GALVANIC

APPLIED SCIENCES

MESSENGER PC TRANSMITTER
User's manual
Release 1.2   September 15, 2015

NOTE: Also available with Stainless Steel Enclosure

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Manufacturer's Warranty Statement

Galvanic Applied Sciences Inc. ("Seller") warrants that its products will be free from defects in materials and workmanship under normal use and service in general process conditions for 12 months from the date of Product start-up or 18 months from the date of shipping from Seller's production facility, whichever comes first (the "Warranty Period"). Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. Buyer must give Seller notice of any warranty claim prior to the end of the Warranty Period. Seller shall not be responsible for any defects (including latent defects) which are reported to Seller after the end of the Warranty Period.

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Limitations
These warranties do not cover:

- Consumable items such as lamps.

- Analyzer components which may be damaged by exposure to contamination or fouling from the process fluid due to a process upset, improper sample extraction techniques or improper sample preparation, fluid pressures in excess of the analyzer's maximum rated pressure or fluid temperatures in excess of the analyzer's maximum rated temperature. These include but are not limited to sample filters, pressure regulators, transfer tubing, sample cells, optical components, pumps, measuring electrodes, switching solenoids, pressure sensors or any other sample wetted components.

- Loss, damage, or defects resulting from transportation to Buyer's facility, improper or inadequate maintenance by Buyer, software or interfaces supplied by Buyer, operation outside the environmental specifications for the instrument, use by unauthorized or untrained personnel or improper site maintenance or preparation.

- Products that have been altered or repaired by individuals other than Seller personnel or its duly authorized representatives, unless the alteration or repair has been performed by an authorized factory trained service technician in accordance with written procedures supplied by Seller.

Revision Date: June 2019

- Products that have been subject to misuse, neglect, accident, or improper installation.

- The sole and exclusive warranty applicable to software and firmware products provided by Seller for use with a processor internal or external to the Product will be as follows: Seller warrants that such software and firmware will conform to Seller's program manuals or other publicly available documentation made available by Seller current at the time of shipment to Buyer when properly installed on that processor, provided however that Seller does not warrant the operation of the processor or software or firmware will be uninterrupted or error-free.

The warranty herein applies only to Products within the agreed country of original end destination. Products transferred outside the country of original end destination, either by the Seller at the direction of the Buyer or by Buyer's actions subsequent to delivery, may be subject to additional charges prior to warranty repair or replacement of such Products based on the actual location of such Products and Seller's warranty and/or service surcharges for such location(s).

Repaired Products
Repaired products are warranted for 90 days with the above exceptions.

Limitation of Remedy and Liability
IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY INDIRECT, CONSEQUENTIAL, INCIDENTAL, SPECIAL OR PUNITIVE DAMAGES, OR FOR ANY LOSS OF USE OR PRODUCTION, OR ANY LOSS OF DATA, PROFITS OR REVENUES, OR ANY CLAIMS RAISED BY CUSTOMERS OF BUYER OR ANY ENVIRONMENTAL DAMAGE OR ANY FINES IMPOSED ON BUYER BY ANY GOVERNMENTAL OR REGULATORY AUTHORITIES, WHETHER SUCH DAMAGES ARE DIRECT OR INDIRECT, AND REGARDLESS OF THE FORM OF ACTION (WHETHER FOR BREACH OF CONTRACT OR WARRANTY OR IN TORT OR STRICT LIABILITY) AND WHETHER ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR NOT.

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1. General Information

1.1 Introduction

The Monitek Messenger is a compact, highly efficient, and expandable system that is designed to interface to a broad range of Monitek sensors. It also has the capability to interface with multiple and different sensors at the same time. Its modular design approach enables several applications to be customized for a variety of measurements, such as Turbidity, Suspended solids, Color, % Concentration, and oil in water, using optical in-line Sensors. The Messenger PC Transmitter has a Touchscreen PC (TPC). The TPC (or GUI, Graphical User Interface) offers completely menu-driven screens that are easy to understand and also has online help. The GUI interface is designed to allow three access levels (Operator, Technician and Factory) to prevent an unskilled operator from changing any critical parameter in the setup of the transmitter. The interface is intuitive with no need for programming codes or program numbers. The system also includes some self-check operations as well as the ability to access the basic measurement values without the use of a multi-meter or even physically accessing the electronics. The system includes the ability to perform field calibrations while the instrument is installed in the process and is operating. It comes factory pre-configured to your application. For most accurate setup we recommend that the user calibrate on his process sample condition. Please refer to Process calibration.

Icons used in this User's Manual

⚠️ **WARNINGS INDICATE SITUATIONS THAT COULD RESULT IN THE INJURY TO HUMAN OPERATOR OR BYSTANDER. WARNINGS ARE PRINTED IN ALL UPPERCASE CHARACTERS IN BOLDFACE FONT**

🟡 **Cautions indicate situations that could damage the Monitek Messenger or sensor. Cautions are printed in mixed case characters in boldface font**

Note   Notes indicate miscellaneous information and are printed in mixed case characters, in normal font

1.2   Safety Considerations

- Power source:

This instrument requires an input of 90-260VAC at 50-60 Hertz (unless otherwise specified). A 24VDC/AC power supply is optional.

Installing AC Wiring:

AC power consumption is less than 50 Watts at 110 Volts AC. Use #18AWG wire for power connections. Transmitter relay ratings for alarms and external devices are 2 A at 250V~ maximum; use #18 AWG or 20AWG for wiring.

⚠️ **WARNING: MAKE SURE THE AC POWER MAINS ARE SWITCHED OFF OR OTHERWISE DISCONNECTED BEFORE YOU BEGIN WIRING THE SYSTEM TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK. IT IS A REQUIRED TO INSTALL A MAIN POWER CUTOFF SWITCH NEAR THE SYSTEM WITH EXTERNAL MAIN FUSES.**
SPECIFICATIONS FOR THE FUSES: 260VAC, ¾ AMP

- Proper instrument grounding:

The instrument must be grounded to avoid electrical shock hazards to personnel, damage to the unit and erroneous operation.

⚠️ **THE SYSTEM REQUIRES AN AC-GROUND (EARTH GROUND) AND ALL SENSORS CONNECTED TO THE TRANSMITTER MUST BE GROUNDED.**

- Do not operate with open enclosure. Exposed electronics will promote the risk of electrical shock and might cause damage to the unit.

- Do not alter cable length. The instrument was calibrated with a specified cable length. Altering cable length can cause unstable signals and void instrument calibration.

- Keep original packing materials. Ship the instrument in the original packing material to avoid damage to the sensor or transmitter. If packing material is needed, contact Monitek.

- Mishandling of the sensor is not covered under warranty. Do not disconnect the interior wiring of the sensor.

1.3   Device Installation

1.3.1 Transmitter location, specifications and installation.

The transmitter should be installed using the mounting ears in a vertical position. The transmitter should not be installed in direct sunlight, as this will tend to cause abnormally high heat inside the enclosure, also avoid locations that are close to excessive heat generating equipment.

Specifications:

Sensors: Includes MoniTurb-F, MoniTurb-FS, MoniSpec AD, 210, MoniSpec A, MoniTurb-S, TS2, Model 22 Probes, Model 25 Probes (includes CSK, CSH, CSS), Model 450 (CS6, CS8), Cell Density Probes FS4&FS5.

Number of Sensors: 1 to 4 sensors. Each sensor may be linked to a separate 8 points Calibration table with 1st order or Curve fit linerization techniques.

Area Classification: General Purpose

Environmental:

Operating Temp: -14 °F to 122 °F (-10 °C to 50 °C)

Humidity: 0 to 95% RH, non condensing

User Interface:

GUI Touchscreen PC mounted on inner swing panel behind enclosure door with window.

Alarms: Low High Alarms and General Fault Alarm are user programmable, latching or non-latching, energized or de-energized with programmable alarm delay and hystersis.

Display: Optional, 4 lines by 20 Characters backlight LCD.

Programming: Using Desktop, Laptop or touch screen PDA or Panel PC.

Analog Outputs: Two standard 0/4-20 mA Isolated. Optional Two additional outputs 0 to 1000 Ohms

Internal Relays: Optional, 4 relays fully programmable rated at 2A/250VAC

Digital Inputs: Four Digital Inputs, fully programmable with activate levels of 5 to 24 VDC

Power

Input Power: 90 to 260 VAC 50/60 Hz

Power consumption: less than 50 watts

Enclosure Types

Material:	**304SS**		Material:	**Fiberglass**
Height::	14.76in (375mm)		Height::	13.19in (335mm)
Width:	10in (254mm)		Width:	11.85in (301mm)
Depth:	6.8in (173mm)		Depth:	6.77in (172mm)
Weight:	19.4 lbs (8.8kg)		Weight:	12.4 lbs (5.62kg)
Rating:	NEMA 4X, IP65		Rating:	NEMA 4x, IP65

Approvals CE

Warranty One year (materials and workmanship)

Installation dimensions for Messenger PC transmitter in fiberglass enclosure:
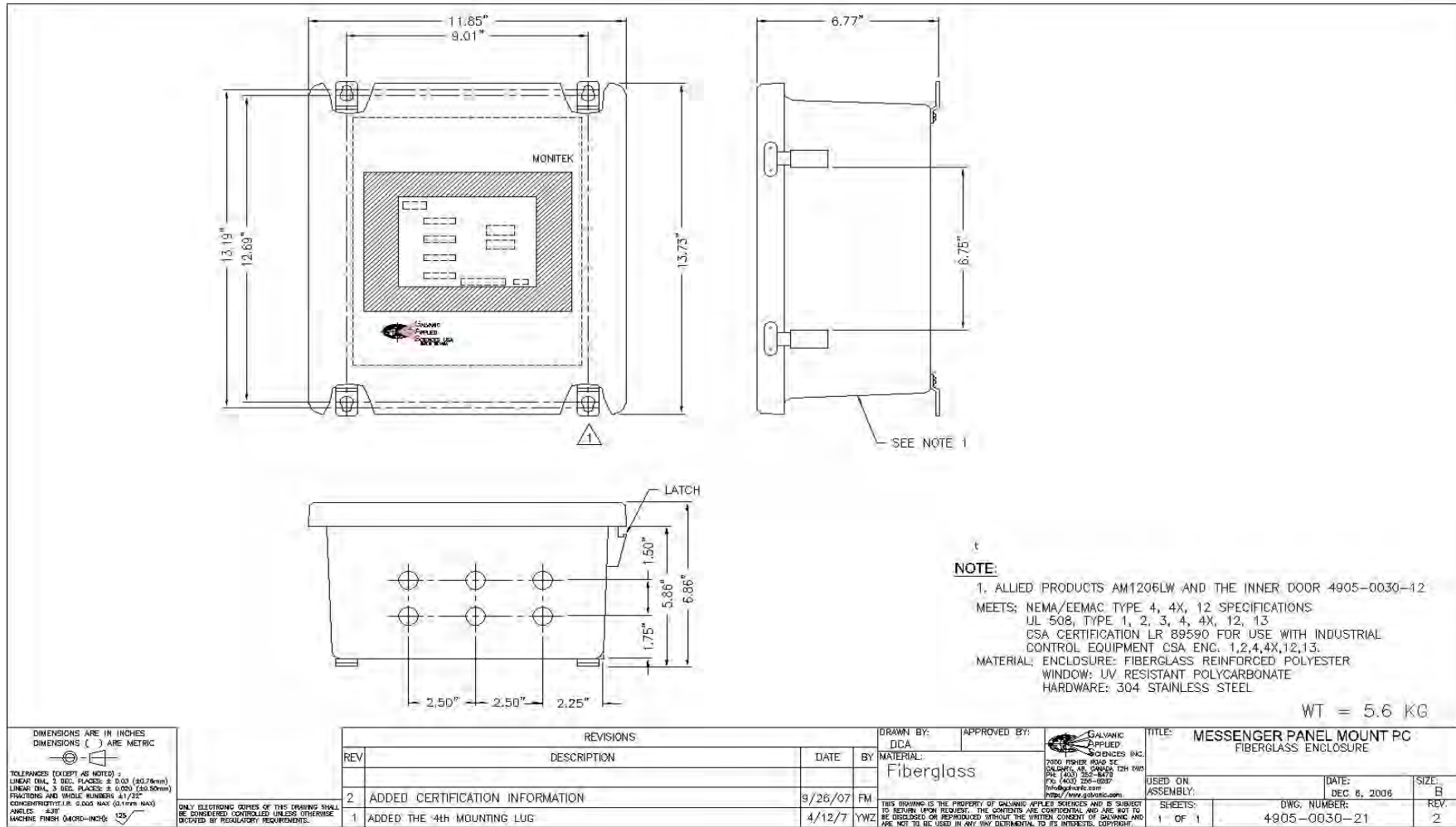
Installation dimensions for Messenger PC transmitter in stainless steel enclosure:

DRAWING NOT TO SCALE

305mm [12"]

8 mm (4) HOLES

375mm [14.7"]

356mm [14"]

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WT= 8.8 KG

254mm [10"]

173mm [6.8"]

Hoffman cat.# A1412CHNFSS

DIMENSIONS ARE IN INCHES
DIMENSIONS ( ) ARE METRIC

TOLERANCES (EXCEPT AS NOTED) :
LINEAR DIM, 2 DEC. PLACES: ± 0.03 (±0.76mm)
LINEAR DIM, 3 DEC. PLACES: ± 0.020 (±0.50mm)
FRACTIONS AND WHOLE NUMBERS ±1/32"
CONCENTRICITY/T.I.R. 0.005 MAX (0.1mm MAX)
ANGLES   ±30'
MACHINE FINISH (MICRO-INCH)s   125

ONLY ELECTRONIC COPIES OF THIS DRAWING SHALL
BE CONSIDERED CONTROLLED UNLESS OTHERWISE
DICTATED BY REGULATORY REQUIREMENTS.

