Users Manual

Model YPC 4000 Series
Portable Modular Calibrator

YPC 4000 Calibrator
YPC 4010 Calibrator with HART®

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Models
YPC 4000 Modular Calibrator
YPC 4010 Modular Calibrator / HART® Communicator

IMPORTANT NOTICE

> Important information on the product is contained in this manual.
> Read this manual carefully and completely before operating the
> product. For the safety of the operator and the system, a thorough
> understanding of this manual is necessary before commissioning,
> using or maintaining the product.

ASSISTANCE

For customer assistance please contact the local Yokogawa Representative or Yokogawa Corporation of America directly. For a geographic listing of Representatives and their contact information, visit our web site at www.us.yokogawa.com/mi. Contact Yokogawa Corporation of America directly by phone at (770) 254-0400 or by e-mail at info@us.yokogawa.com. Direct all assistance inquiries to the Meter & Instrument group.

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YPC 4000 SERIES OVERVIEW
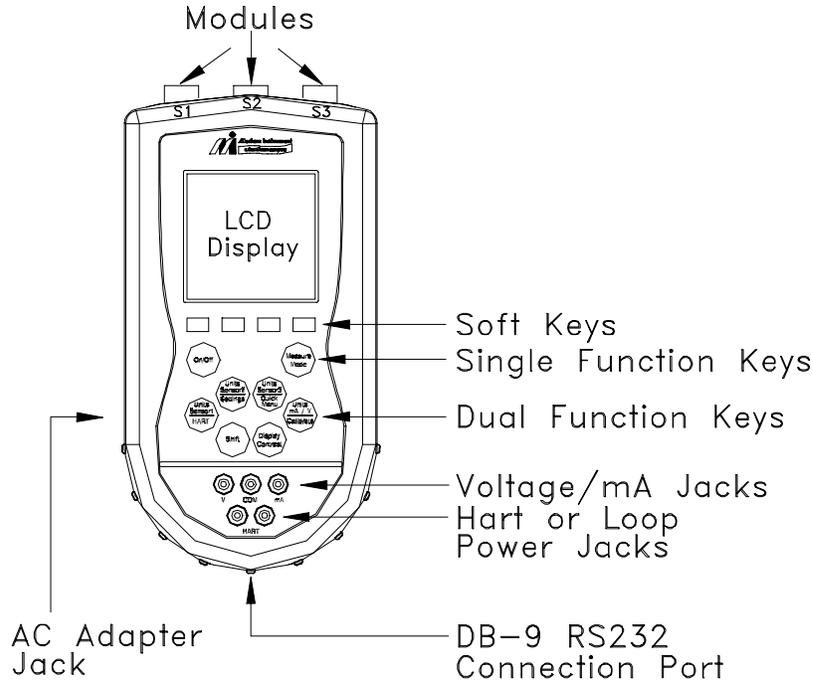
The YPC 4000 Multi-Function Tester (YPC) is a modular calibrator with three sensor bays accommodating up to three independent pressure, temperature or special function modules. The base YPC incorporates a voltage and current meter, several keys for user interface and will display up to four measurements simultaneously. The YPC 4010 adds HART communication capability to the same handheld base unit for greater flexibility and versatility in commissioning, reconfiguring, and maintaining HART field devices.

Note: For Intrinsically Safe YPC models, consult the Hazardous Area Use *section of this manual for specific details on use of approved YPCs and applicable restrictions.*

KEYPAD OVERVIEW
The following is an overview of the YPC 4000 series keypad operations. The YPC keypad has three basic key types (the functions of each are described below): Single function keys, dual-function keys, and soft keys. Single function keys control a dedicated YPC function. Dual-function keys, through the use of the Shift key, control two separate functions. Soft key functions change depending on the operating mode. Their definitions are displayed at the bottom of the LCD, just above each white soft key.

Single Function Keys

On/Off
Pressing the On/Off key powers up the YPC. As the unit powers up, it performs an internal diagnostic check of its systems. Any abnormalities are posted on the display. The unit will briefly display the YPC model number and the installed sensor module ranges and bay locations (S1, S2, or S3) before the unit enters the **Measure Mode.**

Measure Mode
Pressing the Measure Mode button will instantly return the unit to measure mode from any menu or sub-menu. **Measure** will appear on the upper left of the display.

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Display Contrast
This key allows the user to adjust the contrast of the LCD display for ambient conditions or user preferences. Pressing and holding this key will cycle through all available contrast settings. If the display is faded or blacked out, simply depress the key until the display returns to an acceptable level. After adjusting Contrast, wait at least five (5) seconds before turning unit off to insure storage of new contrast setting.

Shift
The Shift key is pressed to access the functions labeled in blue on the dual-function keys. Pressing the Shift key will allow the user to access and/or alter the corresponding properties. Shift remains on until it is depressed again. When the Shift key is active, an up arrow will appear at the top of the display left of the battery power or AC wall plug icon.

Dual Function Keys

Units Sensor1
The Units Sensor1 key changes the engineering units for the module in sensor bay 1. The **Shift** key
must be active before the units can be changed.

**HART (*Active only with YPC 4010)*
The HART key puts the YPC 4010 series calibrator into its HART Communications mode and initiates communications via the HART connections at the bottom of the YPC.

Units Sensor2
The Units Sensor2 key changes the engineering units for the module in sensor bay 2. The **Shift** key must be active before the units can be changed.

Settings
Provides access to the settings menu. This menu shows the current unit settings and allows the user to customize YPC settings. See **Settings** section for more details.

Units Sensor3
The Units Sensor3 key changes the engineering units for the module in sensor bay 3. The **Shift** key must be active before the units can be changed.

**Quick Menu (*Active only with YPC 4010)*
This key provides a list of frequently used HART configuration and maintenance function menus. User can quickly scroll to any desired menu.
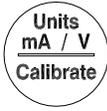
Units mA / V
Toggles between voltage, current (mA), and off display for the integral voltage and current meter. This measurement is designated by "V/I" on the display.

Calibrate
This key enters the YPC into calibration mode for local indicators, conventional transmitters, HART transmitters, Fieldbus transmitters, and mA loop calibrations.

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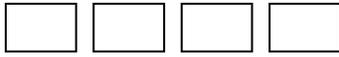
Soft Keys

[ ] [ ] [ ] [ ]   **Soft Keys** *(unlabled)*
The four white keys located below the display are the Soft Keys. The specific functions of these keys change depending on the operating mode of the YPC. Current defintions are displayed at the bottom of the LCD display.

Alphanumeric Data Entry

For YPC applications requiring alpha, numeric, and symbol entry (examples: tagging or messaging), the YPC uses three display grids, the **SHIFT** key to change from one grid to another, and four soft keys used for cursor movement and selection of characters and text. YPC and HART communication functions that require alpha and numeric entry automatically call up the appropriate grid and make the other grids accessible using the **SHIFT** key. **Row** and **Col**umn soft keys are used to move the flashing cursor through the displayed grid. The **Select** soft key enters the indicated character in the text line and the **Done** soft key accepts the displayed text line and returns the YPC to service.

Character grids are provided for numeric, alpha, and symbol characters to permit complete editing of text fields. Each grid includes back space (←), forward space (→), delete (del) and space (spc) operators to accommodate text editing needs.

User Interface

The displays shown below illustrate the alphanumeric entry grids and soft key functions. Pressing the YPC's **SHIFT** key changes the display from one grid to another allowing text messages to be developed using all three grids when needed.

HART	HART	HART
Tag No PT-3456	Tag No PT-3456	Tag No PT-3456
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 − . --> <-- del spc PT−_	1 2 3 4 5 6 7 8 9 . 0 + − --> <-- del spc PT−3456_	@ [\ ] ^ " " # $ % ( ) ' & * + − . / : ; < = > ? , ! --> <-- del spc PT−3456 OUTPUT < 50% @_
Row Col Select Done	Row Col Select Done	Row Col Select Done
Alpha entry grid	**Numeric entry grid**	**Symbol grid**

When using any character grid, pressing **Row** or **Col** keys will move the flashing cursor one character across or down the gird. Pressing and holding the **Row** or **Col** key causes the cursor to advance down or across, respectively, at a regular rate. Releasing the key when the cursor is under the desired character stops the cursor movement and allows the selection of the character using the **Select** key.   Press the **Done** soft key when the character string is completed to enter the string and continue YPC operations.

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Numeric Entry: Many HART functions require only numeric entry. For these functions the YPC uses an **Inc**rement and **Dec**rement scheme to change the input field one place at a time. Press the **Inc** / **Dec** soft keys to move through a scroll of -, . , 0, 1…9, and space until the desired value is displayed. Press the **Next** soft key to enter that value and advance to the next place in the input field. Repeat as necessary. Press the **Done** soft key to end the numeric entry session.

```
┌──────────────────────────────────┐
│ HART              ♡  ▯▬▬▬▬        │
│ 3051:  PT-3456                    │
│ Output:                           │
│                                   │
│                                   │
│                                   │
│  6.5_       mA                    │
│                                   │
├──────────────────────────────────┤
│ Inc     Dec     Next     Done     │
└──────────────────────────────────┘
```
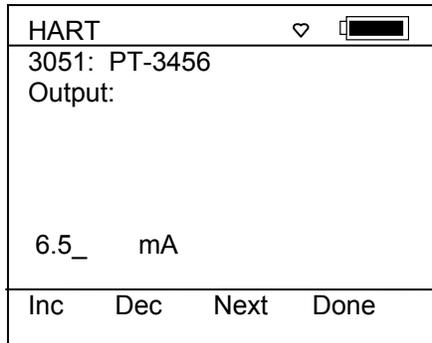
Numeric Only Entry Screen

MEASURE MODE

   After the YPC performs its power up diagnostics and displays the model number and sensor data, it defaults to the **Measure Mode**. The word *Measure* appears on the upper left of the display, confirming this mode is active. The soft key definitions in this mode are directed toward measurement and information functions.

Section 1.01   **Header-line Symbol Key** (see location at right)

♡   heart symbol indicates active HART communication

⬆   up arrow indicates SHIFT key is activated

D   "D" indicates Damp (exponential) function is activated

~   "~" indicates all damping is off

H   "H" indicates Hold (display freeze) function is activated

▯▬▬▬▬   battery symbol indicates YPC under battery power;
           filled portion indicates remaining battery life

⊐▭   electrical plug symbol indicates the AC adapter
           (P/N A36742) is connected and powering the YPC

BUS   BUSY text box replaces either power symbol when
           the microprocessor is busy executing requested tasks

```
┌──────────────────────────────────┐
│ Hart            ♡ ⬆ ▯▬▬▬▬         │
│ 3051: PT-19C                      │
│                                   │
└──────────────────────────────────┘
```
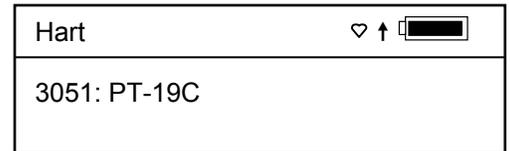
NOTE: Power icons may temporarily disappear during certain HART Communication operations

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DISPLAY SCREEN

The display screen displays measurements from the modules installed in sensor bays S1, S2, and S3 plus the voltage or current measured by the YPC base unit. Measurements are identified on the display by lines with "S1", "S2", and "S3" designators for sensor module bay locations and by "V/I" for voltage or current measurements. The measured values are shown with the corresponding unit of measure.

```
┌─────────────────────────────┐
│ Measure          ▐■■■■▌     │
│ S1:    0.00        inW20C   │
│                             │
│ S2:    0.0000      PSI      │
│                             │
│ S3:    0.00        inHg     │
│                             │
│ V/I:   0.000       mA       │
│ Zero   Mn/Mx   Damp   More  │
└─────────────────────────────┘
```

Measure Mode Main Screen

Measured values displayed here are subject to the YPC's Smart Damp system unless otherwise changed using the Damp Soft Key (see details in the section below). Smart Damp eliminates electronic circuit noise but does not slow the display of changes in measured signal. The result is a very stable but responsive digital display of measured values.

SOFT KEY MENU OPTIONS

On the bottom of the main menu screen in **Measure Mode** the following definitions are displayed just above the white soft keys. These definitions indicate the function of each soft key.

```
┌──────────────────────────────┐
│  Zero   Mn/Max  Damp    More  │
└──────────────────────────────┘
```

Zero

Zeros the installed sensor modules and integral mA/Volts meter. The LCD will display "Zero in Progress" as this function is carried out. Sensors should be zeroed prior to making measurements to provide an accurate zero reference. Make sure that no physical signal is applied to the YPC when performing this function. To prevent unintentional zero offset, a Zero command will be aborted if more than $\pm 5\%$ of full scale signal is being measured by any YPC sensor. Absolute pressure modules cannot be zeroed until the applied pressure is less than 5% of full scale. This prevents the accidental corruption of the absolute zero reference essential to absolute pressure module performance.

Mn/Max

The Mn/Max key allows the user to display the minimum and maximum measured value each sensor has measured since this function was activated. The min/max values are displayed below the normal pressure or V/mA reading. To reset the Mn/Max function, toggle the Mn/Max key once for off and again to restart.

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Damp

The YPCs default Measure Mode includes Smart Damp for the most stable yet responsive display of measured values. This can be changed to exponential Damp or completely removed using the **Damp** Soft Key.

Pressing the **Damp** soft key once from normal mode initiates an exponential averaging function over a user selectable time constant. This function smoothes the peaks and valleys of pulsating measurements for a more stable display. A "**D**" symbol appears in the top line of the LCD display when this feature is activated. ***To change the time setting for* Damp *refer to the YPC Configuration Settings section of this manual.***

Pressing the **Damp** soft key again will remove all forms of damping. This mode is indicated at the top of the LCD display by a "**~**" symbol.

More

This option takes the user to more soft key menu options. After pressing **More** from the menu options above, the following soft key options are made available:

Hold	Sensr	Rcal	More

Hold

Pressing the **Hold** button freezes the measurements on the display to allow convenient reading or transcription of data. An "**H**" symbol appears on the top of the LCD display when this feature is active. Pressing **Hold** again returns the YPC to normal **Measure Mode.**

Sensr

Pressing the **Sensr** key provides detailed information about the installed modules. The first screen provides information pertaining to the sensor in module bay 1, including the sensor model, serial number, and the date the unit was last calibrated.
Pressing **Next** consecutively scrolls through the remaining installed sensors, then the electrical inputs, and finally the YPC itself.

The YPC information provides the model number of the unit, the serial number, firmware revision, and the date the firmware was installed.

Pressing **Next** after scrolling through all available information returns the user to the **Measure Mode** screen.

Rcal

Pressing the **Rcal** key enters the YPC into the **Field Recalibration** mode. This allows the unit's sensors and modules to be recalibrated in the field to maintain optimal accuracy. ***See section on Field Recalibration for details.***

Pon	Poff	Vrng	More

Pon

Used to turn on the 24V dc supply feature of the VMA0055 module. See the VMA0055 manual in the Appendix for more information.

Poff

Used to turn off the 24V dc supply feature of the VMA0055 module.

Vrng

Used to select the V dc measurement range best suited to the application. See the VMA0055 manual in the Appendix for more information.

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YPC CONFIGURATION SETTINGS

Press the **Settings** key to review the preferences on the YPC for Users, Measurements, Applications, Lockouts, Clock/Timers and Other options. This will display the **Settings** menu. *Note: Not all options will be active on all YPC models.*

The **Settings** menu shows the current settings for the YPC and allows the user to make adjustments through the use of the soft keys:

```
Configuration          #  ▭▬
Current Settings
  Users
➡ Measurements
  Applications
  Lockouts
  Clock/Timers
  Other

Up    Down   Chng   Back
```

Settings Main Menu Screen

Users *(active only on 21CFR Part 11 capable YPCs)*
Displays the approved Users for Configuration changes and Calibrations – See the YPC 21CFR Part 11 User's Manual for more information.

Measurements
Allows user to set exponential Damp rate, display units for Sensor Bays 1, 2, and 3, plus the integral volts / current display.

```
Configuration             ▬▬
Current Settings:
➡ Damping:      Smart
  S1 Units:     inW20C
  S2 Units:     PSI
  S3 Units:     deg F
  S1 Units:     inW20C
  IV Units:     mA



Up   Down   Chng   Back
```

Measurements Menu Screen

Damping
Allows users to select between Smart Damp, exponential Damp or no damping at all. Smart Damp if the factory default mode and provides the most stable yet responsive display of measured values. This can be changed to exponential Damp to provide the user with control the averaging time constant or damping can be completely removed. Move the cursor to the **Damping** menu line of the Measurements Menu Screen and press the **Chng** Soft key scroll through the available options and select the desired damping.

Units
The Units menu line of the Measurements Menu Screen allows the user to scroll through and select the available units of any of the three Sx sensor module bays and the integral YPC volts/current meter. Move the cursor to the desired line and press the **Chng** Soft key to scroll through the available options.

Applications
Allows user to select special applications available on the YPC. Follow the on-screen prompts and directions to utilize these Applications.

EJA Accuracy
This program is designed to aid in the calibration of the Yokogawa EJA / EJX Pressure Transmitter series. The program will calculate the maximum error based on design accuracy of the EJA / EJX and the pressure module used when performing a calibration with the YPC.

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Get HART Data
If the EJA / EJX has HART Communications, the program will automatically read all necessary information needed to perform the calculations. If the EJA / EJX does not have HART Communications an "EJA not found" error will be displayed. Data can be input manually into the program for non-HART units.

EJA Model:
This data can be obtained automatically by selecting "Get HART Data" or manually input by selecting the **Chng** soft key.

Pres Unit:
The pressure units can be obtained automatically by selecting "Get HART Data" or manually input by selecting the **Chng** soft key.

Zero (LRV):
The Low Range Value can be obtained automatically by selecting "Get HART Data" or manually input by selecting the **Chng** soft key.

Span (HRV):
The High Range Value can be obtained automatically by selecting "Get HART Data" or manually input by selecting the **Chng** soft key.

Module:
Select the position of the pressure module (S1, S2, S3, or None) used for the calibration. If a module is selected then the accuracy of the pressure module is used to determine overall error. If "None" is selected then the design accuracy of the EJA / EJX is calculated. If no pressure module is installed, "n/a" is displayed and the design accuracy of the EJA / EJX is calculated.

Calculate
Calculates data and goes to the results screen. If a pressure module was selected, the message "Accuracy is dependent on the span of the pressure module used" is displayed for 3 seconds.

Accuracy %
This is the maximum error of the calibration of the EJA / EJX in % of span. If a pressure module was selected, then the accuracy of the pressure module is included in the calculation to determine overall error. If "None" is selected then the design accuracy of the EJA / EJX is used to calculate the overall error.

Accuracy mA
This is the maximum error of the calibration of the unit in mA. If a pressure module was selected then the accuracy of the pressure module is included in the calculation to determine overall error. If "None" is selected then the design accuracy of the EJA / EJX is used to calculate the overall error.

Min Span
Displays the minimum span of the EJA / EJX unit.

Max Span
Displays the maximum span of the EJA / EJX unit.

LRL
Displays the lower Range Limit of the EJA / EJX unit.

URL
Displays the upper Range Limit of the EJA / EJX unit.

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Lockouts

The YPC HART Communicator can be programmed to lock out all adjustable functions or only certain functions that a supervisor may wish to control. These are **Enabled** or **Disabled** individually on the **Lockout Details** screen shown at right. To access, select the **Cfg** soft key from the Configuration Main Screen, then the **Lockouts** option, and finally the **View Details** option. "Disable" on this screen means the particular menu function will not be locked out and "Enabled" means the particular menu function will be locked out once the Master Lockout is Enabled. Move the cursor to the desired line and use the **Chng** soft key to change the status of each line.

```
Configuration            ▬

Lockout Details
➡ All        :    Disabled
  Zero       :    Disabled
  Recal      :    Disabled
  Setting    :    Disabled
  Units      :    Disabled
  DOFs       :    Disabled
  Configs    :    Disabled
  Firmware   :    Disabled
  PV Prompt  :    Enabled

Up    Down   Chng    Back
```

Lockout Details Screen

> **All** - all YPC functions listed on Lockout Details screen
> **Zero** - zeroing of installed sensor modules and integral volts / current (see the "Zero" section of this manual for details)
> **Recal** - Rcal feature of YPC (see the "Rcal" section of this manual for details)
> **Settings** - clock, timers, battery type, PC comm mode
> **Units** - changing units of measure for sensor modules and integral volts / current meter
> **DOFs -** the ability to install new DOFs (YPC 4010 only)
> **Configs** - the ability to edit saved configurations in Offline mode (YPC 4010 only)
> **Firmware** - the ability to install new firmware
> **PV Prompt** - the ability to lock out the PV Prompt (see the "Saving Configurations for Multivariable HART Devices PV Prompt" section of this manual for more details) (YPC 4010 only)

Master Lockout

Once the Lockout Detail status (Disable or Enabled) is correct, select the **Back** soft key to arrive at the Current Settings screen shown at right. To activate the lockout features previously selected on the Lockout Details screen, move the cursor to the Lockout option line and press the **Chng** soft key. If there is an active Lockout code, then the display will prompt the user to enter the code. Use the **Inc**, **Dec**, **Next**, and **Store** soft keys to enter and store a 3-digit code. If no Lockout code is active, then using the **Chng** soft key to change the status to Enable will cause the unit to request a 3-digit lockout code of the user's choosing. Once the code is stored and power is cycled, all Lockout Details selected are locked out from use.

```
Configuration         # ▬
 Current Settings:
➡ Lockout:        Disable
  PV Prompt:      Disable
  View Details



Up    Down   Chng    Back
```

Master Lockout Enable / Disable

PV Prompt

PV Prompt option on this display allows the user to "Disable" the PV Prompt question for multivariable HART devices or to "Enable" the display of this question and its capabilities. The question reads:

"Multivariable device, allow PV changes? Yes / No"

See the "Saving Configurations for Multivariable HART Devices" section of this manual for more details.

Unlocking a YPC

To perform any changes to the YPC's settings when lockout is engaged the user will be prompted to input the lockout code prior to allowing any changes. Use the **Inc**rement, **Dec**rement and **Next** Soft Keys to input a lockout code value. When you are satisfied with the lockout code value, press **Store** to unlock the YPC.

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Changing the Lockout Code
To change the lockout code, disable the Master Lockout option on the Current Settings screen. You will be prompted for the old code before any change is made. Press the Chng soft key until Enable is displayed again and then press the Chng one more time. The unit will prompt for entry of a new 3-digit code. Press Store soft key and cycle power to complete.

Important note: All YPC units are shipped with the PV Prompt locked out with a lockout code of 3-2-1. See the "Saving Configurations for Multivariable HART Devices" section of this manual for more information on PV Prompt.

Important note: After the lockout code is entered, the user must cycle the power to activate the lockout mechanism! BE SURE TO SAVE THIS CODE IN A SAFE PLACE IN THE EVENT YOU FORGET THE NUMBER. ACCESS TO LOCKED-OUT FEATURES WILL BE DENIED WITHOUT THE PROPER CODE.

Important note: Check Lockout status after each YPC firmware update install session to ensure desired status has been maintained.

Clock/Timers
The Clock Edit option allows the user to correct the date and time of the YPC's internal clock. To select the **Clock Edit** feature, select the **Clock Edit** option and press **Chng**. Choose a clock or date option to adjust by selecting the desired menu line**.** Press **Chng** to choose that option. Enter the correct value using the numeric keypad and text edit key if needed. When complete, press **Done**. You will be asked if you wish to save the new data. Press **Yes** to accept the new value. Pressing **No** will take you back to the **Clock Edit** without making any changes to the YPC clock.

```
Configuration        # ▭
  Current Settings:
➡ Clock Edit
   Backlight:    1 min
   Off Timer:    1 min


Up    Down   Chng   Back
```

Lockout Enable / Disable

The Backlight Timer – not yet available

The Off Timer can be used to conserve battery life by setting the timer to shut off after a period of keypad inactivity. To change the Off Timer on the unit, select the **Off Timer** option and press **Chng** until the desired time period is displayed. The Off Timer can be disabled or set to shut off after time periods from 1 minute up to 2 hours.

NOTE: The Off Timer is disabled when the optional AC Adapter (P/N A36742) is powering the YPC.

NOTE: When replacing the batteries, the date and time will remain active. Date & time information is continuously powered by an internal, 10-year life back-up battery. This battery is not serviceable by the user.

Other
This menu option provides access to Model Information, Battery type setup and PC Comm Mode setup

The "Model Info" menu option gives all the information about the model. It shows the model name, serial number, firmware version, and date of last firmware update. It also displays information about number of DOFs installed, number of configuration stored, and percentage of free memory for each*.*

```
Configuration        # ▭
  Current Settings:
➡ Model Info
   Battery:  Alkaline
   Off Timer:    1 min


Up    Down   Chng   Back
```

Lockout Enable / Disable

The "Battery" menu option allows the user to set the battery type being used. Alkaline, NiMH and Lithium batteries all have different discharge curves. Selecting the correct battery type provides the most accurate battery gauge icon performance. To change the battery type, select the menu option line until the correct type is shown.

The "Enter PC Comm Mode"menu option could be needed for communication with a PC. When the YPC is connected to a PC for updates via MFx Installer (see MFx Installer section in this manual), a DB-9 serial cable is used. Occasionally a DB-9 Serial cable is encountered that does not have a DTR line. The DTR line is important to the update process because it is used to initiate and confirm communication between the two machines. If a DB-9 cable without a DTR line is used, the YPC must be manually placed in the **Enter PC Comm. Mode**. Go to the YPC Main display and select **YPC**. Scroll down to the **Enter PC Comm. Mode** menu option and press **Select**. Proceed with update and cycle YPC power when the update is complete. It is recommended to use fresh batteries or an AC adaptor during update procedures. This mode will automatically time-out after approx. 2 minutes of inactivity and return to the main display.
Pressing the **Back** soft key at this point will return to the previous screen. Pressing the **Back** soft key when in any of the **Settings** sub-menus will return to the previous screen *without* making any changes.

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GENERAL OPERATION

Sensor Installation/Removal

To install a new sensor module into a sensor bay, make sure the spring-loaded sensor lock is facing toward the rear of the YPC. Depress the sensor lock until the base of the sensor module passes into the sensor bay. Push module into bay until it locks into place.

Once installed, the YPC will immediately read the data from the sensor and load it into the system. The display will briefly show what sensor has been installed. The engineering units that were previously assigned to that sensor module will automatically be displayed. *Sensor modules may be installed in any sensor bay.*

To remove a sensor module from a sensor bay, depress the spring-loaded sensor lock corresponding to the module you wish to remove. The sensor lock needs to be depressed so that it clears the YPC housing. While pressing down on the sensor lock, simultaneously pull upward on the module. A pen or small screwdriver may be used to depress the sensor lock far enough to clear the housing.

Once a sensor module is removed from a bay, the display will clear that sensor's information from the display screen.

Note: Modules may be "hot swapped" or changed while the YPC is on or off.   For intrinsically safe versions, however, installation, removal or hot swapping must be done in a non-hazardous environment only. See Hazardous Area Use section for more details.

