	DISPLAY CHANNEL 10-PAGE 00
db %00	DISPLAY CHANNEL 11-PAGE 00

db %00	DISPLAY CHANNEL 12-PAGE 00
db %00	DISPLAY CHANNEL 13-PAGE 00
db %09	DISPLAY CHANNEL 14-PAGE 00
db %09	DISPLAY CHANNEL 15-PAGE 00

The location of each graphic element on a page is determined by a index to a screen position. The entire 320X240 graphic space is divided to 24 regions where elements can be assigned

The Position Index determines the display location of the selected sensor value on the 40X30 character display matrix as outlined below.

0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3
0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3
0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3
0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3
0 0 0 0 0 0 0 0 0 0	1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3
4 4 4 4 4 4 4 4 4 4	5 5 5 5 5 5 5 5 5 5	6 6 6 6 6 6 6 6 6 6	7 7 7 7 7 7 7 7 7 7
4 4 4 4 4 4 4 4 4 4	5 5 5 5 5 5 5 5 5 5	6 6 6 6 6 6 6 6 6 6	7 7 7 7 7 7 7 7 7 7
4 4 4 4 4 4 4 4 4 4	5 5 5 5 5 5 5 5 5 5	6 6 6 6 6 6 6 6 6 6	7 7 7 7 7 7 7 7 7 7
4 4 4 4 4 4 4 4 4 4	5 5 5 5 5 5 5 5 5 5	6 6 6 6 6 6 6 6 6 6	7 7 7 7 7 7 7 7 7 7
4 4 4 4 4 4 4 4 4 4	5 5 5 5 5 5 5 5 5 5	6 6 6 6 6 6 6 6 6 6	7 7 7 7 7 7 7 7 7 7
8 8 8 8 8 8 8 8 8 8	9 9 9 9 9 9 9 9 9 9	10 10 10 10 10 10 10 10 10 10	11 11 11 11 11 11 11 11 11 11
8 8 8 8 8 8 8 8 8 8	9 9 9 9 9 9 9 9 9 9	10 10 10 10 10 10 10 10 10 10	11 11 11 11 11 11 11 11 11 11
8 8 8 8 8 8 8 8 8 8	9 9 9 9 9 9 9 9 9 9	10 10 10 10 10 10 10 10 10 10	11 11 11 11 11 11 11 11 11 11
8 8 8 8 8 8 8 8 8 8	9 9 9 9 9 9 9 9 9 9	10 10 10 10 10 10 10 10 10 10	11 11 11 11 11 11 11 11 11 11
8 8 8 8 8 8 8 8 8 8	9 9 9 9 9 9 9 9 9 9	10 10 10 10 10 10 10 10 10 10	11 11 11 11 11 11 11 11 11 11
12 12 12 12 12 12 12 12 12 12	13 13 13 13 13 13 13 13 13 13	14 14 14 14 14 14 14 14 14 14	15 15 15 15 15 15 15 15 15 15
12 12 12 12 12 12 12 12 12 12	13 13 13 13 13 13 13 13 13 13	14 14 14 14 14 14 14 14 14 14	15 15 15 15 15 15 15 15 15 15
12 12 12 12 12 12 12 12 12 12	13 13 13 13 13 13 13 13 13 13	14 14 14 14 14 14 14 14 14 14	15 15 15 15 15 15 15 15 15 15
12 12 12 12 12 12 12 12 12 12	13 13 13 13 13 13 13 13 13 13	14 14 14 14 14 14 14 14 14 14	15 15 15 15 15 15 15 15 15 15
12 12 12 12 12 12 12 12 12 12	13 13 13 13 13 13 13 13 13 13	14 14 14 14 14 14 14 14 14 14	15 15 15 15 15 15 15 15 15 15
16 16 16 16 16 16 16 16 16 16	17 17 17 17 17 17 17 17 17 17	18 18 18 18 18 18 18 18 18 18	19 19 19 19 19 19 19 19 19 19
16 16 16 16 16 16 16 16 16 16	17 17 17 17 17 17 17 17 17 17	18 18 18 18 18 18 18 18 18 18	19 19 19 19 19 19 19 19 19 19
16 16 16 16 16 16 16 16 16 16	17 17 17 17 17 17 17 17 17 17	18 18 18 18 18 18 18 18 18 18	19 19 19 19 19 19 19 19 19 19
16 16 16 16 16 16 16 16 16 16	17 17 17 17 17 17 17 17 17 17	18 18 18 18 18 18 18 18 18 18	19 19 19 19 19 19 19 19 19 19
16 16 16 16 16 16 16 16 16 16	17 17 17 17 17 17 17 17 17 17	18 18 18 18 18 18 18 18 18 18	19 19 19 19 19 19 19 19 19 19
20 20 20 20 20 20 20 20 20 20	21 21 21 21 21 21 21 21 21 21	22 22 22 22 22 22 22 22 22 22	23 23 23 23 23 23 23 23 23 23
20 20 20 20 20 20 20 20 20 20	21 21 21 21 21 21 21 21 21 21	22 22 22 22 22 22 22 22 22 22	23 23 23 23 23 23 23 23 23 23
20 20 20 20 20 20 20 20 20 20	21 21 21 21 21 21 21 21 21 21	22 22 22 22 22 22 22 22 22 22	23 23 23 23 23 23 23 23 23 23
20 20 20 20 20 20 20 20 20 20	21 21 21 21 21 21 21 21 21 21	22 22 22 22 22 22 22 22 22 22	23 23 23 23 23 23 23 23 23 23
20 20 20 20 20 20 20 20 20 20	21 21 21 21 21 21 21 21 21 21	22 22 22 22 22 22 22 22 22 22	23 23 23 23 23 23 23 23 23 23

The following table sets the positions for each element on the first page

db %00	POSITION 00 - PPOS0
db %03	POSITION 01 - PPOS0
db %00	POSITION 02 - PPOS0
db %08	POSITION 03 - PPOS0
db %0B	POSITION 04 - PPOS0
db %00	POSITION 05 - PPOS0
db %10	POSITION 06 - PPOS0
db %13	POSITION 07 - PPOS0
db %00	POSITION 08 - PPOS0
db %00	POSITION 09 - PPOS0
db %00	POSITION 10 - PPOS0
db %00	POSITION 11 - PPOS0
db %00	POSITION 12 - PPOS0
db %00	POSITION 13 - PPOS0
db %0D	POSITION 14 - PPOS0
db %01	POSITION 15 - PPOS0

These settings would create the following screen format for the first page

The Page Format file contains 15 pairs for Format and position assignments but only the first 8 are used.

The final entry in the Page Format file is the NMEA tag assignment table

db %00	POSITION 00 - NMEA
db %00	POSITION 01 - NMEA
db %00	POSITION 02 - NMEA
db %00	POSITION 03 - NMEA
db %00	POSITION 04 - NMEA
db %00	POSITION 05 - NMEA
db %00	POSITION 06 - NMEA
db %00	POSITION 07 - NMEA
db %00	POSITION 08 - NMEA
db %00	POSITION 09 - NMEA
db %00	POSITION 10 - NMEA
db %00	POSITION 11 - NMEA
db %E1	POSITION 12 - NMEA
db %D1	POSITION 13 - NMEA
db %00	POSITION 14 - NMEA
db %00	POSITION 15 – NMEA

This table assigns selected NMEA 0183 tags to selected channels for display at the specified location. A non-zero entry in a specific channel location will decode that NMEA string and place it according to chosen graphic and location.

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The following table shows the currently available tags that can be captured and displayed. Once a selected tag is detected for the designated display label, the data is decoded and displayed if that label is assigned to a Display Group. NMEA data can only be displayed in Digital Data format..