DRAWN BY: FM	APPROVED BY: JC	GALVANIC APPLIED SCIENCES INC. 7000 FISHER ROAD SE CALGARY, AB, CANADA T2H 0W3 PH: (403) 252-8470 FX: (403) 255-6887 info@galvanic.com http://www.galvanic.com	TITLE: MESSENGER PANEL MOUNT PC STAINLESS STEEL ENCLOSURE		
MATERIAL: 304 St.St Enclosure			USED ON ASSEMBLY:	DATE: 12-18-08	SIZE: B
		THIS DRAWING IS THE PROPERTY OF GALVANIC APPLIED SCIENCES AND IS SUBJECT TO RETURN UPON REQUEST. THE CONTENTS ARE CONFIDENTIAL AND ARE NOT TO BE DISCLOSED OR REPRODUCED WITHOUT THE WRITTEN CONSENT OF GALVANIC AND ARE NOT TO BE USED IN ANY WAY DETRIMENTAL TO ITS INTERESTS. COPYRIGHT.	SHEETS: 1 OF 1	DWG. NUMBER: 4900-0036-00	REV. 1

1.3.2 Transmitter and Sensor Wiring

System Layout and Interconnections details

Left diagram labels:
- Optional analog Output board Out |3| and Out|4| |0/4 – 20| mA
- Optional LCD Connector
- Power to main board
- Optional Relay Card Connector
- AC Power — 1 2 3 / L1 N GND
- Lamp — 1 2
- BU3
- JP10
- JP9
- JP1 JP2 JP3 JP4
- JP5 JP6 JP7 JP8
- S2 S1
- 23 24 25 26 27 28 29 30 31 / + | + | + | / mA #2 mA #3 mA #4 Ext. Lamp / GND
- 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
- | + GND | + GND | + GND | + GND + | GND 4 3 2 5 | + GND
- AIN #2 Direct / AIN #3 FW|12°| / AIN #4 S|90°| / AIN #5 / RS485 / RS232 / mA #1

Right table:

RS485	13	A |+|
	14	B |–|
	15	AC GND
RS232	16	DSR EN–
	17	TxD
	18	RxD
	19	GND
mA #1	20	Out |+| 0/4 – 20 mA
	21	Out |–| 0/4 – 20 mA
		Out |+| 0/4 – 20 mA
		Out |–| 0/4 – 20 mA
mA #3	25	Out |+| 0/4 – 20 mA
	26	Out |–| 0/4 – 20 mA
mA #4	27	Out |+| 0/4 – 20 mA
	28	Out |–| 0/4 – 20 mA
Ext. Lamp	29	On/Off external lamp
	30	Input external lamp error
	31	GND
JP9		Jumper to reset with power off/on
JP10		Used for boot mode to programm micro-controller
JP1 thru JP4		Connect 1–2 for sensor |Diode|
		Connect 2–3 for probe |0...+2mA|
JP5 thru JP8		Connect 1–2 for high Gain |0...1uA range|
		Connect 2–3 for STD GAIN |0...100uA range|

Left diagram

Connector to Main PC board 'BU3'

Group		
RLY #1	NC	40
	NO	41
	C	42
RLY #2	NC	43
	NO	44
	C	45
RLY #3	NC	46
	NO	47
	C	48
RLY #4	NC	49
	NO	50
	C	51

Digital Inputs

#1	61
#2	62
#3	63
4#	64
COM	45

Right diagram
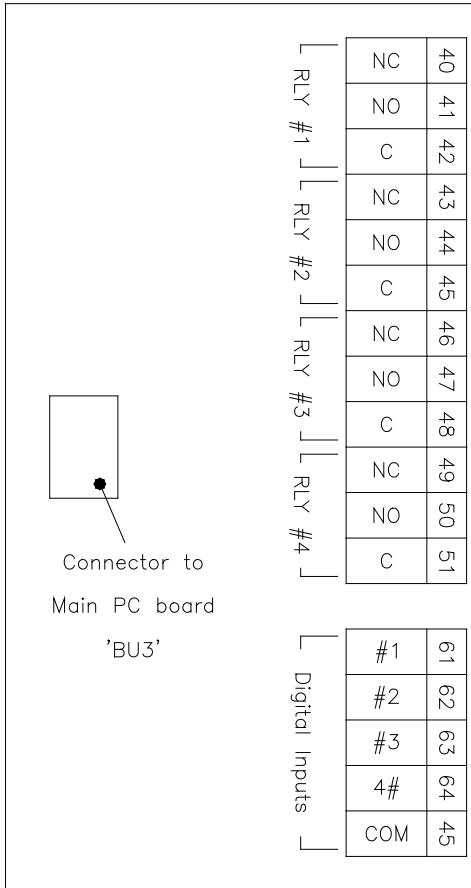
RLY #1	40	NC	
	41	NO	
	42	C	
RLY #2	43	NC	
	44	NO	Relay may be programmed as fail safe to detect power failure Rating 2 A @ 250 VAC
	45	C	
RLY #3	46	NC	
	47	NO	
	48	C	
RLY #4	49	NC	
	50	NO	
	51	C	
Digital Inputs	61	Digital Input #1	To activate an input apply 5 – 24 VDC for logic ' 1 ' apply 0 VDC for logic ' 0 '
	62	Digital Input #2	
	63	Digital Input #3	
	64	Digital Input #4	
	65	Common	

Messenger

- Netz/Power 115/230 VAC 50-60 Hz

1 2 3
L1 N PE
− + GND

1 2
Blau/Blue
Rot/Red
Grau/Grey
Rosa/Pink
− +

Optionale Relaiskarte/Optional Relay Card
51 50 49 48 47 46 45 44 43 42 41 40
65 64 63 62 61

+ − + − + − GND
23 24 25 26 27 28 29 30 31

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

Braun/Brown
Weiss/White
Schirm/Shield
Gelb/Yellow
Grün/Green
Gelb/Yellow
Grün/Green
Schirm/Shield
Lila/Lilac
Rot/Red
Orange/Orange
Grün/Green
4 – 20 mA
4 – 20 mA

— RS232 —

— mA – Ausgang/mA – output —

Sensor

2
1   3

Sensor [Ex-Version]

2
1   3

— Detektor/Detector 90° —

— Detektor/Detector 12° —

Lampe/Lamp

① Detektor/Detector 12°
+ 1 Weiss/White
− 2 Braun/Brown
+ 3 Grün/Green
− 4 Gelb/Yellow

② Detektor/Detector 90°
+ 1
− 2
+ 3 Grün/Green
− 4 Gelb/Yellow

③ Lampe/Lamp
+ 1 Grau/Grey
+ 2 Rosa/Pink
− 3 Blau/Blue
− 4 Rot/Red

-13-

The product is pre-configured at the Factory for the dedicated sensor hardware. So in most cases, you may not need to change the jumpers on the Main board. If you really need to change the settings, please write down the original setting before changing any settings.

1.3.3 Sensor wiring and connections:

The table below shows a typical Forward Side scatter sensor connections to a Messenger.

MONITURB FS (Forward and Side Scatter) Flow cell.

Terminal	Wire color	Cable ID	Signal
1	Brown	FS module	(-) Direct beam
2	White	FS module	(+) Direct Beam
3	Black	FS module	(AC-GND) Shield
4	Yellow	FS module	(-) 12 Deg. Sensor
5	Green	FS module	(+) 12 Deg. Sensor
6	-		
7	Yellow	SS module	(-) 90 Deg. Sensor
8	Green	SS module	(+) 90 Deg. Sensor
9	Black	SS module	(AC-GND) Shield

Lamp connections

Terminal	
1	Lamp (Blue and Red)
2	Lamp (Grey and Pink)

1.4   Software Installation

1.4.1   PC Version

System Requirements

| Supported Operating Systems	Window 95, 98,NT, 2000, ME, XP
RAM	32MB
Hard Disk Space	5MB

Installation procedure

I.   Close any open programs that are running on your computer before starting the installation.

II. Double click on setup.exe.

III. As the installation progresses, follow the instructions on the screen. Some Windows system files will be updated to newer versions during installation of Messenger software. If these updates are done, you will be required to reboot your PC. If so, repeat steps 1 through 2 of the installation procedure to continue with the installation. Once the installation of Messenger software is complete, you will be required to restart your computer once again for proper functioning of the software.

IV. Welcome screen shown below will appear, Click OK to continue the installation process. To abort the installation process click Exit Setup.
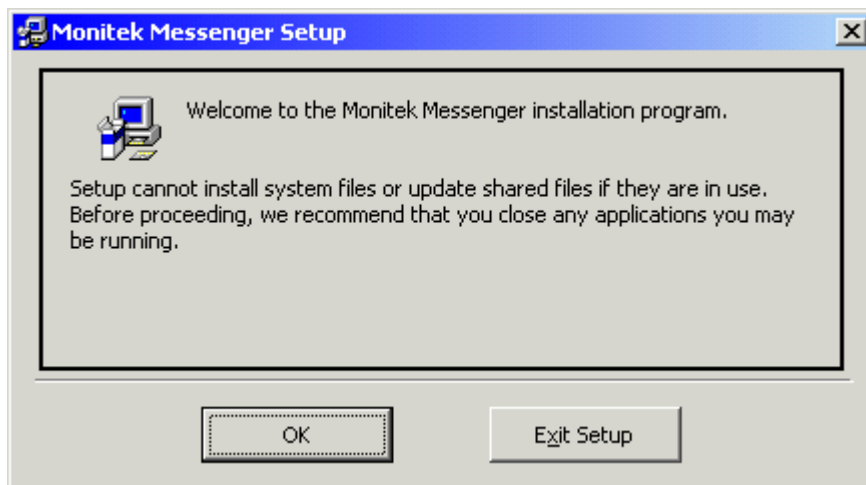
V. Choose the Destination location.
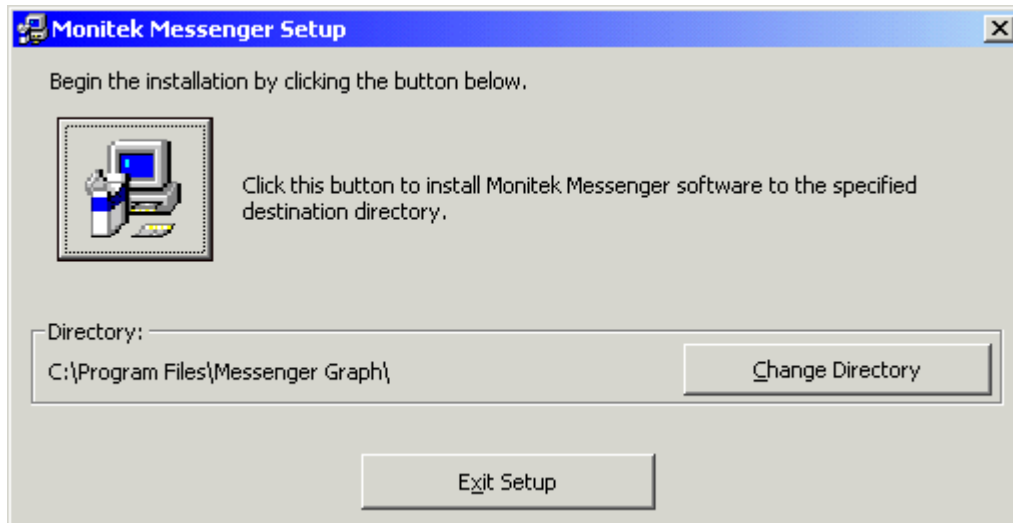
VI. To change the default destination location click on Change Directory. Choose new destination location using the following screen.
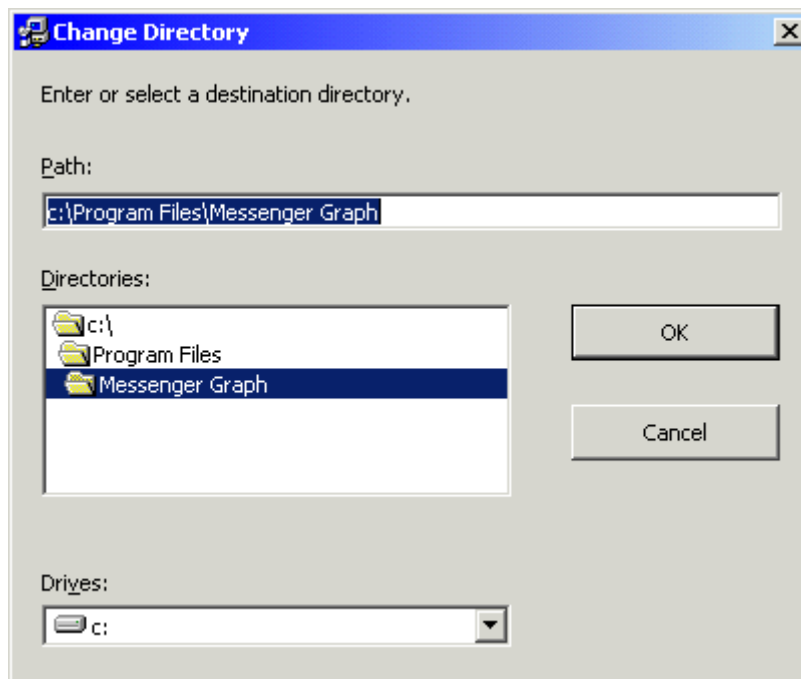
VII. Choose the program group under which the application has to appear.
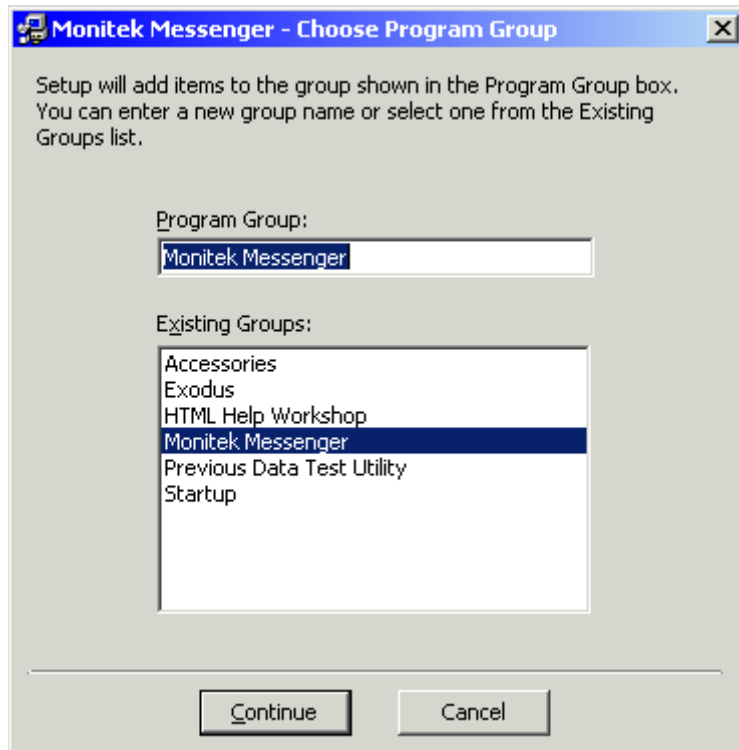
VIII. Click Continue.