Sensor Module Locations

S1: Sensor Bay 1 (Left)
S2: Sensor Bay 2 (Center)
S3: Sensor Bay 3 (Right)

Pressure Ports
Low   High

Sensor Module

Sensor Lock

Module Interface
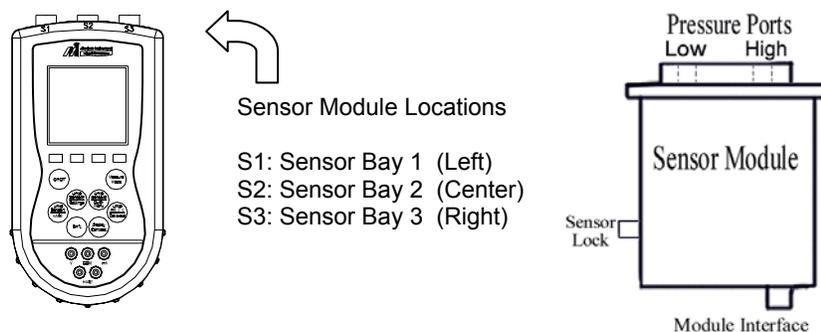
Changing Units / Removing & Restoring Sensors on Display
Specific sensors can be turned on and off individually if they are not required. To turn off a specific sensor, press the **Shift** key and select the corresponding **Units Sensor** key for the sensor you wish to remove from the display. Repeatedly pressing the **Units Sensor** key will cycle through the available engineering units. Before the unit cycle repeats, the sensor display will go blank. The sensor is now off. Press the **Shift** key again to return to normal operation.

To reactivate a sensor that has been removed from the display, press the **Shift** key then press the corresponding **Units Sensor** key. Continue to cycle through the engineering units by pressing the **Units Sensor** key until the desired unit appears on the display. Press the **Shift** key to accept the engineering unit and return to normal **Measure Mode.**

Note: Open sensor bays on the YPC should be filled with dummy modules (P/N A36741) to protect the electrical connector and avoid contamination of or damage to the sensor bays. Dummy modules are shipped as needed to fill YPC bays.

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Sensor Module Engineering Units

Pressure
PSI
Inches of Water @ 20° Celsius
Inches of Water @ 60º Fahrenheit
Inches of Water @   4º Celsius
Kilograms/cm^2
Kilopascals
MilliBars
Bars
Centimeters of Water @ 20º Celsius
Inches of Mercury (Referenced @ 0º C)
Millimeters of Mercury (Referenced @ 0º C)
oz/in^2

Temperature
º Fahrenheit
º Celsius
º Rankin
º Kelvin
Ohms
milli-Volts

Installation & Removal of Batteries – standard YPCs

To install or remove the batteries, turn the YPC face down and pull down on the loose end of the Velcro strap to separate it from the opposite side, then pull the strap through the lower metal strap guide. Use a finger to push down and pull back on the battery cover latch to remove the cover. Be sure to follow the polarity diagram shown on the bottom of the battery holders when installing the batteries. Make sure all batteries are firmly secured. Replace cover, reinsert strap through metal strap guide, and re-secure the Velcro.

Note: Replace all six (6) AA batteries at once with alkaline or NiMH cells. Do not mix alkaline or NiMH batteries with each other or with other battery types. Batteries replacement is recommended when battery icon shows one segment; however, the YPC will function briefly after the battery icon is empty.

Note: When replacing the batteries, the date and time will remain active. Date & time information is continuously powered by an internal, 10-year life back-up battery. This battery is not serviceable by the user.

Installation & Removal of Batteries – Intrinsically Safe YPCs

Intrinsically Safe rated YPCs have a battery compartment door fitted with two captive thumbscrews and a metallic bracket to mechanically secure the door to the YPC case. To install or remove batteries, follow the above instruction and unscrew the two thumbscrews to remove door. After battery maintenance is complete, replace door and tighten thumbscrews to re-secure.

Rear of Intrinsically Safe YPC shown

Thumbscrews / bracket
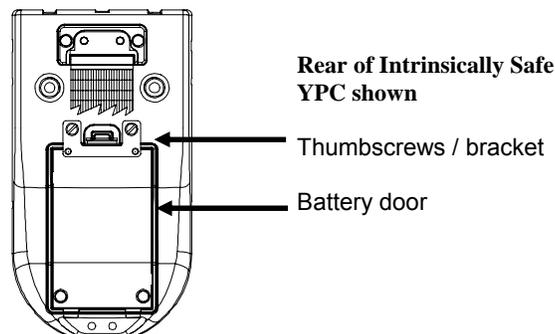
Battery door

Note: For Intrinsically Safe YPC models, replace batteries only with approved types. See the YPC Intrinsic Safety Control Document in the Appendix for approved battery details.

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Over Pressurization - Pressure Modules

If an YPC pressure sensor is over pressurized above its full scale pressure range, an "Overrange" warning appears on the LCD above the engineering units of the affected sensor. If the applied pressure exceeds 20% of the sensor's full scale range, the affected pressure measurement is replaced by an "Overrange" warning. If this occurs, immediately release the pressure until the YPC displays a normal reading. Although pressures are displayed up to 20% over full scale range, specified accuracy is guaranteed for full scale range only.

xGI (Gauge Isolated) and xAI (Absolute Isolated) Modules are capable of withstanding up to 2x the sensor range without sustaining damage.

xDN (Differential Non-Isolated) Modules are capable of withstanding up to 2x the sensor range when pressurized on *the high side only*. When pressure is applied to *both* the high and low side *simultaneously*, all xDN sensors have a 150 PSI pressure limit.

x is a place holder for the sensor module accuracy designator. *See information in the Appendix for additional sensor module information.*

Note: Subjecting pressure sensor modules to pressure limits beyond those listed above may damage the sensors and void the warranty.

Media Compatibility - Pressure Sensors

Gauge (xGI) and Absolute (xAI) pressure sensor modules are compatible with fluid and gas medias that are compatible with 316 stainless steel.

Differential (xDN) pressure sensors are for use with clean, dry, non-corrosive gases only.

APPLICATIONS

Gauge Pressure Calibration

The diagram below shows two typical set-ups for calibrating a gauge pressure unit under test. If the process is a liquid, it is vital that the gauge under test be isolated and drained. If liquid enters a xDN module, damage to the sensor can occur. To use a xDN sensor, connect the pressure source to the high pressure port of the xDN sensor. Vent the low pressure port to atmosphere.

When calibrating a gauge pressure unit using a xGI sensor, the connection is the same with the exception that the xGI sensor does not have an external vent to atmosphere.

In some cases the actual process may be used as the pressure source for calibration. If you choose to use the process to perform the calibration, make sure the process is compatible with the sensor used, and that it provides a stable pressure. If your process has a fluctuating or pulsating pressure, use of an external pressure source is recommended to ensure the accuracy of your measurements and calibration.

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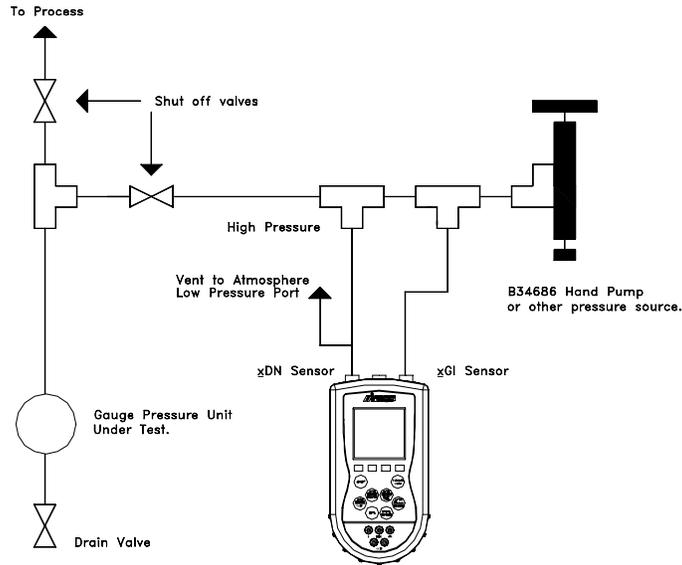
Calibration of Gauge Pressure Unit.

Differential Pressure Calibration

Differential pressure gauges and transmitters can be calibrated using xDN or xGI sensor modules. The following drawing depicts a typical calibration set-up. The units under test should be isolated from the process and drained of liquids if necessary. The low pressure port of the DP unit under test is vented to atmosphere. Do not connect the low pressure port of a xDN sensor to the low pressure port of the DP unit under test. Such a dead end connection can cause errors due to the expansion or contraction of trapped gas as a function of temperature change.

Yokogawa does not recommend using process pressure as the pressure source for DP pressure device calibration. Errors in measurement and calibration can easily creep in if the pressure source is unstable. In addition, xDN sensors have a maximum overpressure limit of 150 PSI when a three valve equalizing manifold is used properly. Sensor damage can occur if more than 15 PSI is applied to the high or low side of a xDN0020 or xDN0200 sensor through improper use of the equalizing manifold.
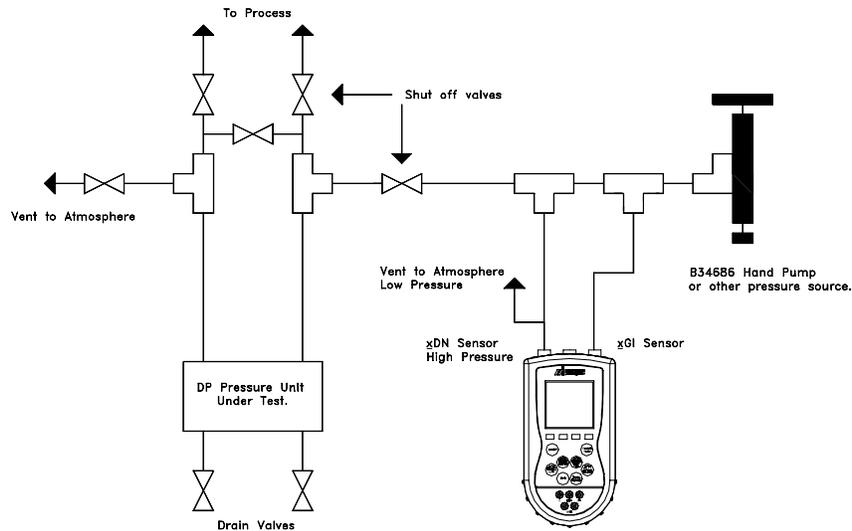
Differential Pressure Calibration

Additional DP Application Information

In addition to reading gauge pressures, the YPC can also be used to measure the pressure drop across a device in a pressurized pipe. Examples include measuring the differential pressure across positive displacement meters, filters, orifice plates or valves. Process compatibility and pressure ranges of the sensor modules need to be considered for each application.

A three valve equalizing manifold or push-to-read equalizing valve should be used to avoid damaging xDN sensors. Follow the specific operating procedure for each type of valve manifold.

3-Valve Manifold: Make sure all shut-off valves are closed. Connect to the process. Slowly open the equalizing valve. Slowly open the high pressure valve and then the low pressure valve. Close the equalizing valve and take the measurement.   Reverse the process to disconnect.

Push-to-read valve: Connect to the process. Open shut off valves. Push the push-to-read plunger to take the reading.

Measure Pressure Drop across a positive displacement meter.
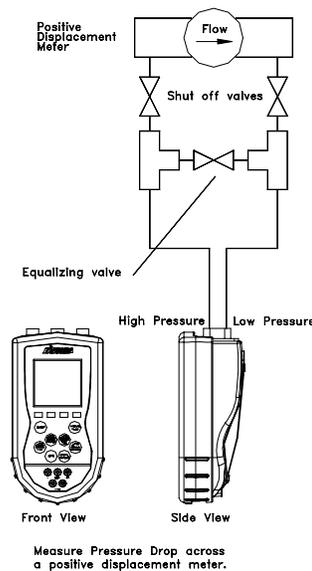
Vacuum and Absolute Pressure Calibration

Vacuum calibrations can be performed with a xDN sensor module by venting the high pressure connection to atmosphere and applying the vacuum to the low pressure connection. Atmospheric pressure is the reference pressure for all vacuum measurements.

Absolute pressure calibrations use a xAI sensor module. These sensor modules have an internal absolute zero reference. Simply connect the pressure (or vacuum) source to the single port on the module.

The following diagram shows the connection for both a vacuum and an absolute pressure measurement. If the process maintains a stable pressure, it can be used as the pressure source in some calibrations. Process compatibility and pressure ranges of the sensor modules need to be considered for each application.

To Process

Shut off valves

Low Pressure

Vent to Atmosphere
High Pressure

xDN Sensor   xAI Sensor

B34700 Hand Pump
or other vacuum source.

Absolute/Vacuum Unit
Under Test.

Drain Valve
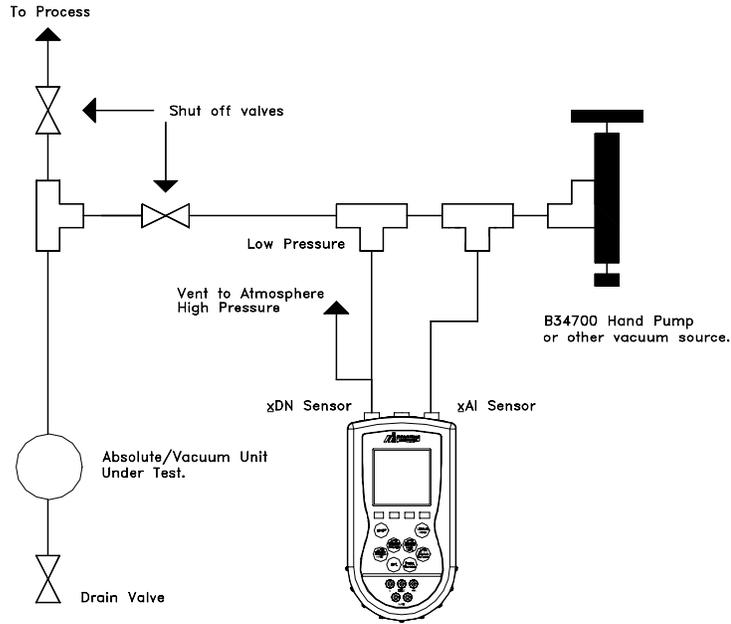
Absolute Pressure and Vacuum Calibration.

ELECTRICAL CONNECTIONS
See Hazardous Area Use Section of this manual for Intrinsically Safe guidelines / restrictions.

Milliamp Transmitter
The diagram below depicts the proper connection for measuring the current output from a transmitter. The YPC is connected in series with the loop using standard banana jacks.

Important: Use the transmitter's working terminals to measure mA, <u>not</u> the TEST terminals found on some transmitters. Do not use digital communication terminals found on smart transmitters. These terminals will give incorrect current reading.

Milliamp Transmitter

Loop
Power Supply

mAMPS
Com
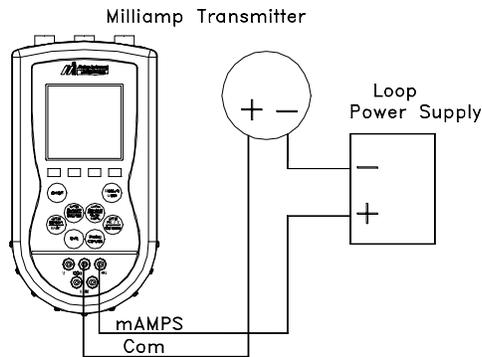
Voltage Transducer
The following diagram depicts the correct set-up for transducer calibrations.

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Voltage Transducer
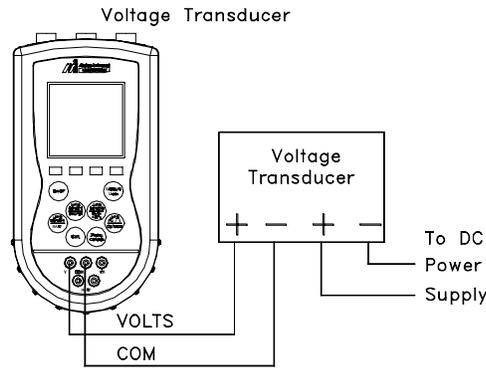
FIELD RECALIBRATION

The sensor modules and mA/V meter can be recalibrated in the field for zero, span, and linearity. The proper primary standards must be available prior to calibrating the YPC or modules. These standards should meet the accuracy requirements for your company or industry. Yokogawa Corporation of America follows the guidelines established by ANSI / NCSL Z540-1-1994 which requires that the primary standard be 4 times more accurate than the unit under test.

For sensors up to 200 PSI, Yokogawa recommends a ±0.0015% of reading deadweight tester for optimal accuracy. For sensors 200 PSI and above, a ±0.0030% of reading deadweight tester is recommended. If calibrating using inches of water units, be sure to match the reference temperature of water in both devices.

To enter **Field Recalibration** mode from the **Measure Mode** display, press the **More** soft key, then press the **Rcal** soft key. This will access the **Field Recal Setup** screen.

```
Field Recal
Field Recal Setup:
    Start
 ➡ Module:     1
    Units:        inW20C
    Points:       3
    Restore Defaults


Up    Down   Select    Back
```
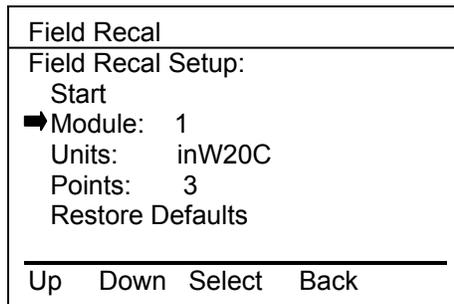
Field Recalibration Setup Screen

Module: Select to choose which sensor module (S1, S2, S3) or mA/V (I or V) meter to calibrate.

Units: Allows the user to choose the engineering units to calibrate in. Yokogawa recommends the calibration be performed in the default units of the subject sensor. For example: a xDN0200 sensor with a range of 0-200" of water referenced to 20º Celsius should be calibrated using a deadweight tester with the same units and temperature reference. Other engineering units or reference temperatures may be used but great care in units and temperature reference conversion must be used to achieve accurate calibration results.

Points: This option allows the user to select the number of calibration points desired. The example above would use 3 calibration points; 0%, 50%, and 100% of the full range of the sensor. The user may select 3, 5, or 9 point calibrations.

Start: Begins the recalibration process.

Restore Defaults: Restores factory calibraton coefficients for use

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Recalibration Set-Up Menu

Select the parameters desired and the sensor module to be calibrated using the options provided. Press the **Up** or **Down** soft keys to scroll to the desired parameter. Press the **Select** soft key to choose that parameter. A sub-menu opens showing the options for the selected parameter. Use the **Up** or **Down** soft keys to scroll to the desired option. Use the **Save** soft key to choose that option. The display will then return to the main recalibration set-up menu. If you choose not to make any changes to a selected parameter, the **Back** soft key returns the display to the main recalibration set-up menu without making any changes.

Repeat this procedure for each parameter that needs to be changed.

Procedure - Field Recalibration

Once all of the desired parameters and options have been set, scroll **Down** to **Start** on the main recalibration menu and press the **Select** soft key. This takes you into the recalibration display.

```
┌─────────────────────────────┐
│ Field Recal                 │
│ Cal Point:   0%             │
│   Apply:  0.00              │
│                             │
│   S1:     0.00    inW20C    │
│   Error:  0.000      %      │
│ Adj    Abort   Next    Back │
└─────────────────────────────┘
```

Sample Field Recalibration Screen (xDN Pressure Module

The recalibration screen shown above provides the following information:

Cal Point: This is the target calibration point expressed as a percentage of the sensor module full scale pressure.

The next line shows the sensor bay location or analog sensor being calibrated (S1, S2, S3, V, or mA). The pressure applied by the user is also shown in the engineering units previously selected.

Error: Is the percentage error between the applied calibration pressure and the recalibration target pressure for the recalibration point (Apply value). + and – indicates whether the error is above or below the recalibration target pressure (Apply value).

Apply: This is the recalibration target pressure the YPC assigns based on the number of calibration points set in the **recalibration set-up** menu.

Make sure your pressure source and calibration standard are properly connected to the sensor module under test. Connections must be leak free. The first recalibration target pressure is normally zero, so the first point should have all zeros. (As shown in example above—See section **Adj** for other options).
Adjust the pressure source until the pressure you are applying matches the **Apply** pressure & the **Error** percentage goes to zero.

If the error percentage is not zero, attempt to adjust the applied pressure until the unit reads zero. If zero error can't be achieved, a small error percentage within the accuracy of the unit under test or error within company accuracy guidelines may be acceptable.

When the error % is within acceptable limits, press the **Next** soft key. This moves the unit to the next calibration point. Repeat the procedure outlined above. When the final recalibration point is set, press **Next** to store the data.

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After completion of the calibration process for 3, 5, or 9 points, the YPC will inquire if the cal data should be saved. Select **Yes** to accept the recalibration data or **No** for other options.

If Yes was selected, the screen will verify the new calibration by displaying the date and module position number. Press the **OK** soft key. The YPC then returns to the **Measure Mode.**

Choosing **No** opens the **Cal Not Saved** screen with options:

```
Exit Cal
Restart Cal
Save Cal
```
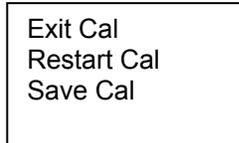
Exit Cal: Does not save any new calibration data and returns the user to the **Measure Mode.**

Restart Cal: Takes the user back to the **Recalibration set up** screen to begin a new recalibration procedure.

Save Cal: Gives the user a second opportunity to accept the recalibration data.

The user can verify sensor module or mA/V calibration status by pressing the **Sensr** soft key from the **Measure Mode** display. The calibration data will show the sensor ID information and the most recent calibration date.

Other Recalibration Keys and Functions

Adj: Used at the start of the recalibration cycle, this option allows the user to redefine the recalibration target points. For example: if the first calibration point is a value other than zero, press **Adj** and enter the desired target pressure using the Numeric Grid and soft keys. Press **Select** to go to the next digit. Once you are satisfied with the new target pressure press **Done**. The YPC will prompt the user to save this value. Pressing **Yes** will change the calibration pressure value for that point. Begin recalibration with the new point designated on the **Apply** line. Perform this adjustment on any calibration point you wish to customize.

Abort: Pressing the **Abort** key will immediately cancel all calibration value changes made to that point, retain the previous calibration, and return to the **Measure Mode.**

Next: Takes the user to the next calibration point.

Back: In this mode, **Back** aborts the calibration procedure and returns the user to the **recalibration set-up** screen. The previous calibration data is retained. It does not return the user to the previous screen in the calibration procedure.

DB-9 CONNECTION PORT

All YPC models are equipped with a standard DB-9 connection for RS-232C communications. The DB-9 provides the hardware interface to facilitate download / upload operations from a host PC. This connection port facilitates download of YPC firmware improvements, HART® Device Object Files (DOFs) and documenting operations. All YPC upgrades are available via the Yokogawa Corporation of America Download Site accessible from www.us.yokogawa.com/mi/ypcyhc.com. The YPC does not need to be returned to Yokogawa or for firmware updates for additional DOF loading.

Note: Do not use the DB-9 connection port in Hazardous Areas. Use in non-hazardous areas only. See Intrinsic Safety Control Document in the Appendix for more details on I. S. YPC units.

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HAZARDOUS AREA USE

The YPC 40X0 Series Calibrator / Communicator is available with Intrinsically Safe Certification from MET Laboratories. MET Laboratories is a Nationally Recognized Test Lab (NRTL). The Communicator is certified by MET Laboratories to comply with standards CSA C22.2 No.1010.1, CSA C22.2 No. 157-92, and UL913 Fifth Edition Rev 2/21/97 for Class I, Division I, Groups A, B, C, and D, T5 hazardous areas. Refer to the Intrinsically Safe Control Document shipped with each unit for more information. An uncontrolled copy of the I.S. Control Document is included in the Appendix of this User's Manual for reference only.

The following table identifies YPC model numbers and areas of acceptable use.

Model Number	Non-hazardous Area	Hazardous Area
YPC 4000-01-X-00-X-XX	√	NO
YPC 4000-01-X-01-X-XX	√	√
YPC 4010-01-X-00-X-XX	√	NO
YPC 4010-01-X-01-X-XX	√	√

Intrinsically Safe YPCs can be identified by model number (see table above or Appendix), by special Intrinsically Safe Certification label and by WARNING label affixed to the YPC case. See the label samples below.

WARNING label for Intrinsically Safe YPC Units
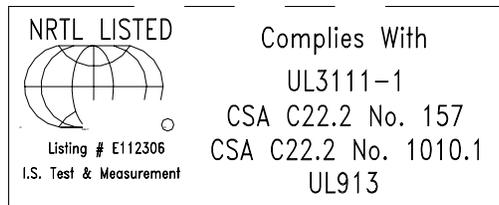
Intrinsically Safe Certification Label

Intrinsically Safe YPCs have special battery door hardware to prevent the accidental ejection of batteries. This hardware consists of threaded inserts in the YPC case plus a bracket and captive thumbscrews on the battery door. See the Installation and Removal of Batteries section of this manual for more details.

WARNING: Serious injury or death may result from explosions. Do not make connection to the DB – 9 connection port or to the AC adapter jack in a hazardous area

WARNING: Serious injury or death may result from explosions. Before making electrical connections to an Intrinsically Safe YPC at the V/Com/mA jacks or at the HART jacks, verify the instruments in the loop are installed in accordance with intrinsically safe field wiring practices.

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Note: Restrictions apply to the use of Intrinsically Safe YPC units in hazardous areas. Refer to the Intrinsically Safe Control Document in the Appendix for exact details. The manufacturer reserves the right to revise the Control Document without notice. Contact Yokogawa Corporation of America for the current Intrinsically Safe Control Document.

Note: Intrinsically Safe modules RTD1000, RIO4000, TIO0110 and VMA0055 require the use of electrical connections and leads. Any electrical connections made to Intrinsically Safe modules installed in an Intrinsically Safe YPC base unit must be made in non-hazardous areas only. Refer to the Intrinsically Safe Control Document in the Appendix for details.

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YPC 4000 SERIES
MODEL SPECIFIC FEATURES:
YPC 4000, YPC 4010

Previous sections of this manual have covered specifications and instructions that are common to all models of the YPC. The following sections address model specific instructions.

ELECTRICAL CONNECTIONS by YPC Model
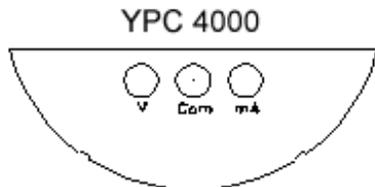
YPC 4000 Calibrator
Electrical connections are shrouded standard banana jacks (3/4" center) for ±50 mA/volts measurements.
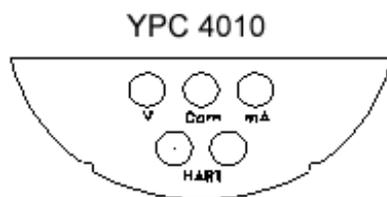
YPC 4010 Calibrator with HART®
Electrical connections are shrouded standard banana jacks (3/4" center) for ±50 mA/volts measurements. HART® loop connections are also standard banana jacks.

For Intrinsically Safe YPC models, consult the **Hazardous Area Use** *section of this manual for restrictions and special instructions for use and electrical connections.*

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CALIBRATE KEY – YPC 4000, 4010

Pressing the **Calibrate** key allows the user to set up the YPC to calibrate HART or non-HART devices. In YPCs that do not have the HART or Documentation options this key has no value. However, for YPCs with HART and / or Documentation the **Calibrate** key provides access to powerful calibration tools.

