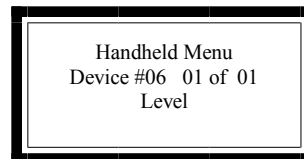# Quick Start

Quick Start

Quick Start

Quick Start
Procedures to Install, Reference and Calibrate the X99

1) Unpack the equipment and mount the equipment. See chapter 3 page 4 for more details.
2) Wire the microprocessor and detector. See chapter 4 the last page for the interconnect diagram.
3) Connect the Hand-Held Programmer (HHP) to the microprocessor. See chapter 5 pages 1-3 for more details.

4) Make or locate a test-block to be used for the high calibration. See Chapter 6 "Preparation for Calibration" for more details.

5) Turn the Power Switch to the ON position from the Power Supply Module.
   See Power Supply Module in chapter 4 for more details.

6) Press the "MODE" key on the HHP to turn on the display.
7) Press the "OK" key to "Scan for Devices".
8) Press the "OK" key to Devices found = 01.

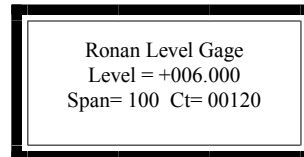9) Press the "OK" key to

```
Handheld Menu
Device #06   01 of  01
Level
```

10) Press the "OK" key to "Connect to device"

```
Handheld Menu
Connect to device
Level
```
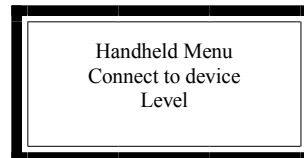
11) This Screen is called the Status Screen

```
Ronan Level Gage
Level = +006.000
Span= 100  Ct= 00120
```

11) Press any of the top four keys on the HHP to exit the Status Screen and this will allow you access to the "Enter Access Code" screen..

   Enter in the access code "1 2 1 3 2 3"
   Now you can access the Menu Variables screens to Reference Low and Calibrate High.

Next Page

Performing a Low Reference:

Make sure the Source's Shipping-cover has been removed from the front of the source holder and stored away.

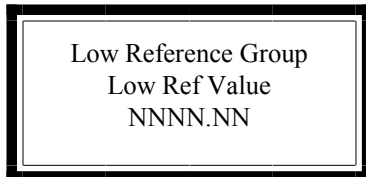**Make sure the vessel is empty under normal operating conditions.**
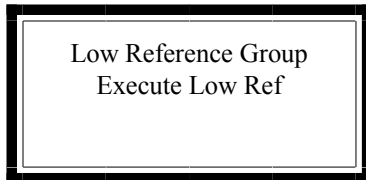
1) Press the "Open" key to the "Low Reference Group"

2) Toggle the "Next" key until you reach the "Auto Setup Enable" Menu. Press the MODify key. **Enabled** this option.

3) Toggle the "Next" key until you reach "Low Reference Value" Menu, Figure 9a, and set the value to the desired Low Reference Value. (See Chapter 8 pages 1-3 on modifying Menu Variables).

4) Toggle the "Next" key until you reach the "Execute Low Ref" Menu, Figure 9b, and press the MODify key, and follow the two remaining prompts. (Continue, Ready)

```
Low Reference Group
Low Ref Value
NNNN.NN
```
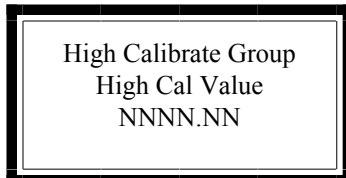
Figure 9a: The Low Referencing Value

```
Low Reference Group
Execute Low Ref
```

Figure 9b: Executing Low Ref:

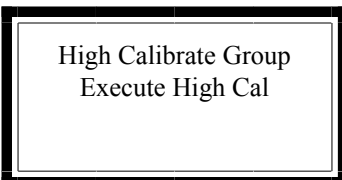## Performing a High Calibrate:

1) Insert the test-block into the mold covering the full range of measurement.

2) Toggle the "Next" key until you reach the "High Calibrate Group" Press the "Open" key

3) Toggle the "Next" key until you reach "High Cal Value Value" Menu, Figure 10a, and set the value to the desired High Cal Value. (See pages 1-3 on modifying Menu Variables).

4) Toggle the "Next" key until you reach the "Execute High Cal" Menu, Figure 10b, and press the MODify key, and follow the two remaining prompts. (Continue, Ready)

5) Press the "Exit" key and return the Status screen.

```
High Calibrate Group
High Cal Value
NNNN.NN
```

Figure 10a: Entering the High Calibration Value.

```
High Calibrate Group
Execute High Cal
```

Figure 10b: Executing the High Calibration Variable.

> Repeat the reference and calibration if the X99 does not indicate zero when the mold is emptied, or if the X99 does not indicate full with the test-block covering the complete measurement range.

Auto-Reference (Optional)
Procedures to Auto-Reference the X99 microprocessor for Low Level.

Make sure the Source's Shipping-cover has been removed from the front of the source holder.

Before performing a Auto-Reference:
Make sure mold is emptied and mold water is flowing through the mold!

1) Make sure the Mold is empty with Mold water running, and the oscillator running.

2) Locate the Auto-Reference pushbutton and the Auto-Reference indication. Hold pushbutton for 3 to 5 seconds until the Auto-Reference indication turns on. Continued to run the mold in the empty condition until the Auto-Reference indication turns off.

3) X99 Mold Level output should indicate zero (example: 4.00 mA or 0 VDC). If not repeat steps 1 & 2 again.

4) Auto-Referencing (the zero) is complete.

Auto-Calibrate (Optional)
Procedures to Auto-Calibrate the X99 microprocessor for High Level.

Make sure the Source's Shipping-cover has been removed from the front of the source holder.

Before performing a Auto-Calibrate:
Make sure the test-block is inserted into the mold covering the full range of measurement.

1) Insert the test-block into the mold covering the full range of measurement.

2) Locate the Auto-Calibrate pushbutton and the Auto-Calibrate indication. Hold pushbutton for 3 to 5 seconds until the Auto-Calibrate indication turns on. Continued to hold the test-block in front of the mold until the Auto-Calibrate indication turns off.

3) X99 Mold Level output should indicate full (example: 20.00 mA or 10.00 VDC). If not repeat steps 1 & 2 again.

4) Auto-Referencing complete.

Specification Sheets

Specification Sheets

Specification Sheets

RONAN

SPECIFICATIONS:
X99 Standard Level System

Consists of Microprocessor, Power Supply, I/O Modules, Hand-held Programmer and chassis. Accepts input signal(s) for standard level from either ion chamber or scintillation detector and provides linear, isolated output(s) for recording or control. Internal RS485 communications loop for additional functions such as Temperature Compensation, Digital Outputs, Analog Outputs, etc. Addition of modules requires simple connection of four wires to implement. Software features include Source Decay Compensation, Dynamic Process Tracking and Self-diagnostics. The X99 Computer may be located locally at the detector or remoted to a more convenient location.

POWER SUPPLY MODULE

Part Number	**PWRSPLY-16018**
Type	High-efficiency switching
Input Voltage	85 to 265VAC or 24VDC
Output Voltage	+5VDC
Output Current	3 A max.
Input Interface	3 term. strip
EMI/RFI Protection	Integral line filter
Output Interface	plug-in term strip
Output Protection	Short-circuit proof-auto recovery

CPU MODULE

Part Number	**MOD-15133**
Power required	+5VDC @ 100mA
Microprocessor	80188 10mHz
Memory	Prom, non-volatile RAM
Intermodule communications	RS485
Module comm. interface	term. strip
Max. Modules	32 (RS485 limit)
Communications	RS485
Remote comm interface	term. strip
Maximum cable length	4000ft (1200m)
Power to Hand-held prog	+5VDC
Local comm interface.	RJ-11 conn
Alarm Outputs	
Power Fail Relay	SPST
Contact Rating	1A / 24VDC 0.5A / 120VAC
Communications Error Alarm	SPST
Contact Rating	1A / 24VDC 0.5A / 120VAC

INPUT MODULE (ION CHAMBER) ◆

Part Number	**MOD-15180**
Input	Analog, 0-5VDC
Input interface	Plug-in term .strip
Output power	±15VDC @ 30 mA to detector
Output interface	Plug-in term strip
Internal communications	RS485 to CPU