IX. Dialog showing the status of the files being copied will be displayed.

X. On Completion of Installation Process Message "Installation process complete" will appear.

XI. Click on OK to finish the installation process.

1.5 Menu layout and Operation

1.5.1 Messenger Software Navigation Tree (Operator)

```
                        ┌──────────────────┐
                        │  Start/Exit Menu │
                        └──────────────────┘
          ┌───────────────────────┼───────────────────────┐
          ▼                       ▼                        ▼
  ┌─────────────────┐    ┌─────────────────┐    ┌─────────────────────┐
  │ Select Language │    │    Main Menu    │    │  Select Messenger   │
  └─────────────────┘    └─────────────────┘    └─────────────────────┘
     ┌──────────┬───────────┼───────────────┬───────────────┐
     ▼          ▼           ▼               ▼               ▼
┌──────────┐ ┌──────────┐ ┌──────────┐ ┌──────────┐ ┌──────────────┐
│ Setup    │ │Diagnostic│ │Set       │ │Set Access│ │ Measurement  │
│ Inputs/  │ │Menu      │ │Cleaning  │ │Level     │ │ Screen       │
│ Outputs  │ │          │ │Event     │ │          │ │              │
└──────────┘ └──────────┘ └──────────┘ └──────────┘ └──────────────┘
     ▼            │                                         │
┌──────────┐     │    ┌──────────────────┐                │    ┌──────────────┐
│Set Alarms│     ├───▶│ Clear/Reset Menu │                ├───▶│  Previous    │
└──────────┘     │    └──────────────────┘                │    │  Data        │
                 │                                         │    └──────────────┘
                 │    ┌──────────────────┐                │    ┌──────────────┐
                 │    │  Reset Alarms    │                ├───▶│  Online      │
                 │    └──────────────────┘                │    │  Data        │
                 │                                         │    └──────────────┘
                 │    ┌──────────────────┐                │    ┌──────────────┐
                 └───▶│ Software Revision│                ├───▶│  Graph       │
                      └──────────────────┘                │    │  Settings    │
                                                          │    └──────────────┘
                                                          │    ┌──────────────┐
                                                          ├───▶│  Copy Image  │
                                                          │    └──────────────┘
                                                          │    ┌──────────────┐
                                                          ├───▶│  Copy Data   │
                                                          │    └──────────────┘
                                                          │    ┌──────────────┐
                                                          └───▶│  Save As Bmp │
                                                               └──────────────┘
```
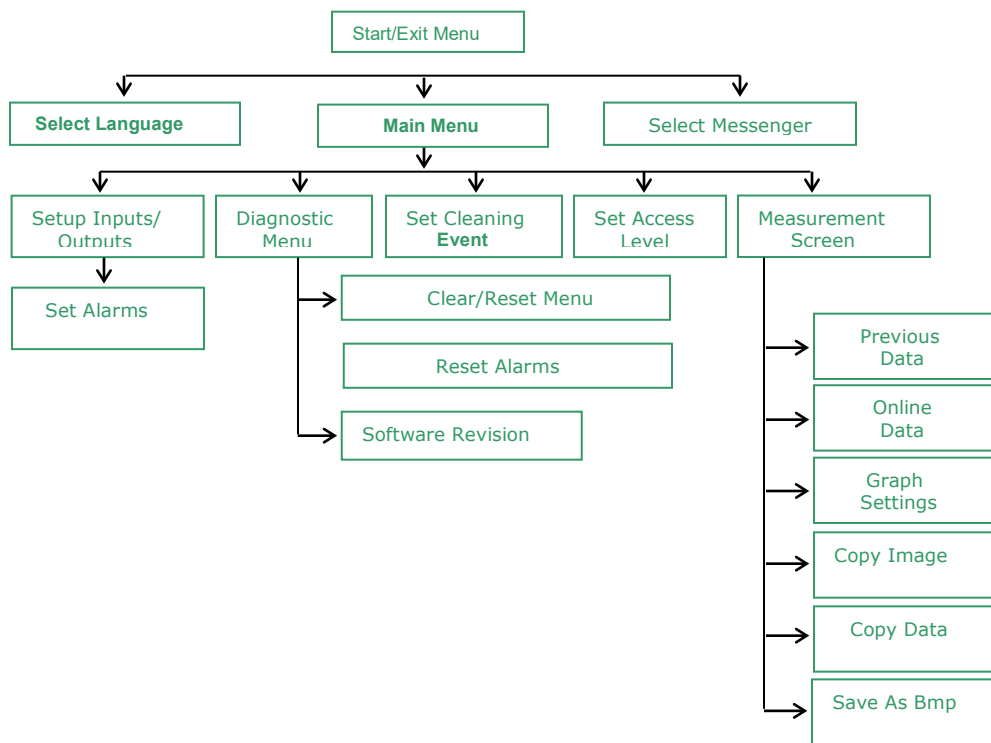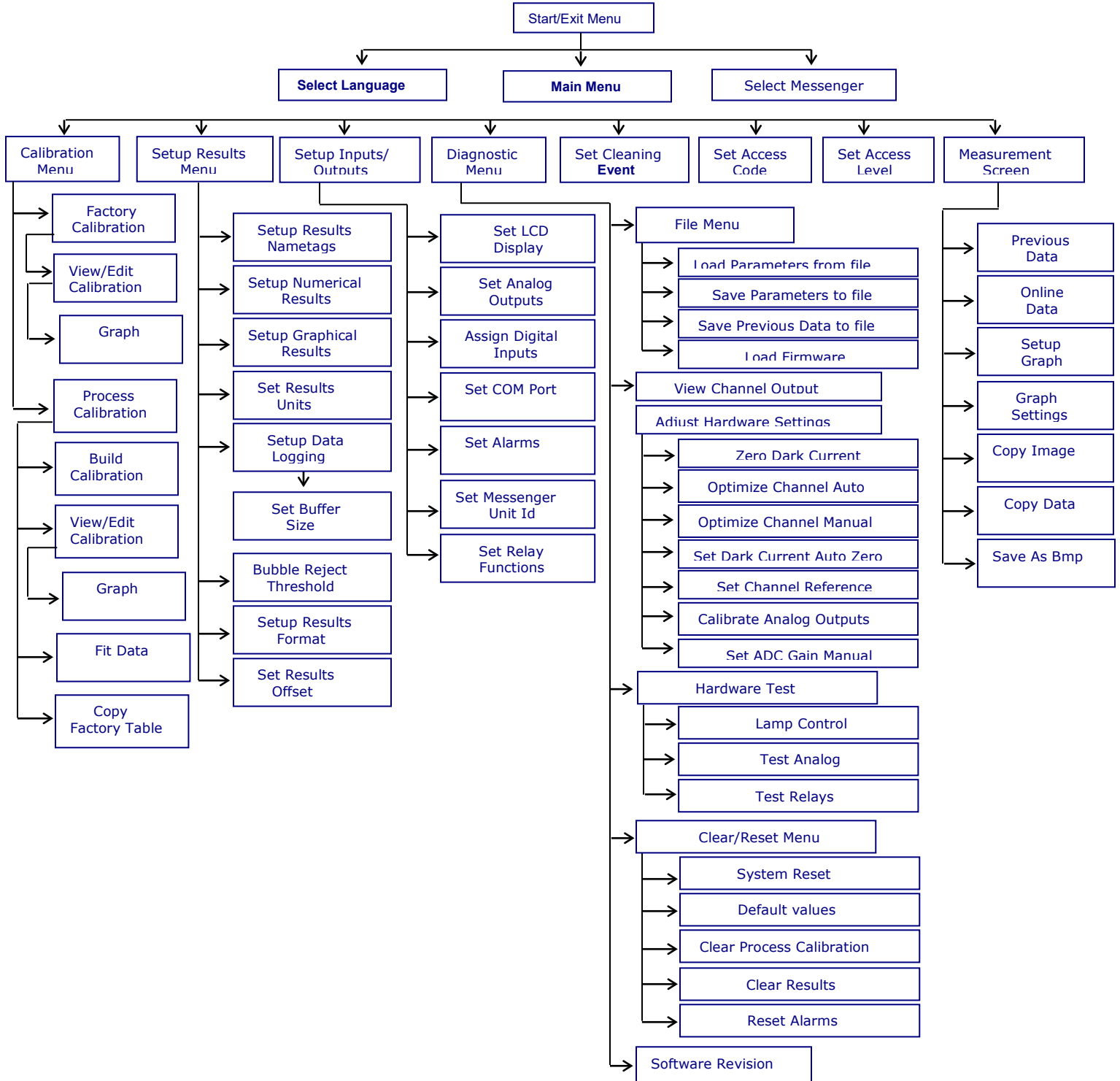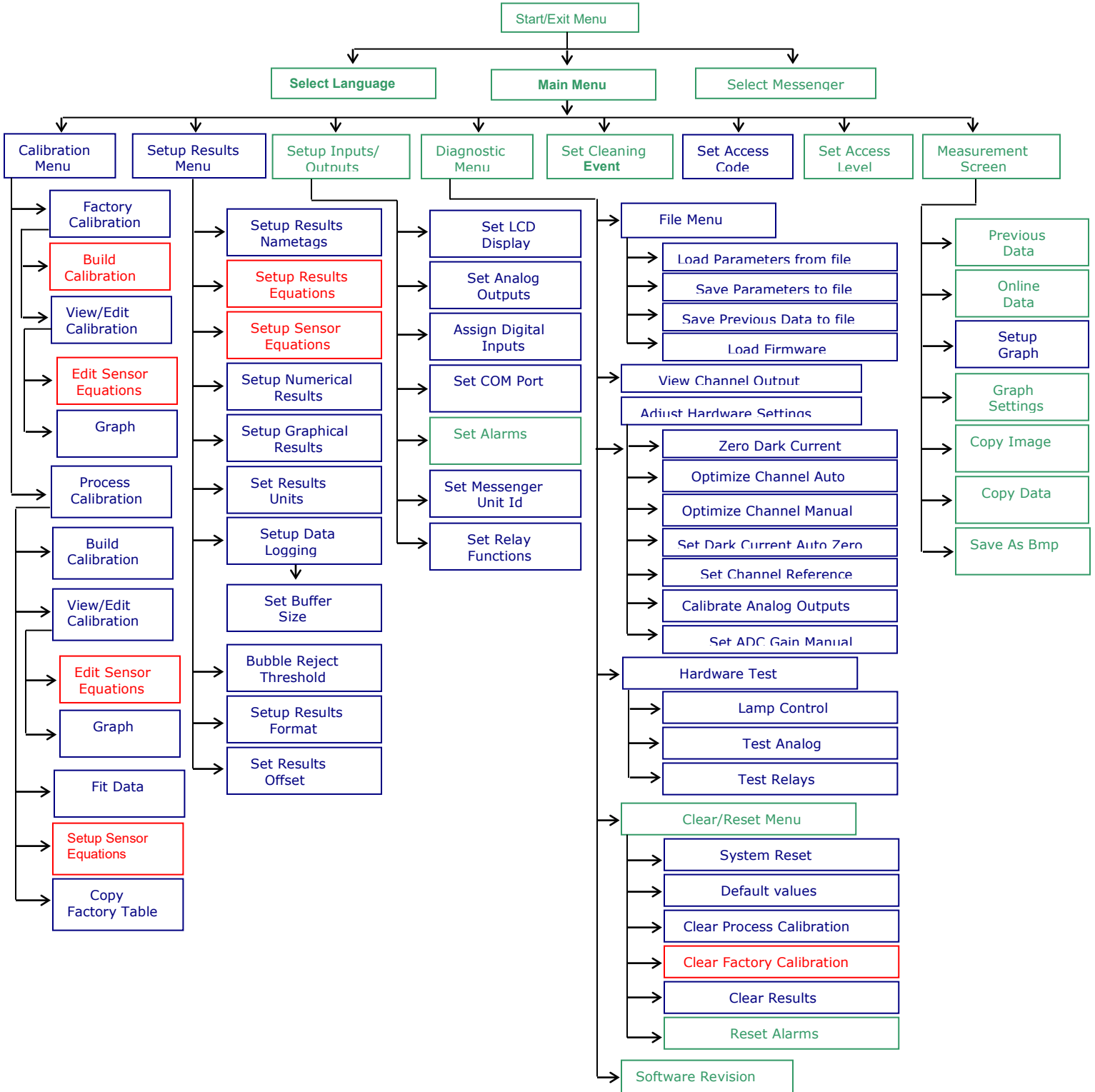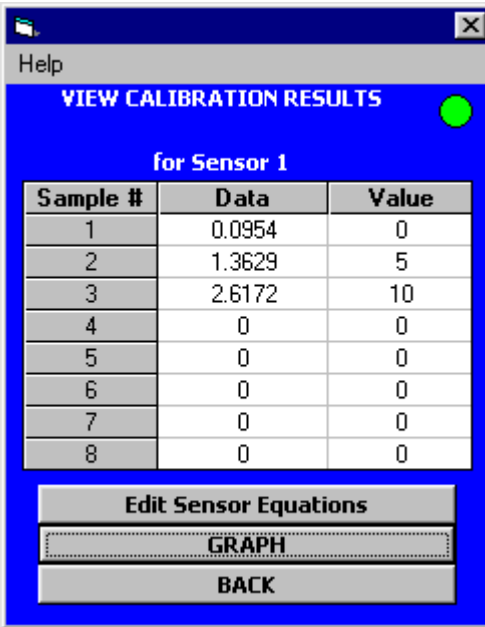
1.5.2 Messenger Software Navigation Tree (Technician)

```
                                      ┌─────────────────┐
                                      │ Start/Exit Menu │
                                      └─────────────────┘
                  ┌──────────────────────────┼──────────────────────────┐
         ┌─────────────────┐        ┌─────────────────┐        ┌─────────────────┐
         │ Select Language │        │    Main Menu    │        │ Select Messenger│
         └─────────────────┘        └─────────────────┘        └─────────────────┘
```

| Calibration Menu | Setup Results Menu | Setup Inputs/ Outputs | Diagnostic Menu | Set Cleaning Event | Set Access Code | Set Access Level | Measurement Screen |

Calibration Menu
- Factory Calibration
- View/Edit Calibration
- Graph
- Process Calibration
- Build Calibration
- View/Edit Calibration
- Graph
- Fit Data
- Copy Factory Table

Setup Results Menu
- Setup Results Nametags
- Setup Numerical Results
- Setup Graphical Results
- Set Results Units
- Setup Data Logging
- Set Buffer Size
- Bubble Reject Threshold
- Setup Results Format
- Set Results Offset

Setup Inputs/Outputs
- Set LCD Display
- Set Analog Outputs
- Assign Digital Inputs
- Set COM Port
- Set Alarms
- Set Messenger Unit Id
- Set Relay Functions

Diagnostic Menu

File Menu
- Load Parameters from file
- Save Parameters to file
- Save Previous Data to file
- Load Firmware

View Channel Output

Adjust Hardware Settings
- Zero Dark Current
- Optimize Channel Auto
- Optimize Channel Manual
- Set Dark Current Auto Zero
- Set Channel Reference
- Calibrate Analog Outputs
- Set ADC Gain Manual

Hardware Test
- Lamp Control
- Test Analog
- Test Relays

Clear/Reset Menu
- System Reset
- Default values
- Clear Process Calibration
- Clear Results
- Reset Alarms

Software Revision

Measurement Screen
- Previous Data
- Online Data
- Setup Graph
- Graph Settings
- Copy Image
- Copy Data
- Save As Bmp

1.5.3   Messenger Software Navigation Tree (Factory Level)

2   Setup and Calibration

The system is calibrated at the factory using clean laboratory standards. For best results we recommend that the user calibrate using the process conditions. The system has TWO types of calibration that can reference sample measurements: Factory and Process Calibration. The factory calibration is to be used as reference. Calibration may be done in the field using sample conditions; the user may alter the data acquired by the system in the View/Edit calibration screen. Up to 8 data points may be entered and the user may select either a Linear fit or a curve fit equation. For a range where the upper and lower limits are known the curve fit gives the best fit, if the range is extended, select the Linear fit for best approximation.