After pressing the **Calibrate** key the following screen will appear:

```
┌────────────────────────────────┐
│ Cal                            │
│ Cal: Pump 8                    │
│ ➡Begin Calibration             │
│  Output:  HART (mA)            │
│  Procedure:  Manual            │
│  Sensor    :   S1              │
│  Quick Cal                     │
│  Smart Trim                    │
│  View Results                  │
│  Clear Cal Memory              │
│                                │
│ Up    Down   Select    Back    │
└────────────────────────────────┘
```

Calibrate Key Main Menu Screen

Begin Calibration: Select to perform a calibration. (see **Documenting Calibration Results** for more information)

Output (Conventional / HART / Fieldbus transmitters or Local Indicator): This option allows the user to select between the calibration of a HART device, non-HART, or a Fieldbus (local indicator, Foundation Fieldbus, or Profibus) device. To select, make sure the selection arrow points to **Output** and press **Select.**

```
┌────────────────────────────────┐
│ Cal                            │
│ Output :      HART (mA)        │
│  ➡ Conv  (mA)                  │
│     Conv   (V)                 │
│     HART (mA)                  │
│     HART (PV)                  │
│     Fieldbus                   │
│                                │
│ Up    Down   Save   Back       │
└────────────────────────────────┘
```

Conv (mA): This option is used for a non-HART transmitter device. The output selected is 4 – 20mA for calibration
Conv (V):   This option is used for a non-HART transducer device. The output selected is 1 – 5V for calibration..
HART (mA): This option is used for a HART transmitter device. The output selected is 4 – 20 mA from the HART transmitter for calibration.
HART (PV): This option is used for a HART transmitter used in multi-drop or burst mode. The output selected is the HART PV signal for calibration.
Fieldbus: This option is used for local indicators or Fieldbus devices. Selecting Fieldbus makes keyed input available for entering the indicator reading or reading relayed from the control room into the YPC.

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Press the **Back** soft key if you choose not to make any changes. The YPC will then return to the **Calibrate** key main menu screen.

To calibrate a Fieldbus device (local indicator or Fieldbus device), set Output to **Fieldbus** and select **Begin Calibration.** The following screen will appear.

```
 Cal

 Manual Calibration

  S1 : 0.004     inW20C
  FB: 0.000      inW20C

  0 Points Saved


  Save             Entry   Done
```

where,
    S1 (sensor module bay 1): shows the input value applied to the device as measured by
                                sensor S1.
    FB (Fieldbus): shows output value from the device under test that was keyed in by the user.
                    This value is read from a local indicator or an external meter or relayed from
                     the control room.

To enter a value in the FB line, press the **Entry** Soft key to activate the keyed entry system.

```
 Cal

 Enter Xmitter Value


   15_.000


 Inc    Dec    Next    Done
```

        Use the **Inc** and **Dec** Soft keys to enter the first number of the value being input.
        Press the Next Soft key to move to the next place on the entry screen.
        Repeat until complete value is entered and press the **Done** Soft key.
        The user will be prompted, "Save New Data? Yes   No". Select Yes if correct.
        When satisfied with the value, press the **Save** key to save this calibration point and proceed to
        the next point.
        Continue until the calibration procedure is complete
        Press the **Done** key to complete the "As found" portion of the calibration.

Procedure: This option allows the user to select a Manual calibration (the user defines the procedure as he calibrates the device under test) or Stored calibration procedure (the procedure has previously been stored in the YPC memory for later use in the field). The Stored calibration option requires the YPC Documentation option and Device Management System from Yokogawa.

To select a calibration type, make sure the selection arrow points to **Procedure** and press **Select.** The following screen will appear:

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```
┌─────────────────────────────────┐
│  Cal                            │
├─────────────────────────────────┤
│                                 │
│   Procedure:    Manual          │
│  ➡Manual                        │
│   Stored                        │
│                                 │
├─────────────────────────────────┤
│  Up    Down   Save   Back       │
└─────────────────────────────────┘
```

Use the **Up** or **Down** soft key to scroll to the desired option and press **Save** to make the change.

If **Manual** procedure is selected, and **Begin Calibration** is pressed, the following screen will appear:

```
┌─────────────────────────────┐   ┌─────────────────────────────┐
│ Cal                         │   │ Cal                         │
├─────────────────────────────┤   ├─────────────────────────────┤
│ HART Calibration            │   │ HART Calibration            │
│ ➡ Begin calibration         │   │ ➡ Begin calibration         │
│   Cal type: Pressure        │   │   Output LRV: 4.000         │
│   Tag: Default              │   │   Output URV: 20.000        │
│   S/N: 00000                │   │   Units: mA                 │
│   LRV: 0.000 in H₂0c        │   │                             │
│   URV: 200.000 in H₂0c      │   │                             │
│   Units: in H₂0c            │   │                             │
│   X-fer from: Linear        │   │                             │
│   <More>                    │   │                             │
│                             │   │                             │
├─────────────────────────────┤   ├─────────────────────────────┤
│ Up   Down   Save   Back     │   │ Up   Down   Save   Back     │
└─────────────────────────────┘   └─────────────────────────────┘
```

Cal Type: This option allows the user to select the type of calibration from the following options:

```
┌─────────────────────────────┐
│ Cal                         │
├─────────────────────────────┤
│ Cal Type: Pressure          │
│ ➡ Pressure                  │
│   Switch                    │
│   T/C sim                   │
│   RTD sim                   │
│   T/C meas                  │
│   RTD meas                  │
│   VMA sim                   │
│   VMA meas                  │
│   Loop, 2 pt                │
│                             │
├─────────────────────────────┤
│ Up   Down   Save   Back     │
└─────────────────────────────┘
```

Pressure: is selected for pressure calibration.
Switch: is selected for switch test.
T/C Sim: is selected for T/C simulating mode.
RTD Sim: is selected for RTD simulating mode.
T/C Meas: is selected for T/C measurement mode.
RTD Meas: is selected for RTD measurement mode.
VMA Sim: is selected for VMA simulating mode.
VMA Meas: is selected for VMA measurement mode.
Loop, 2pt: is selected for loop check functionality.

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Loop: If **Loop** menu line from above screen is selected for **Cal Type**, the following selection display appears:

```
Cal
Cal Type: Loop, 2pt
➡ 4-20 mA, 2 pt
   4-12-20 mA, 3 pt
   4-8-12-16-20 mA, 5 pt
   4 mA, 1 pt
   20 mA, 1 pt
   Custom

Up    Down   Save   Back
```

This menu allows the user to choose a calibration procedure from a list of commonly checked loop output values or to input a custom loop calibration procedure. This function can be used with conventional or HART devices with current (mA) output. For conventional devices, the YPC's VMA0055 module is used on the loop to simulate a transmitter output to the loop. For HART devices, the YPC 4010 sends HART commands to "fix" the device's analog output to the selected values (regardless of process variable value). In either case, the user keys in the value of the loop received by the control room, or read by a receiving device, to document the loop performance. See the Loop Calibrations and Documentation section of this manual for more details.

Sensor: This option allows the user to select which YPC sensor to use to perform the calibration: None, S1, S2, or S3. To change the selected sensor, make sure the selection arrow points to **Sensor** and press the **Select** soft key. The following screen will be displayed:

```
Cal
Sensor:           S1
   None
➡ S1
   S2
   S3
Up    Down   Save   Back
```

Use the **Up** or **Down** soft key to scroll to the desired sensor module location and press **Save**. Selecting **None** will allow the user to perform calibration using the YPC's mA/V meter only.

Press the **Back** soft key if you choose not to make any changes. The YPC will then return to the **Calibrate key** main menu screen.

Quick Cal: The Quick Cal feature for YPC 401x models displays the PV and AO from the HART signal along with the corresponding values measured by the YPCs NIST traceable standards. The user can determine at a glance whether or not an analog trim or sensor trim is needed. Direct access to trim commands (see Smart Trim above) from this screen provides convenience and enhances productivity when trimming HART devices. Documenting versions of YPC 401x (YPC 4011 and YPC 4013) will also document the As found and As left calibration points of the device.

From **Measure Mode** screen, press the **Calibrate** key and move the selection arrow to **Quick Cal** menu option. Press the **Select** soft key. The following screen will appear:

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```
┌─────────────────────────────────┐
│ Quick Cal            ♡           │
│ ─────────────────────────────── │
│ Cal: Pump 8                      │
│ ➡ AO: 4.000 mA                   │
│   PV:  0.03  InH2O               │
│                                  │
│   V/I: 0.000 mA                  │
│   S1:  0.00 inW20C               │
│                                  │
│                                  │
│ ─────────────────────────────── │
│ Cal    Trim    Proc    Back      │
└─────────────────────────────────┘
```

Quick Cal Main Screen

Comparison of AO to the YPCs V/I measurement of loop current and of PV to the YPCs S1 measurement of applied pressure provides the user with unique and convenient way to determine what trim function(s) is needed to bring the HART device back into calibration. Pressing the **Trim** soft key takes the YPC to the **Smart Trim** main menu screen which typically includes trim options for 4 mA, 20 mA, Sensor Zero, Sensor Lower Trim and Sensor Upper Trim. These options can vary by HART device. For more information, see the section on **Smart Trim** section below**.**

Pressing the **Cal** soft key initiate's manual calibration documentation for YPC models YPC 4011 and YPC 4013. AO, PV, V/I and Sx information will be stored in memory after the user applies a pressure and presses a Save soft key. See the **Documentation** section of this manual for more information on manual calibrations.

Pressing the **Proc** soft key initiates a search for stored calibration procedures in YPC memory. Utilizing stored calibration procedures does require the Device Management System (DMS) software. Procedures can be designed for transmitter categories, assigned to device tag numbers and downloaded into YPC memory for use in field calibrations. The YPC documents the As found calibration results, facilitates analog and sensor trims, documents As left results and uploads data back to DMS. For more information on these YPC features see the Documentation section of this manual. For more information on DMS go to www.us.yokogawa.com/mi/ypcyhc.com or call us at (770) 254-0400.

Pressing the **Back** soft key will return the YPC to the **Measure Mode** screen. Refer to the **Calibrate** section for more information.

Smart Trim: The YPC 401x multi-function calibrator / HART communicator provides all measurement and communication features needed to trim / calibrate HART transmitters. No other handheld device is needed. **Smart Trim** enables this by providing direct access to the five common HART trim commands from one YPC screen.

To perform a trim on a HART transmitter, move the selection arrow in the **Calibrate** key main menu to **Smart Trim** and press **Select.**
The following screen will appear:

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```
Cal Menu
Cal: Pump 8
➡ 4mA Analog Trim
  20mA Analog Trim
  Zero Trim
  Lower Sensor Trim
  Upper Sensor Trim


Up    Down   Select   Back
```

Hart Smart Trim Screen

4 mA Analog Trim: YPC 401x executes 4 mA trim on HART device
For **4mA Trim** function, make sure the selection arrow points to **4 mA Analog Trim** and press **Select.**

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue (or press the **Abort** soft key to return to the Hart Smart Trim Screen). The following screen will appear:

```
Trim 4ma                    ♡
Cal: Pump 8
➡ AO: 4.000 mA

   YPC Analog Data
   V/I: 4.002 mA

        AO Fixed

Up    Down   Select   Back
```

4 mA Analog Trim Screen

This screen shows the analog output (AO) value being transmitted by the HART signal and the loop value measured by the YPC.

The "AO Fixed" message indicates that the device's output current has been fixed or set to 4 mA.

To perform a 4 mA Trim. Press the **Select** soft key. The screen will clear and report "Trim Successful". Press **OK**. Press **OK** again at the "Put Loop back online" notice. The YPC returns to the Hart Smart Trim Menu Screen. AO should now match the YPC's measured V/I value. Pressing **Back** will return the YPC to the **Calibrate** key main menu screen.

20 mA Analog Trim: YPC 401x executes 20 mA trim on HART device
To perform the 4mA Trim, make sure the selection arrow points to **20 mA Analog Trim** and press **Select.**

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue (or press the **Abort** soft key to return to the Hart Smart Trim Screen). The following screen will appear:

```
┌─────────────────────────────────┐
│ Trim 20 ma          ♡           │
├─────────────────────────────────┤
│ Cal: Pump 8                      │
│ ➡ AO: 20.000 mA                 │
│                                  │
│    YPC Analog Data               │
│   V/I: 20.002 mA                 │
│                                  │
│        AO Fixed                  │
│                                  │
├─────────────────────────────────┤
│ Up    Down  Select   Back        │
└─────────────────────────────────┘
```

20 mA Analog Trim Screen

This screen shows the analog output (AO) value being transmitted by the HART signal and the analog value measured by the YPC.

The "AO Fixed" message indicates that the device's output current has been fixed or set to 20 mA.

To perform a 20 mA Trim. Press the **Select** soft key. The screen will clear and report "Trim Successful". Press **OK**. Press **OK** again at the "Put Loop back online" notice. The YPC returns to the Hart Smart Trim Menu Screen. AO should now match the YPC's measured V/I value. Press the **Back** soft key to return to the **Calibrate** key main menu screen.

Zero Trim: YPC 401x executes Zero trim on HART device. Use the **Up** or **Down** soft key to move the selection arrow to **Zero Trim**, then press the **Select** soft key.

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue (or press the **Abort** soft key to return to the Hart Smart Trim Screen).

The YPC will now prompt: **Apply zero to Sensor**. Make sure that no pressure is applied to the HART device or YPC. Press the **OK** soft key to continue. The YPC will then prompt the user: **Wait until stable.**

This notice reminds the user to wait for all pressure to be vented before continuing. Press the **OK** soft key to continue.

```
┌─────────────────────────────────┐
│ Trim Zero           ♡           │
├─────────────────────────────────┤
│ Cal Setup:                       │
│ ➡ PV: 0.00 InH20                │
│                                  │
│   S1:  0.00 inW20C               │
│                                  │
├─────────────────────────────────┤
│ Up     Down  Select   Back       │
└─────────────────────────────────┘
```

Zero Trim Screen

PV displays the pressure being reported by the HART signal and S1 (or whichever sensor bay location is selected) displays the pressure being measured by the YPC's NIST traceable module.

When the S1 reads zero pressure, press the **Select** soft key. The sensor will automatically be trimmed, and the screen will display the prompt: **Put Loop back online**. This notice reminds the user to reconnect the device under test to the receiving device. Press the **OK** soft key to continue.

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Press the **Back** soft key to return to the **Hart Smart Trim Screen** main menu screen. Pressing **Back** again will return the YPC to the **Calibration** key main menu screen.

Lower Sensor Trim: YPC 401x executes Lower Sensor Trim on HART device
Use the **Up** or **Down** soft key to move the selection arrow to **Lower Sensor Trim**, then press the **Select** soft key.

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue (or press the **Abort** soft key to return to the Hart Smart Trim Screen).

The YPC will now prompt: **Apply Low Pressure**. Press the **OK** soft key to continue. The YPC will then prompt the user: **Wait until stable.** This notice reminds the user to wait for the pressure to stabilize before accepting a pressure value. Press the **OK** soft key to continue.
The following screen will appear

```
┌─────────────────────────────┐
│ Trim Lower        ♡         │
├─────────────────────────────┤
│ Cal Setup:                  │
│                             │
│ ➡ PV: 9.780 InH20           │
│                             │
│   YPC Lower Sensor          │
│   S1:  10.00 inW20C         │
│                             │
├─────────────────────────────┤
│ Up    Down  Select   Back   │
└─────────────────────────────┘
```

Lower Sensor Trim Screen

Apply a low pressure value to the HART device and allow it to stabilize. The actual value chosen for this low pressure point is at the operator's discretion. When the S1 sensor (or whichever sensor is selected) reads a steady low pressure value, press the **Select** soft key. The sensor will automatically be trimmed to match the YPC measured value, and the screen will display the prompt: **Remove Pressure**. This notice
reminds the user to release the pressure applied. Press **OK** to continue. The screen will now prompt: **Put Loop back online**. This notice reminds the user to reconnect the device under test to the receiving device. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Hart Smart Trim Screen** main menu screen. Pressing **Back** again will return the YPC to the **Calibration** key main menu screen.

Upper Sensor Trim: YPC 401x executes Upper Sensor Trim on HART device
Use the **Up** or **Down** soft key to move the selection arrow to **Upper Sensor Trim**, then press the **Select** soft key.

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue (or press the **Abort** soft key to return to the Hart Smart Trim Screen).

The YPC will now prompt: **Apply High Pressure**. Press the **OK** soft key to continue. The YPC will then prompt the user: **Wait until stable.** This notice reminds the user to wait for the pressure to stabilize before accepting a pressure value. Press the **OK** soft key to continue.
The following screen will appear:

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```
┌─────────────────────────────────┐
│ Trim Upper        ♡             │
│ Cal: Pump 8                     │
│ ➡ PV: 0.00 InH20                │
│                                 │
│    YPC Upper Sensor             │
│    S1:  0.00 inW20C             │
│                                 │
│                                 │
│ ─────────────────────────────── │
│ Up    Down   Select  Back       │
└─────────────────────────────────┘
```

Upper Sensor Trim Screen

Apply a high pressure value to the HART device and allow it to stabilize. The actual value chosen for this pressure point is at the operator's discretion. When the S1 sensor (or whichever sensor is selected) reads a steady high pressure value, press the **Trim** soft key. The sensor will automatically be trimmed to match the YPC measured value, and the screen will display the prompt: **Remove Pressure**. This notice reminds the user to release the pressure applied. Press **OK** to continue. The screen will now prompt: **Put Loop back online**. This notice reminds the user to reconnect the device under test to the receiving device. Press the **OK** soft key to continue.

Press the **Back** soft key to return to the **Hart Smart Trim Screen** main menu screen. Pressing **Back** again will return the YPC to the **Calibration** key main menu screen.

View Results: Available on YPC 40x1 and YPC 40x3 models, **View Results** allows users to View saved calibration results. Selecting this menu option provides the user with a summary of saved calibration files, soft key functions used for viewing the information, and a delete file function.

Use the **Up** or **Down** soft key to move the selection arrow to **View Results**, then press the **Select** soft key. The following screen will appear.

```
┌─────────────────────────────────┐
│ Cal       ♡                     │
│ Select Cal to view:             │
│    PT-102                        │
│ ➡ PT-307                        │
│    DPT-101                       │
│    DPT-106                       │
│    TT-621                        │
│ ─────────────────────────────── │
│ Up    Down   Select  Back       │
└─────────────────────────────────┘
```

Move the selection arrow to the tag number desired and press the Select soft key. Point one of the saved calibration is displayed as shown below.

```
┌─────────────────────────────┐
│ Cal                  ♡       │
├─────────────────────────────┤
│ Results:  PT-307            │
│  Single variable            │
│  As found                   │
│  Point 1 of 6               │
│  In:  0.090 inW20C          │
│  Out:  3.999 mA             │
│  Error:  -0.096 %           │
│  Pass                       │
│                             │
│                             │
├─────────────────────────────┤
│ Del    Done   Next   Back   │
└─────────────────────────────┘
```

View Calibration Results Screen

Use the **Del** soft key to delete the entire calibration record. *Note: This **Del** key only removes the record from viewing by the YPC; it does not clear memory space. Connect the YPC to DMS or PC utility (pending) and use the clear YPC calibration data function to clear memory.*
Use the **Done** soft key to end the Viewing session
Use the **Next** soft key to move to the next saved point for the active tag number
Use the **Back** soft key to go back to the prior screen

Clear Cal Memory: To clear all calibration procedure / result files, **Select** the **Clear Cal Memory** menu option under the YPCs **Calibrate** key (see the Calibrate Key section of this manual for more details). A delete confirmation screen is provided to prevent unintended clearing of all documentation files.

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DOCUMENTING CALIBRATION RESULTS

Overview
The YPC 4000 Series of multi-function calibrators are available with documentation capability. The Documentation option enables the YPC to work with manually created or DMS generated "stored" calibration procedures for use with specific field devices, save As found results, trim the device, save the As left results, view saved calibration results and upload saved results to the available Device Management System (DMS) software. YPCs with both Documentation and HART options (YPC 4010) also have the ability to save configurations to memory and upload those configurations to DMS to provide a complete history on the field device. For more information on DMS, please go to www.us.yokogawa.com/mi/ypcyhc.com or contact Yokogawa at (770) 254-0400.

The YPC 4000 and YPC 4010 with documenting enable the user to document both **Manual Procedure Calibrations** and **Stored Procedure Calibrations**. (See the Applications section of this manual for typical calibration connection diagrams). Typically, manual and stored procedures require an As found calibration check, trimming operations to correct an out-of-calibration condition, and an As Left calibration check. YPCs with the documentation option provide this functionality. The documenting models support keyed entry of unit under test output values that can be saved along with the corresponding YPC measured or simulated value. Keyed entry allows users to document calibrations of Local Indicators, Fieldbus devices, and current Loops as well.

Manual Calibrations are performed by varying the input signal (e.g. pressure for a pressure transmitter), allowing the input to stabilize, and saving the measurements made by the YPC to memory. Manual calibrations can be defined on the fly by the technician as the variable to the unit under test is applied or the YPC can be used in advance of the calibration to create a Manual Calibration Procedure in the field. If the device under test is a HART device, the AO and PV obtained via HART communication will also be saved. If the device is a Local Indicator or Fieldbus device, or if a current Loop is being calibrated, the user keys in the device output value so that it can be saved along with the YPC measured or simulated value. The number of calibration points saved per manual calibration is up to the user (maximum of 255 per device).

Stored Procedure Calibrations prompt the user for each input signal according to the predefined procedure stored in the YPC memory. Stored procedures are set up in the Device Management System software and assigned to device tag numbers there. The procedures are then downloaded to the YPC. Conventional and HART transmitters can both be supported by Stored procedures as can Local Indicators, Fieldbus devices, and Loop calibrations. When calibrations become due, the DMS operator downloads the list of tag or loop numbers and their associated procedures to the YPC. The technician then takes the YPC to the field, makes the needed connections to the device of interest, looks up the stored procedure for the UUT, and begins the calibration. The YPC guides the user through the complete procedure and electronically documents the results.

The dedicated YPC calibration data memory can save up to 100 calibration result files with up to 21 As found and 21 As Left points with header information including Tag, S/N, LRV, URV, date and time.

Entering Calibration Documentation Mode
Press the **Calibrate** key to setup the YPC to calibrate HART or conventional devices. The following screen will appear (see the Calibrate Key section in this manual for more details):

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```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ Cal: Pump 8                     │
│ ➡ Begin Calibration             │
│   Output: HART (AO)             │
│   Procedure:  Manual            │
│   Sensor    :  S1               │
│   Quick Cal                     │
│   Smart Trim                    │
│   View Results                  │
│   Clear Cal Memory              │
│                                 │
├─────────────────────────────────┤
│ Up    Down   Select    Back     │
└─────────────────────────────────┘
```

Calibrate Key Main Menu Screen

Begin Calibration: select to initiate a calibration documenting operation

Output: Select to set up the YPC for calibration of HART devices (current or PV for multidrop loops), conventional devices, local indicators, or Fieldbus devices.
The following screen will appear:

```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ Output     Conv (mA)            │
│ ➡ Conv  (mA)                    │
│   Conv  (V)                     │
│   HART (mA)                     │
│   HART (PV)                     │
│   Fieldbus                      │
│                                 │
├─────────────────────────────────┤
│ Up    Down   Save   Back        │
└─────────────────────────────────┘
```

Procedure: Select to set up the YPC for Manual Calibration or Stored Procedure Calibration. The following screen will appear:

```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ Procedure:     Manual           │
│ ➡ Manual                        │
│   Stored                        │
│                                 │
├─────────────────────────────────┤
│ Up    Down   Save   Back        │
└─────────────────────────────────┘
```

Sensor: This option allows the user to select which YPC sensor that will be used to perform the calibration: None, S1, S2, or S3. The following screen will be displayed:

```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ Sensor:        S1               │
│   None                          │
│ ➡ S1                            │
│   S2                            │
│   S3                            │
│ Up    Down   Save   Back        │
└─────────────────────────────────┘
```

Manual Calibrations and Documentation

To start a **Manual Calibration**, press the YPCs **Calibrate** key, set up the YPC for **Manual** Procedure using the Procedure, Output, and Sensor menu options described above, and then **Select** the **Begin Calibration** option. The following screen will appear:

```
┌────────────────────────────────┐   ┌────────────────────────────────┐
│ Cal                            │   │ Cal                            │
│  Cal: DEFAULT                  │   │  Non-Hart Cal                  │
│ ➡ Begin Calibration            │   │ ➡ Begin Calibration            │
│   Cal Type:  Pressure          │   │   Output LRV: 4.000            │
│   Tag:  DEFAULT                │   │   Output URV: 20.000           │
│                                │   │   Units:  mA                   │
│   SN:  00000                   │   │                                │
│   LRV:  0.000  inW20C          │   │                                │
│   URV:  0.000  inW20C          │   │                                │
│   Units:  inW20C               │   │                                │
│   Xfer Fn:  Linear             │   │                                │
│   <More>                       │   │                                │
│                                │   │                                │
│ Up    Down   Select   Back     │   │ Up    Down   Select   Back     │
└────────────────────────────────┘   └────────────────────────────────┘
```

Manual Calibration Input Screen   **Manual Calibration Input Screen**
Page 1 for all Device Types   **Page 2 for Conventional & Indicator**

Devices

When Manual Calibration is selected the above Cal screens are available. Users input the Device Tag, URV, and other information they want the YPC to store with the calibration data by moving the selection arrow Up or Down to the desired line and pressing Select. ***Be sure to specify the correct Cal Type for each calibration.*** This lets the YPC know which of its features will be of benefit during the calibration. The abbreviation PV above stands for Primary Variable of the device under test.

Select **Begin Calibration** to when satisfied with the information entered. The screen below will be displayed:

```
┌────────────────────────────────┐
│ Cal                            │
│ Manual Cal Proc                │
│ ➡  Manual Cal                  │
│    Create Procedure            │
│                                │
│                                │
│                                │
│                                │
│ Up    Down   Select   Back     │
└────────────────────────────────┘
```

Select **Manual Cal** to simply document the results of a calibration one point at time as the user applies the desired input variable. Select **Create Procedure** to design a manual calibration procedure in the field.

Manual Cal allows the user to apply calibration signals as proceed with the As found portion of a Manual Calibration. The following screen will appear:

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```
┌─────────────────────────┐   ┌─────────────────────────┐
│ Cal                     │   │ Cal                     │
│ Device:  DPT-1003       │   │ Device:  DPT-1003       │
│                         │   │   AO:  4.004 mA         │
│   S1:  0.00   inW20C    │   │   Pres:  0.07 inH2O     │
│   IV:  4.006 mA         │   │                         │
│                         │   │   IV:  3.991  mA        │
│                         │   │   S1:  -0.00  inH2O     │
│   0 Points Saved        │   │                         │
│                         │   │ 0 Points Saved          │
│ Save          Done      │   │ Save          Done      │
└─────────────────────────┘   └─────────────────────────┘
```

Manual Cal Screen for Conventional Devices   Manual Cal Screen for HART Devices

Apply the desired input signal to the YPC and device under test, wait for the value to stabilize and press the **Save** soft key to save the displayed data to memory. The YPC will provide "Saving Data Point…" feedback on the display, show "1 Points Saved," and prepare to accept the next point.

Apply the next desired input signal and press the **Save** soft key when satisfied with the input signal. Repeat as needed to complete the calibration. Press the **Done** soft key to end the As found portion of the calibration.