INDEX	NMEA TAG	Function
0x00	$IIXDR,G	Instrumentation Data
0x10	$GPGGA	UTC TIME, Position, Sat info
0x20	$GPVTG	Track and ground speed
0x30	$SDDBT	depth below transducer
0x40	$SDMTW	water temperature
0x50	$GPRMC	Position, ground speed, true heading
0x60	$GPRMB	Destination WP position, Bearing to WP, Closing speed to WP, Distance to WP
0x70	$VWVHW	Speed and heading
0x80	$VWVLW	Water traveled distance
0xA0	$SDDPT	depth below transducer
0xB0	$GPGLL	Basic position
0xC0	$SDVHW	Sonar Water Speed and heading
0xD0	$PCDIS,T	Custom tag for DATE TIME
0xE0	$PCDIS,H	Custom tag for Engine Hour Meter Display
0xF0	$GPRMC	Used for adjusted UTC time to local time

All NMEA tags use a comma "," to separate data fields in the NMEA sentence. The lower half (nibble) if the index determines which position to extract.

 A value of 0x25

The example pulls the 5th data position to obtain the GPS Speed in knots.

is important to always pair the selected NMEA tags with the correct Display Labels. This flexibility allows freedom to choose any text label for selected NMEA data.

If the same NMEA Tag is used in more then one display location, both locations will receive random updates.

For example, here are two NMEA display positions (NMEA0 and NMEA1) with two different Display Labels (SPEED1 and SPEED2) looking for the same NMEA TAG ($GPVTG).

In this case both NMEA positions will receive random updates since it is impossible to determine which location to assign the incoming data to. It is important to avoid using the same NMEA TAG in multiple display location with the exception of $IIXDR, G tags.

The unit handles $IIXDR,G tags differently to allow multiple display positions. For example, here are two NMEA display positions (NMEA0 and NMEA1) with two different Display Labels (TEMP1 and TEMP2) looking for the same NMEA TAG ($IIXDR).

In the case of $IIXDR,G tags, display positions are determined by looking at the last character of the Data Label field of the incoming NMEA sentence.

$IIXDR,X,DATA,U,LABEL,CHECKSUM

- X = sensor type (G,P,C,..)
- DATA = 8 character sensor data value returned from the lookup table
- U = unit of measurement specifier
- LABEL = 8 character sensor label and a 1 character number representing the channel
- CHECKSUM = NEMA check sum calculation on the string

EXAMPLE - $IIXDR,G, 175.6,D,TEMP1 1,*45

All vGauge units append a sequential number to the end of the LABEL field that corresponds to the display position assigned on that unit. This allows other units to decode that number and place the received data in the correct location on the slave unit. Multiple vGauge units can cascade data while sharing the same $IIXDR.G tag.

Display Engine Hour Meter

A special NMEA tag ($PCDIS,H) is reserved for allowing display of the internal Engine Hour Meter in one of the NMEA data positions. Selecting this tag for any of the NMEA positions will display a 40 character readout of the current hour tachometers with the display label assigned to the selected NMEA position. This display is Text readout only.

Display Date/Time

A special NMEA tag ($PCDIS,T) is reserved for allowing display of the internal Date and Time in one of the NMEA data positions. Selecting this tag for any of the NMEA positions will display a 16 character readout of the current Date and time with the display label assigned to the selected NMEA position. This display is Text readout only.

Alarms

vGauge G12 display units are capable of indicating alarms for each of the NMEA or Analog inputs NMEA $IIXDR sentences contain a sensor value index (0-255) that can be used to lookup user defined alarm thresholds for both Low and High conditions. The alarms are set using the **vDash** configuration application in the same manner as setting alarms for any vGauge Remote sensor unit. Individual alarm values are stored in the Options file which is latter loaded into Flash Memory by the **vDash** application.

The following screen shows an example of setting 3 high temperature alarms.
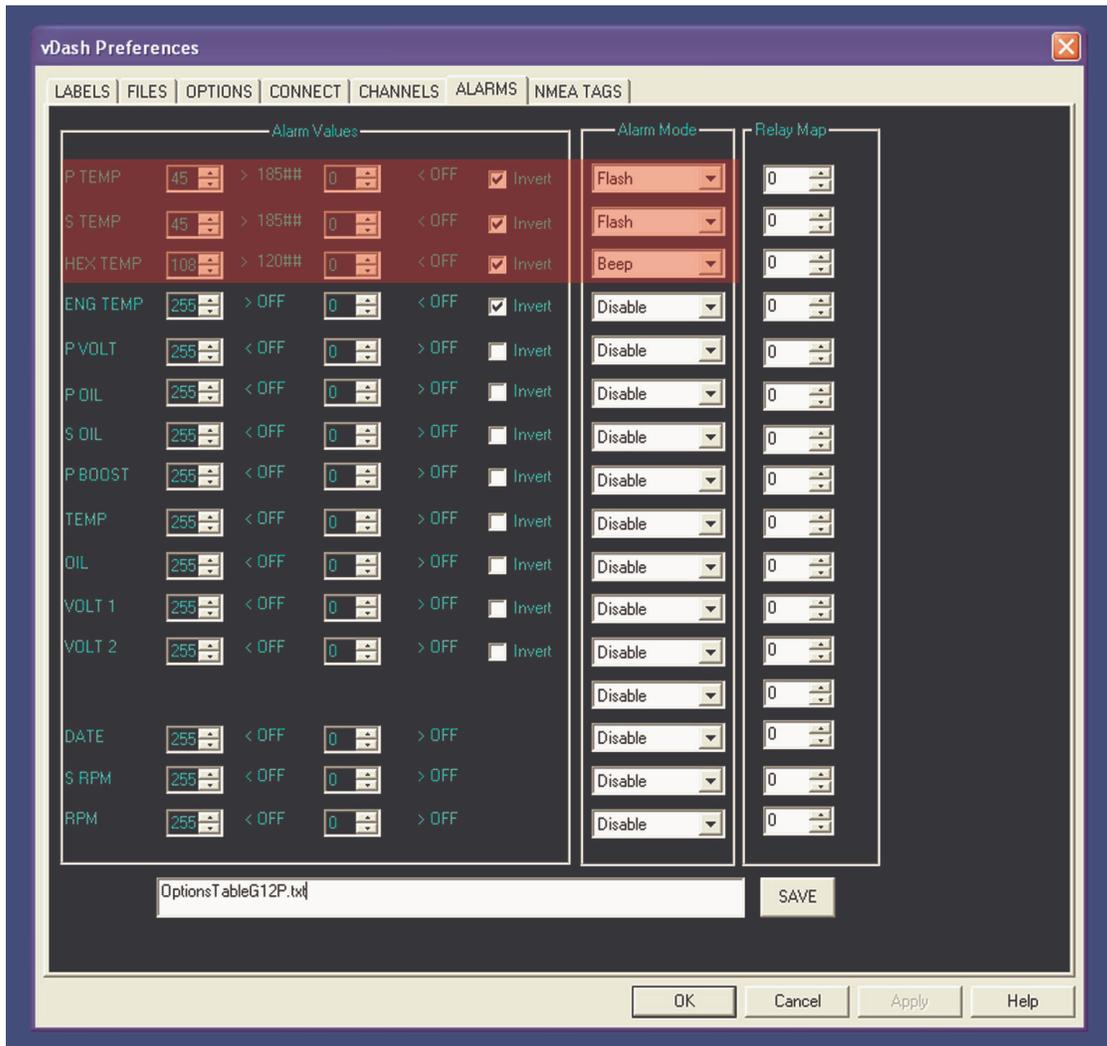
vGauge G12 parses incoming NMEA $IIXDR sentences and extracts the raw sensor index value

$IIXDR,G,   88##3C,G,P TEMP   0*72
| Sensor Index (Hex)

This value is then compared according to the user specified conditions from the Alarm Options and the indicated action performed. The Alarm Mode determines what action is taken for each individual sensor input.