2.1   Field Calibration and Curve Fitting

The Messenger includes a feature that allows the user to calibrate the instrument in-line. Once the instrument is installed and operating, data points can be taken and stored using the View/Edit Data selection from the Calibration menu. First select a sample point from 1 to 8   then the user can select "Read New Data", and the Messenger will read the current value and store it. At the same time that the user saves that sample into the Messenger, a manual sample should be taken from the process. This sample should be analyzed for the appropriate content in the laboratory. Once the laboratory has established the value, the user can come back to the "View/Edit Calibration" Data screen and select the appropriate sample point. The user should then enter the laboratory value for that data point. The Messenger has now stored the proper laboratory value to the actual Data value that the instrument was reading when the sample was taken. This should be repeated for several values at different ranges of the expected operational span of the process.
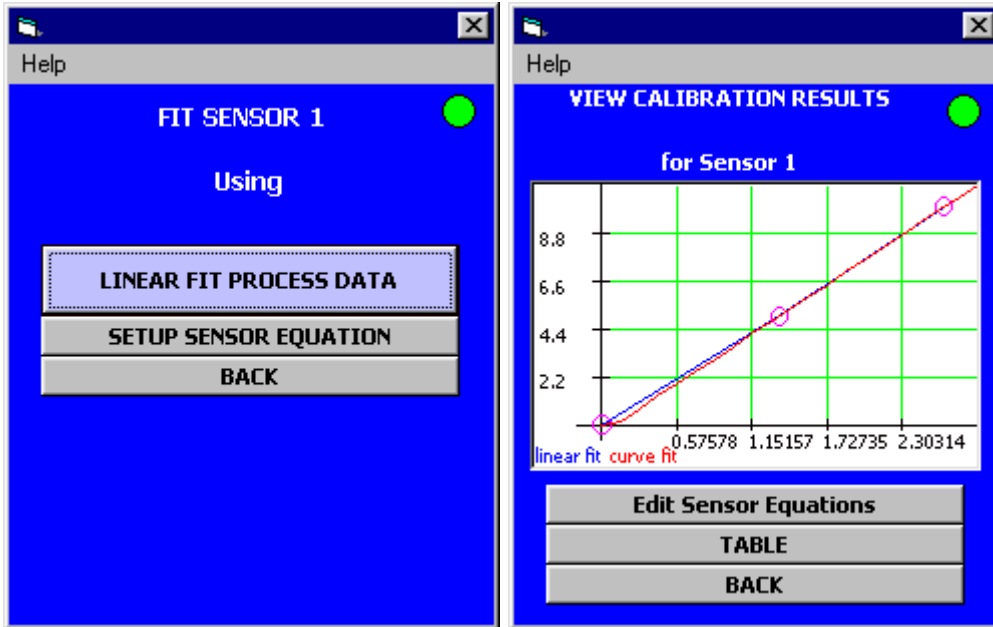
Once at least three values have been stored, the system can perform a curve fit. Select Curve Fit from the Calibration menu and the Messenger will fit a Linear fit or a curve fit through the data points that are entered into the sample data table. The Messenger will then display the curve, and that calibration curve will become the active curve for the instrument. The Messenger can be calibrated and programmed to read the same value on the front panel as the concentration value that was determined by the laboratory. This unique method is the ideal way to calibrate an in-line device because it takes into account the real dynamics of the process and allows the device to read out in the same units that the user will receive from the laboratory.

To Access Process Calibration you need to enter "Technician Access" level and to Access Factory Calibration data you need to enter Factory access level. The following procedure explains in step how a Process Calibration may be done:

➢ Set the Access Level to Technician and then select Calibration menu.
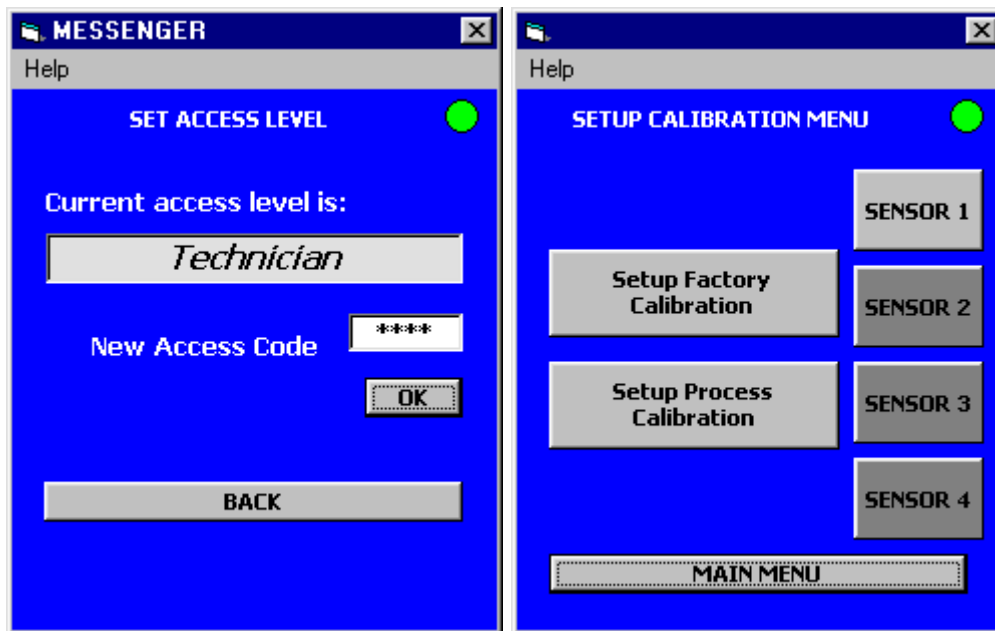
➢ Select " Setup Process Calibration" and Then "Build Calibration"

➢ Up to FOUR sensors may be configured in the Messenger. Typically Sensor #1 corresponds to Result # 1 and Sensor # 2 corresponds to Result # 2 and similar setup for 3 and 4.

➢ At least three data calibration points are needed to get a good representation of the data curve. If you are only doing Turbidity then all you need is to calibrate sensor #1. Enter the value for the sample in the cell and then press "Read New Data", you may want to repeat pressing "Read New data" until you feel that the number is fairly the same between successive reads. Press "Store New Value" to store selected values.
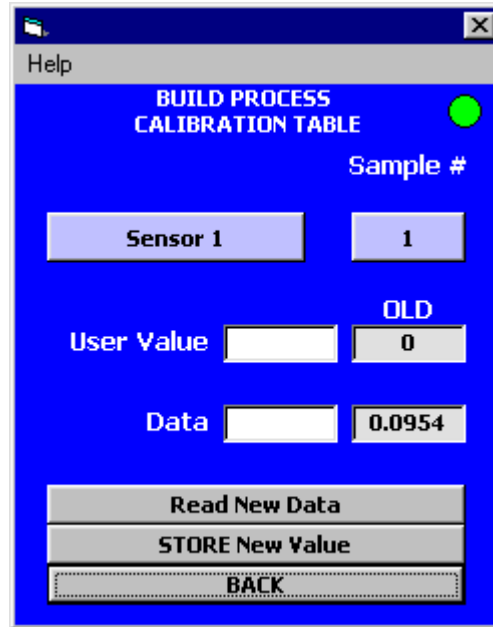
> ➢ You may proceed to enter the various calibration data points by selecting Sample # (1…8) and entering the corresponding values.

> ➢ When done go "BACK" to previous menu and select "View/Edit Calibration".

> ➢ In View Calibration Results the user may review or edit the calibration data and then view graph to review the shape of the calibration curve as shown below.

> ➢ The system will show the Linear fit and curve fit curves. User may select which curve fit represents his process better.
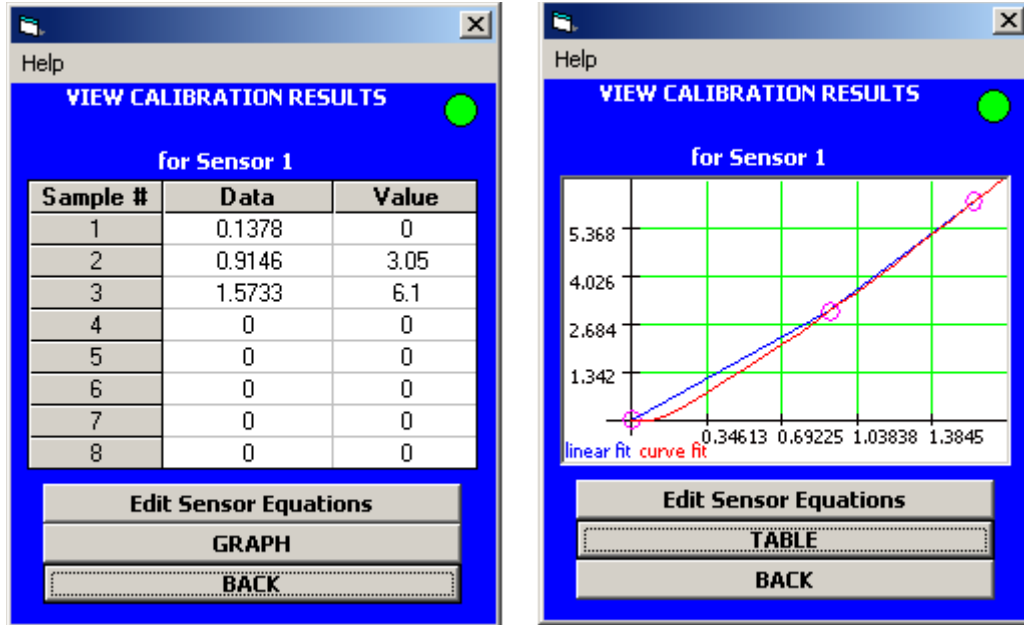
➢ Using "Fit Data" menu you may select either to use the Factory or Process calibration for sample analysis. You may select "Factory Calibration" data as reference but in most cases the process calibration will be more accurate as it represents the sample and not the factory standards.
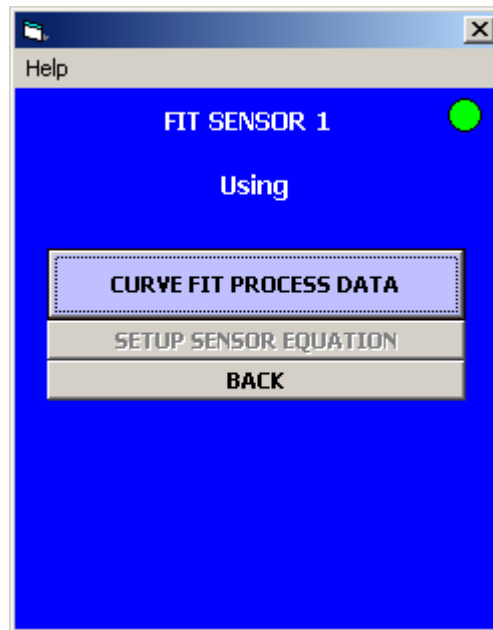
➢ You may repeat the above procedure for the various sensors that are connected to the system.

2.2   Analog Outputs and Alarms

The system includes TWO analog outputs that may be set as 0-20 mA or 4-20 mA or 20-0 and 20-4 mA (Reverse acting). Two additional analog outputs may be added as an option. Also OPTIONAL the user may add "Relay and Digital Inputs card" with four SPDT relays for process alarms or controls, the same board includes 4 digital inputs for additional control by external devices like a PLC (Programmable Logic Controller) or other equipment. The Analog Outputs (4-20 mA) have been calibrated at the factory and may be trimmed or re-adjusted by the user under the "Adjust Hardware settings" screen menu. These analog outputs values are a direct function of whatever values are on the display. The 4-20mA outputs operate over a wide range, a minimum of 25 to 1000 Ohm load.

The alarm contacts are also controlled by the display value. The alarm values are selected and Setup in the "Setup Inputs/Outputs" menu.


The Messenger also includes a feature that allows the customer to dampen the response of the system, by including added signal filtration. A unique bubble reject feature is also available; this feature allows the system to reject spurious signals caused by bubbles presence. The factory default is set for 5% and Filter

response to 5 sec. The Bubble Reject feature control may be accessed from the Setup Results menu.

2.3   Display Units

To display the process variable or sample Analysis the user should select MEASUREMENT SCREEN.

The display units are the units of measure that the user wants to appear on the display. This bears no relation to the calibration values, it is simply a tag displayed below the sample process result variable. This is selected from Setup Results → Set Results Units.
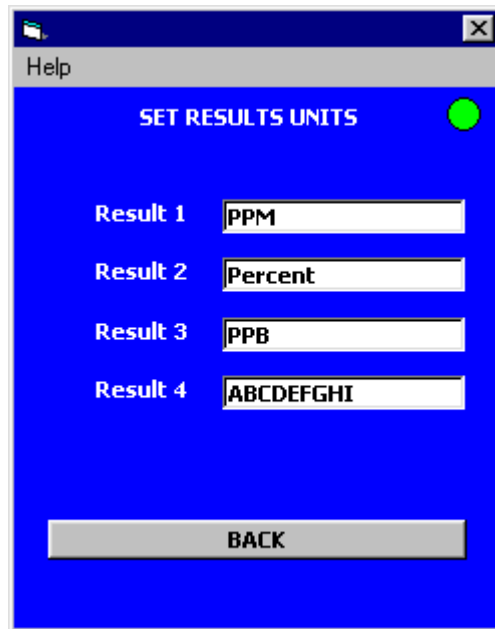
Up to NINE characters may be entered.

2.4 Data Trending Display and RS-232 Output.

The system includes memory storage of process results data. This data is stored and will NOT be lost if power is disconnected from the transmitter. This feature is meant to allow operations personnel to check on recent changes or trends in the process by displaying the trends directly on the display of the linked device (PC, PDA or TPC) logging again.
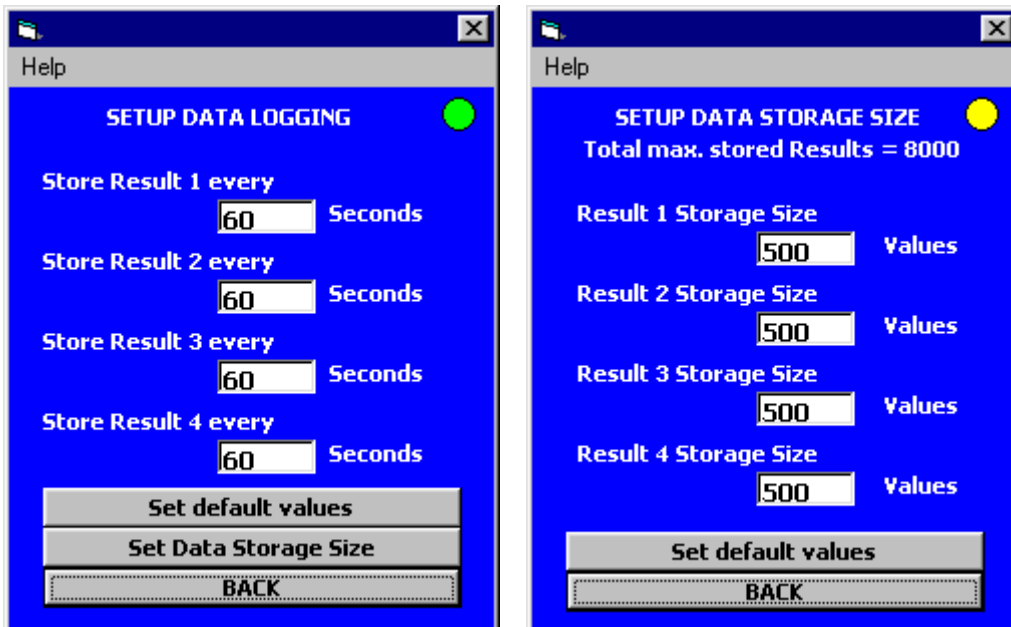
The Maximum number of data points stored is 8000. The user may allocate all the 8000 points to one sensor (Result) or may divide them as needed.
Based on the default setup of one data point every 60 seconds and 500 points per result, the Messenger will continuously have the last 8 hours of sample data.