INPUT MODULE (SCINTILLATOR) ◆

Part Number	**MOD-14397**
Input	Pulse
Input interface	Plug-in term .strip
Output power	+15VDC @ 30 mA to detector
Output interface	Plug-in term strip
Internal communications	RS485 to CPU

OUTPUT MODULE (ANALOG)

Part Number	**MOD-14403**
Isolated output	0-10VDC @ 20mA or 0-20mA into 1000Ωmax.
Function	Programmable
Interface	Plug-in term strip
Isolation type	Optoelectronic
Isolation voltage	300 VDC
Internal communications	RS485 to CPU

◆Only (1) used per gage

ENVIRONMENTAL

Ambient temperature ....(-40 to +75°C)
-40 to +167°F
Humidity...................................0 to 95%
non-condensing
EMI / RFI emissions/
susceptibility.............................Meets CE
requirements

CHASSIS,Surface Mount

Part Number...............................**CHAS-16020**
Chassis material ....Carbon steel
Finish ....Gray enamel
Area rating ....Non-hazardous
location
Weight.......................................1lb(.45 kg)

8.25(209.5)
7.5 (190.5)
3.18(80.7)

Card Guides

3.75(95.2)
3.0 (76.2)

1.25(31.7)

4.0 (101.6)

(4) Mounting Holes, ⌀ .20 (5.08)

Wire Duct

HAND-HELD PROGRAMMER

Part Number **HHP-16019**
Operating system ....8031 µP
Display......................................4x20 character
LCD
Keyboard ....(5) membrane
switches,sealed
Power ....+5V from CPU or
AC adaptor ◆
Communications.........................RS485
Comm.interface.........................RJ 11 connector
Comm.cable ....7ft(2.1m)RJ11◆
Material.....................................ABS Plastic
Weight ....2 lbs (.9 kg)
Line Terminator ....RJ11 box ◆

◆ Included with Hand Held Programmer

3.75 (95.2)

9.25
(235)

FOR OPTIONS SEE X99 "OPTIONS SPECIFICATIONS SHEET"

Gage Components

Gage Components

Gage Components

Components LIST

X99 Standard level gages perform measurements for numerous applications. Below is the List of the individual components that are unique to the X99 ordered. Keep this List handy, as it will be referenced numerous times in the following manual.

Item	Quantity	Part Number	Name
(1)	1		X99 Processor (see below)
(2)	1		Scintillator Detector
(3)	1		RS-485 Wires: 40 ft.
(4)	1		Hand-Held Programmer (HHP)

The Individual X99 Processor Contains:
1) CPU Module   5) Analog Output Module ( )
2) Power Supply   6) Input Modules ( )
3) 1 Scintillator Detector Module
4) Enclosure

These functions are to be enabled at setup:

Extracting Information from the X99 Processor:
With HHP: 485 Interface

X99 Mold Level Components:

X99 Processor:

The CPU, power supply, and all I/O Modules for receiving and analyzing data from the detector are located in the X99 Processor. Operator Interface is via the Ronan Hand-Held Programmer.

Interconnect Cables:
Detector to X99 Processor

The Processor may be located remotely or locally relative to the detector. The length of the Interconnect Cable may be specified up to 5000 feet. It should be continuous (containing no splices) and run in conduit or cable trays with instrument cable only. Cables should be routed away from any high current or high voltage device. Interconnect drawings are provided.

Hand-Held Programmer (HHP)

RONAN

X99-HHP

X99 Handheld

The Hand-Held Programmer (HHP) is used to query and calibrate the X99 Processor.

The X99 HHP can communicate with the X99 Processor locally and remotely. It operates from a wall-plug transformer. It can also communicate with a PC.

Operator Interface Cables
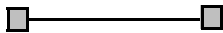
10 foot RJ-45 Cable   Serial Adapter

Each system comes with a 10 ft. RJ-11 cable for operator interface between the Hand-Held Programmer (HHP) and the X99 Processor. A serial adapter is provided for communications between the Hand-Held Programmer and a Personal Computer (PC). Also, a power supply line is given for the HHP.

Module Descriptions

Ion Chamber Input Module Description

The Ion chamber Input module is the analog detector input to the Ronan Intelligent Detector systems.

The Ion Chamber Input module supplies ±15VDC to the detector for power and receives the voltage signal from the detector that represents the strength of the radiation field applied to the detector. The system can accept a voltage of 0 VDC to 5 VDC .

This module is microprocessor-based with an RS-485 communications interface, and the RONET proprietary protocol. The module's communications address is normally preset at the factory, but is field selectable.

Ion Chamber Input Module Specifications

Power: +5 VDC ± 5%, 75 mA maximum
Communications: Single RS-485 multi-drop communications channel
Temperature: -40 to +75ºC
Humidity: 0 - 95% non-condensing
Vibration:

Input Range: 0 - 5 VDC
Outputs: ±15VDC for detector power

Resolution: 15 bit (0 - 32767 counts)

Calibration: Factory Pre-calibrated;
                              No field calibration required.

Ion Chamber Input Module

	Pin Number	Description
Blk	10	-15 VDC to Ion Chamber
Red	9	+15 VDC to Ion Chamber
Grn/Wht	8	Shield
Blu	7	FeedBack Control
Grn	6	Ion Chamber Signal Common
Yel	5	Ion Chamber Signal Input
	4	RS-485 -D (from CPU)
	3	RS-485 +D (from CPU)
	2	5 VDC Ground (from Power Supply)
	1	+5 VDC (from Power Supply)

Scintillator Input Module Description

The Scintillator Input module is the digital pulse detector input to the Ronan Intelligent Detector systems.

The Scintillator Input module supplies +18VDC to the detector for power and receives the digital pulses from the detector that represent the strength of the radiation field applied to the detector. The system can accept a value of 32767 maximum each scan. Normally, the Ronan detectors are well within this limitation.

The module can be calibrated for the Count Period (typically matches the gage's scan time of 400 mS), and Prescale Divider (to divide the counts down - typically set to one).

This module is microprocessor-based with an RS-485 communications interface, and the RONET proprietary protocol. The module's communications address is normally preset at the factory, but is field selectable.

Scintillator Input Module Specifications

Power: +5 VDC ± 5%, 75 mA maximum
Communications: Single RS-485 multi-drop communications channel
Temperature: -40 to +75 ºC
Humidity: 0 - 95% non-condensing
Vibration:

Input Range: Digital pulses up to 1MHZ in frequency.
Outputs: +18VDC for detector power

Resolution: 15 bit (0 - 32767 counts)

Calibration: Factory Pre-calibrated;
                           Field calibration capable.

Scintillator Input Module
Pin Number   Description

	Pin	Description
Green/White	9	Shield to Scintillator
	8	Isolated Ground
Red	7	+18 VDC to Scintillator
Blk	6	Scintillator Signal Common (-)
Wht	5	Scintillator Signal Input (+)
	4	RS-485 -D (from CPU)
	3	RS-485 +D (from CPU)
	2	5 VDC Ground (from Power Supply)
	1	+5 VDC (from Power Supply)

Analog Output Module Description

The Analog Output module is used for voltage or current output from the Ronan Intelligent Detector systems. A switch on the module selects either voltage or current output.

This module produces an isolated voltage of from 0 - 10 VDC, or an isolated current from 0 to 20 mA. The module can be calibrated for any voltage or current within the above limits by setting the Zero and Span in the calibration procedure. Zero and Span values can also be inverted (Zero = maximum input value, Span = minimum input value).

The Analog Output module also incorporates a Failure Mode of operation, where the output from the module can be specified in the event of an I/O communications failure. This mode can be selected during the calibration procedure to be Hold or Specific Value. In the Hold mode, the last valid value received by the module will be maintained until either power is removed from the module, or communications is restored. In Specific Value mode, you select a percent of full scale output to be maintained during communications failure.

The module is microprocessor-based with an RS-485 communications interface, and the RONET proprietary protocol. The module's communications address is normally preset at the factory, but is field selectable.

Analog Output Module Specifications

Power:	+5 VDC ± 5%, 75 mA maximum
Communications:	Single RS-485 multi-drop communications channel
Temperature:	-40 to +75ºC
Humidity:	0 - 95% non-condensing
Vibration:	
Output Range:	Isolated 0 - 20 mADC (switch selectable between mA and V)
	Isolated 0 - 10 VDC
Max Output Load:	1,000 Ω
Resolution:	12 bit
Accuracy:	±½ LSB over full range
Calibration:	Factory Pre-calibrated;
	Field calibration capable.