Alarm Mode = Disabled results in no alarm indication

Alarm Mode = Flash will flash the indicated sensor value on the display if currently shown.

Alarm Mode = Beep will sound an internal buzzer if the sensor is in alarm. It will also flash the display value if shown.

All other Alarm Modes do not apply to vGauge G12 Display heads.

Important Note – When using **vDash** to set alarms for vGauge G12 display units – it is important to be sure the correct corresponding calibration tables are chosen for each sensor to achieve the desired conditions.

vGauge G12i units must have the correct calibration tables loaded for the analog inputs to achieve the desired alarm conditions.

Analog Inputs

vGauge G12i units are configured with 4 analog inputs and one pulse (tachometer) input. These Display units can be operated stand-alone without a vGauge Remote sensor unit.

A separate 6-pin connector in the rear is used for interface to analog signals from temperature, pressure, fuel, or voltage sensors.

Configuration and operation is the same as all other G12 units except for assigning the NMEA input channels used for analog input.

When attached to a vGauge Remote, input data is received via NMEA 0183 $IIXDR sentence digital protocol which maps sensor reading to each of 16 channels for possible display on the display head. For analog inputs, some of the 16 NMEA input are reassigned to analog mode. vGauge G12i use NMEA channels 8 – 11 for analog mode and NMEA channel 15 for pulse (tachometer) input. Units configured for analog inputs can still receive NMEA digital data on other channels via USB or serial inputs

The re-assignment of NMEA channels for analog mode is performed by using the **vDash** program on a PC and loading the modified options file to the display head. The following table shows a typical modified section in the Options File for setup in analog mode.

db %86	NMEA CHANNELS 00
db %85	NMEA CHANNELS 01
db %84	NMEA CHANNELS 02
db %83	NMEA CHANNELS 03
db %82	NMEA CHANNELS 04
db %81	NMEA CHANNELS 05
db %80	NMEA CHANNELS 06
db %87	NMEA CHANNELS 07
db %08	ANALOG CHANNELS 08
db %09	ANALOG CHANNELS 09
db %0A	ANALOG CHANNELS 10
db %0B	ANALOG CHANNELS 11
db %8C	NMEA CHANNELS 12
db %8D	NMEA CHANNELS 13
db %8E	NMEA CHANNELS 14
db %0F	PULSE CHANNELS 15

The **vDash** applaction has a Channels section to allow for resetting NMEA channels 8-11 for analog input.

In addition to channel assignment, then Options File is also modified to indicate the number of analog inputs (0-4).

The following screen shows a typical Options screen in **vDash** which is configured for use on a vGauge G12i display head with 4 analog inputs and 1 tachometer input.
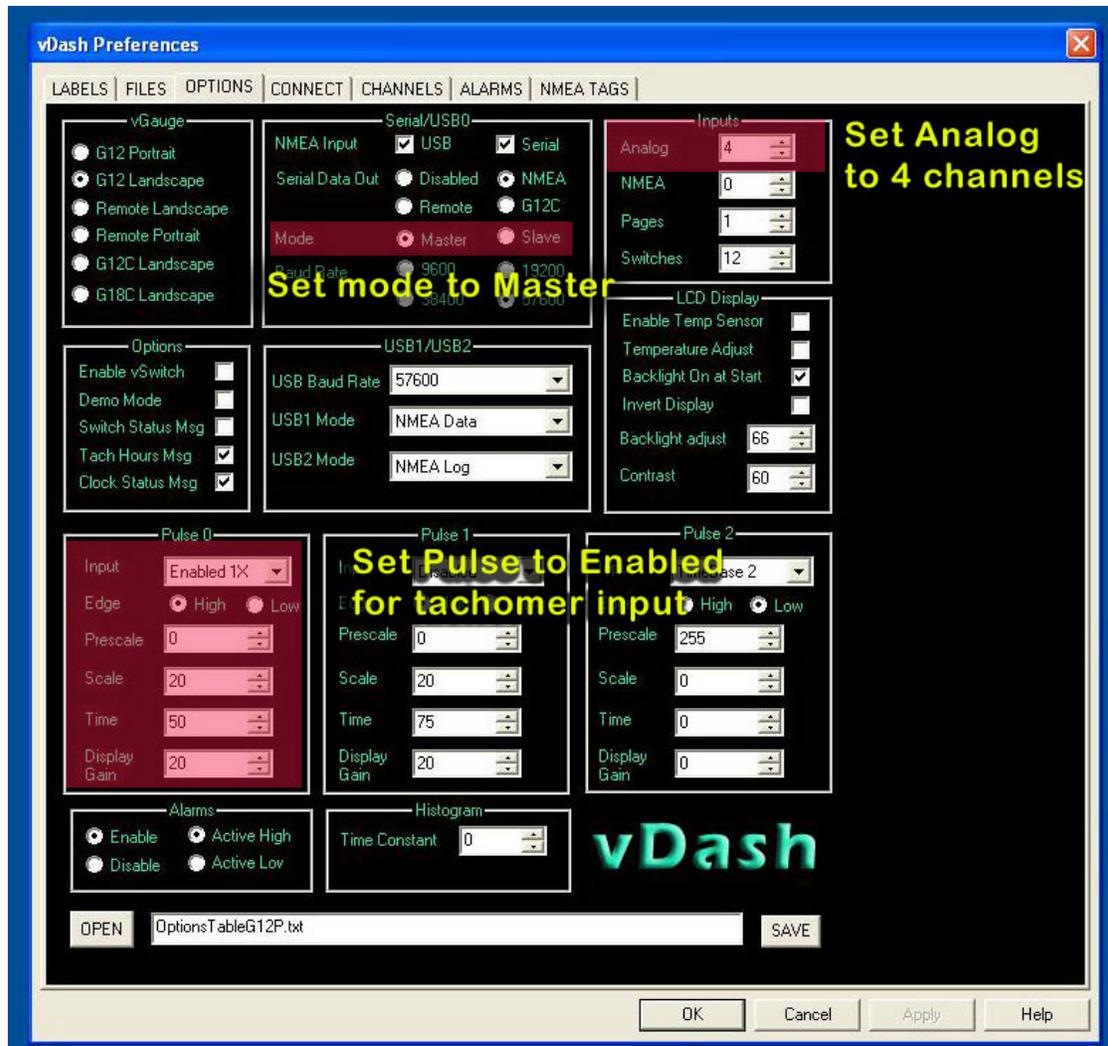
Note the Analog setting in the Input section is set to 4 and that the Pulse 0 section has enabled to allow for tachometer function.

When purchasing G12i display units from Chetco Digital Instruments with analog input options, be sure to specify which type of sender is going to used on each analog channel to ensure proper operation. Typical configuration is as:

Channel	Function	Termination
Channel 8	Temperature	300 OHM Pullup
Channel 9	Pressure	50 OHM Pullup
Channel10	Fuel	50 OHM Pullup
Channel 11	Volt	1/11 Divider
Channel 15	Tachometer	Pulse 0-12V

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Connectors

The vGauge G12P/G12S display unit has single water-resist quick-connect connector on the rear panel (two for G12i with analog input option). Each connector is keyed to ensure proper alignment when attaching the supplied cables. Never force a cable in. Rotate the cable until the keys align and it should smoothly insert.