Selecting Measurement Screen and then selecting Graph Data for displaying results display the data trend. The Graph settings (Setup Graphical Results) may be accessed under "Setup Results menu" where maximum and minimum values for the y-axis (the process variable) as well as the time interval for data collection and display. The system will then display whatever data is in storage and the time span on the x-axis will be whatever the selected logging span duration. Plotting the data does not erase or corrupt the data, so the user can

actually re-plot the data and zoom in or out on the y-axis by entering different values.

2.5   Self-Cleaning Interval

The interval between automatic self-cleaning cycles is selected from the "Set Cleaning Event" option on the System menu. The value is entered in minutes. The MONITEK MESSENGER holds the display and all outputs at the previous value while the self-cleaning cycle is underway. Once the self-cleaning cycle is complete, the instrument returns to normal operation. The self-cleaning cycle can always be initiated or tested by selecting the "Start Clean Cycle" option from the Set Cleaning Event Menu.
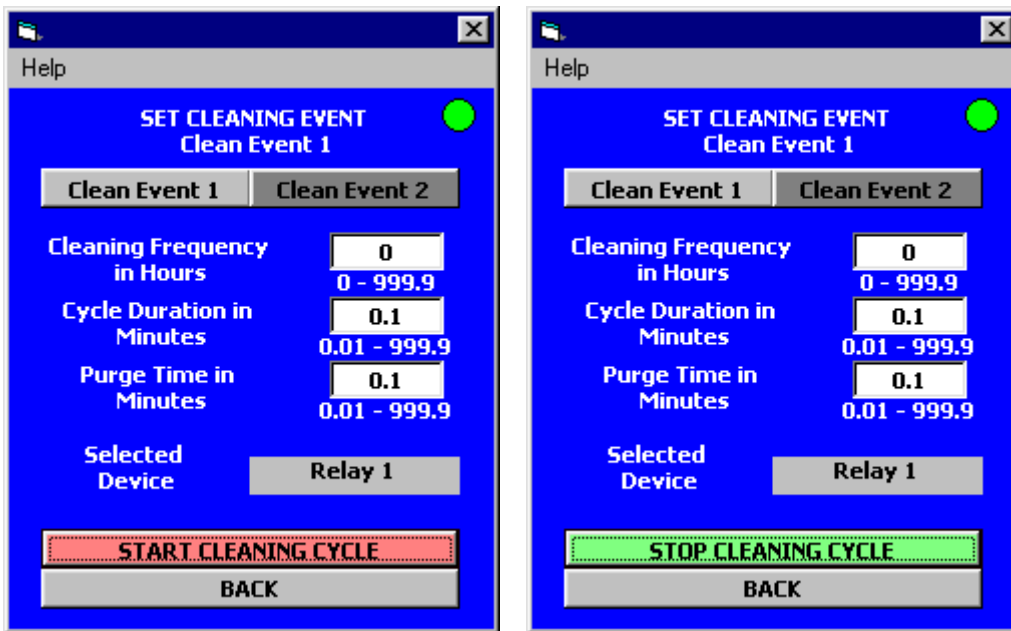
When manually starting a cleaning cycle make sure you have the variables set properly and a device selected.

Note: The Monitek Messenger Provides the electronic control for the signals needed to activate cleaning jets. The user must provide the appropriate hardware, including sensor with cleaning jets, a solenoid valve to switch either pressurized air or cleaning solution (water for example) to the cleaning jets in the flow cell.

2.6   LCD Display (OPTIONAL) Contrast Adjust

This option is not applicable to the Messenger PC Transmitter.

3 System and Troubleshooting

3.1 View Channel Output Display
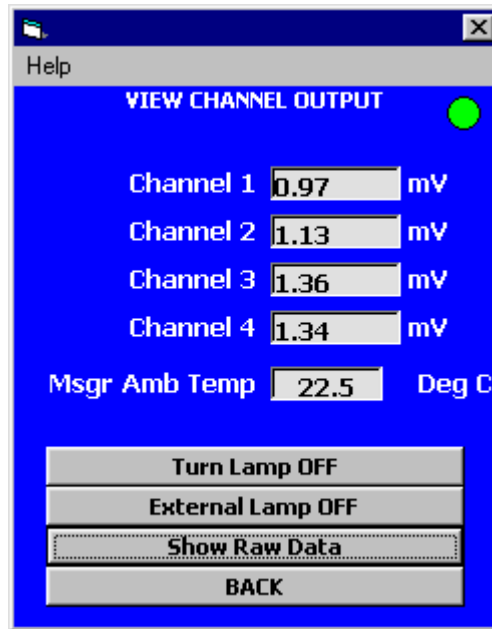
The Messenger includes a feature that allows the user to display the primary measurement values (in mV) of the system directly on the screen. The "View Channel Output" option in the "Diagnostics menu" will display the Channels signals i.e. the direct beam value, scatter beam or other signal connected. The scatter beam and direct beam values are the amount of light being received by each of the direct and scatter beam detectors respectively. Forward scatter turbidity is defined as the ratio of the amount of light scattered at 12º to incident divided by the amount of light making it directly across the optical gap. As more suspended solids or oil droplets are present, more light is scattered and less is transmitted, making the ratio of these two become larger. The ratio value is determined by dividing the scattered beam by the direct beam. This is the same value that is recorded in the Sampled column of the View/Edit calibration Data screen.

3.2 Factory Calibration
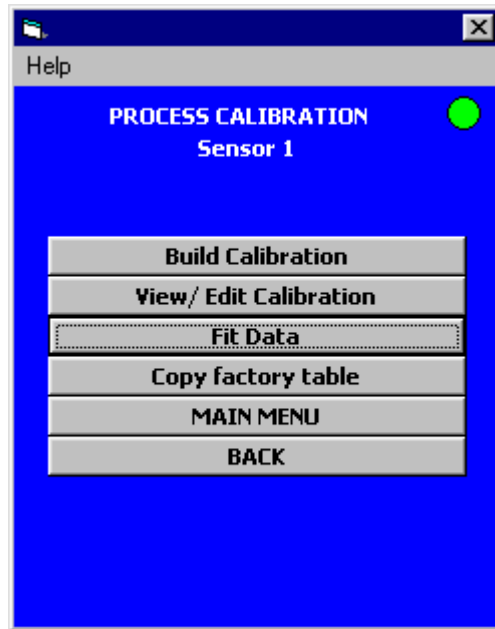
The user may elect to switch to factory calibration if his measurement data using the process calibration are not correlating. The factory calibration data may be copied into the "Process Calibration" menu by selecting "Copy factory table". A data fit, on this transferred factory data may now be performed by selecting "Fit Data", the unit will use the factory calibration data to report the cell sample analysis. At the factory, Formazin standards were used to create the calibration data table. The Sensor is calibrated with at least 3 data points: a nominal 0 FTU standard, a full-scale standard and a mid point standard. This feature is included to allow easier troubleshooting by referencing known and factory verified calibration. Alternatively the Field process calibrations may be checked against the Formazin or diatomaceous calibration data performed at the factory.

3.3   Toggling Between Factory and User Calibration

The user can activate the field calibration or the factory calibration. Selecting "Fit Data" menu allows the user to select which calibration the system uses to Display results. This is intended to give the user the ability to switch between Factory and Process Calibration as a method of checking the existing primary calibration or performing a new primary calibration.

3.4   Default parameters:

Take extreme care when you are trying to DEFAULT all the parameters.

⚠   **This Option will DEFAULT ALL Parameters**.

Consult factory before proceeding with this menu, as the system will require you to either re-enter manually all the parameters or load back the setup file to go back on line. **Make sure that you have saved the setup before proceeding with "Default values" option.**
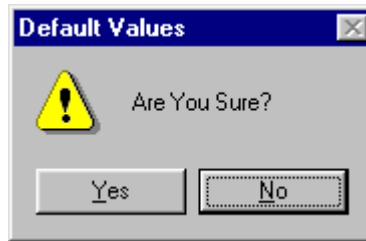
⚠️ **DO NOT PROCEED UNLESS YOU HAVE SAVED YOUR SETUP IN FILE MENU**.

3.5   Access Levels and Codes

The system has three Access levels:

Operator: Default Access code 123

Technician: Default Access code 1234

Factory: Reserved for Factory Access.

3.6 Error and Warning Messages

Error/Warning Messages	Description
Restart the program to change language.	For New Language settings to take effect Restart the Messenger Application
CAUTION! Download-Program required. Messenger will be stopped. Continue anyway?	"Flip" Program is required to load the Firmware. Messenger Device should be stopped to load the Firmware
Save these values?	Existing Parameters have changed. Do you want to save the NEW Parameters
Normalize to 0	Normalize means to set in relation to a selected channel. If this channel is "0", it would result in a "Divide by Zero"!
Warning: All Data in the Messenger will be defaulted to factory settings, Are you sure?	ALL the existing PARAMETERS & PREVIOUS DATA will be lost and Messenger will be defaulted to factory settings
Value out of range	Entered value exceeds the specified range of the parameter
Invalid File Format	Selected file (*.pda) is corrupt
Saving these values will cause in Loss of "Previous Data"	Changing the existing parameters will clear "Previous Data"
Invalid File Extension	Selected file doesn't have .pda extension
No Data Available	Currently there is no "Previous Data" stored
No More Data Points	There are no more data points in the current DATA frame to Navigate
Are you sure you want to clear stored Results	"PREVIOUS DATA" of Selected Result will be cleared

Are you sure you want to clear all stored Results	"PREVIOUS DATA" of ALL Results will be cleared
Port not available	The Selected Comport (RS-232 / RS-485) is used by another Application
Overflow! Reduce gain?	If you try to auto-set the gain, the signal has to be in range. If gain is already high, it has to be reduced to fit signal to range.
Fill blank fields!	Entered data contain NULL values
Please go online	Connect to Messenger Device
Entered code is not correct.	Entered Access Code doesn't match
Unit ID must be an integer between 0 and 255.	Entered Unit ID value is out of range
Invalid Data	Entered Data is Not Valid Ex: - characters entered instead of Numeric value
Are you sure you want to exit this program?	Exits the Application
NO RESPONSE: Please check device ID# or run the search function	Currently no Device exists in the Network with the specified ID. Navigate to Select Messenger and Run the Search Function which gives the List of Devices present in the Network
Changing language requires closing of the program. Are you sure?	Switching to a different Language requires restarting the Application.
All data in the Messenger will be overwritten with data from this device. Are you sure?	Loading the parameters from .pda file will cause ALL the current parameters to be Overwritten.
Access codes cannot be modified in OFFLINE mode	To modify the Access codes switch to ONLINE mode.

You are OFFLINE. Please load file first	To Edit the parameters in OFFLINE mode you need to First load the .pda File.
NO RESPONSE	Communication between GUI and Messenger Device has failed. Verify the connections.
Lower Limit cannot exceed upper Limit	Entered parameter Lower Limit value exceeds the upper limit value.
Optics Fault	Optical Fault has occurred
Lamps Fault	Lamp Fault has occurred
Fault: -- mA	Fault is registered at Analog output. Where -- Represents the fault current.

List of Codes displayed in STATUS BAR of MEASURMENTS SCREEN are shown below.

1	Alarm 1 Active
2	Alarm 2 Active
3	Alarm 3 Active
4	Alarm 4 Active
CC1	Cleaning Event1 Active
CC2	Cleaning Event2 Active

For Example: -

Code in STATUS BAR **"1,3,CC1"** indicates that Alarm1, Alarm2 and Cleaning Event1 are currently Active

List of Messages displayed on LCD Display.

OpticFlt	Optical Fault has occurred
LampsFlt	Lamp Fault has occurred
Data Transfer…	Data Transfer between Messenger and GUI in Progress

6.   Appendix

6.1   RS485 Connection: Messenger Module to Touchscreen PC (GUI)

RS-485 Cable from Messenger module connections to DB9 connector plugged into COM-2 port of Touchscreen PC.

	Messenger Module	Touchscreen PC COM-2 Port
13	(+) RS 485	DB9 Connector
14	(−) RS-485	DB9 Connector

6.2 Sensor Connections

6.2.1 Moniturb F (MTF)Turbidity: Dual Sensors

MTF DUAL sensor wire connections

The table below shows **forward scatter** sensor 1 and 2 detector connections to the Messenger.

MONITURB F Sensor 1 and 2 (Forward Scatter) Flow cell(s)

Terminal #	Wire Color	Cable ID	Signal
1	Brown	FS (12°) sensor 1	(–) Direct beam
2	White	FS (12°) sensor 1	(+) Direct Beam
3	Black	FS (12°) sensor 1	Shield (ground)
4	Yellow	FS (12°) sensor 1	(–) 12 Deg. Sensor
5	Green	FS (12°) sensor 1	(+) 12 Deg. Sensor
6	-	-	-
7	Brown	FS (12°) sensor 2	(–) Direct beam
8	White	FS (12°) sensor 2	(+) Direct Beam
9	Black	FS (12°) sensor 2	Shield (ground)
10	Yellow	FS (12°) sensor 2	(–) 12 Deg. Sensor
11	Green	FS (12°) sensor 2	(+) 12 Deg. Sensor

The Messenger PC uses an "EXTERNAL" or supplemental (Condor) power supply to drive the lamps of both MoniTurb F sensors.

The following connections are made to the Power Supply Control Board (located inside the Messenger PC enclosure on the lower right corner of the back panel).

Dual Sensors: Lamp connections on the Lamp Supply Control Board (5 VDC)

Sensor 1

Terminal	
3	Lamp (Blue and Red) (+)
4	Lamp (Grey and Pink) (−)

Sensor 2

Terminal	
5	Lamp (Blue and Red) (+)
6	Lamp (Grey and Pink) (−)

Wiring connections from Condor supplemental power supply to the Lamp Supply Control Board:

Lamp Control Cable with three conductors: Orange/Yellow/Black

Interface between Messenger Module and Lamp Control Board

To External Lamp Power Supply Control Board	Wire color	From Messenger Module
9	Orange	29
10	Yellow	30
11	Black	31

6.2.2 MoniTurb F (MTF) Forward Scatter Turbidity Sensor
MTF Detector Wire Connections to Messenger PC

MoniTurb –F Flow cell.

Terminal #	Wire Color	Cable ID	Signal
1	Brown	FS module	(–) Direct beam
2	White	FS module	(+) Direct Beam
3	Black	FS module	Shield (ground)
4	Yellow	FS module	(–) 12 Deg. Sensor
5	Green	FS module	(+) 12 Deg. Sensor
6			
7			
8			
9			

Messenger Lamp supply connections (lamp connector located on the Messenger Module (5 VDC)

Terminal	
1	Lamp (Blue and Red) (–)
2	Lamp (Grey and Pink) (+)

6.2.3   MoniTurb S (MTS) Side Scatter Turbidity Sensor

MTS Detector Wire Connections to Messenger PC

MoniTurb –S Flow cell.