Analog Output Module

Pin Numbers   Description

6   - Output
5   + Output
4   RS-485 -Data (from CPU)
3   RS-485 +Data (from CPU)
2   5 VDC ground (from Power Supply)
1   +5 VDC (from Poser Supply)

AC Power Supply Module Description

The Power Supply module supplies the +5VDC to the modules housed in the NEMA-4 enclosure attached to the detector.

AC Power Supply Module Specifications

Power Input: 85 - 265 VAC ±15%, 15 watts
Power Output: +5VDC, 3A maximum
Temperature: -40 to +75ºC
Humidity: 0 - 95% non-condensing
Vibration:
Fuse: 250 Volt, 3.15A, 5x20mm

Power Supply

AC Ground
Neutral
Hot
Power Switch
Ground
+5 VDC
DC Power OK
Indicator
Fuse
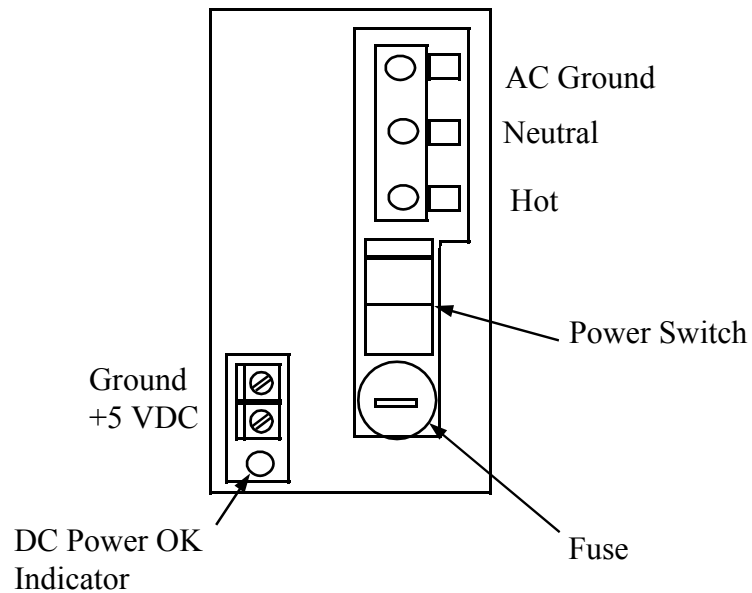
CPU Module Description

The CPU module is the computer module for the Ronan Intelligent Gage Systems.
It incorporates the micro-processor, PROM program memory, non-volatile RAM data memory, and communications.

Two relays provide alarm outputs for the detection of power fail and I/O communications errors. The processor is housed in a NEMA-4 enclosure along with the power supply and I/O modules for a particular gage type.

The gage software for the micro-processor contains the Menu Variable Access package, I/O control and monitoring package, and the gage algorithm package. Two communications ports provide RS-485 communications for the handheld and I/O modules using Ronan's RONET proprietary protocol. One can be switched to RS-232 to support the Field Addressable Remote Transmitter modem option. This option permits communications across the 4-20 mA output wires to the handheld programmer.

The module also contains a switch bank for selecting the address (0-31) on the RS-485 multi-drop communications link to the handheld programmer.

CPU Module Specifications

Power Required: +5 VDC ± 5%, 90 mA maximum
Temperature: -40 to +75ºC
Humidity: 0 - 95% non-condensing
Vibration:

Outputs: Form A relay output for power fail
    Form C relay output for I/O communications errors
    RS-485 communications for I/O modules
    RS-485 communications for handheld programmer
    RS-232 communications for Field Addressable Remote Transmitter
        modem Option
    +5VDC for handheld programmer power

Processor: 10 MHZ 80188 microprocessor
Memory: 128KB PROM memory
    2/4/8KB Non-volatile battery-backed RAM (Minimum 10 year battery
        life. Battery is used only when system is powered down)

Software: Gage-type dependent.

Options: I/O modules (gage-type dependent)
    Field Addressable Remote Transmitter modem - 9600 Bits/Second

CPU Module

Pin Numbers   Description

14   Future Use for modem communications
13   Future Use for modem communications
12   Future Use for modem communications

RS-485 position

RJ-11 connector for Local RS-485 hookup

11   Power-Fail Common
10   Power-Fail N.C. Contact
9   I/O Comm. Error N.O Contact
8   I/O Comm. Error Common
7   I/O Comm. Error N.C. Contact
6   -Data for Remote RS-485 communications
5   +Data for Remote RS-485 communications
4   -Data to I/O boards
3   +Data to I/O boards
2   5 VDC ground (from Power Supply)
1   +5 VDC (from Power Supply)

Relay Out Module Description

The Digital Output module supplies four Form C contacts to the user.

This module is microprocessor-based with an RS-485 communications interface, and the RONET proprietary protocol. The module's communications address is normally preset at the factory, but is field selectable.

Relay Out Module Specifications

Power: +5 VDC ± 5%, 70 mA maximum
Communications: Single RS-485 multi-drop communications channel
Temperature: -40 to +75ºC
Humidity: 0 - 95% non-condensing
Vibration:
Input Range: None
Outputs: 4 Form 'C' contacts
Contact Rating: 1A @ 24 VDC
                    .5A @ 120 VAC

Calibration: Factory Pre-calibrated;
                    No field calibration required.

Indicators: Red LED: Off - No Power
                             On Steady - Power OK, No Communications
                             Blinking - Power and Communications OK

Relay Out Module Connections

Pin Numbers   Description

16   Output 4 N.C.
15   Output 4 Com.
14   Output 4 N.O.
13   Output 3 N.C.
12   Output 3 Com.
11   Output 3 N.O.
10   Output 2 N.C.
 9   Output 2 Com.
 8   Output 2 N.O.
 7   Output 1 N.C.
 6   Output 1 Com.
 5   Output 1 N.O.
 4   RS-485 -D (from CPU)
 3   RS-485 +D (from CPU)
 2   5 VDC Ground (from Power Supply)
 1   +5 VDC (from Power Supply)

3-30 VDC In Module Description

The Digital Input module is designed to accept discreet digital inputs and send them to the Ronan Intelligent Detector systems.

This module will accept up to four discreet inputs.

This module is microprocessor-based with an RS-485 communications interface, and the RONET proprietary protocol. The module's communications address is normally preset at the factory, but is field selectable.

3-30 VDC In Module Specifications

Power: +5 VDC ± 5%, 50 mA maximum
Communications: Single RS-485 multi-drop communications channel
Temperature: -40 to +75ºC
Humidity: 0 - 95% non-condensing
Vibration:
Input Range: 3-30 VDC for DC module (4 inputs)
   0 Logic: Max Input Voltage 0.5 VDC
   1 Logic: Min Input Voltage   3.0 VDC
Outputs: 5VDC @ for input exitation
Calibration: Factory Pre-calibrated;
                        No field calibration required.

Indicators: Red LED: Off - No Power
                                 On Steady - Power OK, No Communications
                                 Blinking - Power and Communications OK

3-30 VDC In Module

Pin Numbers	Description
14	Ground
13	+5 VDC Supply
12	Input 4 -
11	Input 4 +
10	Input 3 -
9	Input 3 +
8	Input 2 -
7	Input 2 +
6	Input 1 -
5	Input 1 +
4	RS-485 -D (from CPU)
3	RS-485 +D (from CPU)
2	5 VDC Ground (from Power Supply)
1	+5 VDC (from Power Supply)