The 8-pin Power/USB cable (P1) it typically used for direct attachment to a vGauge Remote sensor unit. The interface contains both Power (+5V) and digital data.
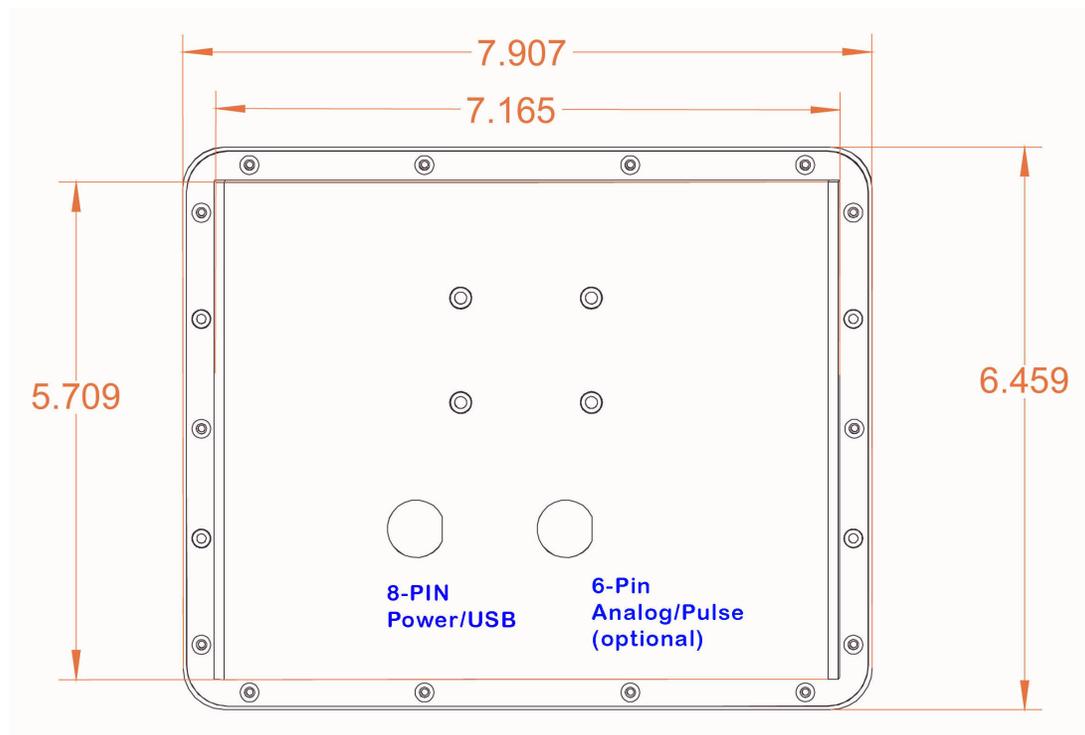
Rear View SeaGauge-G12P Case

System Power

System power is supplied via the 8-pin power/USB connector. G12P/G12S units can be powered directly from +5V USB bus.

8-#20*

POWER (P2)				
Pin	**Color**	**Function**	**Direction**	**Volt**
1	Green	USBP	IN	0-5
2	Orange/White	Serial	IN	0-5
3	Blue	Flash	OUT	0-5
4	Brown & Brown/White	Power	IN	5V/12V*
5	Blue/White	Flash	IN	0-5
6	Green/White	Serial	OUT	0-5
7	White	USBM	IN	0-5
8	Green & Orange	Ground	IN	0

* vGauge G12i units with analog input options are designed to be powered by positive (+) 12 volt battery systems and will not work directly off USB power without an adapter.

vGauge G12P/G12S display units designed to work directly off USB bus (from PC or vGauge Remote sensor unit) will be supplied with a custom USB type A to 8-Pin cable adapter which provide both power and a digital data. The cable can be plugged directly into host PC USB port or vGauge Remote Host USB port.

For distances longer then the specified 16 foot maximum of USB cable length, a optional serial cable interface can be obtained for distances up to 150 feet.

Contact Chetco Digital Instruments to order a custom length serial cable for your installation.

The serial port connector provides the interface to a computer RS232 interface for command and status control of the unit. The unit can be remotely controlled via this interface using ASCII command sequences or the optional software utilities. Status information is transmitted out this interface using NMEA 0185 $IIXDR sentences. Status information includes current gauge readings and display labels.

Cables are supplied for connection to this interface and there should be no need to interface directly. A serial interface cable is normally used to remotely control the unit or to collect status information in NMEA 0185 format. A separate reprogramming (FLASH) cable is used if the unit needs to be reprogrammed. This cable is compatible with RS232 protocols but requires special software to provide this function. This cable is supplied only with the purchase of the development kit.

5VPOWER is a 5.0 volt regulated input from USB power source. This signal should not be used for any other purpose. Maximum output is 500 mA and is not fuse protected.

FLASH TX is the serial transmit line for reprogramming the unit. It is compatible with standard RS232 transmit protocols

FLASH RX is the serial receive line for reprogramming the unit. It is compatible with standard RS232 receive protocols

SERIAL1TX is the serial transmit line for status information from the unit. It is compatible with standard RS232 transmit protocols

SERIAL1RX is the serial receive line for control information to the unit. It is compatible with standard RS232 receive protocols

USBP is then positive USB digital signal input

USBM is then negitive USB digital signal input

SERIALGND is the serial ground. It is compatible with standard RS232 transmit protocols.

Optional Analog Sensors

The analog sensor connector on vGauge G12i units is used to interface with various senders to provide information to the unit. The supplied color-coded cable will have to be terminated to the appropriate senders dependent on your application. The information supplied in the following table is typical but may be different dependent on your application.

There are two basic classes of senders – those that provide a resistive load to ground and those that provide a voltage.

Senders that provide a resistance to ground (temperature/pressure) are easily interfaced by using a pull-up resistance. This resistance should be set to the mid-range resistance of the selected sender.

Senders that produce a voltage need to limit the full range voltage to no more then 2.5 volts. These senders will require a voltage divider (series/pull-down) to scale the range down to 2.5 volt max. For example – to support a voltage reading of 0-27.5 volts requires a scale down of 2.5/11 = 0.091 Using the voltage divider calculation of Vout = Vin (Rpd/(Rpd + Rs)) if we set Rpd to 1000 and Rs to 10000, the resulting divider is 1/11 = 0.091.

The standard vGauge-G12i configuration for direct analog input is to provide 1 temperature sender input, 1 voltage input, 1 fuel level input, 1 pressure inputs, and 1 tachometer input.

- **Temperature Inputs** – These inputs are designed to be used with standard coolant senders with a resistance of 1000 ohms at 70 degrees F. Most VDO and GM style senders fit into this range.
- **Voltage Inputs** – These inputs use a voltage divider ratio of 1/11 and can accept input voltages up to 27.5 volts. Do not connect to a voltage source greater then 28 volts or damage to the unit will result.
- **Pressure Inputs** – These inputs are designed to be used with standard oil pressure senders of 0-45 PSI and an resistance range of 0 – 200 ohms. Most VDO and GM style senders fit into this range.
- **Tachometer Inputs** – These inputs are designed to be used with pulse inputs of 0.5 to 12V. The multi-function input can interface directly with flywheel inductive pickups, HAL effect, negative spark coil, VDO tach generators, and some alternators.

The vGauge-G12i can be ordered with any combination of Rpu, Rpd, and Rs for each of the eight sensor inputs that match your application. Contact Chetco Digital Instruments for your custom application.

6-#20

SIGNAL (P1)										
Pin	Color	Channel	Function		Pull-Up Ω		Pull-Down Ω		Series Ω	
1	Green/White	A8	TEMP1	R36	300	R26	-	R16	-	
2	Blue	A9	PRESSURE	R35	50	R25	-	R15	-	
3	Brown	P0	TACH	-	-	-	-	-	-	
4	Blue/White	A10	FUEL	R33	50	R23	1000	R13	5000	
5	Orange/White	11	VOLT	R32	-	R22	1000	R12	10000	
6	Orange & Green	A1	Ground	-	-	-	-	-	-	

SeaGauge-G12 User's Manual

Installation

Cutout

vGauge-G12 can be mounted directly in the dash by performing a rectangular cut out as shown in the figure. The bezel lip is 0.5" from the cutout dimensions so care must be taken to not to make the cutout any larger then specified. It is a good idea to practice on scrap material before cutting into the panel. You must allow for the 1.5" depth of the unit plus another 4" to support the cables for a total of 6" behind the dash.