Create Procedure allows the user to apply calibration signals and proceed with the As found portion of a Manual Calibration. The following screen will appear:

```
┌─────────────────────────────┐
│ Cal                         │
│ Manual Cal Proc             │
│  ➡ Continue                 │
│     Show Points             │
│     LRV:   0.000  PSI       │
│     URV: 20.000   PSI       │
│     # upscale pts:    3     │
│     # dnscale pts:    3     │
│     Adj to Limit:     5.0   │
│                             │
│  Up    Down  Select   Back  │
└─────────────────────────────┘
```

Complete the information requested to help the YPC develop the cal procedure. The "Adj to Limit" entry controls how closely the applied calibration value must be to the target value as a % of the URV. Select the Continue menu option when satisfied. The following screen will be displayed:

```
┌─────────────────────────────┐
│ Quick Cal                   │
│ Manual Calibration          │
│   Apply  0.000  in W20C     │
│   AO:  4.004 mA             │
│   Pres:  0.07 inH2O         │
│                             │
│   IV:  3.991  mA            │
│   S1:  -0.00  inH2O         │
│                             │
│   0 Points of 6             │
│                             │
│  Save              Abrt     │
└─────────────────────────────┘
```

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Apply the requested input signal to the device under test, wait for the value to stabilize and press the **Save** soft key to save the displayed data to memory. The YPC will provide "Saving Data Point…" feedback on the display, show "1 Points Saved," and provide the next "Apply" value.

Apply the next desired input signal and press the **Save** soft key when satisfied with the input signal. Repeat as needed to complete the calibration procedure. The As found portion of the calibration documenting session will end automatically.

Once the As found portion of a Manual Cal or Manual Procedure Cal is complete, the following display will appear:

```
Cal
As Fnd: DPT-1003
    Save As Fnd to AsLft
    Trim
    As left
    View Results
    Quick Cal


Up    Down    Select    Abrt
```

```
Cal
As Fnd: DPT-1003
    Save As Fnd to AsLft
    Smart Trim
    As left
    View Results
    Quick Cal


Up    Down    Select    Abrt
```

Cal Options Screen for Conventional Devices **Cal Options Screen for HART Devices**

Cal Options for Conventional Devices:

Save As Fnd to AsLft – accepts the first set of saved cal data (As found) to be the As left data.

Trim – Reminds user to perform the trim adjustments for zero and span

As left – Reactivates the documentation feature to save As left data

View Results – Allows user to view saved calibration results from As found or As left work. Returns to Cal Options Screen after all points are reviewed or **Back** soft key is pressed

Quick Cal – displays measured input and device output values to allow user see the impact of trims performed. Press Done to escape back to Cal Options screen.

Cal Options for HART Devices:

Save As Fnd to AsLft – accepts the first set of saved cal data (As found) to be the As left data.

Smart Trim – Provides immediate access to HART analog and sensor trim options. See Smart Trim section of manual for more details.

As left – Reactivates the documentation feature to save As left data

View Results – View saved calibration results from As found or As left work. Returns to Cal Options Screen when finished

Quick Cal – displays HART PV and AO along with YPCs measured values for at a glance determination of needed trims. Direct access to the Smart Trim function through **Trim** soft key. See Quick Cal section of this manual for more details.

Select the As left option to proceed with the As left portion of a Manual Procedure Calibration.

Data saved to the YPC using the Manual Procedure Calibration can be uploaded to DMS software or other compatible FCINTF software programs. The Field Calibrator Interface (FCINTF) specification has been implemented as the YPCs interface for transmitting calibration data. Compatible asset management software programs should be able to

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receive and process YPC calibration data. *Note: HART configuration data saved by the YPC cannot be passed by FCINTF. This data can only be uploaded to DMS.*

To view previously stored calibration results, select the **View Results** menu option under the YPCs **Calibrate** key. See the C**alibrate Key** section of this manual for more information.

Stored Procedure Calibrations and Documentation

The Stored procedure option is only available when the YPC is used in conjunction with DMS software or other compatible FCINTF software programs. The Field Calibrator Interface (FCINTF) specification has been implemented as the YPCs Interface for receiving and transmitting calibration data. Compatible asset management software programs should be able to transmit assigned calibration procedures to documenting version of the YPC 4000. They should also be able to receive calibration results back from the YPC.

Stored procedures are developed and assigned to a tag number in the DMS software. Then they can be downloaded into YPC memory for later use in the field. The downloaded information includes tag number, LRV, URV, units, transfer function, serial number, calibration procedure, allowable test point error percentage, maximum allowable error percentage and adjust-to error percentage. All information is then available to the YPC user in the field for calibrate activities. See the DMS Instruction Manual for more details.

To start a **Stored Procedure Calibration**, press the YPCs **Calibrate** key, set up the YPC for **Stored** Procedure using the Procedure, HART, and Sensor menu options described above, and then **Select** the **Begin Calibration** option. The following screen will appear allowing the user to select the tag number of interest.

Cal	
Cal Setup:	
PT3051	1/3/03
PT11510	1/3/03
PT11512	1/3/03
DPT1001	1/3/03
➡ DPT1003	1/3/03
FT3004	1/3/03
Up Down Select Back	

Stored Procedure List by Tag Number

Arrow to and **Select** the desired tag number.

When the YPC has been set up for "HART – Yes" calibration, the YPC will poll the connected device and confirm the tag number match between the device and the stored procedure. If a tag number mismatch is detected, the YPC display will advise "Device mismatch, continue with this device?" Pressing the **No** soft key aborts the procedure. Pressing the **Yes** soft key enables the use of the stored procedure with the mismatched device tag and saves the calibration data under the connected device's tag number (this information is obtained over the HART connection).

Once a tag number match is confirmed, or the user directs the YPC to use the mismatched procedure, the following screen will appear.

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```
 Cal
┌─────────────────────────────┐
 Cal:  DPT1003
    Single Var Device
    Cal Type:  Pressure
    Device SN:  649201
    LRV:  0.000  inW20C
    URV:  200.00  inW20C
    Xfer Fn:  Linear
    Cal Points:  5
    Max Err:  0.25%



 OK              Back
└─────────────────────────────┘
```

Press the **OK** soft key to continue with **Stored Procedure Calibration** & documentation (or the **Back** soft key to return to the stored procedure list). The next screen provides Setup Instructions that may have been associated with the tag during setup in the DMS software. Typically these would be start up instructions for the technician using the YPC. Press the **OK** soft key to continue. The following screen will appear:

```
 Quick Cal
┌─────────────────────────────┐
 Device: PT-1003
    Apply  0.000  in W20C  ◄──────  Apply line prompts user to apply procedure-
    AO:  4.004 mA         ┐          defined input values.  Auto advances to next
    Pres:  0.07 inH2O     ┘ ◄──────  test value upon "Save" of current data.

    IV:  3.991  mA        ┐          Analog Output and Present Variable value
    S1:  -0.00  inH2O     ┘ ◄──────  from HART link with device under test
    X  Error  0.981  %      ◄──────  Analog output and input values as measured
    0 Points of 6           ◄──────  by NIST traceable YPC sensors
                                     % Error between HART and measured data
                                     Indicator for number of points saved out of
 Save              Abrt              total number of test procedure points
└─────────────────────────────┘
```

Stored Procedure Calibration Documentation Screen

Note the **Apply** value called for by the **Stored** procedure and input that signal with a source device. Monitor the **Sx** (S1 in the example above) to verify the correct input signal value and wait until stable. Press the **Save** soft key to save the displayed data to memory.

The YPC will provide "Saving Data Point…" feedback on the display, show "1 Points Saved," and prepare to accept the next point. If a message "Applied too high" or "Applied too low" is received, adjust the applied input signal as indicated by **Sx** to more closely agree with the **Apply** value shown. The YPC will not save a set of data if the **Sx** value varies from the **Apply** value by more than the percentage selected in the DMS software.

Apply the next input signal indicated by the **Apply** value and press the **Save** soft key when satisfied. Repeat as needed to complete the calibration. Press the **Done** soft key to end the As found portion of the calibration. The following display will appear:

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```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ As Fnd: DPT-1003      FAIL      │
│    Save As Fnd to AsLft         │
│    Smart Trim                   │
│    As left                      │
│    View Results                 │
│    Quick Cal                    │
│                                 │
│                                 │
├─────────────────────────────────┤
│ Up    Down   Select   Abrt      │
└─────────────────────────────────┘
```

Calibration Options Screen for Stored Procedures

Save As Fnd to AsLft – accept the first set of saved cal data (As found) to be the As left data. The **Pass** indicator on this screen indicates this option is acceptable. The **Fail** indicator lets the user know if trim operations and subsequent As left documentation are needed.

Quick Cal – displays HART PV and AO along with YPCs measured values for at-a- glance determination of trim needs. Direct access to the Smart Trim function (see below) is provided through the **Trim** soft key. See Quick Cal section of this manual for more details.

Smart Trim – Provides immediate access to HART analog and sensor trim options. See Smart Trim section of this manual for more details.

As left – Reactivates the Stored Procedure Documentation feature to save As left data

View Results – View saved calibration results from As found work. Returns to Cal Options Screen when finished

Select the **As left** calibration option from the **Cal Options Screen** to document the As left condition of the device under test (after trim operations are complete). The **Stored Procedure Calibration Documentation Screen** appears again to guide the user through the necessary procedure points as before. Press the **Save** soft key after the **Sx** value matches the **Apply value** and is stable. Repeat this process for each **Apply** value until all procedure test points are complete and the following screen appears.

```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ As left: DPT-1003      Pass     │
│    Enter Cal Note               │
│    Smart Trim                   │
│    View Results                 │
│                                 │
│                                 │
│                                 │
├─────────────────────────────────┤
│ Up    Down   Select  Done       │
└─────────────────────────────────┘
```

Store Procedure Ending Screen

Pass / Fail notice – Provides user with notification of the Pass / Fail status of the As left calibration documentation.

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Enter Cal Note – User may enter a calibration note into YPC memory for the procedure just completed; uses the YPCs alphanumeric entry features.

Smart Trim – Provides immediate access to HART analog and sensor trim options. These could be used if a Fail notice was received on this screen. See Smart Trim section of this manual for more details.

View Results – View saved calibration results from As left work. Returns to Cal Options Screen when finished

Press the **Done** soft key to end the Stored Procedure Calibration documentation session.

NOTE: Stored procedures downloaded to the YPC provide data allow allowing the YPC to evaluate if a calibration point is in or out of calibration. YPC tracks the **Pass** or **Fail** of each point in the procedure and marks the overall **As found** results and **As left** results as either **Pass** or **Fail** as appropriate. See the DMS Instruction Manual for more details on Pass / Fail and the tag data entered in DMS to support this feature.

The equation used to calculate the X Error displayed on the YPC Stored Procedure Calibration screens is shown below:

$$\text{Error} \; = \; \frac{AO_{meas} - AO_{calc}}{\text{Output Range}}$$

Where:
$$AO_{meas} \; = \; \frac{AO_{YPC} - 4}{16}$$

$$AO_{calc} \; = \; \frac{YPC_{meas} - LRV}{URV - LRV}$$

$$\text{Output Range} \; = \; 16$$

Loop Calibration and Documentation - Manual
This menu allows the user to choose a calibration procedure from a list of commonly checked loop output values or to input a custom loop calibration procedure. This function can be used with conventional or HART devices with current (mA) output. For conventional devices, the YPC's VMA0055 module is used on the loop to simulate a transmitter output to the loop. For HART devices, the YPC 4010 sends HART commands to "fix" the device's analog output to the selected values (regardless of process variable value). In either case, the user keys in the value of the loop received by the control room, or a read by a receiving device, to document the loop performance.

Enter the Loop Calibration function by pressing the **Calibrate Key** from the YPC's **Measure Mode** and then set up the Output, Procedure, and Sensor menu options as described in the **Calibrate Key** section of this manual.

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```
Cal
Cal: PT-11008
➡ Begin Calibration
   Output: HART (mA)
   Procedure:  Manual
   Sensor    :  S1
   Quick Cal
   Smart Trim
   View Results
   Clear Cal Memory


Up    Down    Select    Back
```

Calibrate Key Main Menu Screen

When satisfied, **Select** the **Begin Calibration** menu option. On the resulting screen, shown at left below, **Select** the **Cal Type** menu option and then the **Loop** menu option from the General Cal Type Selection Screen. This will access the Loop Cal Type Selection Screen shown at right below. Use this screen to select to select the desired loop test procedure.

```
Cal
 Hart Calibration
  Begin Calibration
➡Cal Type:  Pressure
  Tag:  PT-11008

  SN:  2878023
  LRV:  0.000 psi
  URV:  20.000 psi
  Units:  psi
  Xfer Fn:  Linear


Up   Down   Select   Back
```

Begin Calibration Setup Screen

```
Cal
 Cal Type: Pressure
   Pressure
   Switch
   T/C sim
   RTD sim
   T/C meas
   RTD meas
   VMA sim
   VMA meas
➡  Loop, 2 pt


Up   Down   Save   Back
```

General Cal Type Selection Screen

```
Cal
 Cal Type: Loop, 2pt
➡4-20 mA, 2 pt
   4-12-20 mA, 3 pt
   4-8-12-16-20 mA, 5 pt
   4 mA, 1 pt
   20 mA, 1 pt
   Custom




Up   Down   Save   Back
```

Loop Cal Type Selection Screen

Move the cursor to the desired Loop Cal Type procedure and press the **Save** soft key. The YPC display returns to the Begin Calibration Setup Screen with the new Cal Type as shown below.

```
Cal
 Hart Calibration
  Begin Calibration
➡Cal Type:  Loop, 2pt
  Tag:  PT-11008

  SN:  2878023
  LRV:  4.000 mA
  URV:  20.000 mA
  Loop ID:  Default




Up    Down    Select    Back
```

Begin Calibration Setup Screen

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Enter the Loop ID by moving cursor down to the corresponding menu option and pressing **Select**. Use the alphanumeric entry system of the YPC to enter the proper tag and press the **Done** soft key. Answer Yes to save the loop tag, confirm the information on Begin Calibration Setup Screen is correct, and then **Select** the **Begin Calibration** menu line when satisfied. The following selection screen will appear:

```
┌─────────────────────────────────┐
│ Cal                             │
│ Manual Cal Proc                 │
│  ➡  Manual Cal                  │
│      Create Procedure           │
│                                 │
│                                 │
│                                 │
│                                 │
├─────────────────────────────────┤
│  Up   Down  Select  Back        │
└─────────────────────────────────┘
```

Select the **Manual Cal** menu option to launch the Loop Calibration Screen shown at left below. Select the **Create Procedure** menu option to enter the Custom Loop Procedure Setup Screen shown at right below. Once this setup is complete, selecting the **Continue** menu option will launch the Loop Calibration Screen.

```
┌─────────────────────────────────┐     ┌─────────────────────────────────┐
│ Cal                             │     │ Cal                             │
│ Loop Test                       │     │ Manual Cal Proc                 │
│  ➡  Set:        4.000 mA        │     │  ➡  Continue                    │
│      Entered:   4.000 mA        │     │      Show Points                │
│      Error:     0.000 %         │     │      LRV:   0.000  PSI          │
│                                 │     │      URV:  20.000   PSI         │
│      1 points of 2              │     │      # upscale pts:    3         │
│                                 │     │      # dnscale pts:    3         │
│                                 │     │      Adj to Limit:    5.0        │
├─────────────────────────────────┤     ├─────────────────────────────────┤
│  Save           Entry  Abrt     │     │  Up    Down  Select  Back       │
└─────────────────────────────────┘     └─────────────────────────────────┘
```

Loop Calibration Screen

Custom Loop Procedure Setup Screen

For conventional devices on a loop to be tested, remove the device from the loop and replace it with the VMA0055 module connections for transmitter simulation (see the VMA0055 Manual section in the appendix of this manual). The YPC with VMA0055 module will automatically modulate the loop current to the **Set** value displayed on the Loop Calibration screen (4.000 mA in the example at left above).

For HART devices on a loop to be tested, the YPC 4010's HART connections are made to the device on the loop. The YPC then sends the HART commands necessary to fix the device's analog output at the **Set** value (4.000 mA in the example at left above).

At this point, the user determines the loop current received at the control room, or the value read at the receiving device involved, and enters the value into the YPC by selecting the **Entry** soft key. The YPC's numeric entry system is used to enter the value. Press the **Done** soft key when satisfied with the entered value and answer **Yes** to save the new data. The Error percentage between the Entered value and the Set value will be displayed for the user's reference. Finish documenting the loop cal point by pressing the **Save** soft key. The screen will update as shown below for a 2 point loop test:

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```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ Loop Test                       │
│ ➡ Set:        20.000 mA        │
│   Entered:    20.000 mA        │
│   Error:      0.000 %          │
│                                 │
│                                 │
│    2 points of 2                │
├─────────────────────────────────┤
│ Save              Entry   Abrt  │
└─────────────────────────────────┘
```

Once the As found loop calibration test procedure is completed, the screen will change to the intermediate screen shown below. At this point, the user performs any necessary adjustments to the transmitter or troubleshoots the loop to correct errors. Once complete, select the As Left menu option to complete the As Left portion of the loop calibration.

```
┌─────────────────────────────────┐
│ Cal                             │
├─────────────────────────────────┤
│ As found                        │
│ ➡  Save AsFnd to AsLft         │
│    Smart Trim                   │
│    As Left                      │
│    View Results                 │
│    Quick Cal                    │
│                                 │
│                                 │
├─────────────────────────────────┤
│ Up     Down    Select  Abrt     │
└─────────────────────────────────┘
```

When the As Left loop calibration procedure is completed, the calibration record is saved in YPC memory under the Loop Tag previously entered. This data can be viewed at any time by selecting the **View Results** menu option under the **Calibration Key**.

Loop Calibration and Documentation - Stored

Loop calibration procedure setup features similar to those described in the Loop Calibrations and Documentation section above are available in the Device Management System. This allows the user to define loop calibrations and assign calibration procedures to specific loop tag numbers in the DMS database. DMS tracks calibration schedules and alerts the user when loop calibrations are coming due. DMS will download loop calibration procedures to a documenting YPC for use in the field. For conventional devices, the VMA0055 module is used to simulate a transmitter on the loop to be tested. For HART devices, the YPC 4010 sends the HART commands needed to fix the device output to the procedure value. Once the loop calibration has been completed, the results can be uploaded to DMS where they are stored by their loop tag numbers for review and future reference.

Many of the YPC screens shown in the Loop Calibration and Documentation – Manual section above are reused in the Stored procedure method.

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Deleting Files and Clearing Documentation Memory

Deleting Documentation Files
Individual calibration procedure / result files can be deleted from the YPC using the **Del** soft key found on the View Calibration Results Screen. This screen is accessed by pressing the YPCs **Calibrate** key (see the Calibrate Key section of this manual for more details). The **Del** key removes the record from the display ("Deleted" shown instead) but it does not clear the memory space.

Clearing Documentation Memory
To clear all calibration procedure / result files, **Select** the **Clear Cal Memory** menu option under the YPCs **Calibrate** key (see the Calibrate Key section of this manual for more details). A delete confirmation screen is provided to prevent unintended clearing of all documentation files.

An alternate way to clear documentation memory is to connect the YPC to DMS and use the Clear YPC Calibration Data function. See the DMS Instruction Manual for more details.

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YPC 4010 with HART® Communications

Overview

The YPC 4010 includes HART communication functions that allow the user to poll, configure and maintain supported HART field device. The YPC 4010 uses a combination of Universal, Common Practice and Device Specific commands to facilitate communication with a field device. Combining HART ability with the modular calibrator means that technicians can use one device to perform device analog output trim adjustments (4 and 20 mA), trim the sensor, re-configure the field device, or poll a device for basic information.

The YPC 4010 will communicate with any HART device through Universal and Common Practice Commands using the standard Generic DOF (Device Object File) but must have the DOF for a specific HART device installed before it can execute Device Specific Commands. Consult the list of available DOFs at www.us.yokogawa.com/mi/ypcyhc.com for an up to date list of HART devices. The list is found under "DOF Downloads" button on the home page.

HART COMMANDS

Three HART command types are used by the YPC 4010 to communicate with HART field devices. First, *Universal Commands* are primarily used to identify a field device by its model number and tag number and to read process data from the device. This communication is often referred to as "polling". The YPC 4010 can poll any Hart Device. Second, *Common Practice Commands* are used for calibration and maintenance
functions that are common to many devices. An example of this would be to trim or adjust the analog output. Third, *Device Specific Commands* are used to handle functions that are unique to a particular device or manufacturer. Examples of these commands include sensor zero, sensor trim, calibration curve characterization, density inputs required for calculations made by the HART device or other configuration functions unique to the specific device.

HART CONNECTIONS

HART connections are made using the two standard banana jacks (3/4" center) located at the bottom of the YPC 4010. Refer to the following diagram. Polarity is not a concern for HART connections so both jack collars are black. Yokogawa supplies a test lead kit (P/N A36744) complete with standard connector for each model YPC 4010.
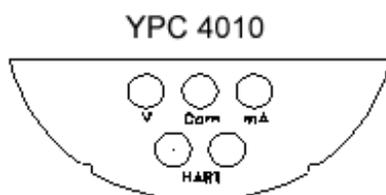
YPC 4010 with HART®
Electrical connections are shrouded standard banana jacks (3/4" center) for   50 mA/volts measurements.   HART® loop connections are also standard banana jacks. Since HART is polarity independent, the HART jacks both have black collars.

For low load loops (less than 250 ohm), a 250 ohm resistor will need to be added to insure reliable HART communications. Yokogawa supplies a 250 ohm load resistor in the form of a standard adaptor (P/N A36821). Refer to the following diagram for details on connecting the adapter. This method requires the loop be opened in order to make the necessary connections.

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Hart Device

Loop
Power Supply

250 ohm
Load Resistor
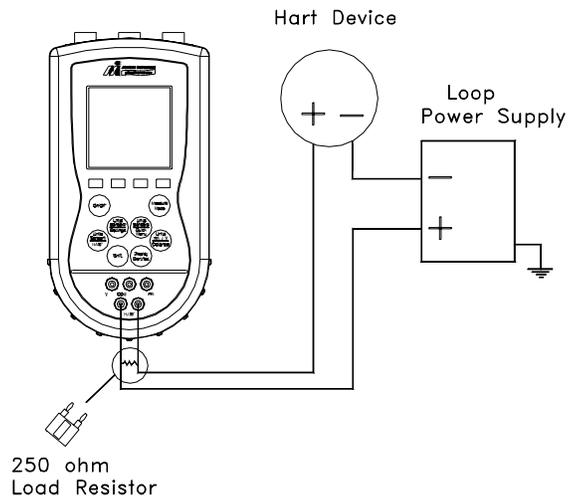
When connecting the YPC 4010 to a loop with a resistive load greater than 250 ohms, the HART jacks may be connected across the loop + and – or to the HART device terminals. Refer to the following diagram for connecting across the loop + and -. Notice the 250 ohm adapter is not needed here.

Hart Device

$R_L \geq 250$ ohms

Loop
Power Supply

214.0

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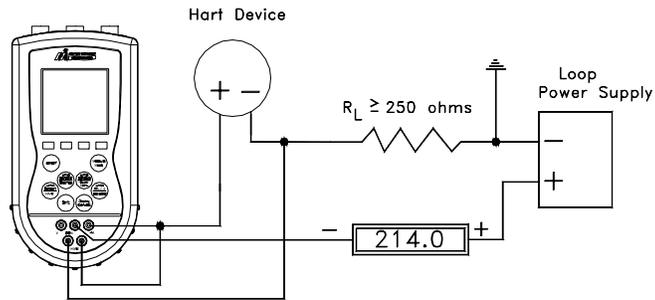
HART® COMMUNICATIONS

Pressing the YPC's **HART** dual-function key initiates the HART communication mode. The YPC automatically searches for a HART device at address 0. The ♡ symbol will appear on the top display line as the YPC searches and "Polling" appears on line two to indicate activity in progress.

Hart ♡
Polling…

When Polling is complete, there are two possibilities; 1) a HART device is found and the YPC launches into **Hart Device Online** communications mode (see details in **Hart Device Online Screen** section) or 2) no HART device is found.

No Device Found Notification

If no device is found, the YPC will display the message: **"No device found at address 0, perform multidrop poll?"** This indicates that no HART device was located at the default address 0. Press the **Yes** soft key to perform a **Multidrop Polling** of all remaining available addresses (1 – 15). Press the **No** soft key to work in the **Hart Offline** mode. See the **Hart Offline Mode** section below for details on this useful offline configuration tool.

Communications Trouble Shooting

If a HART device is connected to the YPC but the "No device found" notification is received, the **Multidrop Polling** option should be selected to determine if the device has a non-zero address. If the "No device found" notification is received again, then the loop connections to the YPC should be checked.

Make sure all connections are correct and secure. Check for shorts, open circuits and multiple grounds.

Determine if the loop resistance is greater than 250Ω and less than 1100 ohms (HART specification). If less than 250Ω then use the supplied 250Ω load resistor in series with the loop (see diagram above) or add resistance to the loop. Some HART devices specify loop load less than 600Ω. In these instances determine if loop resistance is between 250Ω and 600Ω.

Multidrop Polling

When multidrop polling is selected the YPC will search for the remaining 15 address locations (address 0 is checked initially, then 1, 2, 3…15). Each address poll requires up to 4 seconds to complete.

If you wish to discontinue the multidrop polling process, press either the **Stop** or **Abort** soft key options and the YPC will enter the **Hart Offline** screen.

When the YPC locates multiple devices on the loop, their addresses will be displayed on the screen. Mark the address of interest by scrolling **Up** or **Down** through the list. Press the **Select** soft key to choose the indicated address. The YPC will then enter the **Hart Device Online** screen.

Cloning HART devices

Cloning an existing HART device configuration can be very useful for configuring other devices of the same type. The MFC provides two options suitable for cloning.

Copy configuration and send to new device
Connect to the HART device of interest and select the **Save** option to save a copy of the configuration. Connect to the new device of same manufacturer and model and select the

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Send option. The screen will show all saved configurations by tag number. Move the cursor to the desired configuration and press the **Select** soft key. Verify the configuration is the one desired by reviewing the displayed details. When satisfied press the **Select** soft key to send this configuration to the connected device. Now use normal HART communication menus to replace the old tag number sent with the new tag number and to correct any other parameter(s) as necessary.

Make a copy of a previously saved device configuration
Go to the Communicator Main display and select the Offline Menu. Select **List Edit Configs** to view the list of stored configurations, move cursor to desired configuration and press the **Select** soft key. Verify the configuration is the one desired by reviewing the displayed details. When satisfied, press the **Copy** soft key. A complete configuration copy (all variables) will be made and a prompt to "Enter New Tag name" will be displayed. Enter the new tag number here to name the new configuration file. Immediately press the **Select** soft key and edit the Tag parameter to the desired tag number and any of the other parameters necessary. Select the Back soft key to complete the operation. The cloned configuration is now ready to send to the new device.

Saving Configurations for Multivariable HART Devices:

Multivariable HART devices permit the user to select one Primary Variable (PV) from its device variables list and assign the analog output to the selected PV. These device variables may be measured or calculated by the device (e.g. mass flow, density, temperature, viscosity, etc… for a coriolis mass flow meter). For some users saving only the PV's HART parameters may be satisfactory. However, it may be useful in multivariable applications to save the parameters of the secondary, tertiary, and other variables in addition to the PV parameters. The YPC allows the user to save only the PV parameters or to save the parameters of all variables by sequentially changing each variable to PV and saving the respective parameter sets. This is accomplished with the **PV Prompt** setting which can be found under the **Cfg** soft key on the Current Settings screen's Lockout menu option. Enabling this prompt causes the YPC to display the following question when a HART multivariable device is detected.