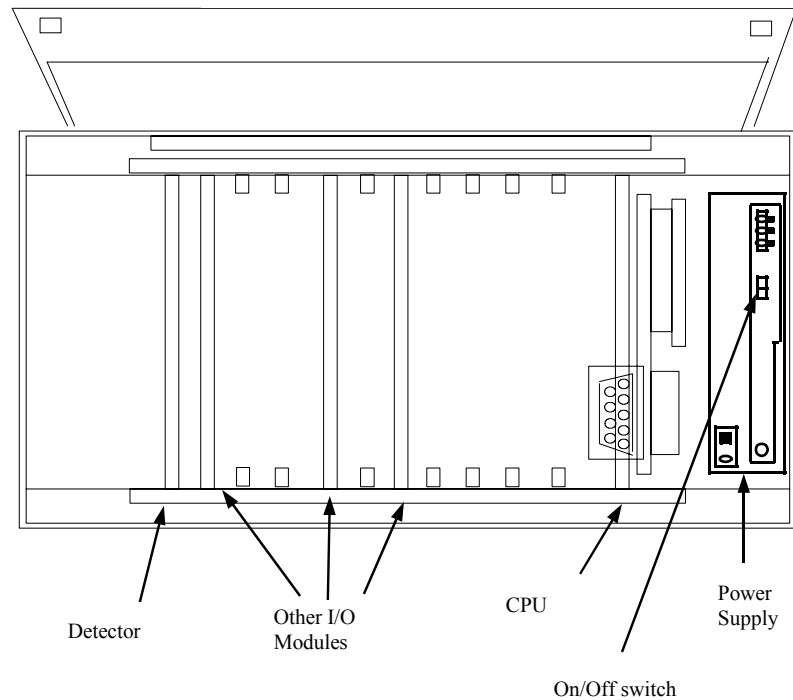# Configuration Drawings

Configuration Drawings

Configuration Drawings

X99 Processor Wiring

X99 Processor Wiring

Loosen the 3 screws on the X99 enclosure and open the top cover. Anywhere between 2 and 8 I/O modules are in the X99, along with the CPU and power supply module (see figure 1). The power supply module will always be on the right, followed by the CPU module. The left most module will most likely be the Detector I/O module. Consult the module description for wiring details. Identify each module and document them on figure 1. Figure 2 shows identification procedures.

Figure 1: The view of the I/O Modules. Each application will have a different number of I/O Modules. There can be up to 8.

Detector   Other I/O Modules   CPU   Power Supply

On/Off switch

TOP:

Pre-Wired

Input/Output Wiring (the number of terminals vary from module to module.)

Side View: Away from CPU

Wiring

LED

+   GND   +   -   options
5V   D   D

I/O NAME

LED

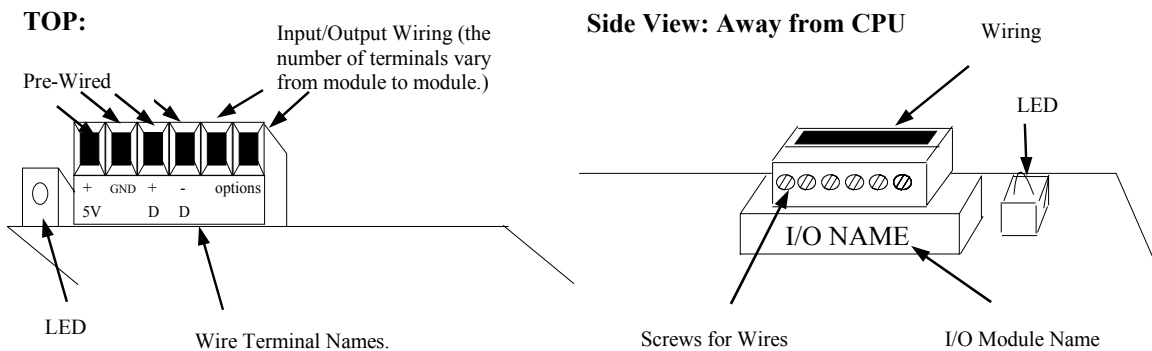Wire Terminal Names.

Screws for Wires

I/O Module Name

Figure 2: I/O Module Wiring. The top of the module is for wiring. The side gives the Module's name. It also contains the screws to fasten the wire. Check the first four wires for proper connections. These will be pre-wired in the factory (+5 V, Ground, RS-485 (+) and RS-485 (-). Note: the optional wire outlets may vary in number for each individual I/O Module. There can be anywhere from 2 to 8 additional terminals.

Now, locate the Detector Module, connect the interconnect wires to the Detector Module.

Locate all Input and Output modules and connect the necessary wires that correspond to each module. Verify the wiring as shown in the interconnect wiring diagram at the end of this section.

Finally, connect the 110 VAC or 220 VAC power supply to the power supply module.

Double check all connections.

It is now safe to turn on the X99 Processor with the switch on the power supply.
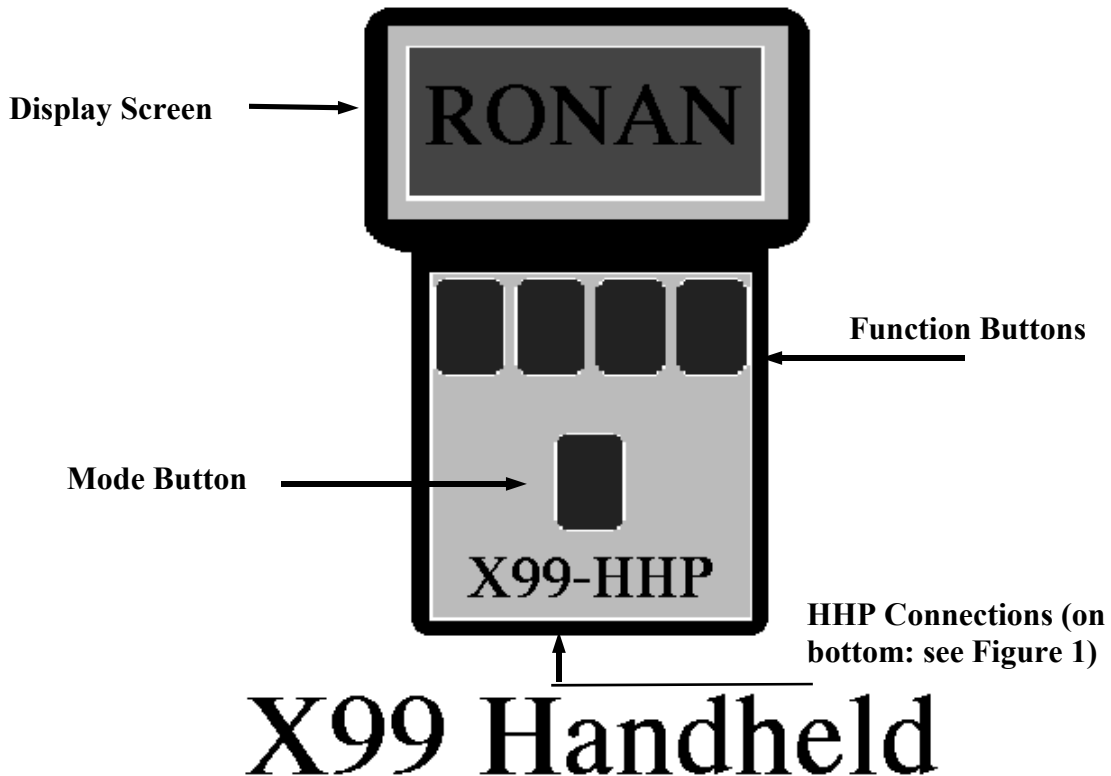
Connecting The H.H.P

Connecting The H.H.P

Connecting The H.H.P
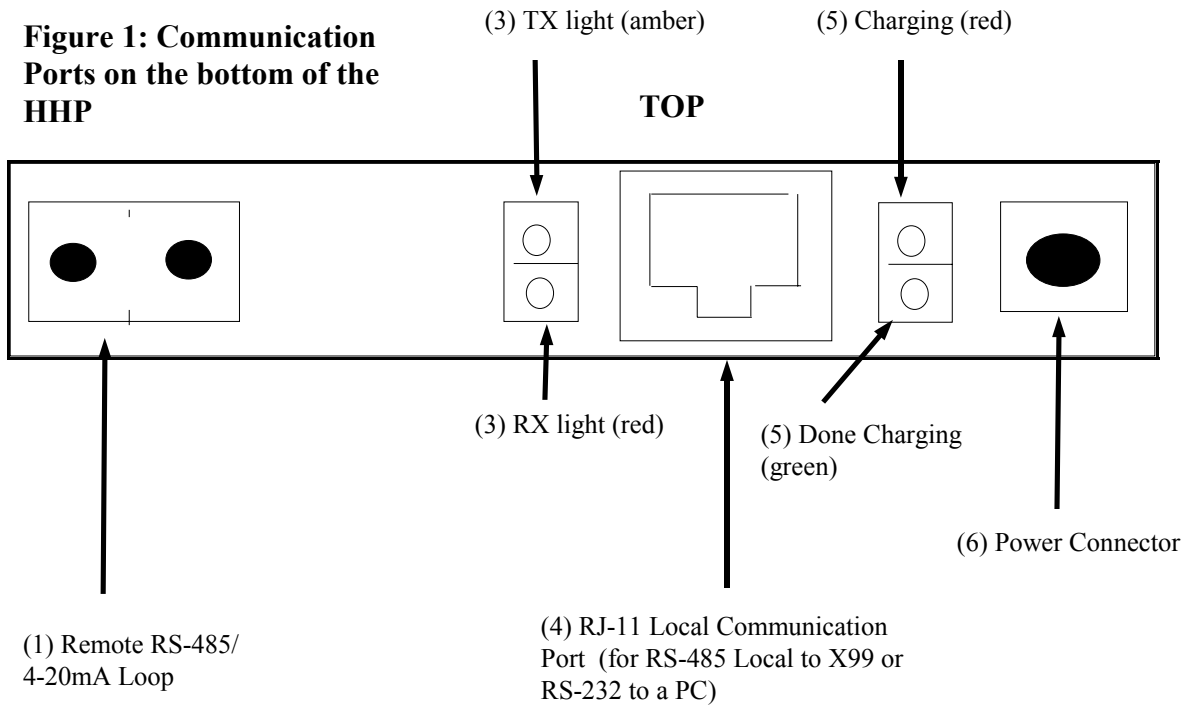
Connecting with the HHP