The G12P cutout dimensions are 7.17" X 5.71"

The G12A cutout dimensions are 7.125" X 5.4"
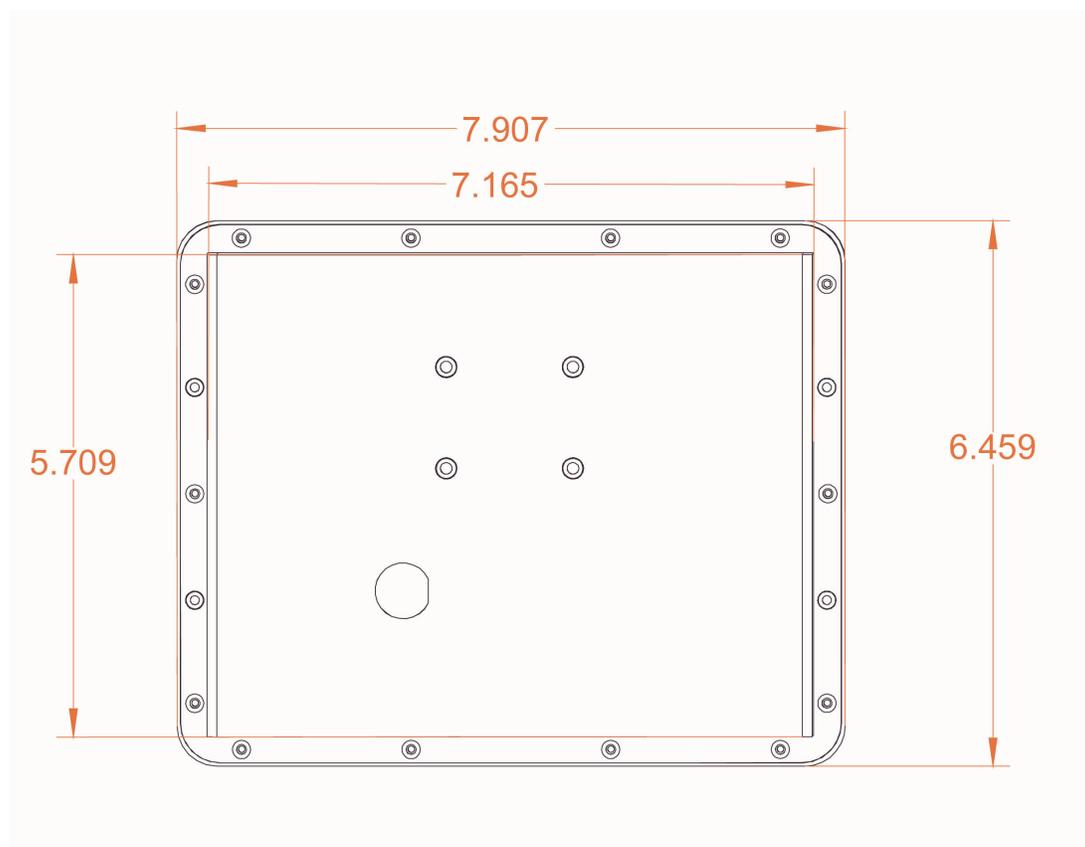
vGauge G12P Rear case dimensions
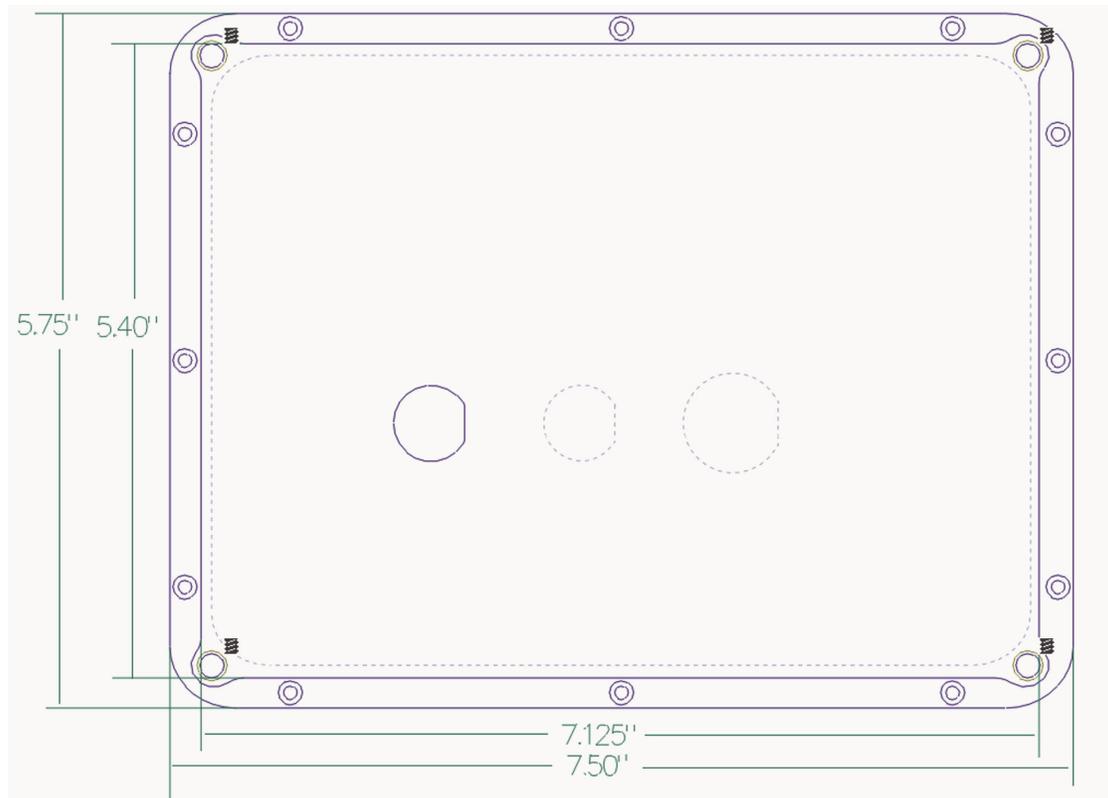
vGauge G12A Rear case dimensions

The unit can be secured in place by using slotted "L" brackets in the threaded gimbal holes on either side of the unit. Be careful not to tighten down the supplied screws into the holes with out a washer or "L" bracket - else damage to the internal seal will result.

vGauge-G12 OEM MODULE can be mounted directly in the dash by performing a rectangular cut out a shown in the figure. You must allow for the 1.5" depth of the unit plus another 3.5" to support the cables for a total of 5" behind the dash.

The cutout dimensions are 3.5" X 2" to allow for the display area. Four mounting holes are required as shown in the diagram.
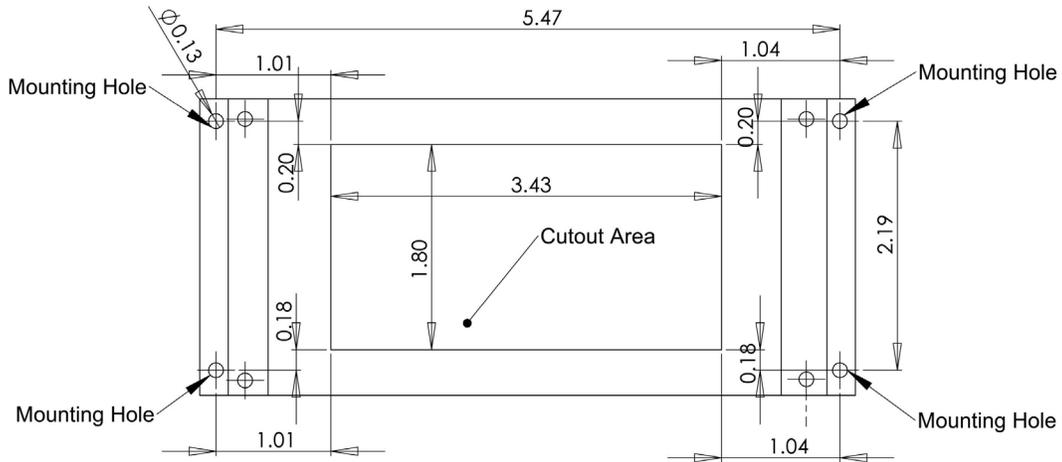
The unit can be secured in place by using bolts through the mounting holes. **Do not let the glass of the display touch the dash**. Use standoffs and foam tape to insolate the glass from the rear of the dash. The module should be suspended by the mounting bolts only.