"**Multi variable device, allow PV changes? Yes / No**"

YPC units are shipped from the factory with the **PV Prompt** setting defaulted to **disable** and locked out with the factory lockout code of "**321**". With the default set to **disable**, the YPC will only save the PV parameters for the current PV assignment of the multivariable device. To enable all multivariable device parameters to be saved to the YPC during a Save command, simply unlock the YPC settings (see the procedure in the "YPC Configurations Settings" section earlier in this manual) and reset **PV prompt** to **Enable**. This setting will cause the YPC to first save the PV parameters for the current PV assignment. The user will them be prompted to allow the YPC to change the PV assignments to perform a save of the next variable. The YPC continues in this manner until all variable parameters have been saved; then the YPC resets the PV to the original variable assignment.

More Status Message

HART device events (diagnostic flags) cause the YPC 401x to display a "More Status Message" at the bottom of the display. This message is a notice to the user that one or more diagnostic warnings are available in the Review Status menu option of the connected device. Upon receipt of this message, enter the **HART** mode and select Detailed Setup / Diagnostics – Service / Test – Status / View Status to retrieve the diagnostic information.

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HART OFFLINE MODE

If communications with a HART device are not established, and **Multidrop Polling** was declined, stopped, or aborted, the following screen will appear:

```
┌─────────────────────────────────┐
│ Hart Offline                    │
├─────────────────────────────────┤
│ Utilities:                      │
│ ➡ List/Show DOFs                │
│   List/Edit Configs             │
│   Create Configs                │
│   Delete All Configs            │
│                                 │
│   DOFs Installed:  204          │
│   Configs Stored:  12           │
│                                 │
├─────────────────────────────────┤
│ Back    Up    Down    Select    │
└─────────────────────────────────┘
```

Hart Offline Main Menu Screen

List / Show DOFs:

Provides a list of installed DOFs (Device Object Files) used by the YPC to communicate with HART devices. Lists can be view by Manufacturer, by Device Name or by stepping through all Devices one at a time. Use the soft key controls to move through the list. Pressing the SHIFT key changes soft key definitions **Down** and **Up** to **PgUp** and **PgDn.** To quickly advance to the next page of a list, press **SHIFT** and then the **PgDn** soft key. To retreat to the prior page, press **SHIFT** and then **PgUp**. Once engaged, the **PgUp** and **PgDn** soft keys remain active until the **Up** or **Down** soft keys or **SHIFT** is pressed again.

List / Edit Configs:

Lists all stored HART configurations by Tag Number. Once a desired tag is located with the cursor, pressing the **Select** soft key displays header information to help the user confirm the identity and origin of the configuration. Pressing **Select** again opens the configuration for review and editing as needed. Any configuration in the list can be sent to another HART device of the same manufacture and model number. This feature enables fast commissioning of replacement devices, cloning of existing systems, or re-configuring for changes in process conditions or batch runs.

```
┌─────────────────────────────────┐
│ Offline              ▭▭▭         │
│ List/Edit Configs               │
│ ➡ PT-105A                       │
│   PT-105B                       │
│   DPT-201C                      │
│   TT-312 A                      │
│   TT-312 A                      │
│   FE-201                        │
│   FE-201                        │
│   PT-6174                       │
│                                 │
├─────────────────────────────────┤
│ Up    Down    Select    Back    │
└─────────────────────────────────┘
```

Offline List / Edit Configs Screen

New entries to this list are loaded to the bottom of the list as indicated by at right. If multiple entries for one device are shown, the most recently saved configuration is always listed last.

Entries in this list may have been saved directly from a connected HART device, created in the YPC using the **Create Configs** function, copied from another configuration and renamed, or created by editing an existing YPC with Documentation option (YPC 4011, YPC 4013) will also list configurations downloaded from the separately available Device Management System software (see www.us.yokogawa.com/mi/ypcyhc.com for more information).

```
┌─────────────────────────────────┐
│ Offline              ▭▭▭         │
│ List/Edit Configs               │
│  PT-105A                        │
│                                 │
│   Device ID 6121486             │
│   Single Var                    │
│   Endress + Hauser              │
│   Cerabar S                     │
│   Complete Config               │
│   Uses DOF 11070702             │
│   81 Variables                  │
│   02/21/03  4:50 PM             │
├─────────────────────────────────┤
│ Copy    Del    Select    Back   │
└─────────────────────────────────┘
```

Offline List / Edit Configs Detail Screen

Create Configs:

The **Create Configs** function allows the user to configure a HART device file in Offline Mode for sending to the intended device later when connected in the Online Mode. Use the soft key controls to move through the list and select the device model number required. The menus prompt the user to make the necessary configuration selections, tag the file for later retrieval and use, and edit configuration lines as required. This function can be locked out. See the Lockout Section of this manual for more information.

Delete Configs / Clearing Configuration Memory:

Individual stored Configurations may be deleted with YPC **Del** soft key functions (see example at right). A delete confirmation screen is provided to prevent unintended deletions. The **Del** key only hides the record from the YPC screen; it does not clear memory space.

To clear **all** configurations from memory (including active and hidden configs), enter the **HART Offline Menu Screen** and select the **Delete All Configs** option. The YPC will ask "Delete ALL Configs… ARE YOU SURE???" Select **Yes** to clear **all** stored configurations from memory.

```
┌─────────────────────────────┐
│ Offline              ▭       │
│ List/Edit Configs           │
│   PT-105A                   │
│                             │
│     Device ID 6121486       │
│     Single Var              │
│     Endress + Hauser        │
│     Cerabar S               │
│     Complete Config         │
│     Uses DOF 11070702       │
│     81 Variables            │
│     02/21/03   4:50 PM      │
│                             │
│  Copy   Del   Select  Back  │
└─────────────────────────────┘
```
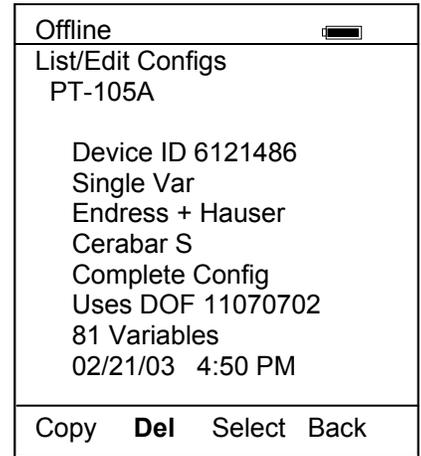
Delete Individual Configuration

HART ONLINE MODE

Once a HART device is located, the YPC enters the **Hart Device Online Screen** as shown below. The word "Hart" appears in the top left of LCD. The ♡ symbol will "flash" when HART communications have been established.

Note: The screen below illustrates a Yokogawa EJA rev. 2 HART display. Screen configuration may vary depending on the HART device connected. For more information, please refer to the owner's manual for the HART device under test.

```
┌─────────────────────────────┐
│ Main Menu    ♡              │
│ EJA: Pump 8                 │
│ ➡Device Config              │
│   Pres:    0.000 Psi        │
│   AO:      4.000 mA         │
│   LRV:     0.00000 Psi      │
│   URV:     20.00000 Psi     │
│   % of Range:   0.00%       │
│                             │
│   AO Fixed                  │
│                             │
│  Up    Down   Select  Back  │
└─────────────────────────────┘
```
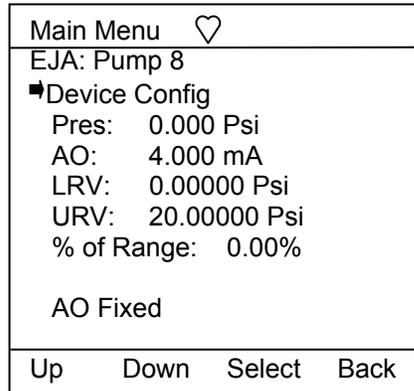
Hart Device Online Screen

EJA: Pump 8: Line 1 displays the model and tag number or service description of the device connected to the YPC. The model of the device is fixed and cannot be changed by the user.

Device Config: Line 2 is dedicated to accessing the HART configuration menus. See the Device Setup section below for further information.

PV: Displays the current primary variable's value as reported by the digital side of the HART device.

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AO: Displays the current analog output value as reported by the digital side of the HART device.

LRV: Displays the Lower Range Value of the transmitter corresponding with a 4 mA analog output.

URV: Displays the Upper Range Value of the transmitter corresponding with a 20 mA analog output.

% of Range: Reflects the primary variable reported as a percent of full-scale range.

AO Fixed: Line 9 is a message line used to display general messages including but not limited to the state of HART device output, errors, or warnings. ***This line will be blank if no messages or warnings are active.***

Device Configuration

From the **HART Device Online Screen** move the cursor to **Device Config** and press the **Select** soft key. The menu screen below allows the user to select a number of tasks. These include changing editable parameters, re-ranging the device, calibration, and device diagnostics.

```
Config Menu

EJA: Pump 8
➡ Process Variables
   Sensor
   Analog Trim
   Basic Info
   Display
   Hart Output
   Write Protect
   Diagnostics
   Save/Send
   Review/ Edit


Up    Down    Select    Back
```

Device Config Screen

Process Variables

The **Process Variables** option allows the user to review information concerning the process variables (such as pressure, current, etc...) as reported by the transmitter.
To enter the **Process Variables** option, use the **Up** or **Down** soft key to move the selection arrow to **Process Variables**, and then press the **Select** soft key. The YPC will then display the process variables being sent by the HART device.
Press **Back** to return to the **Config Menu** screen.

Sensor
This option allows the user to manage and configure sensor range and perform trim functions.
From the **Device Config** screen scroll the cursor to **Sensor** and press the **Select** soft key.
The following screen will appear:

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```
Sensor Menu
─────────────────────
EJA: Pump 8
➡ Rerange
   Signal Conditioning
   Pressure Trim
   Units

─────────────────────
Up    Down    Select   Back
```

Rerange: Allows the user to re-range the settings for Lower and Upper Range Value, set 4-20 mA values, and view Lower and Upper Span Limits.

Move cursor to **Rerange** and press the **Select** soft key.
The following screen will appear showing the current values for LRV, URV, LSL, and USL:

```
Rerange Menu
─────────────────────
EJA:    Pump 8
➡ LRV:  0.00000   Psi
   URV:  20.00000 Psi
   Set 4mA Range
   Set 20mA Range
   LSL:  -15.00 Psi
   USL:   1991.00 Psi

─────────────────────
Up    Down    Select    Back
```

Rerange Main Menu Screen

Pressing the **Back** soft key while in the **Rerange** main menu returns the YPC to the **Device Config** main menu.

LRV: Lower Range Value. Allows the user to adjust the lower pressure range that the HART device will measure. This value typically corresponds to the 4 mA analog output. The values entered must be within the span limits of the device. Move the cursor to **LRV** and press the **Select** soft key.

```
Rerange Menu
─────────────────────

 EJA: Pump 8
 Lower Range Value




 _0.00000 Psi
─────────────────────
 Inc    Dec    Next     Done
```

Use the **Inc** / **Dec** soft keys to make changes. Use the **Next** soft key to move to the next character. Press the **Done** soft key when the changes are complete. A prompt will appear: **Save new data?** Press the **Yes** soft key to accept the changes.

Pressing the **No** soft key will delete the changes and keep the previous settings. The YPC will return to the **Rerange** main menu.

URV: Upper Range Value. Allows the user to adjust the upper pressure range that the HART device will measure. Typically, this value corresponds to the 20 mA output. The values entered must be within the span limits of the device. Move the cursor to **URV** and press the **Select** soft key.

```
┌─────────────────────────────────┐
│ Rerange Menu                    │
│ ─────────────                    │
│ EJA: Pump 8                      │
│ Upper Range Value                │
│                                  │
│                                  │
│                                  │
│                                  │
│ _20.00000 Psi                    │
│                                  │
├──────┬──────┬──────┬────────────┤
│ Inc  │ Dec  │ Next │ Done       │
└──────┴──────┴──────┴────────────┘
```

Use the **Inc** / **Dec** soft keys to make changes. Use the **Next** soft key to move to the next character. Press the **Done** soft key when the changes are complete. A prompt will appear: **Save new data?** Press the **Yes** soft key to accept the changes. Pressing the **No** soft key will delete the changes and keep the previous settings. The YPC will now return to the **Rerange** main menu.

Set 4mA Range: This option allows the user to configure the pressure value at which the HART device will read 4 mA. Move the cursor to **Set 4mA** and press the **Select** soft key.

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Rerange** main menu screen.

After pressing **OK**, the screen will prompt: **Apply new 4ma input**. This screen prompts the user to apply the pressure that will become the lower range value. Press the **OK** soft key to continue and the following screen will appear. Press **Back** to escape.

```
┌─────────────────────────────────┐
│ Set 4ma Range          ♡        │
│ ───────────────                  │
│ EJA: Pump 8                      │
│ ➡ Set 4ma                        │
│    Pres: 0.00  Psi               │
│                                  │
│                                  │
├──────┬───────┬────────┬─────────┤
│ Up   │ Down  │ Select │ Back    │
└──────┴───────┴────────┴─────────┘
```

With pressure connections teed to the YPC and the HART device, apply the desired pressure and press the **Select** soft key. The YPC will then configure the pressure applied to equal 4 mA. To set 4 mA to correspond to zero pressure, make sure HART device is vented to atmosphere.

The screen will display the prompt: **Put Loop back online**. This notice reminds the user to return the device to service. Press the **OK** soft key to continue. The YPC returns to the **Rerange** main menu screen.
Press the **Back** soft key to return to the **Sensor** main menu screen. Pressing **Back** again will return the YPC to the **Device Config** screen.

Set 20mA Range: This option allows the user to configure the pressure value at which the HART device will read 20 mA. Move the cursor to **Set 20mA** and press the **Select** soft key.

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The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Rerange** main menu screen.

After pressing **OK**, the screen will prompt: **Apply new 20ma input**. This screen prompts the user to apply the pressure that will become the upper range value. Press the **OK** soft key to continue. The following screen will appear. Press **Back** to escape.

```
 Set 20ma Range          ♡
 EJA: Pump 8
 ➡ Set 20ma
   Pres: 0.00  InH20



 Up    Down  Select   Back
```

With pressure connections teed with to YPC and the HART device, apply the desired pressure and press the **Select** soft key. The YPC will then configure the pressure applied to equal 20 mA.

The screen will display the prompt: **Put Loop back online**. This notice reminds the user to return the device to service. Press the **OK** soft key to continue. The YPC returns to the **Rerange** main menu screen.
Press the **Back** soft key to return to the **Sensor** main menu screen. Pressing **Back** again will return the YPC to the **Device Config** screen.

LSL: Lower Span Limit. This display is informational only and cannot be edited. It is the lowest output value available with the device.

USL: Upper Span Limit. This display is informational only and cannot be edited. It is the highest Output value available with the device.

Signal Conditioning
Signal Conditioning allows the YPC to configure how the HART device will process the sensor data. This includes pressure units, damping values, alarm settings, and transfer functions.
Move the cursor to **Signal Conditioning** and press the **Select** soft key. The following screen will appear:

```
 Signal  Conditi

 EJA:   Pump 8
 ➡ Transfer Function
   Damping Value
   Units
   H20 Unit select
   Low Cut
   Cut mode
   Bi-dir mode
   Analog Alarm


 Up    Down    Select    Back
```
Signal Conditioning

Transfer Function: This option allows the user to choose how the HART device processes the primary variable. Typical options include linear and square root functions.

Move the cursor to **Transfer Function** and press the **Select** soft key.

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The YPC will enter the **Transfer Function** screen. Use the **Edit** soft key to make changes. Press **Back** to return to the **Signal Conditioning** main menu screen.

After pressing **Edit**, the screen will show the current setting for the **Transfer Function.** Use the **Inc**rease and **Dec**rease soft keys to scroll through the available options. Press **Done** to accept the changes. The YPC will then return to the **Signal Conditioning** main menu.

Damping Value: This option allows the YPC to configure the Damp rate for the HART device.

Move the cursor to **Damping Value** and press the **Select** soft key.
The screen will display the current Damping value. Press the **Edit**
soft key to change the current value, or press **Back** to return to the **Signal Conditioning** main menu.

After pressing **Edit**, the following screen will appear:

```
┌─────────────────────────────────┐
│ Signal Conditi                  │
├─────────────────────────────────┤
│ EJA: Pump 8                     │
│  Damping Value:                 │
│                                 │
│                                 │
│                                 │
│                                 │
│  _0.25  S                       │
├─────────────────────────────────┤
│ Inc     Dec    Next    Done     │
└─────────────────────────────────┘
```

The underscore will prompt the user for changes (_). Use the **Inc** / **Dec** soft keys to change the value and the **Next** soft key to move to the next digit. When complete, press **Done**. A prompt will appear: **Save new data?** Pressing **No** will return the YPC to the **Signal Conditioning** main screen without making any changes. Press **Yes** to accept the new value. The YPC will return to the **Signal Conditioning** main screen.

Units: This option allows the user to configure the engineering units for the connected HART device. Move the cursor to **Units** and press the **Select** soft key. The screen will display the current units being used. Press the **Edit** soft key to change the current unit, or press **Back** to return to the **Signal Conditioning** main menu.

Use the **Inc**rease and **Dec**rease soft keys to scroll through the available engineering units. Press **Done** to select the new engineering unit. The YPC will send the update to the HART device and return to the **Signal Conditioning** main menu.

Analog Alarm: This option allows the user to configure the analog alarm properties for the HART device. Move the cursor to **Analog Alarm** and press the **Select** soft key.

The YPC will enter the **Analog Alarm** screen. Use the **Edit** soft key to make changes. Press **Back** to return to the **Signal Conditioning** main menu screen.

After pressing **Edit**, the screen will show the current setting for the **Analog Alarm.** Use the **Inc**rease and **Dec**rease soft keys to scroll through the available options. Press **Done** to accept the changes. The YPC returns to the **Signal Conditioning** main menu.

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Pressure Trim

This option allows the user to trim various primary variable settings. Move the cursor to **Pressure Trim** and press the **Select** soft key. The following menu screen will appear:

```
┌─────────────────────────────────────┐
│ Sensor Trim Menu                     │
│ EJA:  Pump 8                         │
│ ➡ Zero Trim                          │
│    Lower Trim                        │
│    Upper Trim                        │
│    Low Sensor Trim Pt                │
│    Up Sensor Trim Pt                 │
│                                      │
│ Up     Down     Select     Back      │
└─────────────────────────────────────┘
```

Pressure Trim Main Menu Screen

Zero Trim: This option allows the user to trim the zero pressure reported by the HART device sensor.

Use the **Up** or **Down** soft key to move the selection arrow to **Zero Trim**, then press the **Select** soft key.

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Pressure Trim** main menu screen without making changes, or taking the device offline.

The YPC will prompt: **Apply zero to Sensor**. Make sure that the HART device has no pressure applied. Press the **OK** soft key to continue. The YPC will then prompt the user: **Wait until stable.** All pressure must be vented, and the display stabilized, before accepting a zero pressure value. Press the **OK** soft key to continue.

```
┌─────────────────────────────────────┐
│ Trim Zero            ♡               │
│ EJA: Pump 8                          │
│ ➡ Pres: 0.00 Psi                     │
│                                      │
│                                      │
│                     Trim     Back    │
└─────────────────────────────────────┘
```

Once the display is stabilized, press the **Trim** soft key to set the displayed value.

Press **Back** to exit this screen without performing a zero trim. The screen will display the prompt: **Put Loop back online**. This notice reminds the user to reconnect the device under test to the receiving device. Press the **OK** soft key to continue to the **Pressure Trim** main menu screen. Pressing **Back** again will return the YPC to the **Sensor** main menu screen.
Lower Trim: This option allows the user to trim the low pressure at a specific reference point. This value becomes the low sensor trim point.

Use the **Up** or **Down** soft key to move the selection arrow to **Lower Trim**, then press the **Select** soft key.

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system

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(such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Pressure Trim** main menu screen without making changes, or taking the device offline.

The YPC will prompt: **Apply Low Pressure**. Press the **OK** soft key to continue. The YPC will then prompt the user: **Wait until stable.** This notice reminds the user to wait for the pressure displayed to stabilize before accepting a pressure value. Press the **OK** soft key to continue.

 Apply a low pressure value to the HART device and allow it to stabilize. Press the **Select** soft key to accept the value.

When the **Select** soft key is pressed, the YPC will prompt for changes with the Numeric entry grid and underscore (_). Use the Number Grid and soft keys to change the value and the **Select** soft key to move to the next digit.

When complete, press **Done**. A prompt will appear: **Save new data?** Press the **Yes** soft key to accept the changes.   Pressing **No** returns the YPC to the **Pressure Trim** main menu screen without saving changes.

The screen will display the prompt: **Remove Pressure**. This notice reminds the user to release the pressure applied. Press **OK** to continue. The screen will display the prompt: **Put Loop back online**. This notice reminds the user to reconnect the device under test to the receiving device. Press the **OK** soft key to continue to the **Pressure Trim** main screen.

Upper Trim: This option allows the user to trim the high pressure at a specific reference point. This value becomes the high sensor trim point.

Use the **Up** or **Down** soft key to move the selection arrow to **Upper Trim**, then press the **Select** soft key.

The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Pressure Trim** main menu screen without making changes, or taking the device offline.

The YPC will prompt: **Apply High Pressure**. Press the **OK** soft key to continue. The YPC will then prompt the user: **Wait until stable.** This notice reminds the user to wait for the pressure displayed to stabilize before accepting a pressure value. Press the **OK** soft key to continue.

Apply a high pressure value to the HART device and allow it to stabilize. Press the **Select** soft key to accept the value.

When the **Select** soft key is pressed, the YPC will prompt for changes with the Numeric entry grid and underscore (_). Use the Numeric Grid and soft keys to change the value and the **Select** soft key to move to the next digit.

When complete, press **Done**. A prompt will appear: **Save new data?** Press the **Yes** soft key to accept the changes.   Pressing **No** returns the YPC to the **Analog Trim** main menu screen without saving changes.

The screen will display the prompt: **Remove Pressure**. This notice reminds the user to release the pressure applied. Press **OK** to continue. The screen will display the prompt: **Put Loop back online**. This notice reminds the user to reconnect the device under test to the receiving device. Press the **OK** soft key to continue to the **Analog Trim** main screen.

Low Sensor Trim Pt: Allows the user to view the pressure value where the last Low Sensor Trim Point was referenced. See the **Lower Trim** section for more information.

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Use the **Up** or **Down** soft key to move the selection arrow to **Low Sensor Trim Pt**, then press the **Select** soft key. Use the **Back** key to return to the **Pressure Trim** main menu.

Up Sensor Trim Pt: Allows the user to view the pressure value where the last Upper Sensor Trim Point was referenced. See the **Upper Trim** section for more information.
Use the **Up** or **Down** soft key to move the selection arrow to **High Sensor Trim Pt**, then press the **Select** soft key. Use the **Back** key to return to the **Pressure Trim** main menu.

Analog Trim

The **Analog Trim** option allows the user to trim the analog output of the connected HART device. To enter the **Analog Trim** option, use the **Up** or **Down** soft key to move the selection arrow to **Analog Trim**, then press the **Select** soft key. The following screen will appear:

```
┌─────────────────────────────────────┐
│  Analog Trim Menu                    │
│ EJA: Pump 8                          │
│ ➡ 4mA Analog Trim                    │
│   20mA Analog Trim                   │
│   4mA and 20mA Trim                  │
│   Loop Test                          │
│   Scaled D/A Trim                    │
│                                      │
├─────────────────────────────────────┤
│  Up     Down    Select    Back       │
└─────────────────────────────────────┘
```

Analog Trim Main Menu Screen

4 mA Analog Trim: This option allows the user to trim the 4 mA analog output of the connected HART device. An external multimeter can be used with this trim feature operating out of the HART Communications mode. However, for optimum convenience during Trim operations, the YPC's mA/V meter is recommended. See the Calibrate Key section of this manual and review the Smart Trim information for more details on this time saving feature.

Use the **Up** or **Down** soft key to move the selection arrow to **4mA Analog Trim** and then press the **Select** soft key.

The screen will prompt: **Take loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue. The YPC will send commands to set the HART device output to 4.000 mA and the following screen will appear:

```
┌─────────────────────────────────────┐
│ Trim 4ma                 ♡           │
├─────────────────────────────────────┤
│ ➡ AO: 4.000 mA                       │
│                                      │
│                                      │
│           AO fixed                   │
├─────────────────────────────────────┤
│                    Trim    Back      │
└─────────────────────────────────────┘
```

Verify the output of 4.000 mA using a reliable external multimeter. If the multimeter measurement does not confirm the value, select the **Trim** soft key and then enter the multimeter value at the underscore (_) prompt. Use the **Inc**, **Dec**, and **Next** keys to enter the value measured by the external multimeter and press the **Done** soft key when finished. A prompt will appear: **Save new data?** Press the **Yes** soft key to accept the changes and implement the 4 mA trim (pressing **No** will take you back to the **Analog Trim** main menu screen without saving changes).

The message "Put loop back online" will be displayed. Select the **OK** soft key to return to the **Analog Trim Menu**. When finished with the **Analog Trim Menu**, press the **Back** soft key to return to the **Config Menu** main screen.

20mA Analog Trim: This option allows the user to trim the 20 mA analog output of a connected HART device. See 4mA Analog Trim section above for details on use.

4mA and 20mA Trim: This option links the two independent trims functions so that the 20 mA Trim automatically begins immediately after the 4 mA Trim is completed. See 4mA Analog Trim section above for details on use.

Scaled D/A Trim:

Scaled D/A Trim is a feature that allows HART$^{®}$ communications users to trim a smart transmitter's 4-20 mA output using a different analog scale to measure the loop current. For example, an I/O resistor is commonly placed in series with the two wire 4-20 mA loop to convert the current signal into a voltage signal for use by the DCS. By measuring the voltage across the I/O resistor, the loop current value can be obtained by dividing the voltage by the resistor value. **Scaled D/A Trim** allows the user to enter this voltage directly instead of having to convert it into the actual current value. During the trim function, the transmitter output is set to a fixed output (first 4 mA and then 20 mA). The user is prompted to enter the meter reading using the analog scale selected by the user. The transmitter D/A calibration trim is then adjusted to obtain the correct meter reading. The resulting calibrated loop delivers a precision voltage signal to the DCS.

To use Scaled D/A Trim, first make connections to the HART transmitter of interest and press the **HART** key. Once communication is established, select the **Device Configuration** option on the first display, then **Diagnostics**, then **Calibrate**, then **Analog Trim** and finally **Scaled D/A Trim** (these menu paths and titles may vary with HART device). The screen will prompt: "Loop should be removed from automatic control." This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Use the **Select** soft key to accept **OK**. Press the **Abrt** (Abort) soft key to return to the previous screen without making changes and without taking the device offline.

If **OK** is selected, the following display will appear.

```
┌─────────────────────────────┐
│ Scaleable D/A Trim          │
├─────────────────────────────┤
│  EJA: Pump 8                │
│  Select Trim Scale:         │
│  1.0 to 5.0 volts           │
│ ➡1.2 to 6.0 volts           │
│  2.0 to 10.0 volts          │
│  User Defined               │
│                             │
│                             │
├─────────────────────────────┤
│  Up   Down  Select  Abrt    │
└─────────────────────────────┘
```

Select Scaled D/A Trim Display

Scale Options & Corresponding I/O Resistor Values
1.0 to 5.0 volts corresponds to 250 ohm I/O resistor
1.2 to 6.0 volts corresponds to 300 ohm I/O resistor
2.0 to 10.0 volts corresponds to 500 ohm I/O resistor

Use the **Up** or **Down** key to indicate the desired Trim scale. Use the **Select** key to select the desired scale. Selecting **1.2 to 6.0 volts** will automatically set the "Scaling Lo value:" to 1.2 and the "Scaling Hi value:" to 6.0 and a message will be displayed to "connect reference meter." An accurate reference multimeter should be connected across the I/O resistor at this point. **Select** the OK menu option once this is done. The message "Setting field device output to 4 mA" will be displayed. **Select**ing the OK menu option causes the YPC to send the AO fixed command for device output of 4 mA. The next display asks the user to "Enter meter value" as read from the multimeter display. Use the Numeric Grid and soft keys to enter this value. Press **Done** when finished and the following screen is displayed.