NOTE
The next two pages explain Operator Interfacing with the X99 Processor via the Hand-Held Programmer. It explains both communication along a RS-485 line and a 4-20 mA Loop.

Display Screen → RONAN

Function Buttons ←

Mode Button →

X99-HHP

HHP Connections (on bottom: see Figure 1)

X99 Handheld

The Hand-Held Programmer (HHP):
1) Display Screen: is a 4 x 20 LCD screen that displays the status of a given X99 Processor.

2) Function Buttons: These four buttons control the HHP. The Display Screen will display the commands that each button corresponds to (note: different screen displays will mean different command options).

3) Mode Button: Used for selecting a specific gage on a 'Daisy-Chained' RS-485 Loop. This button is also used for saving and retrieving the X99 Menu Variable data.

4) HHP Connections: These are the ports for transmitting and receiving information between the HHP and a X99 or PC.

Figure 1: Communication Ports on the bottom of the HHP

(3) TX light (amber)

(5) Charging (red)

TOP

(3) RX light (red)

(5) Done Charging (green)

(6) Power Connector

(1) Remote RS-485/ 4-20mA Loop

(4) RJ-11 Local Communication Port (for RS-485 Local to X99 or RS-232 to a PC)

Explanation of Different Communication Ports:

(1) Remote RS-485/ 4-20 mA Loop: The communication line between the X99 and the HHP via a RS-485 or a 4-20 mA loop connects at this port.

(2) The RS-485/ 4-20 mA switch decides the type of communication signal transmitted and recieved by the HHP. If the switch is to the left: the HHP is set up for RS-232 communications. If the switch is set to the right, the HHP is set for 4-20 mA communications.

(3) TX & RX lights: When lit, these lights indicate if the HHP is Transmitting information (TX) with an amber light or Receiving information (RX) with a red light.

(4) RJ-11 Communication Port: This port houses the local RS-485 and RS-232 connection. This port is used for local connection to the X99, or for local connection to a PC.

(5) Power lights: When lit, the top light (red) means that the HHP is charging the internal batteries (The battery option only applies when the 4-20 mA modem has been installed). This occurs when a power supply has been added to (6): Power Connector. When the HHP is done charging, the bottom light is lit green.

(6) Power Connector: This port houses the power supply. Connect the power supply into this port. (Caution: make sure the power supply is the proper type).
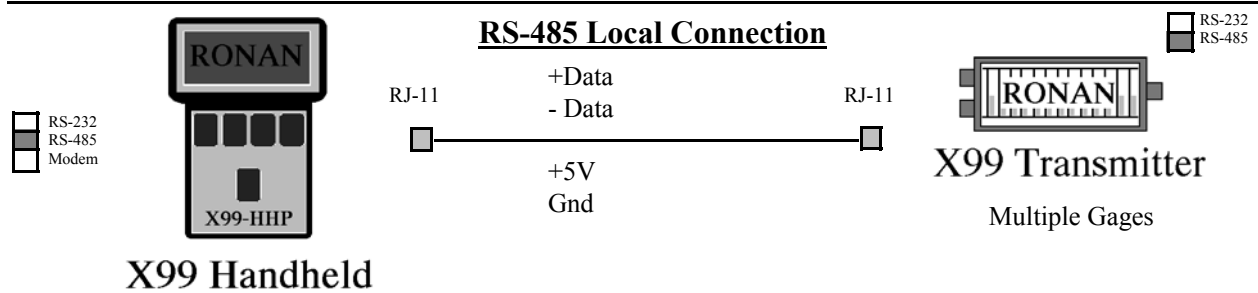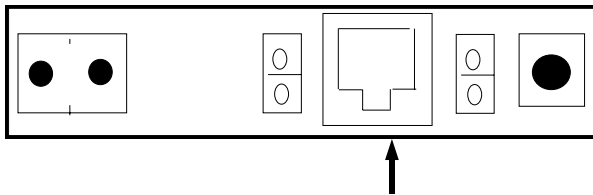
RS-485 Local Connection

RS-485 Local Connection

+Data
- Data

+5V
Gnd

RJ-11   RJ-11

RS-232
RS-485
Modem

RS-232
RS-485

X99 Handheld   X99 Transmitter

Multiple Gages

Figure 2: Communication Ports on the HHP

RJ- 11 Communication Port.

Description: The RS-485 Local Connection does require an outside power line. The connection occurs between the X99 and the HHP within 10 feet of each other, via a RJ-11 cable.

Connecting: Take the RJ-11 place into the RJ-11 Communication Port (RS-485) on the HHP (Figure 2).

At the X99 Processor: Open the NEMA box enclosure. Locate the CPU module. On the CPU module, connect the other end of the RJ-11 line. Communications should now be established.

Remember: at disconnection, make sure the protective cover of the X99 Processor is fully closed so that moisture does not enter the box.

Calibration
Calibration
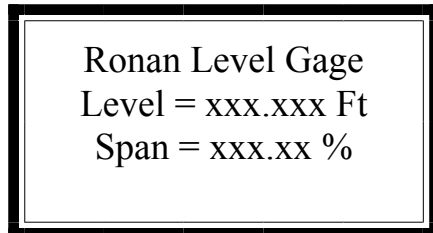Calibration

Accessing the Menu Variables

```
┌─────────────────────────┐
│  Ronan Level Gage       │
│  Level = xxx.xxx Ft     │
│  Span = xxx.xx %        │
└─────────────────────────┘
```

Figure 1a: Status Screen

↓

Press any key (1-4) or button

↓

```
┌─────────────────────────┐
│                         │
│   Enter Access Code     │
│                         │
│                         │
└─────────────────────────┘
```
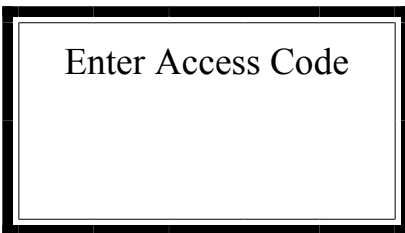
Figure 1b: Enter the Proper Access code. See below.

Box 1a: Steps to enter Menu Variables

1) Press any of the top keys under the Status Screen to obtain Figure 1.

2) Enter the proper access Code
      1 2 1 3 2 3

When the PMP is first powered up (or if 'scan all devices is selected with the 'Mode' key), the PMP will scan the attached network for up to 32 devices. If any are found, select the desired X99 device by browsing the ID of those found. When one is selected, the Status Screen (or last display viewed) appears. The Status Screen is the default opening display screen that shows the given outputs of the X99 Standard Level Gage.

The X99 has three programmable modes: the Status Line Editor, the Menu Variables, and the I/O Module Status. The Menu Variables are used to setup and calibrate the X99.

To access the Menu Variables, follow box 1a. The access codes are listed in Appendix C, chapter 9 If an invalid code is entered, a warning will appear. Press a key, and the screen's display is then returned to the Status Screen.