Power

Power is supplied from the accessory bus via a 2 amp fuse. Never attempt to connect power without providing a fused input or serious damage may result. Unit should have power applied when key is in the accessory or run position and power removed when key is off.

Be sure to attach ground lead to a solid ground bus for proper operation. All sensor/sender grounds should be attached to the same ground buss.

Alarm

The vGauge G12 contains an internal buzzer which will sound when any of the sensor inputs exceed the preset alarm conditions.

To momentarily deactivate the alarm for 60 seconds, press and release the select button on the front of the case with-in 2 seconds

Pulse input

The vGauge G12i unit can detect and count voltage pulses. This is typically used for RPM or MPH calculations. Signals feed into the pulse input should be 5 – 12 volts referenced to ground and not exceed 14 volts. This input is normally attached to the tachometer signal and can be run in parallel with existing gauges. Be careful that the supplied signal does not contain large voltage transients or permanent damage may result. Use caution when connecting directly to the negative terminal of the ignition coil as large voltage spikes may occur if not properly filtered.

Signals

The vGauge G12i unit supports up to 5 sensor inputs (4 analog and 1 pulse). Refer to the connector diagrams for the proper connection for each type of sender. Any unused sensors should be connected to ground to avoid unwanted noise. Never connect any resistive sensor input (temperature/pressure) directly to a voltage source or damage to the unit may result.
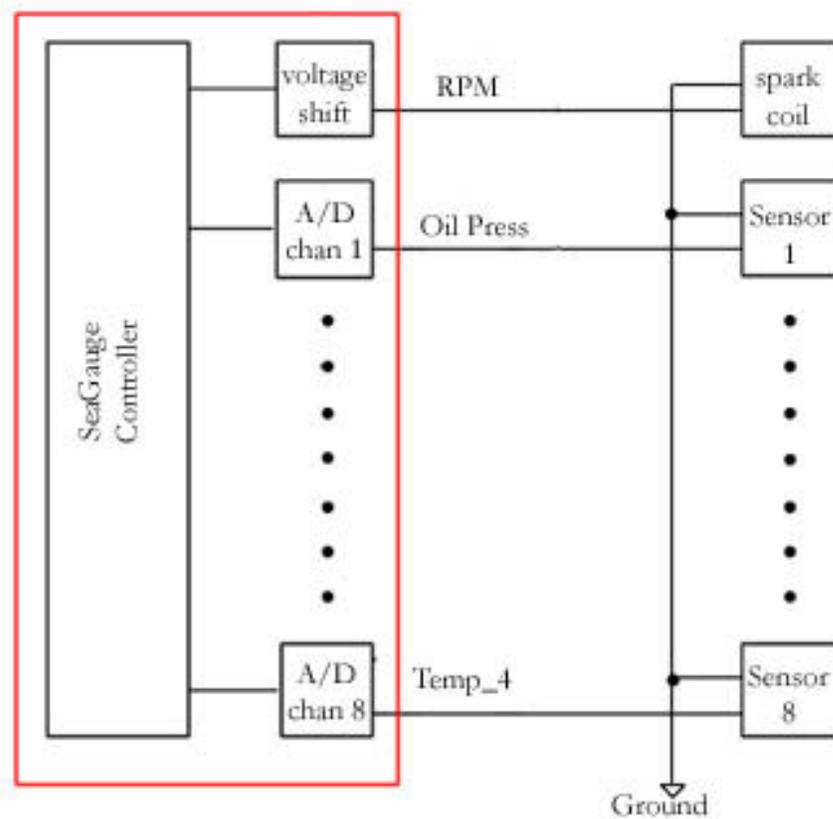
Calibration Tables

vGauge G12i utilizes 12 modifiable calibration tables to convert sensor data into user readable display information. The internal Analog-to-Digital converter converts sensor voltages to 10-bit values. The converter can resolve voltages to 2.5/1024 = 2.5 mVolts. These values are averaged and then used to lookup 8 character values form a 256 point lookup table. The use of a lookup table allows for accurate readings from non-linear sensors like temperature senders. The lookup table also allows for easy modification of display values to suit individual preferences and senders.

Following is an example of a partial table used to display battery voltage. The actual table has 256 indexed values. The measured voltage has a range from 0 to 2.5 volts. In this example it is desired to measure battery voltage from 0 to 18 volts so the input voltage from the battery is scaled down using a voltage divider ratio of 2.5/18 = 0.1388. The scaled down voltage is converted to an averaged digital value and then used as an index lookup in the table. For example an Input voltage of 1.178 volts becomes index value 18 in the table which corresponds to the 8 character display value of 1.1 vdc. Using this method allows the SeaGauge-G12 to display just about any range of values form a large variety of sensors/senders.

Index	Input Voltage	Measured Voltage	Display value
1	0.065	0.012968	0 vdc
2	0.131	0.025936	0.1 vdc
3	0.196	0.038904	0.1 vdc
4	0.262	0.051872	0.2 vdc
5	0.327	0.06484	0.3 vdc
6	0.393	0.077808	0.3 vdc
7	0.458	0.090776	0.4 vdc
8	0.523	0.103744	0.5 vdc
9	0.589	0.116712	0.5 vdc
10	0.654	0.12968	0.6 vdc
11	0.720	0.142649	0.7 vdc
12	0.785	0.155617	0.7 vdc
13	0.851	0.168585	0.8 vdc
14	0.916	0.181553	0.9 vdc
15	0.981	0.194521	0.9 vdc
16	1.047	0.207489	1.0 vdc

The calibration table must conform to a strict format to be loaded. The first row of the text file must start with "[TABLE] [Table Address] [Num of Characters per line = 8] [Number of lines = 256]" to indicate to the download program it is a text file. The remaining 256 lines are the display lookup values corresponding to each of 256 table indexes. No extra spaces or other symbols can be inserted as the file is parsed by position.

Following is an example of a partial table used to display battery voltage. The actual table has 256 indexed values.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	17
[	T	A	B	L	E	]	[	C	0	0	0	]	[	8	]	[	2	5	6	]	
d	b	'				0	.	0		0	0	'	;	0	0	0					
d	b	'				0	.	1		0	0	'	;	0	0	1					
d	b	'				0	.	1		0	0	'	;	0	0	2					
d	b	'				0	.	2		0	0	'	;	0	0	3					
d	b	'				0	.	3		0	1	'	;	0	0	4					
d	b	'				0	.	3		0	1	'	;	0	0	5					
d	b	'				0	.	4		0	1	'	;	0	0	6					
d	b	'				0	.	5		0	1	'	;	0	0	7					
d	b	'				0	.	5		0	2	'	;	0	0	8					
d	b	'				0	.	6		0	2	'	;	0	0	9					
d	b	'				0	.	7		0	2	'	;	0	1	0					
d	b	'				0	.	7		0	2	'	;	0	1	1					
d	b	'				0	.	8		0	3	'	;	0	1	2					
d	b	'				0	.	9		0	3	'	;	0	1	3					
d	b	'				0	.	9		0	3	'	;	0	1	4					
d	b	'				1	.	0		0	3	'	;	0	1	5					
d	b	'				1	.	1		0	4	'	;	0	1	6					
d	b	'				1	.	1		0	4	'	;	0	1	7					
d	b	'				1	.	2		0	4	'	;	0	1	8					
d	b	'				1	.	3		0	4	'	;	0	1	9					

- Column 0-3 must be "db '" to indicate start of data field
- Column 4-9 is the 6 character display value associated with the table index
- Column 10-11 is two character (HEX) used for graphic display lookup
- Column 12-13 must be ";" to indicate end of display values
- Column 14 – is a comment and usually is the table row index number for reference

The 6 character display value can be any alpha-numeric value but usually is a numeric sequence representing the desired readout for the given table index. The "*" character is reserved to skip the space when displaying the sequence. For example ' 1.3**04" will only display the 4 character value " 1.3". Most display values will only be 4 characters long.