Terminal #	Wire Color	Cable ID	Signal
1	Brown	FS module	(–)Direct beam
2	White	FS module	(+) Direct Beam
3	Black	FS module	Shield (ground)
4	Yellow	FS module	(–) 90 Deg. Sensor
5	Green	FS module	(+) 90 Deg. Sensor
6			
7			
8			
9			

Messenger Lamp supply connections (lamp connector located on the Messenger Module (5 VDC)

Terminal	
1	Lamp (Blue and Red) (–)
2	Lamp (Grey and Pink) (+)

6.2.4 MoniTurb Forward and Side Scatter (MTFS) Turbidity Sensor

MTFS Detector Wire connections

Terminal #	Wire Color	Cable ID	Signal
1	Brown	FS module	(–) Direct beam
2	White	FS module	(+) Direct Beam
3	Black	FS module	Shield (ground)
4	Yellow	FS module	(–) 12 Deg. Sensor
5	Green	FS module	(+) 12 Deg. Sensor
6	-	-	-
7	Yellow	SS module	(–) 90 Deg. Sensor
8	Green	SS module	(+) 90 Deg. Sensor
9	Black	SS module	Shield (ground)

Messenger Lamp supply connections: located on the Messenger Module (5 VDC)

Terminal	
1	Lamp (Blue and Red) (–)
2	Lamp (Grey and Pink) (+)

6.2.5 Model 450 COLOR sensor connections

Terminal #	Wire Color	Cable ID	Signal
1	Brown	MS-450 module	(–) Reference Beam
2	White	MS-450 module	(+) Reference Beam
3	Black	MS-450 module	Shield (ground)
4	Yellow	MS-450 module	(–) Measure Beam
5	Green	MS-450 module	(+) Measure Beam
6	-	-	-
7	-	-	-
8	-	-	-
9	-	-	-
10	-	-	-
11	-	-	-
12	-	-	-

Lamp supply connections must be connected to the Lamp Supply Control Board in the Messenger PC

The Model 450 sensor lamp **should NOT be powered directly from the Messenger module**.

Connections are made to Pins 3 and 4 of the Lamp Supply Control Board.

Terminal	
3	Lamp (Orange) (+)
4	Lamp (Green) (–)

6.2.6 MoniSpec AD (MSAD) Color Sensor

MSAD detector wire connections to Messenger

Terminal #	Wire Color	Cable ID	Signal
1	Brown	MS-AD module	(–) Reference Beam
2	White	MS-AD module	(+) Reference Beam
3	Black	MS-AD module	Shield (ground)
4	Yellow	MS-AD module	(–) Measure Beam
5	Green	MS-AD module	(+) Measure Beam
6	-	-	-
7			
8			
9			

Messenger Lamp Supply Connection lamp supply connector located on the Messenger Module (5 VDC)

Terminal	
1	Lamp (Blue and Red) (–)
2	Lamp (Grey and Pink) (+)

6.2.7 MoniSpec A (MSA) Color & Concentration Sensor

MSA detector wire connections to Messenger*

Terminal #	Wire Color	Cable ID	Signal
1	Brown	MS-A module	(–) Measure Beam
2	White	MS-A module	(+) Measure Beam
3	Black	MS-A module	Shield (ground)
4			
5			
6	-	-	-
7			
8			
9			

* MSA uses only terminals 1, 2, and 3.

Messenger Lamp Supply Connection: located on the Messenger Module (5 VDC)

Terminal	
1	Lamp (Blue and Red) (–)
2	Lamp (Grey and Pink) (+)

6.2.8 Model FS4/FS5 Sensors

Probe Detector wire connections to Messenger.

Terminal #	Wire Color	Cable ID	Signal
1	Black	Probe module	(−) Sense Beam
2	Red	Probe module	(+) Sense Beam
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			

Probe LIGHT source Connections on the Messenger Module.

Terminal #	Wire Color	Cable ID	Signal
1	Green	Probe module	(−) LED
2	White	Probe module	(+) LED

6.2.9 Model 22 & 25 (CSK, CSS, CSH, CSG) Probes

Probe detector wire connections to Messenger

Terminal #	Wire Color	Cable ID	Signal
1	Black	Probe module	(–) Sense Beam
2	Red	Probe module	(+) Sense Beam
3	Green	Probe Module	Shield (ground)
4			
5			
6			
7			
8			
9			
10			
11			
12			

Probe LIGHT source Connections on the Messenger Module

Terminal #	Wire Color	Cable ID	Signal
1	White	Probe module	(–) LED
2	Orange	Probe module	(+) LED

6.2.10 Model 210 (TS2) Turbidity Sensor

TS2 Detector wire connections to Messenger

Terminal #	Wire Color	Cable ID	Signal
1	Black	TS2 module	(–) Direct Beam Detector
2	Red	TS2 module	(+) Direct BeamDetector
3	White	TS2 module	Shield (ground)
4	Green	TS2 module	(–) 12 Degree Detector
5	Yellow	TS2 module	(+) 12 Degree Detector
6	-	-	-
7			
8			
9			

Lamp connections must be connected to the Lamp Supply Control Board in the Messenger PC

Terminal	
3	Lamp (Orange) (–)
4	Lamp (Green) (+)

The Model 210 lamp should not be powered directly from the Messenger module.

6.3   Power supply Jumper configuration:

The power supply may be configured to power up either the standard sensors with Flow cells or the FS4 & FS5 series cell density probes.

The settings are as follows:

1Amp
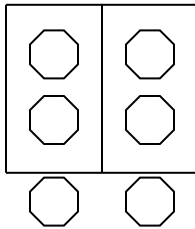
Flow Cell lamps (1Amp typical current at approximately 5V). Includes the following sensor series: MoniTurb, MoniSpec, Model 210 & 450.

300 mAmps
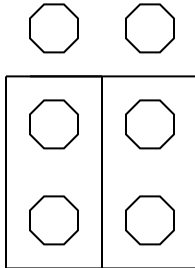
CSS, CSK probes and FS4 & FS5 BIO-PROBES (position 3-4) as shown below (approximately 300mA current).

These jumpers are set at the Factory.

⚠️   **DO NOT MODIFY**

6.4   OPTIONAL Lamp Supply Control Board

Using the OPTIONAL Lamp Supply Control Board the user may power multiple sensors. The sensors may be Flow cells (MTF, MTS, MSA, MSAD, etc.) using Lamps or Probes (CSK, CSS, FS4, etc.) using LED's.

The Messenger PC with Lamp Supply Control Board enables the customer to connect the following sensors to one Messenger PC converter:

- 1 Model 210 (TS2)
- 4 CSK probes
- 4 CSS probes
- 2 MoniTurb F
- 2 MoniTurb S
- 2 MoniSpec AD
- 2 MoniSpec A

The Board has jumpers for selecting the type of sensor lamp to power. Jumpers J4, J5 and J6 on the Lamp Supply Control Board are for selecting the source as either a sensor with a Halogen Lamp or a Probe with an LED.

For sensors with Halogen lamps (MTF, MSA, MSAD, etc.) the Jumper(s) is/are INSTALLED (1A current). For sensors with LED(s) (CSK, CSS, FS4, etc.) the Jumper(s) is/are REMOVED:

Jumper #	Sensor #	For Sensor with Halogen Lamps	For Probes with LED
J4	1	Jumper Installed	Jumper Removed
J5	2	Jumper Installed	Jumper Removed
J6	3	Jumper Installed	Jumper Removed

	CONNECTING A PROBE DEVICE TO A CHANNEL THAT IS CONFIGURED FOR A LAMP DEVICE WILL DAMAGE THE PROBE.

NOTE: These jumper settings are configured at the factory and should not be changed.

EXTERNAL LAMP CONTROL CONNECTOR PIN OUT:

1	+5V at 4 A MAX (from Power supply)	
2	GND (-) (from Power supply)	
3	SENSOR (+) #1 (LAMP/PROBE)	J4
4	SENSOR (–) #1 (LAMP/PROBE)	
5	SENSOR (+) #2 (LAMP/PROBE)	J5
6	SENSOR (–) #2 (LAMP/PROBE)	
7	SENSOR(+) #3 (LAMP/PROBE)	J6
8	SENSOR (–) #3 (LAMP/PROBE)	
9	LAMP ON/OFF (H/L) Control FROM Messenger Pin 29 (Orange wire)	
10	LAMP FAULT (L) signal TO Messenger Pin 30 (Yellow wire)	
11	GND (-) connects to Messenger Pin 31 (Black wire)	

JUMPERS J1 thru J3 (ACTIVE)

These jumpers control activation of the fault detection for each of the connected devices:

For example, if you have a sensor (with Halogen Lamp or LED) connected to terminals 3 and 4 then you may enable fault detection for this sensor (lamp or LED) by placing a jumper in position 1 (JP1) i.e.:

Connect Jumper #1	to enable Fault signal from	Sensor #1
Connect Jumper #2	to enable Fault signal from	Sensor #2
Connect Jumper #3	to enable Fault signal from	Sensor #3

Sensor Lamp (or LED) Fault is Signaled when Device is OPEN or when the current to the Device drops below 200 mA (Fault Setup is done using "LAMP CONTROL" menu using the graphical user interface software).

The Lamp Supply Control Board has the following LEDs:

      RED   LED is   ON when Fault is detected

      Green LED is   ON when power is ON (Control from Messenger)

6.5   Internationalization

Messenger Software Supports 4 Languages English, German, French and Spanish.

I.   Run the Messenger Application
II. Choose > **Select Language** to switch to different language

Note: - Selected language should match with Regional settings of the computer

6.6   On-Line Help menus and related contents

This section describes the HELP menus and related contents.

Software HELP menus

6.6.1 Main Menu

This menu helps in navigating to various Messenger options.

Choose **Main Menu**
- Calibration Menu
- Setup Results Menu
- Setup Inputs/Outputs
- Diagnostic Menu
- Set Cleaning Event
- Set Access Code
- Set Access Level
- Measurements screen

6.6.2 Set Calibration Menu

This menu is used to correlate raw data collected from the sensors (photo detectors) corresponding to a specific standard or sample concentration. Up to 8 different calibration data points can be stored for each of the four sensors read by the instrument. From this information the instrument can construct a lookup table.

Choose **Main Menu** > **Calibration Menu**

Select the **Sensor**, which needs to be calibrated.

You have two calibration tables, Factory calibration and Process calibration tables. Choose the desired calibration table, which needs to be changed by selecting the respective button
- Factory Calibration
- Process Calibration

Note: Factory calibration table can be altered / viewed using **FACTORY** level Access permissions.

6.6.2.1   Process Calibration

- Build Calibration
- View/Edit Calibration
- Fit Data
- Copy Fact Table

Build Calibration

For each Sensor, up to 8 different samples can be used during the calibration process.

Select the Sensor number by choosing the **Sensor** Toggle Button.
Select the Sample number by choosing the **Sample** Toggle Button.

Enter the **User Value** (Ex: - Known concentration value of a Standard) in the text box provided. This value can also be changed using **View/Edit Calibration** menu.

Choose **Read New Data** to capture the data.
Choose **Store New Value** to store the data.
Repeat steps 2 to 5 for each sample.

View/Edit Calibration

The selected Sensor number appears on the top. The data present in the selected process calibration table can be viewed/edited using the following option.

To edit **user value** or **data,** Tap/Click on the cell.

Choose **Graph** to view the curve fit based on the **Fit Type** selected.

Choose **Edit Sensor Equations** to alter the Sensor Equations.

Fit Data

Choose the type of Curve Fit to be performed on the Calibration data. There are 4 options available.

- Linear Fit Process Data
- Curve Fit Process Data
- Linear Fit Factory Data
- Curve Fir Factory Data

Copy Factory Table

The selected sensor's factory calibration table is copied to process calibration table.

6.6.2.2   Factory Calibration

- Build Calibration
- View/Edit Calibration

Build Calibration

For each Sensor, up to 8 different samples can be used during the calibration process.

Select the Sensor number by choosing the **Sensor** Toggle Button.
Select the Sample number by choosing on the **Sample** Toggle Button.

Enter the **User Value** (Ex: - Known concentration value of a Standard) in the text box provided. This value can also be changed using **View/Edit Calibration** menu.

Choose **Read New Data** to capture the data.
Choose **Store New Value** to store the data.
Repeat steps 2 to 5 for each sample.

View/Edit Calibration

The selected Sensor number appears on the top. The data present in the selected factory calibration table can be viewed/edited using the following option.

To edit **user value** or **data,** Tap/Click on the block.

Choose **Graph** to view the curve fit based on the **Fit Type** selected.
Choose **Edit Sensor Equations** to alter the Sensor Equations.

6.6.3   Setup Results

The Setup Results are used for formatting the output that is to be displayed to the user, which is captured from different sensors

Choose **Main Menu** > **Setup Results Menu.** You will see different Options to format the output

- Setup Results Nametags
- Setup Results Equations
- Setup Sensor Equations
- Setup Numerical Results
- Setup Graphical Results
- Set Results Units
- Setup Data logging
- Bubble Reject Threshold
- Set Results Format
- Set Results Offset

6.6.3.1   Setup Results Nametag

Choose the **Result (1...4)** Text box to specify the Nametags to be displayed for results captured in the Measurements Screen.

For Example: - If the data captured in Result1 is Turbidity then the Nametag for Result1 can be given as "Turbidity"

6.6.3.2   Setup Results Equation

Choose the **Result (1...4)** text box to specify the Result Equations.

Rules for Result Equations:

1.   An Equation can consist of 5 terms combined by operators.
2.   Each term can be a sensor or logarithm of sensor and can have a numerical factor.
3.   The fifth term is +/- offset and can only be added.

For Example: -

The Equation is constructed by "term1 [op] term2 [op] term3 [op] term4 + offset" where each term can be a sensor or the logarithm of sensor and has a numerical factor (i.e. 3.67LogSEN4). The operators [op] can be +, -, *, / .

6.6.3.3   Setup Sensor Equation

Choose the **Sensor (1...4)** text box to specify the Sensor Equations.

Rules for Sensor Equations:

1.   An Equation can consist of 5 terms combined by operators
2.   Each term can be a channel or logarithm of channel and can have a numerical factor
3.   The fifth term is +/- offset and can only be added

For Example: -

The Equation is constructed by "term1 [op] term2 [op] term3 [op] term4 + offset" where each term can be a channel or the logarithm of channel and has a numerical factor (i.e. 3.67LogCH1). The operators [op] can be +, -, *, / .

6.6.3.4   Setup Numerical Display

You can format the Numerical display. Check on relevant **Show Result** checkboxes to select which results need to be displayed during the Numerical display in Measurements screen.

Choose **Font Size** Toggle Button to specify the Font Size (Small / Medium/ Large) with which the results need to be displayed.

- When all results are selected for display Font size can be only **small**.
- When 3 results are selected for display Font size can be **Small/Medium.**
- When 2 or less results are selected for display Font size can be **Small/Medium/Large.**

Choose **Show All** when all results need to be displayed.

6.6.3.5   Setup Graphical Display

You can format the Graphical display in Measurements screen. Check on **Show Result** checkboxes to select which of the results need to be displayed during the Graphical display.

Choose **Range of Values** to specify the Lower & Upper Limits of the Graph.

Choose **Time Step in Minutes** to specify the time duration with which the X-Axis Scale needs to be displayed.

Choose **Show Color** to select the color with which the result should be displayed on the graph.

 Note: Time Step in seconds can be specified by entering decimal values
          Ex: - 0.1, 0.2.

6.6.3.6 Set Results Units

Choose the **Result (1...4)** Text box to specify the units to be displayed for results captured in the Measurements Screen.

For Example: - If the data captured in Result1 is Turbidity then the unit of Result1 can be given as "FTU".

6.6.3.7 Setup Data Logging

You can specify the Time Interval (Sec) with which the data needs to be stored in buffer for each result.