Menu Variables: Moving Between Groups and Variables

```
Menu Variable
Description
Value (if applicable)
```

Figure 2a: Description of the four lines
of the Menu Variables.

```
Low Reference Group
```

Figure 2b: Example of a Group

The Menu Variables are listed in Appendix A, chapter 8. They are arranged in Groups (Bold-faced and underlined in Appendix A). Groups organize the Menu Variables by application and/ or functions.

Press OPEN to enter the Group's Variables. NEXT and PREVious scroll from Group to Group. If a Group has been entered, scroll between the Menu Variables within that Group via the Next and Previous keys.

To Exit a Group, go to the last menu variable in that group and press NEXT.

Menu Variables: Modifying Variables
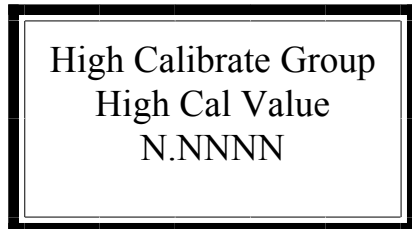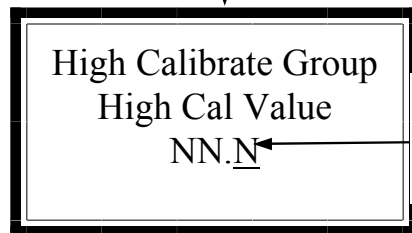
Changing a Menu Variable, an example:

High Calibrate Group
High Cal Value
N.NNNN

Figure 3a

↓

Press "Mod" to change the value

↓

High Calibrate Group
High Cal Value
NN.N

Value to be changed

Figure 3b: Changing the Value

Press "Incr" and "Decr" to change the value. Press "Shft" to move the cursor. Press "Done" when finished.

If a variable's value needs to be changed, or modified, locate that Menu Variable. Press the MODify key to change the value (Figure 3a will go to Figure 3b).

Use the SHiFT key to move the cursor (underlined in Figure 3b) to the right (if more than one digit exists). INCRement increases the highlighted value by one, while DECRement decreases the value by one (Figure 3b).

Once the new value has been entered, press DONE and then either SAVE to save the modifications or QUIT to restore the original value of the variable. "Value out of range" will appear if an invalid value has been entered.

See Box 3a for an explanation of

Box 3a: Types of Variables:

1) Read-Only Variables: Variables that cannot be changed. These variables display a value that has been calculated by the X99 Processor.

2) True Values: variables that the entered values are the value of the variable (i.e. 189 means 189).

3) On/Off or Enable/Disable: Variables contain multiple choices. Pressing one of the 'change' keys will index through the choices.

4) Table Variables: These variables have the characters 'Tbl' in the title line. The value initially displayed is the first entry in the tables (index 1). Pressing the 'Modify' key here will allow you to index through the table entries and view or modify the values. Press the 'Exit' key to exit the Table Variables. Note: All entries in a Table Variable have the same Menu Variable Number.

5) Variables with the word 'Get' or 'From': are Menu Variables that obtain their values by calling the value of another Menu Variable.
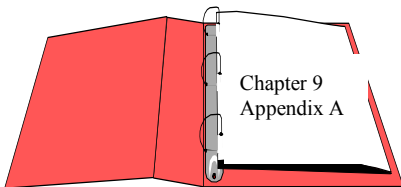
Calibrating the System

This section discusses three steps calibrate the X99 Standard Level Gage.

1 Check Factory defaulted Menu Variables so that they are appropriate for the given application. Make changes where necessary and document these changes.

2 Perform a Low Reference and High Calibration that correlates the X99's output to the actual mold level.

3 Documentation of changes in all factory-default settings. Keep this for future reference.

---

1 **Factory-Default Settings**

Locate the Factory Configuration Sheets which are filed Chapter 9 of this manual.   That information will indicate how the system is configured for your application. Check the Menu Variables and change accordingly (especially the output groups).

Document all changes. Keep this document in chapter 9 for future reference

Chapter 9
Appendix A

Reference: :
Menu Variables in Appendix A

Calibration correlates the X-99's output to the actual standard level. It instructs the microprocessor to read and store the detector counts for a low and high level. Once the system is conditioned to recognize the low and high level, it will provide an output over the entire range of interest (such as a 4-20 mA output).

NOTE

Once the desired functions are configured, the Low Reference Function and the High Calibrate Function are the only functions needed (see steps 2, 3, 4, 5, and 6 for a basic calibration).

Steps for Low Reference (zero) and High Calibrate (span):

1) Enable the functions in the gage that are expected to be used. See the Appendix A in chapter 9 and mark in the chart below which functions need to be enabled. To enable these functions, go to the given Enable Menu Variable, and select 'Enabled'.

2) Locate the Low Reference Group and press OPEN.

3) Enter in Low Ref Value. Execute a Low Reference with process under normal operating conditions. See page 7 for Performing a Low Reference.

4) Establish a High Level in the vessel under normal operating conditions. Make sure the Measurement range is completely covered.

5) Enter in High Cal Value. Execute a High Calibration with the process level as describe in step 4.

6) Exit the Menu Variables (see pg. 13). The Status Screen should be displaying accurate values for its outputs.

Note: *You will need to set up the following variables manually before you Reference or Calibrate the gage:*

Low Ref. Fault Counts: This is the count value that the counts must stay above during a Low Reference. It ensures that you do not accidentally perform a High Calibrate when the vessel is at Low Reference conditions.

Hi Cal Fault Counts: This is the count value that the counts must stay below when executing a High Calibrate. It ensures that you do not accidentally perform a Low Reference when the vessel is set up for the Calibrate condition.

Detector Low Flt Cts: If the Raw counts fall below this value, the Detector Fault Relay will be energized, an in-process Low Reference or High Calibrate will be aborted.

Detector Hi Flt Cts: If the Raw Counts reach this level, the Detector Fault Relay will be energized, and an in-process Low Reference or High Calibrate will be aborted.

Performing a Low Reference:

Make sure the Vessel is under normal operating condtions during the Low Reference!
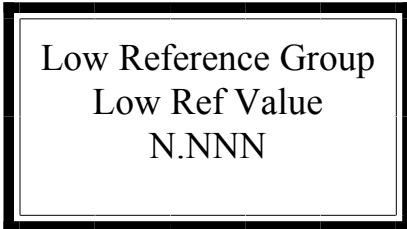
```
┌─────────────────────────┐
│  Low Reference Group    │
│  Low Ref Value          │
│  N.NNN                  │
└─────────────────────────┘
```

Figure 9a: The Low Referencing Value

```
┌─────────────────────────┐
│  Low Reference Group    │
│  Reference Time         │
│  NNN                    │
└─────────────────────────┘
```
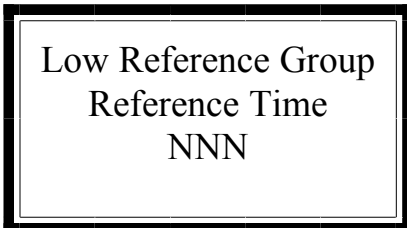
Figure 9b: Time taken for Low Referencing

```
┌─────────────────────────┐
│  Low Reference Group    │
│  Execute Low Ref        │
│                         │
└─────────────────────────┘
```
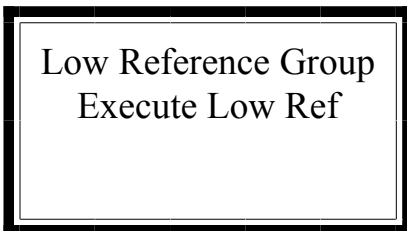
Figure 9c: Executing Low Ref:

1) Locate and open the Low Reference Group.

2) Locate and open the Menu Variable "Low Ref Value" Figure 9a, and set the value to 0.0000 inches for an empty vessel. (see pages 1-3 on modifying Menu Variables).

3) Check the Reference Time, Figure 9b, for validity. (Time should be between 2-60, defaulted at 20 seconds).

4) Locate the Execute Low Ref Menu Variable, Figure 9c, and press the MODify key, and follow the two remaining prompts.