The 2 character HEX Graphic Display Lookup value is used to calibrate the graphic displays. The values range for 0x00 Hex to 0x3F Hex (63 decimal) were 0x3F represents the maximum range for the graphic display. Normally these values can increase in a linear fashion form 0x00 to 0x3F. However, they can be adjusted in a non-linear sequence to give graphic displays more resolution in a desired operating range. For example if it is desired to have more sensitivity at vehicle operating temperature of 180 F, these values can be adjusted so graphic displays ramp quickly and then level off.

Less sensitive graphic display	More sensitive graphic display
db ' 55F 20' ; 164	db '155F 31' ; 229
db ' 60F 20' ; 165	db '160F 32' ; 230
db ' 65F 20' ; 166	db '165F 33' ; 231
db ' 70F 20' ; 167	db '170F 34' ; 232
db ' 75F 21' ; 168	db '175F 35' ; 233
db ' 80F 21' ; 169	db '180F 36' ; 234
db ' 85F 21' ; 170	db '185F 37' ; 235
db ' 90F 21' ; 171	db '190F 38' ; 236
db ' 95F 22' ; 172	db '195F 39' ; 237
db '100F 22' ; 173	db '200F 3A' ; 238
db '105F 22' ; 174	db '205F 3B' ; 239
db '110F 22' ; 175	db '210F 3C' ; 240

Each table has 2048 characters to modify and there are 88 choices for each character for a total of over 18,000 character choices for each table. For this reason the tables are much too large to be modified directly from the Setup Mode. However table files can be obtained and downloaded to the unit to allow for modification of any table. All that is needed is a computer interface (RS232 or Bluetooth) and a communication program such as HyperTerminal or the **vDash** utility.

Contact Checto Digital Instruments or http://www.chetcodigital.com/support.htm for more information on obtaining additional table files to match particular senders/sensors.

Serial Port Protocols

The serial port interface of the SeaGauge-G12 unit can be used for real-time status and reprogramming. The status information is sent in NMEA 0183 format using the $IIXDR sentence format. Custom NMEA control sentences are used to control the unit via the serial port interface.

To access the serial port information – connect the supplied cable to computer RS232 port. Set the baud rate of the computer interface to match the baud rate of the unit (57200 or 9600). Use the standard 8 bits, no parity, and 1 stop bit (8-N-1). Start a serial interface program such as HyperTerminal with these settings then power up the unit. If the connection is correct you will status message from the unit –

vGauge Version 2.02. This indicates the settings are correct.

NMEA 0183 support custom message formats for command and control of propriety equipment. SeaGauge uses the sentence structures:

$PCDIC,X - for control were X is the control command

- **N** = Next menu. Same as pressing the top button
- **S** = Set function. Same as pressing the bottom button
- **G** = Start dumping NMEA $IIXDR sentences in real-time at two updates per second
- **P** = Initiate programming the unit
- **B** = Initialize the Bluetooth module.

$PCDIS,YYYYY – for status where YYYYY is the returned status information

- $PCDIS,SEAGAUGE,0001.100,,*79 = Model Name and Firmware revision

Instrumentation data is returned using the standard NMEA $IIXDR sentence structure:

$IIXDR,X,DATA,U,LABEL CHECKSUM

- **X** = sensor type (G,P,C,..)
- **DATA** = 8 character sensor data value returned from the lookup table
- **U** = unit of measurement specifier
- **LABEL** = 8 character sensor label and a 1 character number representing the channel
- **CHECKSUM** = NEMA check sum calculation on the string

NEXT MENU

The **$PCDIC,N** command is used to command the unit to display the next menu or group. It functions exactly the same as pressing the top button on the unit

SET Function

The **$PCDIC,S** command is used to enter Set-up mode or increment a setting. It operates the same as pressing the bottom button on the unit.

Real-time data

The **$PCDIC,G** command is used to view real-time instrumentation from the serial port. When the unit is first powered up it will start listening to the default serial port (RS232 or Bluetooth) for commands. It will not dump data until it receives the **$PCDIC,G** command. To view real-time data type this command in HyperTerminal after you see the prompt. Data for each of the sensors will immediately begin to be displayed in NMEA 0183 $IIXDR sentence format. The unit will dump data for all 8 sensors every 0.5 seconds.

HyperTerminal allows capture of real-time data to a text file. First enable the Capture Text command under the Transfer menu. Select the file name and location to capture to. Next enter the **$PCDIC,G** command string to start dumping data to the specified file.

STOP Function

The **$PCDIC,X** command is used to stop real-time display out the serial ports..

Program Mode

The **$PCDIC,P** command is used to put the unit into reprogramming mode. Once in this mode a programming file can be sent to the unit to update Lookup Tables, Sensor labels, Display Groups, Label positions, or channel assignments.

Use caution when using this command as improper use will erase the unit and it will have to be sent back for reprogramming.

Programming files can be obtained from Chetco Digital Instruments for use in this mode. These are in a special propriety format and can not be constructed or edited in the field. Contact Chetco Digital Instruments for more information on this option.

Download of new table information requires three steps:

- Enter program mode
- Erase existing table
- Load new table

Program mode is entered by using the $PCDIC,P command from HyperTerminal. If this command is successful the unit will display:

- **READY->**

At this point the unit will wait to receive the starting and ending pages to erase. Page numbers are 512 bytes and can be calculated by dividing the starting page memory location by 512. The following table will help you determine the table page numbers.

Table	Address	Start Page	End Page	Erase Command
Sensor Labels	6800	0D	0D	*0D0D
Groups	7000	0E	0E	*0E0E
Options	7800	0F	0F	*0F0F
Lookup Table 0	0800	01	01	*0101
Lookup Table 1	1000	02	02	*0202
Lookup Table 2	1800	03	03	*0303
Lookup Table 3	2000	04	04	*0404
Lookup Table 4	2800	05	05	*0505
Lookup Table 5	3000	06	06	*0606
Lookup Table 6	3800	07	07	*0707
Lookup Table 7	4000	08	08	*0808
Lookup Table 8	4800	09	09	*0909
Lookup Table 9	5000	0A	0A	*0A0A
Lookup Table 10	5800	0B	0B	*0B0B
Lookup Table 11	6000	0C	0C	*0C0C

To erase the memory you must enter a "*" symbol followed by the start and end page values with no spaces. For example to erase the GROUPS table enter:

- ***0E0E**

To erase Lookup Table 3 enter:

- ***0404**

Once you have entered the 5 characters the unit will erase the memory and respond with

- **ERASED->**

At this point the unit will wait to receive the data to reprogram the unit. Use the HyperTerminal Send Text File function to transfer the appropriate file to reprogram the memory. As the file is transferring data the unit will display the memory address for each update. The display should increment till it reaches the end of file and then reset if no errors occur.

NMEA INPUT

The serial port interface of the vGauge unit can be used to receive information in NMEA 0183 format using the $IIXDR sentence format.