Choose **Store Result1 (1…4)** text box to specify the time in seconds.

Choose **Set Buffer Size** to Specify the Buffer Size for each Result

In order to default the values Choose Set **Default Values** (i.e. 60 Seconds).

Note: Changing Data Logging rate clears the PREVIOUS DATA of the selected Result.

6.6.3.8 Setup Buffer Size

Choose **Result Storage Size (1.... 4)**; specify the storage size of each result.

If the data to be stored exceeds the Result storage size, Existing data is overwritten.

Choose **Default Values** (i.e. 500)

Note: Total maximum stored results can't exceed 8000.
  Changing the Buffer Size clears PREVIOUS DATA of ALL Results.

6.6.3.9   Bubble Reject Threshold

Bubble Reject Filter is used to smooth system response when bubbles are passing and based on a data averaging and acts upon a threshold limit set by the user in %change detection.

Choose **Bubble Reject** textboxes to specify the % Threshold.

Choose **Filter Delay** textboxes to specify the delay in sec.

6.6.3.10   Set Results Format

You can format the results displayed in Measurements screen.

Choose **Number of Decimal Places** for each Result to specify the precision with which the result needs to be displayed in Measurements Screen.

Choose **Allow Values** for each Result to specify whether **POS** (Positive values) or **ALL** (Positive and Negative values) to be displayed in Measurements Screen.

6.6.3.11   Set Results Offsets

Choose **OFFSET TO RESULT (1…4)** text box to specify the Offset.

The Offset Specified here will be a part of the Setup Results Equations.

6.6.4 Setup Inputs/Outputs Menu

You can configure the Inputs / Outputs of the Messenger Device.

Choose **Main Menu** > **Setup Inputs / Outputs Menu.** You will see the following Options.

- Set LCD Display
- Set Analog Outputs
- Assign Digital Inputs
- Set Alarms
- Set Messenger Unit ID
- Set Relay Functions

6.6.4.1   Set LCD Display

This option is not applicable to the Messenger PC.

6.6.4.2   Set Analog Outputs

The system has FOUR independent and assignable Analog 0/4 -20 mA loops, which can be connected to External Devices. Each output will operate from a user-defined RESULT equation. The sub-menus allow you to set all the necessary parameter values for Low and High limits and the required mode for the analog output.

Over range:

Analog Outputs can flag abnormal conditions or upset conditions that can be caused by Malfunction of Optics or by some material coating over the windows. We can assign a range of mV for normal operation. If the range exceeds, a fault is registered and an appropriate error message (OPTICS FAULT) will be displayed on the LCD and Measurements Screen.

How to configure Analog Outputs?

➢ To configure the Analog Output, Choose the **ANALOG OUT** (Out 1-4).

➢ Choose **Output** Toggle Button (Not Assigned / Result1 / Result2 / Result3 / Result4) to specify the user defined RESULT equation needs to be assigned to ANALOG OUTPUT.

➢ Choose **Mode** Toggle Button to Specify the Mode (0/4-20 mA) Loops.

➢ Choose **Low**, **High** text boxes to specify the Low and High mV.

➢ Choose **Overrange** toggle button to specify the channel (CH1...4) Assign the range of mV for normal operation by choosing the **Low** mV and **High** mV.

Note: In case any of the Analog Output is not used, make sure that **OUTPUT**, **OVERRANGE** parameters are **"NOT ASSIGNED".**

6.6.4.3　　　Assign Digital Inputs

- Choose Cleaning Event 1…2
- Set Cleaning Frequency in Hours = 0
- Specify the **Cycle Duration**, and **Purge Time.** Save the settings. Activate the Relay through Assign Digital Inputs. The Cleaning Cycle gets activated ONLY ONCE.

Note: Whenever you are trying to activate a Cleaning Event through **Assign Digital Inputs** make sure that the Cleaning Frequency in Hours is 0. Failing to do so may cause malfunctioning of the Cleaning Event.

6.6.4.4　　　Set Alarms

You can setup Alarm set conditions. Each Alarm can have a **HYSTERESIS** and a **TIME DELAY** (the condition must be met for at least this time before the alarm is reported). The alarm mode (LOW, HIGH, LOW LATCH, HIGH LATCH) can be selected per individual Alarm.

Alarms can be assigned to the following signals
- Result1
- Result2
- Result3
- Result4
- Ambient Temp
- General Alarm

The different Alarm Types are
- Low
- Low Latch
- High
- High Latch

Choose on the **Alarm (1- 4)**.

Specify the signal to which the Alarm needs to be assigned by Choosing on the **Assigned Signal** Toggle Button.

Choose **Type** Toggle Button to specify the type of Alarm.

Choose Limit text box to specify the mV. Choose **Delay on Make/Break** Text box to specify the delay in which the condition needs to be met at least before the alarm is reported.

Choose on **Hysteresis** to Specify the Hysteresis value

The Hysteresis value will not have any affect for High and Low Latches.
In case any of the Alarms are not used, make sure that **Type** and **Assigned Signal** are **"NOT ASSIGNED".**

6.6.4.5 Set Messenger Unit ID

The UNIT ID is necessary when multi-units are connected on the same bus.

Choose **Unit ID** to specify the ID of the Messenger. The Unit ID should lie between 1...255.

Choose **Messenger Tag** to specify the extra information for easy identification when multiple devices are connected in the network.

6.6.4.6 Set Relay Functions

This menu allows the user to assign the FUNCTION of the Relay.

Functions available are:
- NOT ASSIGNED
- Alarm 1
- Alarm 2
- Alarm 3
- Alarm 4
- General Fault
- Cleaning device 1
- Cleaning device 2

Relay functions in 2 states
- Active ON
- Active OFF Fail -Safe

ACTIVE ON:

As long as assigned function is TRUE The Relay stays in activated state.

For Example:

The Alarm 1...4 are selected and thresholds are defined in the Set Alarm menu. If we set an Alarm on Result 1 exceeding a threshold of 100 and we assign Relay #1 as an indicator of such Alarm condition, the Relay#1 is activated when this threshold is reached or exceeded based on the Alarm mode latching or NON-latching. It would reset when the Result is back below the threshold defined.

ACTIVE OFF Fail Safe:

As long as the Assigned signal is FALSE the Relay stays in activated state

For Example:

The Alarm(s) 1...4 are selected and thresholds are defined in the Set Alarm menu.
If we set an Alarm on Result 1 exceeding a threshold of 100 and we assign Relay #1 as an indicator of such Alarm condition, the Relay#1 is NOT activate as long as the Alarm condition is TRUE.

6.6.5   Diagnostic Menu

This menu is provided with diagnostic tools.

Choose **Main menu > Diagnostic Menu,** you will see a list of Diagnostic options.
- File menu
- View Channel Output
- Adjust Hardware settings
- Hardware Test
- Software Revision
- Clear Reset Menu

6.6.5.1 File Menu

The parameters set by the user can be saved and these can be retrieved at a later point of time.

Choose **Save Parameters to File.** You will see a dialog pop up Specify the name of the file in which the parameters need to be saved. These files will be stored with .pda extension and are referred as PDA Files.

Choose **Load Parameters from File.** You will see a dialog pop up. Select the file in which the parameters have been stored earlier. During the process of reading the data from the File and Transferring to Messenger Device, the percentage of data that has been transferred will be displayed on the button.

Choose **Load Firmware** to prepare the Messenger Device ready for Installation of Firmware.

6.6.5.2 View Channel Outputs

Here you can view the outputs from all the 4 channels and Messenger Ambient Temp.

Raw Data:
Raw Data is channel mV displayed irrelevant of ZERO DARK CURRENT.

Channel Signal:
Channel signal is Channel mV displayed after we subtract the ZERO DARK CURRENT.

Choose Show Raw Data / Show Channel Signal Toggle Button to switch between the display of Raw data and Channel signal.

6.6.5.3 Adjust Hardware Settings

Using this menu. You can adjust the hardware settings

- Zero Dark Current
- Optimize Channel Auto
- Optimize Channel Manual
- Set Dark Current Auto Zero
- Set Channel Reference
- Calibrate Analog Outputs
- Set ADC-GAIN Manual

Zero Dark Current

You can store the Zero Dark Current using this menu.

Choose **"ZERO CHANNELS"** to store the dark current. The lamps are turned OFF and the system will take a reading for ALL the channels and stores it as Dark current.

Choose **"Restore Defaults Settings"** to set the Zero Dark Current to 0.

Optimize Channel Signal Auto

The Messenger Device is provided with Multi Stage Amplification. The Primary stage of Amplification is done with help of Front End Amplifiers and Secondary stage of Amplification is done with the Analog to digital converter (ADC) that has an internal amplifier.

The Front End Amplifiers setting can be done using Optimize **Channel Auto**.

%Range is related to the set point i.e. 100% which is 2000mv and 120% is 2500 mV which is the range of the ADC Converter.

Raw mV displays the current channel mV

Choose Channel (CH1…4)

When a Channel is selected and the **Optimize Gain key** is entered, the Messenger will try to set the Gain (Increase or decrease) to adjust the output level of the amplifier to 2000 mV (with range set at 100%) or higher if the 100% is higher, this relates to the A/D input of 2500 mV (80 to 120%).

Choose **Restore Default Settings** to restore the %Range to the default value i.e. 100.

The TRIMPOTS of the Front End Amplifier can be selected manually using Optimize Channel Manual.

Optimize Channel Signal Manual

This shows the TRIMPOT settings on the front end Amplifier Range 0 to 100. Choose **Channel (1…4)** and Tap/Click on "+" or "-" in order to increment or decrement the TRIMPOT Settings.

Auto Zero Dark Current

Choose **Auto Zero Frequency in Hours** text box to specify the Time Interval (Hours) at which the Dark current should be made zero.

Store Channel Reference

Using this option you can store a reading from a channel, which allows us to store an initial reference reading for the channel.

For Example:

When doing a color measurement with a single channel (detector) the equation for sensor may look like the following:

LOG REF CH1 – LOG CH1. Where LOG REF CH1 is a constant as it relates to the initial energy level with clear water in the cell.

Store Reference:

Choose CH (1...4).

When a channel is selected and STORE REFERNCE key is entered the current reading of the channel will be stored as Reference

When a channel is selected and RESET REFERENCE key is entered the Reference value will be defaulted to zero.

Normalization:

Choose CH (1...4).
Choose the channel (CH1 / CH2 / CH3 / CH4) with which the selected channel needs to be normalized and Normalized Key is entered. The Channel gets normalized.
Note:

Normalized Channel values are displayed in Green color.

Calibrate Analog Outputs

You can Calibrate Analog Outputs or adjust the 0/4- 20 mA loop, this is like a trim pot adjustment.

For example, the 4 mA to 4.00 mA (Zero setting) and 20 mA to 20.00 (Factor setting) as the technician sets these loops he can iterate between the zero and factor to adjust the 4-20 mA exactly to the right levels.

Choose **CH (1...4)**
Choose **Zero** Setting and Tap/Click on "+" or "-" in order to increment or decrement by 0.025.

Choose **Factor** Setting and Tap/Click on "+" or "-" In order to increment or decrement by 0.0005 value.

ADC-GAIN Manual

This is a secondary stage of Amplification setting on the ADC chip where we have a FRONT end Amplification setting using the electronic trim pots which can be adjusted using **Optimize Channel Auto** or **Optimize Channel Manual.**

ADC gain setting allows a second stage of amplification when we are looking at very low signals and we need to amplify further beyond the front-end range adjustment allowed.

This of course will cause a higher offset voltage and may reduce the range of the detection because of this offset potential that is due to the multi-stage amplification and the initial offset potential of the front-end op-amps.

The settings are defaulted to 1 but may be adjusted to 2,4,8,32,64,128 Choose **Channel (1...4)** and Tap/Click on the "+" or "-" in order to increment or decrement the gain setting.

6.6.5.4　　　　Hardware Test

This menu is used for testing of hardware
- Lamp Control
- Test Analog Outputs
- Test Relays

Lamp Control

You can view the current lamp's status and Lamp Intensity.
MAIN FAIL in Lamp Status indicates Lamp Failure.

Choose Display Fault Toggle (INT LAMP / EXT LAMP / BOTH LAMPS) button to explicitly generate Faults.

Choose **Lamp Intensity** text box to specify the percentage of Intensity of the Internal lamp (only) terminal 1 & 2 on the Messenger module. This does not work for the External lamp (Lamp Supply Control Board).

Choose **Turn Lamp ON / Turn Lamp OFF** Toggle Button to specify whether Lamp needs to be Switched ON / OFF (Internal lamp ONLY). This is for the Messenger's setup for single sensors (only).

Choose External **Lamp ON / External Lamp OFF** Toggle button to specify whether External Lamp needs to be ON/OFF (for supplemental Lamp Supply Control Board ONLY). This is for the Messenger's setup for multiple sensors (lamps).

Test Analog Outputs

This Menu displays the mV of the FOUR Analog Outputs. A Fault in the Analog Output is displayed as "**FAULT: 2mA**" where 2mA is the current assigned during the fault condition. You can also test the Analog outputs using this option.

For Example: -

Set **Analog Out1** to the following parameters
OUTPUT = Result1
Low = 0mv, High = 100mv
Mode = 4-20mA
OVERRANGE = CH1
Low mV = 0, High mV = 150

Choose **Analog OUT1**

Enter the 50 Millivolts in the Analog Output text box and choose the **"Update Outputs"** key. The current observed at the Analog OUT1 should be 12mA.

Choose **Restore Previous** to restore the Analog Outputs to previous values before the entry of 50 Millivolts.

Test Relays

This Menu displays the current status of the FOUR Relays i.e. Signal to which Relay has been assigned and whether it is switched ON / OFF.
Choose the ON / OFF Toggle button to Switch ON / OFF the Relay.

6.6.5.5   Clear/Reset Menu

- System Reset
- Default Values
- Clear Process Calibration
- Clear Factory Calibration
- Clear Results
- Reset Alarms

Choose **System Reset** to reset the Hardware.

Choose **Default Values to** default the parameters of the Messenger.

On Selection of Default Values, Factory calibration table will not be defaulted.

Clear Process Calibration

Choose **Sensor (1...4).**

On Selection of Sensor, choose **Copy From Factory Table** key. Factory calibration table contents of the Selected Sensor are copied to the Process calibration table.

On Selection of Sensor, choose **Clear Table** key. Process calibration table contents of Selected Sensor are defaulted to 0.

Clear Factory Calibration

Choose **Sensor (1...4)**
On Selection of Sensor when **Clear Table** key is entered. Factory calibration table contents of selected sensor are defaulted to 0.

Clear Results

Choose **Clear Results (1-4)** to clear the historic data stored in the buffer.

6.6.5.6　　　Reset Alarms

This menu displays the status of the 4 Alarms.

ACTIVE in the status block with RED background indicates Alarm is ON.
In order to clear the Alarm, choose the Alarm with **ACTIVE** in the Status block and choose **Clear ALARM** key.

6.6.5.7　　　Software Revision

The Menu displays the current Version Number of GUI and Messenger.
The Messenger Version will be displayed only when GUI is connected Online.

6.6.6　　　Set Cleaning Event

You can program up to TWO cleaning events.

A cleaning event is an automatic cycle that allows the optics to be CLEANED by the introduction of a cleaning solution to flow through the cell.