```
┌──────────────────────────────┐
│  Scaleable D/A Trim          │
├──────────────────────────────┤
│ EJA:Pump 8                   │
│  Scaled output               │
│  : 1.200                     │
│  equal to readout device?    │
│     - Yes                    │
│ ➡   - No                     │
│                              │
│                              │
│                              │
├──────────────────────────────┤
│  Up    Down   Select   Abrt  │
└──────────────────────────────┘
```

If the meter now reads the correct scale value for 4 mA output, **Select** Yes to continue on to "Setting field device output to 20mA." Otherwise, select No and you will be prompted to enter the new meter reading. At the "Setting field device output to 20mA," **Select** the OK option and the YPC sets the HART device output to 20.00 mA.   The next display asks the user to "Enter meter value" read from the multimeter display. Use the Numeric Grid and soft keys to enter this value. Press **Done** when finished.   **Select** No if the meter does not read the correct scale value for 20 mA output. **Select**ing Yes completes the trim operation and the display changes to "Data is being made permanent, please wait…" then to "Returning field device to original output" and finally to "Note- Loop may be returned to automatic control". **Select** OK here to complete the Scaled D/A Trim.

This feature also allows custom scaling by entering values for "Scaling Lo value" and "Scaling Hi value". Selecting the **User Defined** menu option on the "Select Trim Scale" display provides the Numeric Grid display to allow input of the Scaling Lo and Hi values. Once this is complete, the following display is shown.

```
┌──────────────────────────────┐
│  Scaleable D/A Trim          │
├──────────────────────────────┤
│  EJA: Pump 8                 │
│  Trim will be scaled from    │
│     : 1.400                  │
│   to                         │
│     : 8.000                  │
│                              │
│ ➡ -Apply above scale         │
│   - Change scale             │
│                              │
├──────────────────────────────┤
│  Up    Down   Select   Abrt  │
└──────────────────────────────┘
```

Selecting "Change scale" gives the user a chance to further adjust the desired scale. Once "Apply above scale" is selected, the remaining procedure is identical to the **1.2 to 6.0 volts** example given above. Complete the procedure as prompted by the YPC displays using the custom scale for the D/A trim.

Loop Test:

This option allows the user to send HART commands to the device under test to "fix" its analog output to any desired value between 4 and 20 mA, regardless of process variable value.

This test is useful in determining the ability of a loop to deliver the accurate analog signals by providing a specific current output to a receiving device.

Use the **Down** soft key to scroll to **Loop Test** and press the **Select** soft key to select. The screen will prompt: **Take Loop offline**. This notice reminds the user that the device output will not be a measurement of the actual process, and to place the receiving device or control system (such as a chart recorder, PLC, or DCS) in manual mode. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Analog Trim** main screen.

The YPC will execute the selected analog output assignment to the connected HART device and display the results.

```
┌─────────────────────────────────┐
│ Hart            ♡               │
├─────────────────────────────────┤
│ EJA: Pump 8                     │
│   Choose analog output level    │
│  ➡  -4mA                        │
│     -8mA                        │
│     -12mA                       │
│     -16mA                       │
│     -20mA                       │
│     -Other                      │
│     -End                        │
│                                 │
├─────────────────────────────────┤
│ Up    Down   Select   Back      │
└─────────────────────────────────┘
```

Messages relevant to Loop Test will appear in the message area shown above. This area will be blank if no messages are issued by the HART device.

To set output automatically to desired value of 4, 8, 12, 16, 20mA select the corresponding key.

To manually change the fixed analog output value from the HART device, select "other" key. The following screen will appear.

```
┌─────────────────────────────────┐
│ Hart                            │
├─────────────────────────────────┤
│ EJA: Pump 8                     │
│  Output:                        │
│                                 │
│                                 │
│  _3.999999 mA                   │
│                                 │
│                                 │
│                                 │
├─────────────────────────────────┤
│  Inc    Dec    Next    Back     │
└─────────────────────────────────┘
```

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An underscore will prompt the user for changes (_). Use the **Inc** / **Dec** soft keys to change the value and the **Next** soft key to move to the next digit. When complete, press **Done**. A prompt will appear: **Save new data?** Pressing **No** will take you back to the **Loop Test** main screen without making any changes. Press **Yes** to accept the new value. The YPC returns to the Loop Test main screen. The message line will indicate: "AO Fixed."

The screen will display the prompt: **Loop may be returned to automatic control**. This notice reminds the user to return the device to service. Press the **OK** soft key to continue. Press the **Back** soft key to return to the **Analog Trim** main menu screen. Pressing **Back** from the **Analog Trim** screen will return the YPC to the **Config Menu s**creen.

Select **End** option to return field device to original output and exit loop test. When you select **End**, the screen shows:

```
┌─────────────────────────────────────┐
│ Hart                                 │
├─────────────────────────────────────┤
│   EJA: Pump 8                        │
│   Returning Fld device to            │
│   original output                    │
│                                      │
│                                      │
│                                      │
├─────────────────────────────────────┤
│                               Abrt   │
└─────────────────────────────────────┘
```

Or, press **Abort** soft key from loop test main screen to exit the loop test.

Select **Back** key to return back to device **Config Menu**.

BASIC INFO

This function provides basic but valuable HART device information to the user.
Use the **Up** or **Down** soft key to move the selection arrow until it points to **Basic Info**, then press the **Select** soft key.
The following screen will appear:

```
┌─────────────────────────────────────┐
│ Basic Info                           │
├─────────────────────────────────────┤
│ EJA: Pump 8                          │
│ ➡ Tag                                │
│    Date                              │
│    Descriptor                        │
│    Message                           │
│    Model                             │
│    Ext SW mode                       │
│    Private Label                     │
│    Revisions                         │
│    Construction Matls                │
├─────────────────────────────────────┤
│ Up   Down   Select   Back            │
└─────────────────────────────────────┘
```
Basic Info Main Screen

All of the options listed on this screen are accessed by scrolling the cursor **Up** or **Down** to the desired parameter and pressing **Select** to enter that option's edit screen.

Non-editable screens provide information only. The **Back** soft key will be the only soft key shown for these screens. For options that can be edited, press the **Edit** soft key to change current settings. Use the Alphanumeric Grids options (see Alphanumeric Entry Section in this manual) and

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soft keys to select desired characters. Press the **Select** key to enter alphanumeric information. Press **Done** to save the information.   The YPC will send the update to the HART device and return to the **Basic Info** main menu.

   Tag: Allows the user to program a tag number/name for the HART device. Up to 8 characters, including spaces, may be used.

   Date: Allows the user to set the date.

   Descriptor: Allows the user to provide a brief custom description of the HART device. Examples: "Pipe 7E" or "DP xmtr". Up to 15 characters, including spaces, may be used.

   Message: Allows the user to enter a short message, similar to the **Descriptor** option above. Up to 20 characters, including spaces, may be used.

   Model: Provides information on the specific model of the connected HART device. This option is non-editable.

   Private Label: Provides the device manufacturer's name. This option is non-editable.

   Revisions: After selecting **Revisions** the screen will change and provide a menu of HART related items. Press **Select** to choose the item of interest.

```
┌─────────────────────────────────────┐
│  Revisions                           │
├─────────────────────────────────────┤
│  EJA: Pump 8                         │
│  ➡ Hart Revision                     │
│     Device Revision                  │
│     Software Revision                │
│     Final Assembly Number            │
│                                      │
│                                      │
├─────────────────────────────────────┤
│  Up    Down    Select    Back        │
└─────────────────────────────────────┘
```
Revisions Main Screen

Most items on this screen are non-editable, and are for informational purposes only.

   Final Assembly Number: This is the only user editable selection.
   Use the **Down** soft key to select **Final Assembly Number**, then press the **Select** soft key.

   The screen will display the current final assembly number. To change the value, press the **Edit** soft key.

   Use the Number Grid and soft keys to adjust the value, and **Select** to edit the next character. This option allows numeric values only. Press **Done** to select the information.

   Construction Matls: This option takes the user to a screen dedicated to construction information about the HART device. Some options can be edited to allow entry of physical details.

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HART OUTPUT

This option allows the user to configure the HART communications protocol options. It also provides information about the HART device ID and Burst Com number.
To enter the **Hart Output** option, use the **Up** or **Down** soft key to move the selection arrow to **Hart Output**, then press the **Select** soft key. The YPC screen provides the options shown below:

```
┌─────────────────────────────────────┐
│ Hart Output                          │
├─────────────────────────────────────┤
│ EJA: Pump 8                          │
│                                      │
│ ➡ Polling Address                    │
│   Burst Mode Select                  │
│   Burst Com Number                   │
│   Device ID                          │
│   Preambles                          │
│                                      │
├─────────────────────────────────────┤
│  Up    Down    Select    Back        │
└─────────────────────────────────────┘
```

Hart Output Main Menu

Polling Address: This option allows the user to configure the address of the HART device. See the **HART Communications** section for more details on HART device addresses.

Move the cursor to **Polling Address** and press the **Select** soft key.
The screen will display the current Polling address. Press the **Edit**
soft key to change the current value, or press **Back** to return to the **Hart Output** main menu.

After pressing **Edit**, the following screen will appear:

```
┌─────────────────────────────────────┐
│ Hart Output                          │
├─────────────────────────────────────┤
│ EJA: Pump 8                          │
│ Polling Address:                     │
│                                      │
│                                      │
│                                      │
│ _15                                  │
├─────────────────────────────────────┤
│  Inc    Dec    Select    Done        │
└─────────────────────────────────────┘
```

The underscore will prompt the user for changes (_). Use the **Inc** / **Dec** soft keys to change the value and the **Next** soft key to move to the next digit.
Note: Acceptable polling addresses are 0 through 15.Care must be taken to insure that the new address is not already assigned to a device on the loop. Failure to do so will result in a loss of communications.

When complete, press **Done**. A prompt will appear: **Save new data?** Pressing **No** returns to the **Hart Output** main screen without making any changes. Press **Yes** to accept the new value. The YPC will return to the **Hart Output** main screen.

Burst Mode Select: Burst mode is a communications option that allows a HART device to continuously broadcast pre-selected information to a host device. The YPC does not use burst mode for its interface with HART devices. Burst information is often used within a plant's information technology framework.
The YPC can be used to set a device's burst mode information and to initiate or terminate the **Burst Mode Select** function. It does not display the burst mode variable.

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To enter the **Burst Mode Select** option, use the **Up** or **Down** soft key to move the selection arrow to **Burst Mode Select**, then press the **Select** soft key.
Press the **Edit** soft key, and use the **Inc**rease and **Dec**rease soft keys to toggle the burst mode on or off. Press **Done** when the desired option is displayed. The YPC will query if the new data should be saved. Pressing **Yes** puts the YPC into the selected burst mode, and returns the YPC to the **Hart Output** main menu screen. Selecting **No** leaves the device in the original "As found" burst mode and returns the YPC to the **Hart Output** main menu screen.

Burst Mode communications are differentiated from normal HART communications with the filled heart ♥ symbol displayed when communicating.

Burst Com Number: This register is used to select the information that will be continuously broadcast. The selection will differ from device to device.
To enter the **Burst Com Number** option, use the **Up** or **Down** soft key to move the selection arrow to **Burst Com Number**, then press the **Select** soft key.

The screen will display the currently selected output setting for the device. Press **Back** to return to the **Hart Output** main menu screen if you do not wish to edit the settings.

To edit the current settings, press the **Edit** soft key. Use the **Inc**rease and **Dec**rease soft keys to scroll through the selections for that specific device.

Press **Done** when the desired selection is displayed. A prompt will appear: **Save new data?**
Press the **Yes** soft key to accept the new **Burst Com Number** changes. Pressing **No** returns the YPC to the **Hart Output** main menu screen without saving changes to the device.

DIAGNOSTICS

To enter the **Diagnostics** option, use the **Up** or **Down** soft key to move the selection arrow to **Diagnostics**, then press the **Select** soft key.

The YPC screen provides two test options as shown below:

```
┌─────────────────────────────┐
│ Diagnostic Menu             │
│─────────────────────────────│
│ EJA: Pump 8                 │
│                             │
│  ➡Self Test                 │
│    Loop Test                │
│                             │
│─────────────────────────────│
│  Up    Down  Select  Back   │
└─────────────────────────────┘
```

Diagnostics Main Menu Screen

Self Test: Provides an overall diagnostic test of the selected HART Device. Press the **Select** soft key to choose the **Self Test** option.

The screen changes as shown below. Press the **Select** soft key to perform a diagnostic test of the HART device.

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```
┌─────────────────────────────────────┐
│ Self Test Menu                       │
│ EJA: Pump 8                          │
│                                      │
│ ➡ Perform Test                       │
│   Test Results                       │
│                                      │
│ ─────────────────────────────────── │
│  Up    Down  Select   Back           │
└─────────────────────────────────────┘
```

The ♡ symbol will appear and flash briefly, indicating the test is being performed. Scroll **Down** to **Test Results** and press **Select** to scroll through the status of the various parameters tested.

Press the **Next** soft key to scroll through diagnostic results and finally return to the **Diagnostics** main menu. The **Back** soft key will return to the previous screen at any point in the diagnostics review.

Loop Test: Refer to **Loop Test** under **Analog Trim** section for more information. When using the Loop Test here, pressing the **Back** and **OK** soft keys will return the YPC to the **Diagnostics** main menu screen.

Save: Allows the YPC to save the HART configuration from a connected device to memory.
For **Multivariable HART** devices:
Multi variable HART devices permit the user to select one Primary Variable (PV) from its device variables list and assign the analog output to the selected PV.   Sometimes, it is useful to save the parameters of the secondary, tertiary, and other variables in addition to the PV parameters. YPC allows the user to save the configuration by two ways,
1) Only the PV parameters OR
2) The parameters of all variables (primary, secondary, tertiary etc.) by sequentially changing each variable to PV and saving the respective parameter sets. This is done by setting the **PV Prompt** in **Settings** menu as **Enable.**

YPC units are shipped from the factory with the **PV Prompt** setting defaulted to **disable** and locked out with the factory lockout code of "**321**". To enable all device variable parameters to be saved to the YPC during a **Save** command, simply unlock the YPC settings (see the procedure in the **Settings** section earlier in this manual) and reset **PV Prompt** to **Enable**. This makes the YPC, prompt the user-
"Multivariable device, allow PV changes: Yes/No"
If **Yes** is selected, it will cause the YPC to first save the PV parameters and then change the PV to the secondary variable and save these parameters as well. The YPC continues in this manner until all variable parameters have been saved; then the YPC resets the PV to the original variable.

Send: Allows the YPC to send (download) a HART configuration to an identical HART device. Once a suitable configuration for one unit is created, it can be shared with identical units requiring the same parameters.

Review/Edit:

This function allows the user to bypass the menu system to view and/or edit variables directly from the configuration information.

To enter the **Review/Edit** option, use the **Down** soft key to move the selection arrow to **Review/Edit**, then press the **Select** soft key.

The **Edit** soft key is active only for editable parameters. To edit the displayed parameter, press the **Edit** soft key. The YPC will then switch to that variable's edit screen. Use the Alphanumeric Grids options (see Alphanumeric Entry Section in this manual) and soft keys to select desired characters. Press the **Select** key to move on to the next character. Use the **Inc**rease and

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Decrease soft keys to make selections from editable menus. Use the **Next** soft key to move to the next selection. Press the **Done** soft key when the changes are complete. A prompt will appear: **Save new data?** Press the **Yes** soft key to accept the changes. Pressing the **No** soft key will keep the previous settings with out saving any changes. In both cases, the YPC display will remain the same. Press the **Next** soft key to move on to the next variable, the **Back** soft key to go back one variable, or the **Done** soft key to exit **Review/Edit** and return to the **Device Config** screen.

QUICK MENU KEY

The **Quick Menu** key allows the user to go directly to a specific HART menu. This is a time saving feature that allows the user to skip entire blocks of standard HART menus and jump directly to a frequently used function. **Quick Menu** titles are the same as HART menu titles for ease of recognition. Press the **Quick Menu** dual function key and the following   screen will appear:

```
┌─────────────────────────────────┐
│ Quick Menu                      │
├─────────────────────────────────┤
│ Select Menu Title:              │
│  Main Menu                      │
│➡ Config Menu                    │
│  Rerange Menu                   │
│  Diagnostic Menu                │
│  Basic Info                     │
│  Construction Matls             │
│  Sensor Menu                    │
│  Signal Conditioning            │
│  Sensor Trim Menu               │
│  Hart Output                    │
│                                 │
├─────────────────────────────────┤
│ Up    Down    Select    Back    │
└─────────────────────────────────┘
```

Quick Menu Screen

Main Menu: Refer to **Hart Device Online Screen** section.

Config Menu: Refer to **Device Config** section for more information.

Rerange Menu: Refer to **Rerange** section for more information.

Diagnostic Menu: Refer to **Diagnostic** section for more information.

Basic Info: Provides quick access to basic information about the connected HART device, including tag number, manufacturer and software information.

Construction Matls: Provides quick access to construction material information for the connected HART device

Sensor Menu: Refer to **Sensors** section for further information.

Signal Conditioning: See **Signal Conditioning** section for more information.

Sensor Trim Menu: Refer to **Sensor** menu for further details.

HART Output: Refer to **HART Output** section for more information.

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YPC 4010 DEVICE SPECIFIC & GENERIC HART® COMMUNICATIONS

The YPC 4010 supports a growing number of Device Specific DOFs (Device Object Files). For a current listing of HART® devices with full Device Specific YPC communications support, go to www.us.yokogawa.com/mi/ypcyhc.com and click on the "Available DOFs" button.

To facilitate communications with HART devices that are not yet supported with Device Specific DOF files or that do not require DOF files, the YPC 401x includes Generic HART Communication capability. This capability allows the user to communicate with any HART device using Universal and Common Practice commands to poll, configure, and maintain HART devices. Specific functions supported include most polling, tagging, and device configuration and trim operations for analog outputs. Generic communications do not support Device Specific commands for higher order HART functions (see the **HART® Commands** section of this manual or the instruction manual for the HART device of interest for more information on the three command levels).

Using Generic HART Communication
The YPC 401x's Generic HART Communication mode starts automatically when the **HART** or **Calibrate** keys are pressed and no Device Specific DOF (device object file) is found to match the connected HART device name. When this occurs, line two of the display will indicate "Generic" and the device tag number.

In general, both Generic **HART** and Generic **Calibrate** modes will operate similarly to their device specific DOF counterparts (see HART Communication and Calibrate sections of this manual for more details). However, the YPC does not display Device Specific related communication menus or options when in the Generic communication mode. For example, the Zero and Sensor trim menu options (normally executed by Device Specific commands) are not displayed for pressure transmitters without DOF support. Please see the **Download Site** section of this manual for information on downloading the latest Device Specific DOF files to your YPC.

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DOCUMENTING HART CONFIGURATIONS

All YPC 4010 models are able to save and send HART device configuration files. The YPC 4010 with Documentation option is also able to uploading saved configurations to the DMS software. The information joins the corresponding tag number history once DMS receives the data.

Within DMS users can review configuration data, compare the most recent configuration to past configurations, and revise configurations for subsequent download to the intended device. See the DMS User's Manual for more information.

All saved configurations can be deleted from YPC memory using the "Delete All Configs" option in the HART offline mode. Users of the DMS software can use DMS functions to clear the configurations from memory of the YPC 4010. See the DMS User's Manual for more details.

Download Site Information – DOFs, Firmware, Utilities

Overview

One of the unique features of the YPC 4000 Series is the built-in ability to have firmware upgrades installed by the user at his location. The Download Site is accessible over the Internet and provides for the convenient download of new or revised firmware and DOF's (Device Object Files) for HART communication. YPC units already in service in the field do not need to be returned to the factory for firmware upgrades released. The user can simply download the files to a PC having Internet access and upgrade the YPC firmware using the Installer PC Utility. DOF's are also available on this site. The Download Site enables users to stay current as new DOF's or revisions of existing ones are released.

Who has access to the Download Site?

All YPC users who have purchased a Download Subscription have unlimited access to the Download Site for three years from date of subscription. These customers may download any published file from the site to their YPC upon entry of the proper authenticating codes (provided with the subscription). After the subscription expires, the Download Site is available with paid subscription renewal. Contact Yokogawa Corporation of America at (770) 254-0400 or info@us.yokogawa.com for more information and to purchase a download subscription. YPC firmware can be downloaded without a subscription.

PC Requirements for Download Operations

Yokogawa recommends IBM compatible Pentium I PCs or higher for download operations. The PC should have an available RS-232 port, minimum modem speed of 28K and access to Internet service.

Preparing the YPC

All YPC models come ready to connect to an IBM compatible PC using the DB-9 socket located at the bottom of the YPC enclosure. A six-foot male DB-9 to female DB-9 cable (P/N A90047-00052) is available from Yokogawa. Similar cables are acceptable. Connect the YPC to the PC and power up the YPC using fresh internal batteries or the optional AC Adapter (P/N A36742). The YPC is ready for download operations.

Preparing to Download

Establish connection to the Download Site by going to the Yokogawa Corporation of America website at www.us.yokogawa.com/mi/ypcyhc.com. Click on the "Download Site" to access all download functions. A list of currently available DOF's for HART device communication can be

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viewed at the www.us.yokogawa.com/mi/ypcyhc.com website. Click "Available DOFs" option to view an up to date list of available DOF's.

Using the Download Site

The landing page of the Download Site requires the user to enter a valid User Name and Password to authenticate user identity and permit entry to the Site. These two codes are initially assigned by the manufacturer and can be found on a card included with shipment. Locate the card and place in a safe place for future reference.

Once a user is logged on to the Site, the **Latest Release Notes** screen appears listing and describing the most recent firmware releases posted and the posting date. Individual files can be downloaded from the detailed description page of each DOF or firmware file listed. Also available on this screen are the navigation buttons for **Current Release Notes**, **File Download Area**, and **Subscriber Options**.

The **Current Release Notes** screen describes the most recent firmware releases available and dates posted. Five (5) columns are shown on this page: Date, Title, Description, Manufacturer, Model. These categories will assist the user in finding the release descriptions of the DOF, the DPC Manager Utility for the YPC, or YPC Firmware releases of interest. Individual files can be downloaded from the detailed description page of each DOF or firmware file listed. Each column can be sorted to assist searches of the release database. Also available on this screen are the navigation buttons for **Latest Release Notes**, **File Download Area**, and **Subscriber Options**.

The **File Download Area** screen is the actual download page. Select from a list of downloadable firmware files (including DPC Manager Utility for the YPC, YPC Firmware, YPC Documentation Firmware and DOF's) by locating the file name of interest with the PC mouse and left clicking. Dialog boxes guide the user through the process. Multiple files can be downloaded. Dialog boxes again guide the user through the process. Also available on this screen are the navigation buttons for **Latest Release Notes**, **Current Release Notes**, and **Subscriber Options**.

Subscriber Options.
The **Subscriber Options** screen provides useful account information. User Name and Password for the account are listed, as well as the subscription expiration date. In addition, this screen allows the user to customize the account Password. The user should also provide an e-mail address that allows Yokogawa to provide notification of new firmware updates, DOF releases, and subscription period expiration. Press the "Update Subscriber Options" button to save all **Subscriber Options** changes.

To report any difficulties with downloading operations, please contact Yokogawa Corporation of America at (770) 254-0400 or info@us.yokogawa.com.

Installer Utility (DPC Manager)

The DPC Manager Utility for YPC firmware and DOFs should be loaded onto the host PC from the instruction manual CD (included with YPC shipment) or from the Download Site where it can be found on the **File Download Area** page. The DPC Manager Utility coordinates the download operations from the host PC to the YPC. Periodic improvements may be incorporated into this Utility. Therefore, Yokogawa recommends periodic comparison of the DPC Manager version installed on the host PC to the latest available version on the Download Site to insure use of the most current DPC Manager Utility. Directions for using the DPC Manager Utility are found under its Help tool bar option.

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RETURNING THE YPC FOR REPAIR

In the event that a YPC requires service and must be returned to the factory for repair, please contact your local Yokogawa Corporation of America Representative (see list and contact information at www.us.yokogawa.com/mi) or the factory direct at the numbers listed below.

Please do not send any unit in for repair without first contacting Yokogawa Corporation of America or Representative for a Return Authorization (RA) number. This number will be provided by the Yokogawa Corporation of America Repair Department when you call, fax or e-mail your information. All incoming packages must be accompanied by an RA number to insure efficient processing and repair work.

To assist us with processing your repair request, please have the Model & Serial Number of the unit available when you call. This information is located on the YPC label and on all sensor module labels. This information can also be obtained directly from the YPC display by pressing the **Sensr** soft key while in **Measure Mode**. *See the **Measure Mode** section in this manual for more details.*

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APPENDIX

PRODUCT SPECIFICATIONS OVERVIEW

BASE UNIT: 9" L x 4.7" W x 3.2"D ABS plastic case with shock absorbing boot, 28 ozs. Three bays for measurement modules

DISPLAY: 128 x 128 pixel graphic display, 2.6" x 2.6" viewable area, 5-digit resolution

POWER: 6 AA alkaline batteries (1.5 V), 6 AA NiMH batteries (1.2 V) or optional 100 – 240 Vac power adapter (P/N A36742)

TEMPERATURE SPECIFICATIONS:
Storage: -40° F to 140° F   (-40° C to 60° C)
Operating: 23° F to 122° F   (-5° C to 50° C)

HUMIDITY SPECIFICATIONS:
10- 90 % RH @ 50°C

CONNECTIONS:
Pressure: 1/8" FNPT, 316ss
Electrical: Standard banana jacks (¾" center)
HART & Loop: Standard banana jacks (¾" center)
Data transfer: DB-9

MODULES – select from a variety of positive-lock measurement modules and special function modules for excellent versatility. Most modules can be "hot swapped" – remove or install measurement modules at any time (restrictions for Intrinsic Safety and VMA0055 models apply).

AVAILABLE UNITS –Pressure: PSI, inches H_2O and cm H_2O (inches H_2O with 4° C, 20° C, and 60° F ref. temp.), kg/cm^2, kPa, mBars, Bars, mm Hg, inches Hg (inches Hg with 0° C ref. temp), oz/in^2. Temperature: °F, °C, °R, °K. Others based on module option.

CONFIGURABLE DISPLAY – user configured for one to four measurements.

AUTO SHUT-OFF - occurs after user-selected period of keypad inactivity or can be disabled

DAMPING - exponential damping is user selectable from 0.5 to 30 seconds to damp pulsation and stabilize the display.

DIAGNOSTICS – YPC 4000 self-tests upon power up and upon installation of sensor modules. Advisories are posted on the display.