The following table shows the currently available tags that can be captured and displayed. Once a selected tag is detected for the designated display label, the data is decoded and displayed if that label is assigned to a Display Group. NMEA data can only be displayed in Digital Data format.

NMEA TAG	Function
$IIXDR,G	Instrumentation Data
$GPGGA	UTC TIME, Position, Sat info
$GPVTG	Track and ground speed
$SDDBT	depth below transducer
$SDMTW	water temperature
$GPRMC	Position, ground speed, true heading
$GPRMB	Destination WP position, Bearing to WP, Closing speed to WP, Distance to WP
$YXMTW	water temperature
$VWVHW	Speed and heading
$VWVLW	Water traveled distance
$SDDPT	depth below transducer
$GPGLL	Basic position
$SDVHW	Sonar Water Speed and heading
$SDVLW	Sonar Water traveled distance
$PDICH	Display Engine Hour Meter
$GPRMC	Used for adjusted UTC time to local time

To receive NMEA 0183 input, the following set-up conditions must be met.

- vGauge put into slave mode
- NMEA tags set to value other then 0
- NMEA display positions set to desired locations
- NMEA data assigned to 1 of 8 display groups
- Display text labels for desired NMEA position set to match incoming $IIXDR label

Please refer to unit Setup sections of this manual for proper information on how to set these modes.

NMEA $IIXDR tags are filtered based on the first 8 characters of the label portion of the sentence. This label must match one of (6-8) the NMEA Display Labels stored in the unit to be displayed. The data value will be displayed in the position assigned to the matching label.

$IIXDR,X,DATA,U,LABEL CHECKSUM

- **X** = sensor type (G,P,C,..)
- **DATA** = 8 character sensor data value returned from the lookup table
- **U** = unit of measurement
- **LABEL** = 8 character sensor label and a 1 character number representing the channel
- **CHECKSUM** = NEMA check sum calculation on the string

By matching NMEA Display Labels with labels from incoming NMEA $IIXDR sentences, vGauge-G12 can decode and display a large variety of NMEA data.

All vGauge and vSwitch units output NMEA $IIXDR data with a number in the last position on the label field so that multiple $IIXDR sentences can be displayed on one screen.

When an incoming NMEA $IIXDR label matches one of the 6-8 stored in the unit, the first 4 characters of the data field are extracted for display in the chosen position. NMEA data can only be displayed in Digital Data format. None of the Graphic Display modes can be used with NMEA data since it arrives as a TEXT stream and is not numerical data.

vGauge-G12 will format any received NMEA data into a $IIXDR sentence for output and data logging. This means that SONAR and GPS sentences will be converted into $IIXDR sentences and output via the serial port. The resulting output stream can be cascaded to other NMEA equipment that is capable of decoding $IIXDR sentences like the vDash display and logging utility which is available for all units.

Flash Programming

The firmware of the vGauge-G12 unit can be upgraded using the optional flash programming cable and software utility. To perform this function you will need a WINDOWS compatible computer or laptop and a NULL MODEM adapter or USB to Serial adapter to connect the supplied cable.

Updating the firmware requires a binary image and flash programming utility. If you do not have these or are not sure on which version is required – PLEASE CONTACT THE FACTORY before proceeding.

Firmware updates are performed using the vDash application from a Windows XP/Vista PC. Please consult the vDash User's guide for further information on how to complete these steps.

If you have any questions/problems with this procedure – contact the factory for assistance.

Unit Dimensions vGauge-G12 Module

The following table provides dimension information for the vGauge-G12 module with 320 X 240 LCD display. All dimensions are in inches..
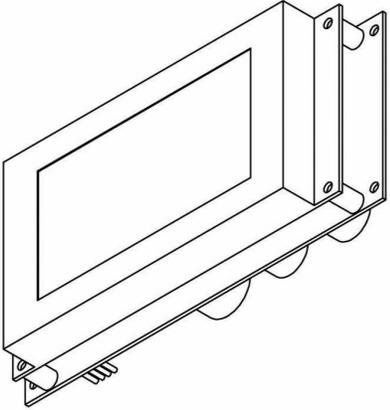
90 day Warranty

"We", "our", or "us" refers to **Chetco Digital Instruments**, the manufacturer of this product. "You" or "your" refers to the first person who purchases this product as a consumer item for personal, family, or household use.

We warrant this product against defects or malfunctions in materials and workmanship, and against failure to conform to this product's written specifications, all for 90 days from the date of original purchase by you. WE MAKE NO OTHER EXPRESS WARRANTYOR REPRESENTATION OF ANY KIND WHATSOEVER CONCERNING THIS PRODUCT. Your remedies under this warranty will be available so long as you can show in a reasonable manner that any defect or malfunction in materials or workmanship, or any nonconformity with the product's written specifications, occurred within 90 days from the date of your original purchase, which must be substantiated by a dated sales receipt or sales slip. Any such defect, malfunction, or non-conformity which occurs within 90 days from your original purchase date will either be repaired without charge or be replaced with a new product identical or reasonably equivalent to this product, at our option, within a reasonable time after our receipt of the product. If such defect, malfunction, or non-conformity remains after a reasonable number of attempts to repair by us, you may elect to obtain without charge a replacement of the product or a refund for the product. THIS REPAIR, REPLACEMENT, OR REFUND (AS JUST DESCRIBED) IS THE EXCLUSIVE REMEDY AVAILABLE TO YOU AGAINST US FOR ANY DEFECT, MALFUNCTION, OR NON-CONFORMITY CONCERNING THE PRODUCT OR FOR ANY LOSS OR DAMAGE RESULTING FROM ANY OTHER CAUSE WHATSOEVER. WE WILL NOT UNDER ANY CIRCUMSTANCES BE LIABLE TO ANYONE FOR ANY SPECIAL, CONSEQUENTIAL, INCIDENTAL, OR OTHER INDIRECT DAMAGE OF ANY KIND.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty does NOT apply in the following circumstances: (1) when the product has been serviced or repaired by anyone other than us, (2) when the product has been connected, installed, combined, altered, adjusted, or handled in a manner other than according to the instructions furnished with the product, (3) when any serial number has been effaced, altered, or removed, or (4) when any

defect, problem, loss, or damage has resulted from any accident, misuse, negligence, or carelessness, or from any failure to provide reasonable and necessary maintenance in accordance with the instructions of the owner's manual for the product.

We reserve the right to make changes or improvements in our products from time to time without incurring the obligation to install such improvements or changes on equipment or items previously manufactured.

This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

REMINDER: You must retain the sales slip or sales receipt proving the date of your original purchase in case warranty service is ever required.

Chetco Digital Instruments, INC.
BOX 5359
Brookings, OREGON 97415
541-661-2051

vGAUGE FIRMWARE LICENSE AGREEMENT

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 5. Prices and programs are subject to change without notice.

6. This License Agreement shall be governed by the laws of the State of Oregon and comprises the complete and exclusive understanding between you and us concerning the above subject matter.

How to Obtain Service

We back your investment in quality products with quick, expert service and genuine replacement parts. If you're in the United States and you have questions, please contact the Factory Customer Service Department using our number listed below. You must send the unit to the factory for warranty service or repair. Please call the factory before sending the unit. You will be asked for your unit's serial number (shown above). Use the following number:

541-661-2051

U.S.A.only. Monday through Friday, except holidays.

Your unit is covered by a full 90 day warranty. (See inside for complete warranty details.) If your unit fails and the failure is not covered by the original warranty, Chetco Digital Instruments has a flat-rate repair policy that covers your unit and accessories packed with the unit at the factory. There is a 30-day warranty on all non-warranty repairs from the factory, which is similar to the original warranty, but is for 30 days rather than 90 days. For further details, please call us at the above number.

Remember, non-warranty repairs are subject to Chetco Digital Instruments published flat rate charges and 30-day warranty.

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Brookings, OR 97415

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http://www.chetcodigital.com