Performing a High Calibrate:

High Calibrate Group

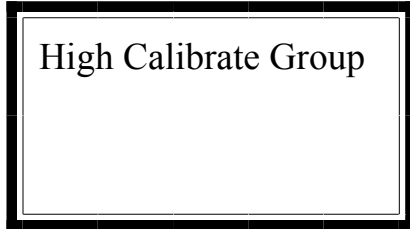**Figure 10a:** Entering the High
Calibrate Group

Press

High Calibrate Group
High Cal Value
N.NNNN
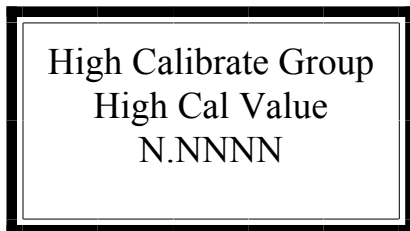
Figure 10b: Entering the High
Calibration Value.

High Calibrate Group
Execute High Cal
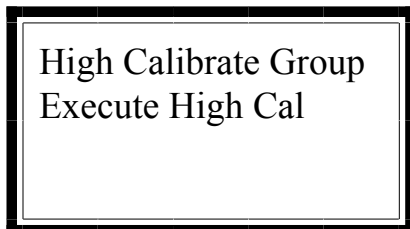
Figure 10c: Executing the High
Calibration Variable.

1) Make sure the Process level is covering the area of measurement between the radioactive source and the detector.

2) Locate the High Calibrate Group and press OPEN to enter into the Group's variables, Figure 10a.

3) Select the High Calibrate Value Menu Variable, Figure 10b, and set the value to the desired level.

4) Locate the Execute High Cal Menu Variable, Figure 10c, and press the MODify key. Follow the two remaining prompts.

Linearizing :
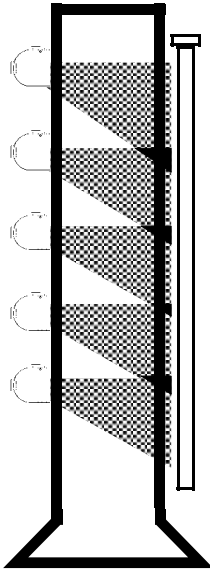
After the Reference Low and Calibration High is completed you will want to verify linearity of the system. The best way to achieve this is by actually moving the process level up and down while recording/comparing the actual level with the X99 indicated level (Raw Gage Value). Sometimes this cannot be achieved. Another way is to simulate the level by opening and closing the source shutters. An example would be a vessel which uses five sources to cover the full measurement range.

All the source shutters in the opened position represents an empty condition.

All the source shutters closed represents a full condition.

Next by opening the top source shutter only represents 80% level. Record the indicated level from the X99 in the s a m e units as the gage was calibrated. Record the actual level in t h e same units as the gage was calibrated.

With the top source shutter opened, open the next source shutter below the top source holder. This represents 60% level. Record the indicated level from the X99 in the same units as the gage was calibrated. Record the actual level in the same units as the gage was calibrated.

With the top two source shutters opened, open the next source shutter below the top two source holders. This represents 40% level. Record the indicated level from the X99 in the same units as the gage was calibrated. Record the actual level in the same units as the gage was calibrated.

With the top three source shutters opened, open the next source shutter below the top three source holders. This represents 20% level. Record the indicated level from the X99 in the same units as the gage was calibrated. Record the actual level in the same units as the gage was calibrated.

If you find the level response from the X99 not linear, you can "Enable" the Linearizer. Enter the above data into the two Linearize Tables. The indicated X99 values collected from the above steps should go into the "Linearize **Gage** Tbl" and the actual level values should go into the "Linearize **Meas** Tbl". Once you have completed the tables make sure any unused registers are set for zero.

Linearize **Gage**	Reg
_____	#01
_____	#02
_____	#03
_____	#04
_____	#05
_____	#06
_____	#07
_____	#08
_____	#09
_____	#10

Linearize **Meas**	Reg
_____	#01
_____	#02
_____	#03
_____	#04
_____	#05
_____	#06
_____	#07
_____	#08
_____	#09
_____	#10

Setting up the Linearizer:

```
┌─────────────────────────┐
│   Linearizer  Group     │
│   Linearize Enable      │
│       Enabled           │
│   Exit Mod Next Prev    │
└─────────────────────────┘
```

1) Locate the Linearizer Group.

2) Enable the "Linearizer "
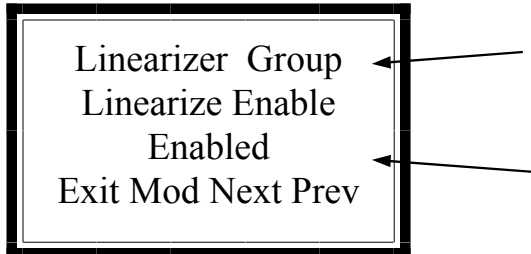
Figure 11a: Enabling the Linearizer.

```
┌─────────────────────────┐
│   Linearizer  Group     │
│   Linearize Gage Tbl    │
│       00010.0000        │
│   Exit Mod Next Prev    │
└─────────────────────────┘
```
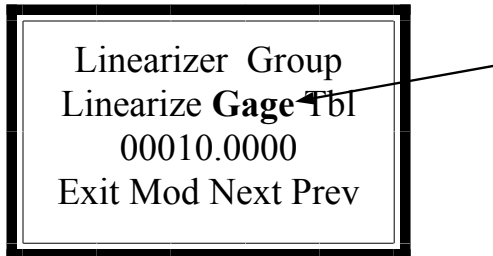
3) Select the Linearize **Gage** Tbl. Press the MODify key.   Figure 11b.

Figure 11b: Setecting the Linearize **Gage** Table.

```
┌─────────────────────────┐
│   Linearizer  Group     │
│   Linearize Gage #01    │
│       00010.0000        │
│   Exit Mod Next Prev    │
└─────────────────────────┘
```

Register Number

4) Select the desired Register by pressing the Next / Prev keys. See Figure 11c. Once the desired Register is selected press the MODify key to change the value.

Figure 11c: Selecting the Register.

```
┌─────────────────────────┐
│   Linearizer  Group     │
│   Linearize Gage #01    │
│      +00010.0000        │
│   OK  Shft Incr Decr    │
└─────────────────────────┘
```

5) Enter in the correct value. Press the OK key. See Figure 11d

6) Press the Save key to save or the Quit key to leave the original value.

Figure 11d: Selecting the value within the each Register.

Setting up the Linearizer continued:

Linearizer Group
Linearize **Meas** Tbl
00010.0000
Exit Mod Next Prev
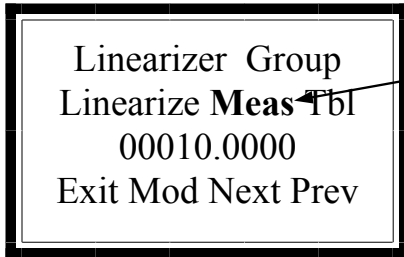
Figure 11e: Setecting the
Linearize **Gage** Table.

7) Select the Linearize **Meas** Tbl.
Press the MODify key.   Figure 11e.

Linearizer Group
Linearize Meas #01
00010.0000
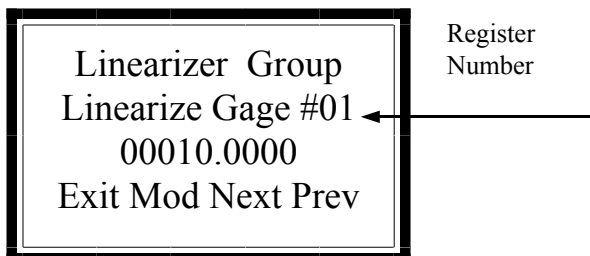Exit Mod Next Prev
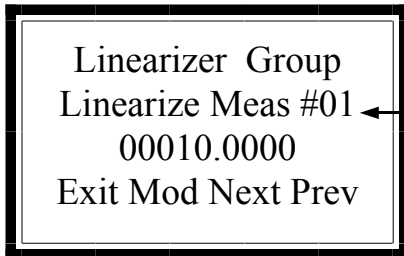
Register
Number

Figure 11f: Selecting the
Register.

8) Select the desired Register by
pressing the Next / Prev keys. See
Figure 11f. Once the desired Register
is selected press the MODify key to
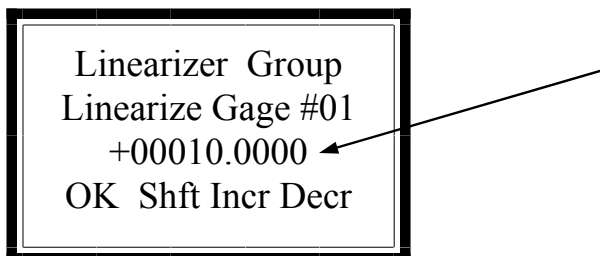change the value.