NIST TRACEABLE ACCURACY:
Pressure: ± 0.025% to ± 0.10% of F.S including all effects of linearity, repeatability, and hysteresis and temperature over the range 23° F to 122° F.
Current / Voltage: ± 0.025% of F.S. ± 0.001% of F.S. per ° F (reference temperature is 70° F)

APPROVALS: Optional Intrinsically Safe Certification from MET Laboratories. MET Laboratories is a Nationally Recognized Test Lab (NRTL). The unit with this option are certified by MET Laboratories to comply with standards CSA C22.2 No.1010.1, CSA C22.2 No. 157-92, and UL913 Fifth Edition Rev 2/21/97 for Class I, Division I, Groups A, B, C, and D, T5 hazardous areas. ***Restrictions apply – see the Intrinsically Safe Control Drawing shipped with each Intrinsically Safe model of the YPC 4000 Series Modular Calibrator for more details. An uncontrolled copy of this drawing is found in the Appendix of this manual.***

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PRESSURE MODULE LIMITS / COMPATIBLE MEDIAS:
xGI / xAI modules: 2X F.S. range / Medias compatible with 316ss
xDN modules: 2X F.S. range when pressurized on high side only,
　　　　　　　 150 PSI when applied simultaneously to high and low
　　　　　　　　 sides / Medias are clean, dry gases only.

ELECTRICAL MEASUREMENTS
Current: ±50.00mA   ±0.025%FS
Voltage: ±50.00VDC   ±0.025%FS

MODULES: 2.3"L x 1.3"W x 2.6"D, 8.3 ozs. Positive-lock with spring-loaded sensor lock. Depress lock to release.

MIN/MAX - minimum and maximum measured values are captured. Capture speed equal to current damping rate setting.

HOLD - toggle function freezes display.

ZERO – simultaneous re-zeroing of all installed modules

CONTRAST – direct adjustment of display contrast

FIELD RECERTIFICATION – sensor modules and integral mA / Volts can be recalibrated for zero, span and linearity through the base unit using appropriate standards at 1, 3, 5, or 9 points

SECURITY LOCKOUT – YPC 4000 Settings can be locked out entirely or by specific feature.

ϵ CE compliance

MODELS

YPC 4000 Multi-Function Tester – Base unit for use with up to three (3) sensor modules.

YPC 4010 Multi-Function Tester with HART[®] - Base unit for use with sensor modules plus HART communication capability.

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YPC 4000 Multifunction Tester

YPC BASE UNIT MODEL NUMBERS *(Includes Plastic Carrying Case, Test Lead Kit, Batteries, Universal Power Adapter, RS-232 Serial Cable, Paper User's Manual)*							
YPC 4000	Calibrator - Base unit with three modular sensor bays - See available Sensor / Simulation Modules on Page 2. **Note: VMA0055 is Required For 24Vdc Loop Power Source**						
YPC 4010	Calibrator/HART Communicator - (Includes HART leads Kit). See Sensor / Simulation Modules on Page 2. **Note: VMA0055 is Required For 24Vdc Loop Power Source**						

Code	*Reserved*
-01	Always -01

Code	*Documenting Options*
-1	Standard documenting (as-found & as-left documenting; separate DMS database software recommended for electronic procedure / result transfer)
-2	21CFR Part 11 documenting for FDA electronic signature compliance (as-found & as left, DMS database software recommended for downloading data to PC sold separately)

Code	*Certification Options*
-00	CE Mark (Standard on all units)
-01	CE Mark, Intrinsically Safe Unit (see **Note 1**)

Code	*Carrying Case and Strap Options*
-0	Rear Hand Strap (Standard on all units)
-1	Fitted Use in Place Soft Carrying Case
-2	YPC Hanging/Shoulder Strap

Code	*User's Manual Language options*
-01	English language
-02	German language (Pending)
-03	French language (Pending)
-04	Spanish language (Pending)
-05	Chinese (Mandarin) language (Pending)
-06	Italian language (Pending)
-07	Japanese (Pending)

Code	*Download Subscription (DLS) Fee options*
-0	No Download Site (DLS)
-1	Standard 3-year DOF Download Subscription

Example Part Number

YPC 4010	**-01**	**-1**	**-01**	**-0**	**-01**	**-1**	**Full Model ID:** **YPC 4010-01-1-01-0-01-1**
Calibrator & HART Communicator	Always	Standard Documenting	Intrinsic Safety	Rear Hand Strap	English Manual	Standard 3 Year DLS	Note: Only YPC 4010-01-1-01 portion of the model number is tracked by DPC Manager and DMS Software

Note 1 – Unit is tested and certified by MET Laboratories. MET Laboratories is a Nationally Recognized Testing Lab (NRTL). This unit is certified by MET Laboratories to comply with standards CSA C22.2 No. 1010.1-92, C22.2 No. 157, and UL913, Fifth Edition Rev. 2/21/97 for Class I, Div I, Groups A, B, C & D

Note 2 - NIST Traceability Certificate is standard for modules & base unit.

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Sensor Modules List

Sensor Modules for YPC 4000 Series Portable Modular Calibrator

SENSOR MODULE MODEL NUMBER, RANGE & ACCURACY Modules are Intrinsically Safe when used in accordance with Control Document		
FDN0010-01-1	1 - 10" H20 dp	± 0.1% FS from 23° F to 122° F (± 0.009" H2O)
FDN0020-01-1	0 - 20" H20 dp	± 0.1% FS from 23° F to 122° F (± 0.02" H2O)
DDN0100-01-1	0 - 100" H20 dp	± 0.025% FS from 23° F to 122° F (± 0.025" H2O)
DDN0200-01-1	0 - 200" H20 dp	± 0.025% FS from 23° F to 122° F (± 0.05" H2O)
DDN0400-01-1	0 - 400" H20 dp	± 0.025% FS from 23° F to 122° F (± 0.10" H2O)
DDN2000-01-1	0 - 2000" H20 dp	± 0.025% FS from 23° F to 122° F (± 0.50" H2O)
DGI0020-01-1	0 - 20 PSIG	± 0.025% FS from 23° F to 122° F (± 0.005 PSIG)
DGI0200-01-1	0 - 200 PSIG	± 0.025% FS from 23° F to 122° F (± 0.05 PSIG)
DGI0500-01-1	0 - 500 PSIG	± 0.025% FS from 23° F to 122° F (± 0.125 PSIG)
DGI1000-01-1	0 - 1000 PSIG	± 0.025% FS from 23° F to 122° F (± 0.25 PSIG)
DGI1500-01-1	0 - 1500 PSIG	± 0.025% FS from 23° F to 122° F (± 0.375 PSIG)
DGI2000-01-1	0 - 2000 PSIG	± 0.025% FS from 23° F to 122° F (± 0.500 PSIG)
GGI3000-01-1	0 - 3000 PSIG	± 0.05% FS from 23° F to 122° F (± 1.50 PSIG)
DAI0900-01-1	0 - 900mm Hg Abs	± 0.025% FS from 23° F to 122° F (± 0.225 mm Hg Abs)
DAI2000-01-1	0 - 2000mm Hg Abs	± 0.025% FS from 23° F to 122° F (± 0.50 mm Hg Abs)
DAI5200-01-1	0 - 5200mm Hg Abs	± 0.025% FS from 23° F to 122° F (± 13.00 mm Hg Abs)
TIO0110-01-1	T/C meas & sim with test lead kit	T/C measure and simulate module supports types B,C,E,J,K,N,R,S,T,M,P. Includes Standard T/C Connector/Wire Kit (P/N A37062)
VMA0055-01-1	V/mA meas & sim with test lead kit	V/I: meas ±55 Vdc, source 0-28Vdc; mA: meas ±100 mA dc, source 0-100 mA dc, Loop power source. Includes VMA Test Lead Kit (P/N A900529-00015)
RIO4000-01-1	RTD meas & sim with test lead kit	RTD measure and simulate module supports 22 different RTDs. Includes Special Module Connectors Kit (P/N A37063)

Note: NIST Traceability Certificate standard for all modules

Note: All modules have CE Mark and are Intrinsically Safe Certified by MET Laboratories
MET Laboratories is a Nationally Recognized Test Lab (NRTL). These modules are certified by
MET Laboratories to comply with standards CSA C22.2 No. 1010.1-92, C22.2 No. 157, and
UL913, Fifth Edition Rev 2/21/97 for Class I, Div I, Groups A, B, C, and D

For a precise list of Intrinsically Safe certified modules, please refer to the Intrinsic Safety Control Drawing in the Appendix of this manual.

YPC Accessories List

Sensor Modules – see list on previous page

P/N A36741 Protection module for open sensor bays
P/N A36742 Power adapter for 100 - 240 Vac with US plug
P/N A36755 International plug adapter kit for A36742
P/N A36800 6-pack AA alkaline batteries (1.5V), also approved for Intrinsic Safety (Duracell PC 1500)
P/N A36843 6-pack AA NiMH batteries (1.2V), also approved for Intrinsic Safety (Harding Energy Quest HWAAC1400U)
P/N A36844 NiMH battery charger, 8 cells, 8 hours, 120 VAC 60 Hz
P/N A36821 250 ohm shunt required for HART$^{®}$ communication on low resistance loops (included with YPC 401X)
P/N A900529-00014 HART test lead kit (inc'd with YPC 401X)
P/N A900529-00011 Standard banana jack test lead kit
P/N B34686 Pressure pump with variator, 145 PSI max.
P/N B34700 Vacuum pump with variator, -600 mm Hg max.
P/N A34386 low pressure fittings and tubing kit – vacuum to 150 PSI; connectors, tees, NPT adapters
P/N A900020-90502 high pressure fittings and hose – up to 9000 PSI; 3' hose w/ $^{1}/_{8}$" & $^{1}/_{4}$" MNPT x quick connect fittings
P/N A900028-90201 Class A, 100Ω platinum RTD probe, ¼" OD, 10" length, 304SS sheath, 5 foot coiled cable with connector for use with RIO4000 RTD measure and simulate module
P/N A36749 Soft carrying case with shoulder strap for base unit, modules, pump and test leads
P/N A36750 Hard carrying case with handle – foam insert for base unit with 3 installed modules, 4 additional modules, test leads, hand pump, RTD temperature probe, fittings and tubing

Kit Options - **Standard kit includes pneumatic pump choice and low pressure connection kit**
A37127   B34686 pressure pump and A34386 low pressure connection kit
A37128   B34700 vacuum pump and A34386 low pressure connection kit

For TIO0110 - t/c measure and simulate module accessories
A36857   t/c wire Kit 1 for types E, J, K, N, T; mini t/c connector with 1 m cable
A36858   t/c wire Kit 1 for types B, K, R/S; mini t/c connector with 1 m cable
A36881   mV measure / simulate cable assembly; mini t/c connector with 1 m cable and alligator clip terminations
A37062   TIO0110 Starter Kit includes all t/c accessories above (A36857, A36858, A36881)

For RIO4000 -   RTD measure and simulate module accessories
A900028-90500   User cable, 1.5 m coiled cable, 4 lead wires, alligator clip terminations
A900028-90201   Class A, 100Ω platinum RTD probe, ¼" OD, 10" length, 304SS sheath, 5 foot coiled cable with connector for use with RIO4000 RTD measure and simulate module
A37063   RIO4000 Starter Kit includes all RTD accessories above (A900028-90500, A900028-90201)

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TIO0110 Module Quick Instructions

For Thermocouple and milli-Volt Measurement and Simulation

Safety Notice: *Intrinsically Safe TIO0110 modules require the YPC 40X2 or 40X3 Intrinsically Safe base YPC units. The TIO module must be installed or removed in a safe area. T/C connectors must be connected to the TIO0110 module in a non-hazardous area. For more information on Intrinsically Safe operation, see the YPC instruction manual section on this topic and see the Intrinsic Safety Control Document in the appendix.*

The TIO0110 Module will measure any of twelve (12) thermocouple types, measure milli-Volts, or simulate the milli-Volt output the twelve (12) t/c types. Connections for measurement applications are made using mini-t/c connectors with appropriate t/c wire. Connections for simulation applications are made using mini-t/c connectors with wire cable and alligator clip ends (see Accessories section for the Yokogawa wire-kit part numbers).

Measure
- T/C types E, J, K, N, T
- T/C types B, K, R
- T/C types C, D, S, M, P
- ± 110.000 mV dc

Simulate
- ± 110.000 mV dc output
  for the same t/c types

Measurement Mode

Install the TIO0110 module in any YPC bay location and turn on the YPC. If no t/c is connected to the YPC, the Sx line will indicate "T/C open." If a t/c is connected a temperature will be shown on the display. Be sure the t/c type is correct - if not go to the TC Setup display to change the type.

Measure	
S1: T/C open	
S2: 0.000 inW20C	
S3: 0.00 PSIG	
IV: 0.000 mA	
Zero Mn/Mx Damp More	

YPC Measure Mode Display showing open T/C

Measure	
S1: 72.8 deg F	
S2: 0.000 inW20C	
S3: 0.00 PSIG	
IV: 0.000 mA	
Zero Mn/Mx Damp More	

YPC Measure Mode Display showing temperature

To access the setup menu for the TIO0110 module, press the **More** soft key from the **Measure Mode** of the YPC and then the **Sensr** soft key to view the S1 sensor bay module information. If the TIO module information is shown, press the **Setup** soft key to arrive at the TC Setup display shown below. Otherwise, press the **Next** soft key until the TIO module is displayed.

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```
┌─────────────────────────────┐   ┌─────────────────────────────┐
│ Sensor              ⊏▮▮▮▮❙   │   │ TC Setup            ⊏▮▮▮▮❙   │
│ Sensor 1                    │   │ Current Settings:           │
│ Yokogawa                    │   │ ➡TC Type        J           │
│   Model:     TIO0110        │   │  Standard       ITS 90      │
│   SN:        xxxxxxxxx       │   │  Resolution     0.1 deg     │
│   Cal Date:  YYYY-MM-DD     │   │  Simulate Mode              │
│                             │   │  User Re-Calibrate          │
│                             │   │                             │
│                             │   │                             │
│                             │   │                             │
│     Next          Setup     │   │  Up    Down   Select   Back │
└─────────────────────────────┘   └─────────────────────────────┘
```

 At the TC Setup display the user can select the desired t/c from the TC Type list, select the mV to temperature conversion standard, set the temperature display resolution, select Simulate Mode or enter the User Re-Calibrate Mode. Arrow Up or Down to the desired menu option and press the Select soft key.

> **TC Type** – select from T/C types E, J, K, N, T, B, R, C, D, S, M, or P. Use the Up and Down soft keys and Save key to set type.
> **Standard** – choose from NIST 175 (default), ITS 90 or ITS 68 standards. Use the Up and Down soft keys and Save key to set.
> **Resolution** – use to select temperature display resolution of 1° or 0.1°. Use the Up and Down soft keys and Save key to set.
> **Simulate Mode** – select simulate mode to simulate a t/c mV output to a receiving device.   See details below.
> **User Re-Calibration** – select this menu option to calibrate the TIO0110 module with appropriate local standards. See details below.

Simulate Mode

Select **Simulate Mode** from the TC Setup screen to access the TC simulation display. From this display the user can select simulation units, start a simple simulation or setup and execute an automated test procedure.

```
┌─────────────────────────────┐
│ TC Simulation       ⊏▮▮▮▮❙   │
│  Simulation Mode            │
│   Start                     │
│   Units:          C         │
│  ➡Auto Step 1               │
│   Auto Step 2               │
│   Auto Step 3               │
│                             │
│                             │
│  Up    Down   Select   Back │
└─────────────────────────────┘
```

The **Start** menu begins a TC or mV simulation. When Start is selected with the Select soft key, a numeric entry screen appears to facilitate the entry of the desired simulation temperature value (or mV value). Once the value has been entered, the YPC will use the previously selected conversion standard to determine the corresponding mV value and output that value through the TIO mini-t/c connector.

The **Units** menu line is used to select the temperature units for the simulation. °C, °F, °K, or °R are the available temperature units. The user can also select mV units for the simulation if desired.

Auto-Step x menu options allow pre-programmed simulations to be set up and executed automatically by the YPC / TIO. Auto-Steps are automatically stored for future use.

.

```
┌─────────────────────────────────────┐
│ TC Setup                    ◁▣▣▣▣    │
│  Auto-Step x                         │
│   Start                              │
│   Units:          mV                 │
│   Low pt:         0.000  mV          │
│ ➡ Upr pt:110.000  mV                 │
│   Steps:          5                  │
│   Dwell Time:     5 sec              │
│                                      │
│                                      │
│   Up      Down     Select     Back   │
└─────────────────────────────────────┘
```

Select **Start** menu option to begin the indicated Auto-Step number.
Select **Units** to change the Auto-Step x simulation units.
Select **Low pt** to enter the beginning test point value.
Select **Upr pt** to enter the ending test point value.
Select **Steps** to enter the number of test points in the procedure including the Upr pt.
Select **Dwell Time** to choose the duration of each simulated point or chose Manual for the manual advance option.

User Re-Calibrate

This menu option accesses the controls used for re-calibration of the TIO0110 module using local standards.

This calibration requires a highly accurate DMM, a stable, programmable DC voltage source and a standard type TT thermocouple probe in a stable ice bath. Required equipment is as follows:

DMM	Fluke 8508A, HP3458A or equivalent
DC Voltage Source	EDC 52X or equivalent
Thermocouple	Omega TRCIII ice point with TRP-T thermocouple probe or equivalent

Each selection on the TC Setup screen enables a mode to measure and capture calibration data. The values are stored in non-volatile memory in the sensor module. Refer to the YPC TIO0110 Calibration Manual for details of the re-calibration process.

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```
┌─────────────────────────────────────┐
│ TC Setup                    ▭▮▮▮▮    │
│ User Re-Calibration                  │
│ ➡ Offsets                            │
│   CJ gain                            │
│   TC neg gain                        │
│   TC pos gain                        │
│   CJ Correction                      │
│   DAC coarse gain                    │
│   DAC fine gain                      │
│   DAC offset                         │
│   Full Recal                         │
│                                      │
│   Up      Down     Select    Back    │
└─────────────────────────────────────┘
```
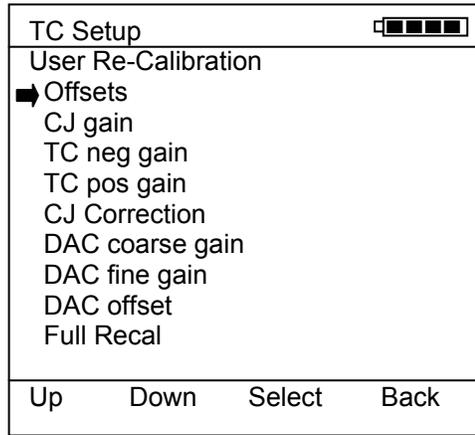
Offsets – Input offsets
CJ gain – Gain of cold-junction compensation
TC neg gain – Thermocouple negative-gain slope
TC pos gain – Thermocouple positive-gain slope
CJ Correction – Offset of cold-junction compensation
DAC coarse gain – Coarse output DAC gain slope
DAC fine gain – Fine output DAC gain slope
DAC offset – DAC offset constant
Full Recal – Sequences from step 3.1 to step 3.8 and stores all calibration constants.

Specifications

Input impedance: > 10 megohms
Warm-up time: ≤ 1 Minute to full rated accuracy

mV Accuracy : ± 0.025% R + 0.005% FS

Temperature Effect: ≤ 2uV/°C

T/C Accuracy: ± 0.3°C for E, J, K, N & T types
T/C Accuracy: ± 1.0°C for B, R & S types

T/C Accuracy: ±0.5°C for C, D, M & P types

Cold junction effect: ± 0.5°C max

Resolution: ± 0.1° or ± 1° for T/Cs, ± 0.001 mV
Voltage range: ± 110.000 mV dc

Temperature: Storage: -40° F to 140° F (-40° C to 60° C)
                   Operating: 23° F to 122° F (-5° C to 50° C)
Connector – Measure & Simulate T: standard mini-t/c connector with t/c wire
                - Source mV: standard mini-t/c connector with cable and two alligator clips
Power: supplied from YPC (simulate / source mode only)
Units: °F, °C, °R, °K, milli-Volts
Weight: 3 ozs

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Approvals

Intrinsically Safe Certification from MET Laboratories. MET Laboratories is a Nationally Recognized Test Lab (NRTL). The module is certified by MET Laboratories to comply with standards CSA C22.2 No.1010.1, CSA C22.2 No. 157-92, and UL913 Fifth Edition Rev 2/21/97 for Class I, Division I, Groups A, B, C, and D, T5 hazardous areas. ***Restrictions apply – see the Intrinsically Safe Control Drawing shipped with each YPC 4000 Series Modular Calibrator for more details. An uncontrolled copy of this drawing is found in the Appendix of this manual.***

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Accessories for TIO0110

P/N A36857	T/C Wire Kit 1 for types E, J, K, N, T - mini t/c connector, 1 m cable, wire ends
P/N A36858	T/C Wire Kit 2 for types B, K, R - mini t/c connector, 1 m cable, wire ends
P/N A36881	mV simulation cable assembly; mini t/c connector, 3.5 ft. copper cable, alligator clips

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VMA0055 Module Quick Instructions

For mA / V measurement, Xmitter Simulation, mA Source and V Source

Notices:
1) *The VMA 0055 module is **not hot-swappable**. To install the module, turn the YPC base unit OFF, install the VMA 0055 in any bay and turn the YPC back ON. Attempting to install the VMA module with YPC power ON will cause the YPC to shut down. **Damage could occur** to the YPC or module.*
2) *Only **one VMA module** is allowed to be install at a time in YPC.*
3) *Intrinsically Safe VMA 0055 modules require the YPC 40X2 or 40X3 Intrinsically Safe base YPC units. The VMA module must be installed or removed in a safe area. For more information on Intrinsically Safe operation, see the YPC instruction manual section on this topic and see the Intrinsic Safety Control Document in the appendix.*

The VMA Module has two measurement functions and four source/simulate functions:

Measure
- $\pm$ 55.000 V dc
- $\pm$ 100.000 mA dc

Source / Simulate
- 24 VDC Loop Power
- Xmitter Sim
- mA Source
- V Source

Measurement Applications

The VMA module will measure voltage and current to upper values that exceed the YPC base unit's metering capabilities.

Use "Volts" and "Com" jacks on the VMA module to measure voltage from upper range values of $\pm$500.000 milli-volts to $\pm$55.000 volts. The "V Range" should be set to the appropriate range for best accuracy. This is done from the YPC **Measure Mode** by pressing the **More** soft key twice and then the **Vrng** soft key. The following display appears for selection of the desired Voltage measurement range.

```
 VMA Setup            ⬛⬛⬛⬛
 V Range          +/-55
➡ +/-55
  +/-30
  +/-15
  +/-8
  +/-4
  +/-2
  +/-1
  +/-.5


 Up    Down  Save   Back
```

Voltage range selection

The top line of the V Range display indicates the range presently in use. To select a more suitable range for the application at hand, simply arrow **Up** or **Down** to the desired range and press the **Save** soft key. Press **Back** when satisfied with the range selection.

For current measurements up to ±100 mA, use the VMA module's "mAmp" and "Com" jacks as you would with a standard meter. ±100.000 mA can be measured without any range selection for current.

Loop Power Application

The VMA will provide 24VDC Loop Power for transmitter loop circuits. The recommended wiring is depicted in the diagram below:

YPC
mA/V Meter
+ −

VMA
Module

VOLTS
COM
mA

YPC
HART

− +
Transmitter
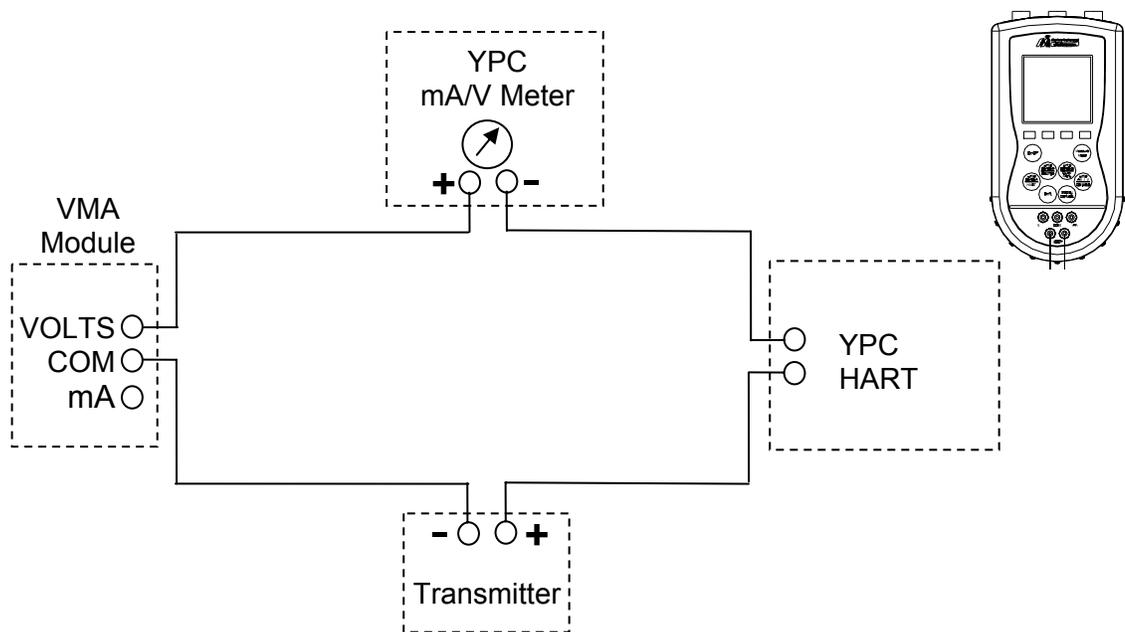
Diagram 2.1 – Loop Power Connection Diagram for simple low load loop

Connect the test circuit according to the Diagram 2.1.
Include 250-ohm resistor for low load loops.
The loop power is turned on from the YPC **Measure Mode** by pressing the following keys:
        Press the **More** Soft Key two times
        Press the **Pon** Soft Key to turn VMA power supply on

```
┌─────────────────────────────────┐
│ Measure                 ◁▮▮▮▮    │
│                                  │
│  S1:   24.00 V                   │
│                                  │
│  S2:   0.000 PSIG                │
│                                  │
│  S3:   72.05 deg F               │
│                                  │
│  IV:   4.000 mA                  │
│                                  │
│ ┌──────────────────────────────┐│
│   Pon     Poff    Vrng    More   │
└─────────────────────────────────┘
```

The SX sensor location (depending which bay the VMA is located in) should read approximately 24.00 VDC. The YPC's IV value will read the loop current.

To establish HART communications with the test device, press the YPC's **HART** key.