For each Cleaning Event, you can specify the **Cleaning Frequency**, **Cycle Duration and Purge Time** (Time to allow the Sample to flow and purge out the cleaning solution). A Relay can be assigned to a Cleaning Event, which will be active only during the Cycle Duration.

Cleaning Events can be activated in 2 ways, automatically or through Assigned Digital Inputs.

Automatic Mode:

Choose Cleaning Event 1...2

Specify the **Cleaning Frequency, Cycle Duration**, **and Purge Time.**

The Cleaning Event gets activated once you save the settings.

Assign Digital Inputs:

Choose Cleaning Event 1…2

Set Cleaning Frequency in Hours = 0

Specify the **Cycle Duration**, and **Purge Time.** Save the settings. Activate the Relay through Assign Digital Inputs. The Cleaning Cycle gets activated ONLY ONCE.

When you are trying to activate a Cleaning Event through Assign Digital inputs make sure that the Cleaning Frequency in Hours is 0. Failing to do so may cause malfunctioning of the Cleaning Event.

6.6.7   Set Access Code

You can set Personal Access code for Operator, Technician and Factory Levels preventing unauthorized personnel from altering key parameters that affect the operation of the unit.

Choose **Operator** text box. An Interface pops up Specify the Operator Password.

Choose **Technician** text box. An Interface pops up Specify the Technician Password.

Choose **Factory** text box. An Interface pops up Specify the Factory Password.

6.6.8   Set Access Level

You can enter the Access code based on the access code entered access level changes.

Choose New Access Code text box. An Interface pops up Specify the new Access code.

Note: On entering incorrect access code the Access Level will be defaulted to Operator.

6.6.9　　　　　Measurements Screen

- Previous Data
- Online Analysis
- Alarm Status

6.6.9.1　　　Previous Data

Choose OPTIONS button ⬚ on the top right corner of the measurements screen, a popup menu appears.

Choose **Previous Data**.

Entire Previous Data is retrieved. Most recently logged data is displayed as first frame of graph.

Choose **Previous "<"** and **Forward " >"** buttons on the bottom of the graph to scroll through the Previous Data.

Note: This operation may take some time to read the data from device and process the data.

Choose **Numerical / Graph / Bar** Toggle button to switch between display formats.

How can you view value of data point on a graph area?

Tap on the data point you want to view on the graph area, Crosshair appears displaying the X-axis and Y-axis data.

Choose Previous "<" and Forward ">" buttons to scroll through the data in the currently displayed frame.

Tap outside the graph area to remove the crosshair.

How can you customize the Numerical and Graphical display?

Graph settings can be configured using the following screen

- Setup Numerical Display
- Setup Graphical Display
- Graph Settings

6.6.9.2   Online Analysis

You can view data being captured by Messenger Device ONLINE.

The data captured from the Messenger Device can be viewed in 3 different formats.

- Numerical Display
- Graphical Display
- Bar Chart Display

Numerical Display and Graphical Display can be customized using the Setup Graphical Display, Setup Numerical display Menus.

Choose Numerical / Graph / Bar Toggle button to switch between the displays.

6.6.9.3   Alarm status

Status of Alarms is represented on the bottom of the Measurements screen.
Codes displayed in Alarm Status are shown below.

        1 - Alarm 1 Active

        2 - Alarm 2 Active

        3 - Alarm 3 Active

        4 - Alarm 4 Active

        CC1 - Cleaning Event1 Active

        CC2 - Cleaning Event2 Active

6.7   Graph/Chart Recorder

1.   Run the Messenger Application.

2.   Navigate to **Main Menu** >**Measurements Screen** and Choose GRAPH view.
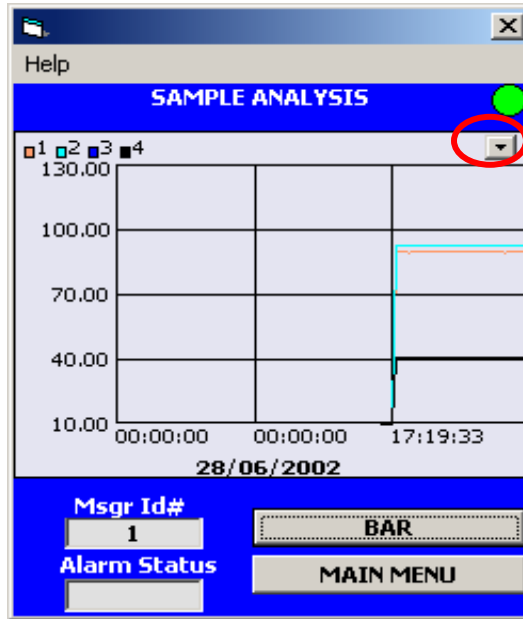
3.   Choose the Button on TOP Right corner of Graph, which displays a Popup Menu with a list of options.
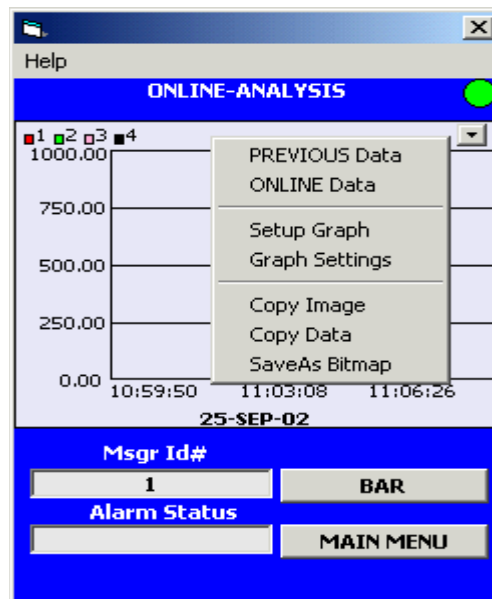
View Previous Data

On Selection of **Previous Data** Menu. Results Selected in SETUP GRAPH
DISPLAY will be pulled from the Messenger and Displayed.

Once the data is retrieved from the Messenger, the data is plotted on the Graph.
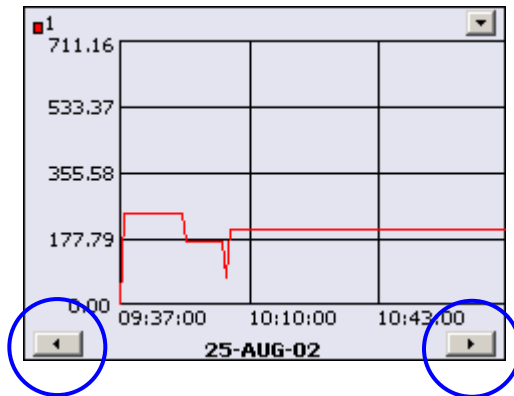
Choose the **FORWARD** and **BACK** buttons to navigate through the DATA SETS.
Each data set displayed contains 100 points or as many available in that group.
Data Sets are grouped based on DATE.

POINT UNDER CURSOR

Choose the point you want to view by Tap/Click on the graph area. A Cross Wire
with corresponding x, y values is displayed as shown below.
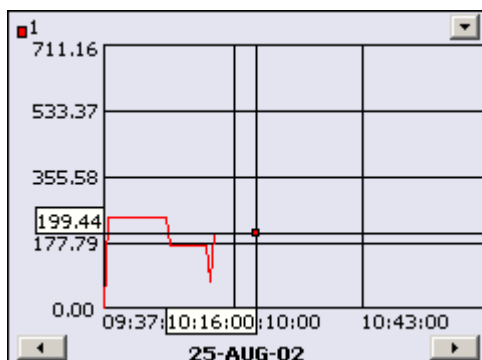
Choose the FORWARD and BACK buttons to navigate through the Points
displayed on the Graph.

Note: To remove the Crosswire Tap/Click outside the Graph Plotting area

When Cross wire is present the BACK and FORWARD buttons move the cross wire through DATA POINTS in the absence of cross wire the BACK and FORWARD buttons help in moving through the DATA SETS

View ONLINE DATA

Choose this option to get Online Data from Messenger.

Setup Graph Display

Choose **Setup Graph Display** *a* Dialog appears as shown below.

Range Of Values

    Specify the Lower Limit & Upper Limit of the Graph.

Select Color

    Click on **Select Color** of Result (1,2,3,4). A dialog pops up displaying the list of colors. Select the color.
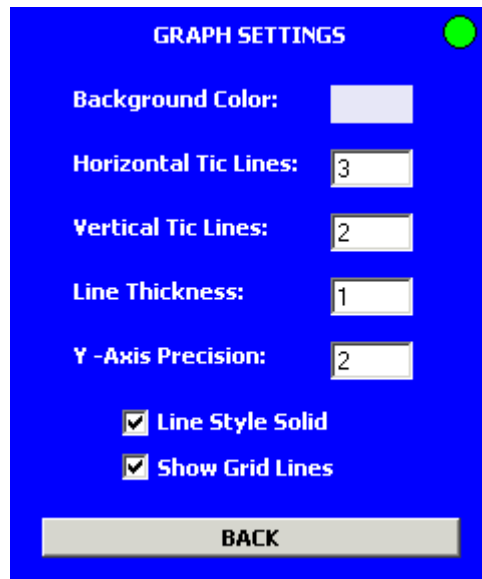
Show Result

    Check the results that should be displayed on Graph.

    After changing the above options Press on the **BACK** button the graph is displayed with new selections taking into affect.

Graph Settings

Choose **Graph Settings** a Dialog appears as shown below.

Background Color

Click on the background color. A dialog pops up displaying the List of
colors. Choose the Color.

Horizontal Tic Lines

Specify the number of Horizontal tics to be displayed on the Graph.

Note: For tics greater than 10 the labels may overlap

Vertical Tic Lines

Specify the number of Vertical tics to be displayed on the Graph

If tic lines is <=2 the display is HH:MM:SS

If tic lines is >2 and < 6 the display is MM:SS

If tic lines is >6 the display is SS

Where HH Represent Hours, MM represent Minutes, SS Represent
Seconds.

Note: for tics greater than 9 the labels may overlap

Line Thickness

Specify the Line thickness.

Note: Display may not be proper if line thickness is greater than 3

Y-axis Precision

      Specify the precision with which the y-axis data needs to be displayed.

Line Style Solid

      Select this option if line style needs to be *solid*. If it is not selected, the line style will be *dashed.*

Show Gridlines

      Select this option to Show/Hide Gridlines.

Copy Image

      This feature is used to capture the graph as Image and transfer it to the Clipboard.

      The transferred Clipboard Image can be pasted in Word Document or in any other applications that support Image clipboard.

      To use this Choose **Copy Image**

Copy Data

      This feature is used to capture the data present in the Graph and transfer it to the clipboard.

      The Transferred clipboard data can be pasted in Word / Excel or any other applications that support clipboard.

      To use this feature Choose **Copy Data.**

SaveAs Bitmap

      This feature is used to capture the Graph Image and save as a Device Independent Bitmap.

      To use this feature Choose **SaveAs Bitmap.** Specify the Name of the File and Location.

6.8   Manufacturer's Warranty Statement

Galvanic Applied Sciences Inc. ("Seller") warrants that its products will be free from defects in materials and workmanship under normal use and service in general process conditions for 12 months from the date of Product start-up or 18 months from the date of shipping from Seller's production facility, whichever comes first (the "Warranty Period"). Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Seller has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. Buyer must give Seller notice of any warranty claim prior to the end of the Warranty Period. Seller shall not be responsible for any defects (including latent defects) which are reported to Seller after the end of the Warranty Period.

THIS WARRANTY AND ITS REMEDIES ARE IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS EXPRESSED OR IMPLIED, ORAL OR WRITTEN, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO, WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH SELLER SPECIFICALLY DISCLAIMS.

Seller's obligation under this warranty shall not arise until Buyer notifies Seller of the defect. Seller's sole responsibility and Buyer's sole and exclusive remedy under this warranty is, at Seller's option, to replace or repair any defective component part of the product upon receipt of the Product at Seller's production facility, transportation charges prepaid or accept the return of the defective Product and refund the purchase price paid by Buyer for that Product. If requested by Buyer, Seller will use its best efforts to perform warranty services at Buyer's facility, as soon as reasonably practicable after notification by the Buyer of a possible defect provided that Buyer agrees to pay for travel time, mileage from the Seller's facility or travel costs to the airport / train station closest to Buyer's facility plus all other travel fees, hotel expenses and subsistence.

Except in the case of an authorized distributor or seller, authorized in writing by Seller to extend this warranty to the distributor's customers, the warranty herein applies only to the original purchaser from Seller ("Buyer") and may not be assigned, sold, or otherwise transferred to a third party. No warranty is made with respect to used, reconstructed, refurbished, or previously owned Products, which will be so marked on the sales order and will be sold "As Is".

Limitations
These warranties do not cover:
- Consumable items such as lamps.
- Analyzer components which may be damaged by exposure to contamination or fouling from the process fluid due to a process upset,

improper sample extraction techniques or improper sample preparation, fluid pressures in excess of the analyzer's maximum rated pressure or fluid temperatures in excess of the analyzer's maximum rated temperature. These include but are not limited to sample filters, pressure regulators, transfer tubing, sample cells, optical components, pumps, measuring electrodes, switching solenoids, pressure sensors or any other sample wetted components.

• Loss, damage, or defects resulting from transportation to Buyer's facility, improper or inadequate maintenance by Buyer, software or interfaces supplied by Buyer, operation outside the environmental specifications for the instrument, use by unauthorized or untrained personnel or improper site maintenance or preparation.

• Products that have been altered or repaired by individuals other than Seller personnel or its duly authorized representatives, unless the alteration or repair has been performed by an authorized factory trained service technician in accordance with written procedures supplied by Seller.

• Products that have been subject to misuse, neglect, accident, or improper installation.

• The sole and exclusive warranty applicable to software and firmware products provided by Seller for use with a processor internal or external to the Product will be as follows: Seller warrants that such software and firmware will conform to Seller's program manuals or other publicly available documentation made available by Seller current at the time of shipment to Buyer when properly installed on that processor, provided however that Seller does not warrant the operation of the processor or software or firmware will be uninterrupted or error-free.

The warranty herein applies only to Products within the agreed country of original end destination. Products transferred outside the country of original end destination, either by the Seller at the direction of the Buyer or by Buyer's actions subsequent to delivery, may be subject to additional charges prior to warranty repair or replacement of such Products based on the actual location of such Products and Seller's warranty and/or service surcharges for such location(s).

Repaired Products
Repaired products are warranted for 90 days with the above exceptions.

Limitation of Remedy and Liability
IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY INDIRECT, CONSEQUENTIAL, INCIDENTAL, SPECIAL OR PUNITIVE DAMAGES, OR FOR ANY LOSS OF USE OR PRODUCTION, OR ANY LOSS OF DATA, PROFITS OR REVENUES, OR ANY CLAIMS RAISED BY CUSTOMERS OF BUYER OR ANY ENVIRONMENTAL DAMAGE OR ANY FINES IMPOSED ON

BUYER BY ANY GOVERNMENTAL OR REGULATORY AUTHORITIES, WHETHER SUCH DAMAGES ARE DIRECT OR INDIRECT, AND REGARDLESS OF THE FORM OF ACTION (WHETHER FOR BREACH OF CONTRACT OR WARRANTY OR IN TORT OR STRICT LIABILITY) AND WHETHER ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR NOT.