Linearizer Group
Linearize Meas #01
+00010.0000
OK Shft Incr Decr

Figure 11g: Selecting the value
within the each Register.

9) Enter in the correct value. Press
the OK key. See Figure 11g

10) Press the Save key to save or the
Quit key to leave the original value.

3 **Documentation**

For future reference, document these items:

(a) Environmental/process conditions (densities, temperatures, etc.) that influence the reference/ calibration. The PMP and the PC can store Menu Variables, but written documentation should be kept.

(b) For all changes made to the factory-default settings, use the chart below.

(c) The information from status displays shown. A record of "counts" being received from the detector may assist with future troubleshooting efforts.
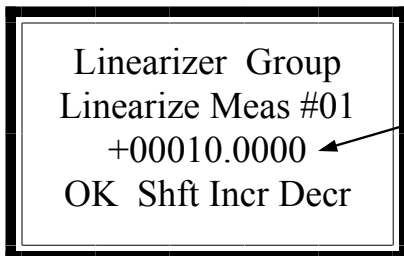
Menu Variable	Description	Factory Setting	New Value	Factory Default Setting

Exiting Menu Variables

Exit Menu Variables?

Figure 13a

To Exit the menu list,
1) Press the Exit button at any Menu Variable.

Once at Figure 13a, press "Yes" to exit. Press "No" to return to the Menu Variables list.

The Status Screen will again be displayed, with the given outputs that correspond to the outputs desired at time of order.

Analog Output

Module

Set-Up Procedure

Analog Output Module Setup Procedure

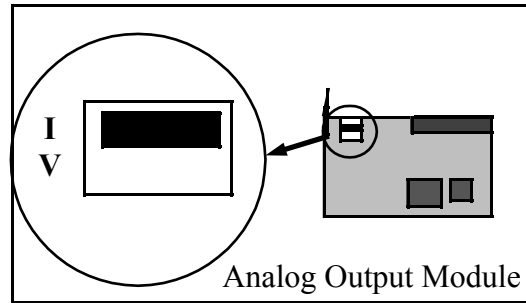Equipment   Required:

Volt/Amp Meter   X99 Handheld   X99 Transmitter   Analog Output Module

Before you start, determine whether you are using the Analog Output module as a voltage(V) or current (I) output, and set the switch on the Analog Output module to reflect your choice. The above is shown in the current position.

Access the Analog Output module's Setup function through the gage's I/O Status Menu, and press the 'Next' key (displays the Zero Out Signal frame).

Setup the Zero Signal
This is the minimum output signal this module will produce.
      1) Press the Modify Key to setup the Zero Signal (displays the Connect Zero Output frame).
      2) Connect a DC voltage or current meter (depending on the switch selection from above) to pins 5
            (positive) and 6 (negative) of the Analog Output module.
      3) Modify the value on the display up or down (Incr or Decr) until the correct Zero Out value is displayed
            by your meter.
      4) When the reading is correct, press the 'Done' key, then the 'Save' key to set the Zero value, or
      'Quit' to abandon the setting. Either key returns you to the Zero Output Signal frame.

Setup the Zero Out Units
This value will be displayed as part of the 'module type' in the I/O Status frames.
      1) Press the 'Next' or 'Prev' key until the Zero Out Represents frame is displayed.
      2) If the Zero value you set up does not match this displayed value, press the 'Modify' key to change it.
            The value displayed here is for identification only. It is not used by the system.
      3) Use the 'Shft', 'Incr', and 'Decr' keys to set the Zero value (00 Volts, 04 mA, etc.). Press 'Done' then
            either 'Save' to store the value, or 'Quit' to abandon the value.

Setup the Span Signal
This is the maximum output signal this module will produce.
      1) Press the 'Next' or 'Prev' key until the Span Output Signal frame is displayed.
      2) Press the Modify Key to setup the Span Signal (displays the Connect Span Output frame).
      3) Connect a DC voltage or current meter (depending on the switch selection from above) to pins 5
            (positive) and 6 (negative) of the Analog Output module.
      4) Modify the value on the display up or down (Incr or Decr) until the correct Span Out value is displayed
            by your meter.
      5) When the displayed value settles, press the 'Done' key, then the 'Save' key to set the Span value, or
            'Quit' to abandon the setting. Either key returns you to the Span Output Signal frame.

Setup the Span Out Units
This value will be displayed as part of the 'module type' in the I/O Status frames.
      1) Press the 'Next' or 'Prev' key until the Span Out Represents frame is displayed.
      2) If the Span value you set up does not match the displayed value, press the 'Modify' key to change it.
            The value displayed here is for identification only. It is not used by the system.
      3) Use the 'Shft', 'Incr', and 'Decr' keys to set the Span value (10 Volts, 20 mA, etc.). Press 'Done'
            then either 'Save' to store the value, or 'Quit' to abandon the value.

Appendix

Appendix

Appendix

Appendix C: System Access Codes

The system access codes were intentionally inserted into an appendix in order to protect those wishing to use the custom passwords. It is advised to set up the custom passwords, issue them to individual users, and then remove this page from the manual. The standard access codes are not listed anywhere else in the manual. This way, the owner will have 'master' access using the standard access codes listed below, but the individual users will only know their 'custom' password. Assuming access to the 'Password Access' Menu Variables has not been granted, the system's changeable Menu Variables are protected from unauthorized access.

When the system is displaying the Status screen, press one of the top 4 keys on the handheld device, and enter one of the following codes for access:

Menu Variable Access Code: 1, 2, 1, 3, 2, 3

I/O Status Access Code: 1, 3, 1, 2, 3, 2

Status Line Editor: 1, 2, 2, 2, 2, 3

Custom Password 1:   __, __, __, __, __, __

Custom Password 2:   __, __, __, __, __, __

Custom Password 3:   __, __, __, __, __, __

NOTE: If usage of any user-defined (or custom) passwords in the system has been granted, record the passwords beside the Custom Passwords above for safekeeping.

Appendix D: Order of Characters shown in the Status Line Editor

When Modifying an alpha-numeric variable, 97 characters may be inputted. The following gives an order to the characters, so that the user can more easily input the desired characters.

```
[space] ! " # $ %& " ' ( ) * + , . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ? @
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ -
' a b c d e f g h i i j k l m n o p q r s t u v w x y z { | } ~
```

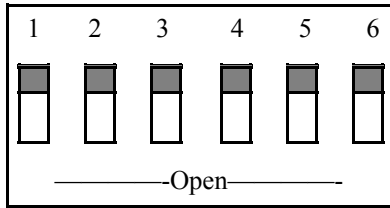## Appendix E: Binary Address Calling of Modules and Gages.
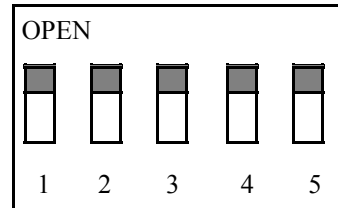

Figure 11a: Switch on CPU Board

Figure 11b: Switch on Modules

When multiple gages are hooked up (daisy-chained), then the HHP needs to be able to identify each X99 Gage. This is done through binary addresses. Notice on the CPU module that there is a six switch orange box on the side, like in Figure 11a. The first five switches represent a binary address from 0-31. Each gage that is daisy-chained together must have an unique address. The sixth switch on the CPU is not used.

Each Module in an X99 has a unique address. This address is how the CPU talks to the Module, and how the HHP or PC talks to the Module in I/O Status. The gage software decides how many and which types of I/O moduels are acceptable for that gage. The list of addresses are shown in Appendix B for each Module.

Below is a chart explaining the call numbers that are represented by the binary switches. Note: 0=Closed and 1=Open on the chart.

Address	Switches (1-5)	Address	Switches (1-5)	Address	Switches (1-5)
0	00000	11	11010	22	01101
1	10000	12	00110	23	11101
2	01000	13	10110	24	00011
3	11000	14	01110	25	10011
4	00100	15	11110	26	01011
5	10100	16	00001	27	11011
6	01100	17	10001	28	00111
7	11100	18	01001	29	10111
8	00010	19	11001	30	01111
9	10010	20	00101	31	11111
10	01010	21	10101		