Manual Source and Simulation Operations–

Wire the test circuit as shown in Diagram 3.1 and 3.2 depending on the desired
  application:
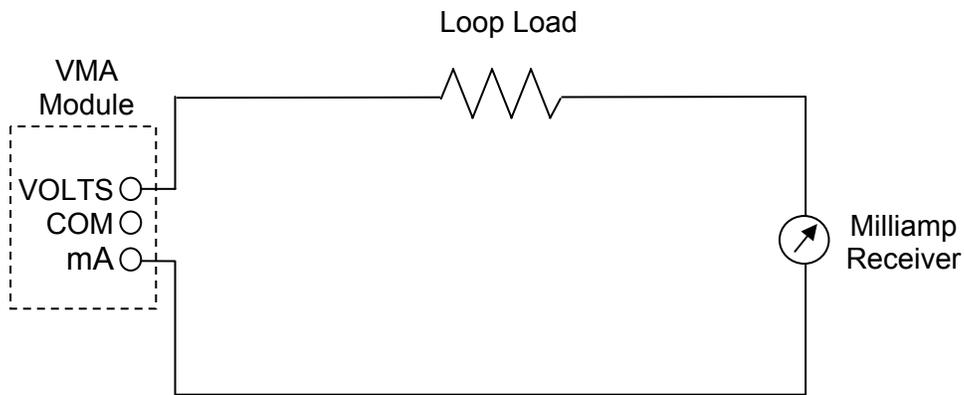
Section 1.02   Diagram 3.1 – mA Source & V Source Connection Diagram

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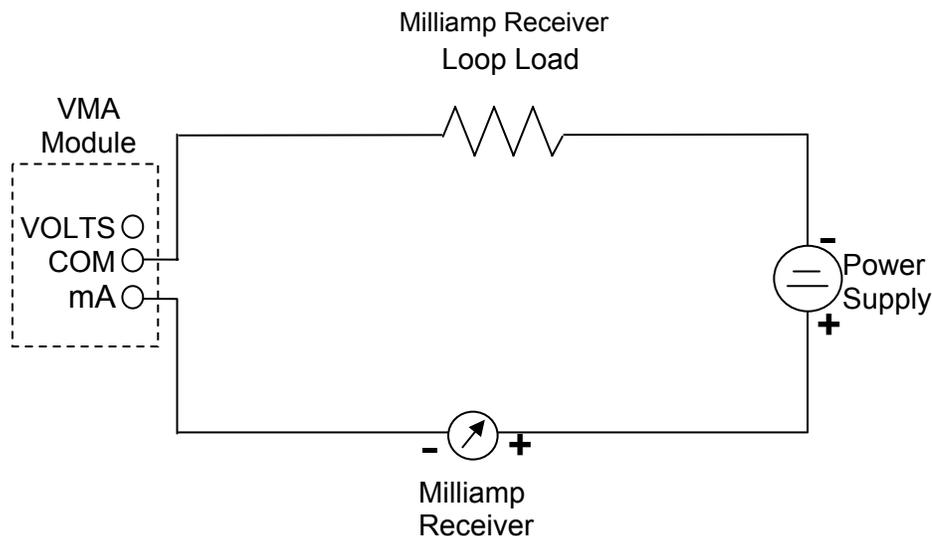
Diagram 3.2 – Transmitter Simulation Connection Diagram

From YPC **Measure Mode**, press the **More** soft key
Press the **Sensr** soft key and then **Next** until the VMA module information is
displayed (YPC bay S1 module information is displayed first, then Next changes to
bay S2, etc…)
Press the **Setup** soft key option for the VMA module to display the VMA Main
Setup Display
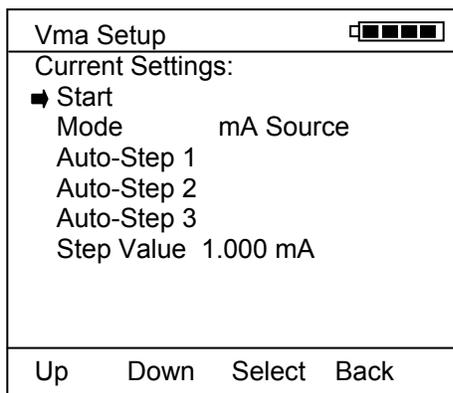
VMA Main Setup Display

Select the **Mode** option to select from **Xmitter Sim**, **mA Source** or **V Source** options. Use the
soft keys to move cursor **Up** or **Down**, to **Select** the desired option and to go **Back** to the VMA
Main Setup Display.
From the VMA Main Setup Screen, select **Start**
The user will be prompted to enter the starting value with the following screen. Use the soft keys
to enter the desired value.

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```
┌─────────────────────────────────────┐
│ Vma Settings            ▯▮▮▮▮         │
│   Current Settings                    │
│   Enter Output Value                  │
│                                       │
│                                       │
│   _ 0.000                             │
│───────────────────────────────────────│
│   Inc     Dec    Next    Done         │
└─────────────────────────────────────┘
```

Inc – Increases the value shown above the cursor
Dec – Decreases the value shown above the cursor
Next – moves cursor to the right; eventually wraps back to left position
Done – Ends data entry session and proceeds with the selected operation

Once the value is entered, press the **Done** soft key to initiate the selected operation.

The operation depicted below is for mA Source. Use the soft keys to change the output value as desired. Note that the YPC base unit's IV (current/voltage) meter reading is shown on this display for use in applications requiring both sourcing and measurement. The IV line can be changed at this display from V to mA to off by using the YPCs "Shift" and "Units mA / V" keys as usual (see the YPC instruction manual section on Changing Units for more information).

```
┌─────────────────────────────────────┐
│ mA Source               ▯▮▮▮▮         │
│                                       │
│   Output = 16.000 mA                  │
│                                       │
│   IV = 16.015 mA                      │
│                                       │
│───────────────────────────────────────│
│   Inc     Dec    Chng    Exit         │
└─────────────────────────────────────┘
```

Inc – Increases the current value by the Step Value (entered in the VMA Main Setup Display).
Dec – Decreases the current value by the Step Value (entered in the VMA Main Setup Display).
Chng – Allows the user to enter another value.
Exit – Ends simulation mode, returns to the VMA Main Setup Display.

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Automated Operation – Source and Simulation

The VMA has features that allow step functions that can be utilized in the source/simulation options. The standard steps programmed by the user are stored for future recall and use.

Refer to Diagrams 3.1 and 3.2 and make connections for the desired application.
From the VMA Main Setup Menu, arrow down and select **Auto-Step X.**

```
┌─────────────────────────────────────┐
│ Vma Setup              ⊏■■■■⊐        │
│ Auto-Step 1:                         │
│ ➡ Start                              │
│    Mode:        mA Source            │
│    Low pt:      4.000 mA             │
│    Upr pt:      20.000 mA            │
│    Steps:       5                    │
│    Auto-Step    3                    │
│    Dwell Time:  Manual               │
│                                      │
│                                      │
│ ┌──────┬───────┬────────┬──────┐    │
│ │ Up   │ Down  │ Select │ Back │    │
│ └──────┴───────┴────────┴──────┘    │
└─────────────────────────────────────┘
```
Auto-Step Setup Display

> **Start** – Begins the desired simulation mode with the stepping
> parameters selected.
> **Mode** – Displays the current selected simulation mode. Select **Mode** to change.
> **Low pt** – Displays the starting source or simulation value. Select to enter a value.
> **Upr pt** – Displays the ending source or simulation value. Select to enter a value.
> **Steps** – Displays the number of steps to take (including the "Upr pt"). Select to change
> the number of steps.
> **Dwell Time** – Displays the time delay in seconds at each step. "Manual" can be selected
> to enable user to manually advance to next programmed step.

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Resolution, Range, Accuracy for VMA0055 Module

mA dc	mA Measure Mode	mA Source Mode
Resolution	.001 mA	.001 mA
Range	±100.000 mA (55 Vdc compliance)	0 - 24.000 mA
Accuracy	± (0.01% of reading + 0.015% FS)	± (0.01% of reading + 0.015% FS)
Open Circuit Voltage		24 VDC
Output Drive		15 VDC minimum @ 24 mA, Resistive load

Volts dc	V dc Measure Mode	V dc Source (Regulated) Mode
Resolution	1/100,000 counts: .001 mV; .001 V	1 / 1,000,000
Ranges	500 mV; 1, 2, 4, 8, 15, 30, 55 V	0 - 24.000 VDC
Accuracy	± (0.01% of reading + 0.05% FS)	± (0.01% of reading + 0.05% FS)
Open Circuit Voltage		24 VDC
Output Drive		15 VDC minimum @ 24 mA, Resistive load

2-wireTransmitter Simulate		mA Simulation
Resolution		.001 mA
Range		0 - 24.000 mA
Accuracy		± (0.01% of reading + 0.015% FS)
Loop Voltage Limits		1 VDC min., 55 VDC max.

Regulated Loop Power		Regulated Power
Resolution		na
Range		24V dc
Accuracy		± (0.01% of reading + 0.015% FS)
Open Circuit Voltage		24 VDC
Output Drive		15 VDC minimum @ 24 mA, Resistive load

Notes: 1. Nominal resistance at VMA current terminal is 10 – 15 Ω
           2. Output load line is linear

Approvals

Intrinsically Safe Certification from MET Laboratories. MET Laboratories is a Nationally Recognized Test Lab (NRTL). The module is certified by MET Laboratories to comply with standards CSA C22.2 No.1010.1, CSA C22.2 No. 157-92, and UL913 Fifth Edition Rev 2/21/97 for Class I, Division I, Groups A, B, C, and D, T5 hazardous areas. *Restrictions apply – see the Intrinsically Safe Control Drawing shipped with each YPC 4000 Series Modular Calibrator for more details. An uncontrolled copy of this drawing is found in the Appendix of this manual.*

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RIO4000 Module Instructions

For RTD (Resistance Temperature Detector) Measurement and Simulation when used with YPC 4000 Series of Documenting Multifunction Calibrator / HART Communicator.

Safety Notice: RIO4000 modules require Intrinsically Safe YPC base unit in order to be Intrinsically Safe themselves. The RIO module must only be installed or removed in a safe area. Similarly, RTDs and User Cables must only be connected to or removed from the RIO4000 module in a safe area. For more information on Intrinsically Safe operation, see the YPC instruction manual section on this topic.

The RIO4000 Module will measure temperature for any of twenty-two (22) RTD types, measure resistance (ohms) from RTDs, or simulate the resistance (ohms) output of twenty-two (22) RTD types. The module will accommodate 2-, 3-, and 4-wire RTDs. The module has a 6 pin connector to mate with a matching 6 pin plug connector. The 6 pin connector is wired to an RTD for measurement applications using a dedicated RTD probe. An available User Cable is used to temporarily connect to any RTD. Connections for simulation applications are also made with the User Cable (see Accessories section of this manual for part numbers).

The RIO4000 will simulate the resistance output of twenty-two (22) RTD / alpha combinations. The module can simulate temperature to all types of RTD conventional or smart transmitters and signal conditioners including those employing pulsed excitation current to measure RTDs.

Measure temperature
- Platinum RTDs
- Nickel RTDs
- Copper RTDs
- Iron RTDs
- Resistance (0 - 4000 ohms)

Simulate temperature
- Standard temperature ranges
- 0 - 4000 ohms for range of selected RTD
- 0 - 400 and 0 - 4000 ohm ranges

The RIO4000 features an automatic RTD recognition system made possible by the two extra pins on the 6 pin connector. A sensor resistor value (Rs) has been assigned to each of the twenty-two (22) combinations of RTD material / alpha (α) coefficients supported (see Table 1 below for values). When a resistor Rs is installed between pins 1 and 2, the YPC reads the Rs value, identifies the connected RTD, and automatically loads the corresponding coefficients from an internal table.

Pt 100 RTDs are available from Yokogawa complete with plug connector, Rs resistor, and 5 foot coiled cable. The RIO module automatically recognizes these probes when connected. Plug connectors are available for customers to use when making up their own RTD standards. Users can install the appropriate Rs resistor (see Table 1) between pins 1 and 2 to make use of the automated recognition system. If no Rs resistor is used, a copper wire (Rs value of zero [0]) must be installed between pins 1 and 2 to cause the RTD Selection display to appear on the YPC display. In this case the user moves the display cursor to the desired RTD type and selects it for use by using the YPC Soft Keys.

The available User Cable with four (4) alligator clips is used to connect the RIO4000 module to any RTD for temperature measurement or to any RTD transmitter or signal conditioner for simulation applications. The User Cable has an Rs value of zero (0). When connected to the YPC, this value is sensed and the RTD Selection menu is automatically displayed. In this case the user moves the display cursor to the desired RTD type and selects it for use by using the YPC Soft Keys.

Table 1: Supported RTD Materials / Rs Sensor Resistor No.

Material	R0	ALPHA	Rs (Probe ID)	Temp Range (deg C)	Recommended Calib Resistor
Platinum	100	0.00385	100	-200 to +850° C	100 Ω
Platinum	1000	0.00385	1000	-200 to +630° C	1000 Ω
Platinum	100	0.00392	46.4	-200 to +630° C	100 Ω
Platinum	100	0.00391	56.2	-200 to +630° C	100 Ω
Platinum	25.5	0.00392	17.8	-200 to +630° C	100 Ω
Platinum	200	0.00385	178	-200 to +630° C	100 Ω
Platinum	470	0.00392	261	-200 to +630° C	1000 Ω
Platinum	500	0.00392	316	-200 to +630° C	1000 Ω
Platinum	500	0.00391	383	-200 to +630° C	1000 Ω
Platinum	500	0.00385	464	-200 to +630° C	1000 Ω
Platinum	1000	0.00375	1210	-50 to +500° C	1000 Ω
Platinum	100	0.00393	68.1	-200 to +962° C	100 Ω
Platinum	100	0.00389	82.5	-200 to +630° C	100 Ω
Platinum	98.129	0.00392	21.5	-200 to +600° C	100 Ω
Platinum	200	0.00392	215	-200 to +630° C	100 Ω
Copper	9.035	0.00427	12.1	-100 to +260° C	10 Ω
Copper	100	0.00427	121	-100 to +260° C	100 Ω
Nickel	100	0.00618	31.6	-60 to +160° C	100 Ω
Nickel	120	0.00672	147	-80 to +260° C	100 Ω
Iron	604	0.00518	562	-100 to +200° C	1000 Ω
Iron	908.4	0.00527	681	-100 to +200° C	1000 Ω
Iron	1816.81	0.00527	1470	-100 to +200° C	1000 Ω
10 Ω resistor	na	na	14.7	Precision cal resistor	na
100 Ω resistor	na	na	26.1	Precision cal resistor	na
1000 Ω resistor	na	na	825	Precision cal resistor	na

RIO4000 Connector, Option 1 – For User Supplied Reference RTD Probes
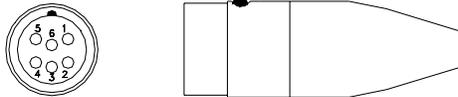
P/N A900442-00026 connector is used to connect an RTD to the RIO4000 module. See the Table 2 below for connector pin-outs.

Table 2: Connector Pin-Outs

PINS	Functions
1, 2	Rs – Probe ID Resistor (see Table above)
3, 4	One side of RTD
5, 6	Other side of RTD

Note: Pins 3 – 6 must be connected. See RTD wiring styles below for further information

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RTD wiring styles for Connector Option 1

IMPORTANT: Pins 3 – 6 on the custom connector must all be connected for readings to take place!

2-wire RTDs
> Connect pin 3 <u>and</u> pin 4 to one wire/terminal of the RTD. Connect pin 5 <u>and</u> pin 6 to the other wire/terminal.

3-wire RTDs
> 3-wire RTDs have two wires/terminals that are the same color. Connect pin 3 to one of these wires/terminals and connect pin 4 to the other wire/terminal of the same color. Connect both pin 5 <u>and</u> pin 6 to the remaining, different color wire/terminal.

4-wire RTDs
> 4-wire RTDs have two wires/terminals of one color and two of another color. Connect pin 3 and pin 4 to each of two wires/terminals of the same color. Connect pin 5 and pin 6 to each of two wires/terminals of the other color.

Notes on RTD wiring
1. For maximum accuracy use 3-wire or 4-wire configurations with DIN Class A RTDs.
2. When using a 2-wire RTD, keep the lead length between the alligator clips of the general-purpose connector and the RTD element as short as possible.
3. In 3-wire and 4-wire configurations, the wire size and length should be identical for all leads.

RIO4000 User Cable, Option 2 – For General Purpose RTD Measurement and Simulations
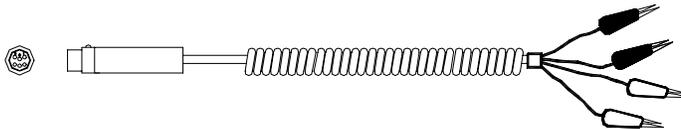
P/N A900028-90500 general-purpose connector is used for connecting to RTD wires or terminals to obtain temperature measurements directly from an RTD devices or for connecting to a temperature transmitter or other receiving device for simulation applications. One pair of white and one pair of red Alligator clips are suitable for connecting to 2-, 3-, or 4-wire RTDs.

RTD wiring styles for User Cable Option 2

IMPORTANT: Alligator clips on the connector/cable assembly must all be connected to something for readings to take place!

2-wire RTDs
> Connect the two Red clips to one wire/terminal of the RTD. Connect the two White clips to the other wire/terminal.

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3-wire RTDs

> 3-wire RTDs have two wires/terminals that are the same color. Connect the two Red clips to the wires/terminals of the same color. Connect the two White clips to the remaining wire/terminal.

4-wire RTDs

> 4-wire RTDs have two wires/terminals of one color and two of another color. Connect the Red clips to each of two wires/terminals of the same color. Connect the White clips to each of two wires/terminals that are the other color.

Note: Restrictions apply for use of Intrinsically Save RIO4000 modules / YPC units in Hazardous Areas.   RTDs and / or RIO4000 modules must only be removed or replaced in non-hazardous areas. RTDs, P/N A900442-00026 connectors and P/N A900028-90500 User Cable must only be connected to the RIO4000 in a non-hazardous area. See the Intrinsically Safe Control Document in the Appendix for more details.

Measurement Mode

> Install the RIO4000 module in any YPC bay location and turn on the YPC. If no RTD is connected to the YPC, the corresponding Sx line on the display will indicate "No Probe." Be sure the RTD type is correct - if not, go to the RTD Sensor Module Setup display to change the type.

Measure ▯▮▮▮▮	Measure ▯▮▮▮▮
S1: No probe	S1: 72.8 deg F
S2: 0.000 inW20C	S2: 0.000 inW20C
S3: 0.00 PSIG	S3: 0.00 PSIG
IV: 0.000 mA	IV: 0.000 mA
Zero Mn/Mx Damp More	Zero Mn/Mx Damp More

YPC Measure Mode Display showing open RTD   **YPC Measure Mode Display showing temperature**

> When an RTD with connector and Rs resistor is connected to the RIO4000, the YPC automatically displays the temperature value measured. Units can be changed by pressing the YPC **Shif**t key and then the appropriate **Units Sensor X** key until the desired unit is displayed.   Press the **Shif**t key again to return the YPC to standard Measure Mode.

> When the YPC is in Measure Mode and the User Cable is connected to the RIO4000, the YPC reads the Rs = 0 value from User Cable pins 1 and 2 and automatically provides the RIO User Select display shown below.

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```
┌─────────────────────────────┐
│ RIO User Select      ▢▮▮▮▮   │
│ Select Probe Type           │
│➡Pt  100   (385)             │
│ Pt 1000  (385)              │
│ Pt  100   (392)             │
│ Pt 1000  (391)              │
│ Pt 25.5  (392)              │
│ Pt  200   (385)             │
│ Pt  470   (392)             │
│ Pt  500   (392)             │
│ Pt  500   (391)          ⬇  │
│ Pt  500   (385)             │
│                             │
│ Up    Down   Select   Back  │
└─────────────────────────────┘
```
RIO User Select screen 1

```
┌─────────────────────────────┐
│ RIO User Select      ▢▮▮▮▮   │
│ Select Probe Type           │
│➡Pt  1000  (375)        ⬆    │
│ Pt 100    (393)             │
│ Pt  100   (389)             │
│ Pt 98     (392)             │
│ Pt  200   (392)             │
│ Cu  10    (427)             │
│ Cu  100   (427)             │
│ Ni  100   (618)             │
│ Ni  120   (672)          ⬇  │
│ Fe 604    (518)             │
│                             │
│ Up    Down   Select   Back  │
└─────────────────────────────┘
```
RIO User Select screen 2

```
┌─────────────────────────────┐
│ RIO User Select      ▢▮▮▮▮   │
│ Select Probe Type           │
│➡Fe 1000   (527)        ⬆    │
│ Fe 2000   (527)             │
│ User Select                 │
│ 1000 Ω Cal Res              │
│ 100   Ω Cal Res             │
│ 10    Ω Cal Res             │
│                             │
│                             │
│                             │
│                             │
│                             │
│ Up    Down   Select   Back  │
└─────────────────────────────┘
```
RIO User Select screen 3

Select the desired RTD probe by using the **Up** and **Down** soft keys to move the cursor to the RTD / alpha coefficient combination needed. Press the **Select** soft key to continue. To move page by page, press the YPC's **Shif**t key to change the soft key row to "**Up   Down   PgUp   PgDn**." **PgUp** and **PgDn** soft keys perform "Page Up" and "Page Down" functions. Subsequent press of the **Up** or **Down** key will return the **Select** and **Back** soft key options to the display.

The RIO Setup screen will appear as shown below. Use the **Up** and **Down** soft keys to move the cursor to the desired setting or function and press **Select**. Note: "Simulate Mode" options will only appear is a User Cable (Rs = 0) is connected.

```
┌─────────────────────────────┐
│ RIO Setup           ▢▮▮▮▮    │
│ Settings & Functions        │
│   Choose New Probe          │
│➡Display: Degrees            │
│   Simulate Mode             │
│                             │
│   Selected Probe:           │
│   U->Pt 100   (385)         │
│                             │
│                             │
│                             │
│ Up    Down   Select   Back  │
└─────────────────────────────┘
```

Choose New Probe: returns to RIO User Select screen
Display: set display for **Degrees only** or **Degrees & Ω**
Simulate Mode: accesses Simulation setup screen, see below
Selected Probe: shows current RTD and alpha selection

To display a temperature reading from an RTD connected via the User Cable, press the **Back** soft key or press the YPC's **Measure Mode** key.

Setup Menu

To access the Setup menu for the RIO4000 module at any time, press the **More** soft key from the **Measure Mode** of the YPC and then the **Sensr** soft key to view the S1 sensor bay module information. If the RIO module information is shown under Sensor 1, press the **Setup** soft key to arrive at the RIO Setup display shown above. Otherwise, press the **Next** soft key until the RIO module information is displayed and then press **Setup**.

```
┌─────────────────────────────┐   ┌─────────────────────────────┐
│ Sensor            ▭▮▮▮▮      │   │ RIO Setup         ▭▮▮▮▮      │
│ Sensor 1                    │   │ Settings & Functions        │
│ Yokogawa                    │   │   Choose New Probe          │
│   Model:      RIO4000       │   │ ➡ Display:  Degrees         │
│   SN:         xxxxxxxxx      │   │   Simulate Mode             │
│   Cal Date:   YYYY-MM-DD     │   │                             │
│   Probe: No Probe!          │   │   Selected Probe:           │
│   Probe Cal:  YYYY-MM-DD     │   │   U->Pt 100   (385)         │
│                             │   │                             │
│                             │   │                             │
│               Next   Setup  │   │ Up   Down   Select   Back   │
└─────────────────────────────┘   └─────────────────────────────┘
```

RIO4000 Sensor Setup Access   **RIO Setup Screen**

From the RIO Setup display the user can access the RIO User Select list to choose the RTD type with associated alpha coefficient, set the temperature display for degrees only or degrees & Ω, or access Simulate Mode. Arrow **Up** or **Down** to the desired menu option and press the **Select** soft key.

> **Choose New Probe** – select from RTD types Pt (platinum), Ni (Nichol), Cu (Copper), Fe (iron) and alpha coefficients listed. Use the **Up** and **Down** soft keys and **Select** key to select the RTD type. See section 1.3 above for more detail on available probes and selection.

> **Display** – use to setup temperature display for **Degrees only** or **Degrees & Ω**. Use the **Up** and **Down** soft keys and **Save** key to set. (Temperature units are selected using the standard YPC units selection from Measure Mode; press Shift key and then the "Units SensorX" key corresponding to the RIO4000 bay locations.)

> **Simulate Mode** – select simulate mode to simulate the resistance of the previously selected RTD type to a receiving device. See details below.

Simulate Mode

Simulate Mode is entered through the RIO Setup menu as discussed above and can only be used when the User Cable is connected. The **Simulate Mode** option line on the RIO Setup Screen WILL ONLY APPEAR IF THE USER CABLE (Rs = 0) IS CONNECTED!

To setup a simulation from the RIO Setup Menu, select **Simulate Mode** from the RTD Setup. The user will be prompted "Verify proper RTD lead connections." Select the **OK** soft key after leads from the User Cable are connected to the receiver device. The RIO4000 will perform a self calibration and then display the RIO Simulation screen shown below. From this screen the user can select simulation units, start a simple simulation, assign a step value change, or setup and execute automated step or ramping test procedures.

```
┌─────────────────────────────────────┐
│ RIO Simulation          ▭▪▪▪▪         │
│ Simulating                           │
│   Start                              │
│   Units:  C                          │
│ ➡ Step Value:   10.0  C              │
│   Auto Step 1                        │
│   Auto Step 2                        │
│   Auto Step 3                        │
│   Auto Ramp 1                        │
│   Auto Ramp 2                        │
│   Auto Ramp 3                        │
│                                      │
│ ──────────────────────────────────  │
│   Up      Down     Select    Back    │
└─────────────────────────────────────┘
```

Start begins an RTD (resistance) simulation. When **Start** is selected with the **Select** soft
key, a numeric entry screen appears to facilitate the entry of the desired simulation value
(degree or ohm value as selected at **Units** line). Once a value has been entered and
saved, the YPC will use the RTD type and alpha coefficient previously specified to both
determine and output the corresponding ohm value through the User Cable.
Units is used to select the temperature unit for the simulation. °C, °F, °K, and °R are the
available. The user can also select ohms if desired.
Step Value is a user entered value that can be used to increment or decrement the
simulation value by after the simulation is started.

```
┌──────────────────────────────┐   ┌──────────────────────────────┐
│ RIO Simulation               │   │ RIO Simulation               │
│ Fixed Simulation Mode        │   │ Simulating Probe             │
│   Enter Output in C          │   │   U->Pt 100    (385)         │
│                              │   │                              │
│   The U->Pt 100    (385)     │   │   Output  =  0.0  C          │
│   probe has a range of       │   │                              │
│   -200.0 C to 850.0 C        │   │   IV:   4.000   mA           │
│                              │   │                              │
│   _    0.0                   │   │                              │
│                              │   │                              │
│ ──────────────────────────── │   │ ──────────────────────────── │
│  Inc    Dec    Next    Back  │   │  Inc    Dec    Chng    Back  │
└──────────────────────────────┘   └──────────────────────────────┘
```

Fixed Simulation Value Entry Screen   **Simulation Display with YPC's I/V Measurement**

Auto Step 1-3 menu options allows pre-programmed Simulations to be set up and
executed automatically by the YPC / RIO. Auto-Steps are automatically stored for future
use.

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```
┌─────────────────────────────────┐
│ RIO Simulation          ⊏■■■■▯  │
│ Auto Step 1                      │
│   Start                          │
│   Units:    F                    │
│   Low pt:  50.000  F             │
│   Upr pt:  250.000  F            │
│ ➡Steps:     5                    │
│   Dwell Time:    5 sec           │
│                                  │
│ Simulating Probe:                │
│ U->Pt 100    (385)               │
│                                  │
├─────────────────────────────────┤
│ Up     Down    Select    Back    │
└─────────────────────────────────┘
```

Select **Start** menu option to begin the indicated Auto Step number.
Select **Units** to change the Auto Step x simulation units.
Select **Low pt** to enter the beginning test point value.
Select **Upr pt** to enter the ending test point value.
Select **Steps** to enter the number of test points in the procedure including the Upr pt. The Low pt to Upr pt range will be evenly divided according to the number of steps selected.
Select **Dwell Time** to choose the duration of each simulated point or choose Manual for the manual advance option.

Auto Ramp 1-3 menu options allow pre-programmed Simulations to be set up and executed automatically by the YPC / RIO for those applications requiring an automatic advance from **Low pt** to **Upr pt** and down again as desired. User selects a start delay time, a ramp cycle time, plus up scale only or up scale and down scale options. Up to three (3) Auto-Ramps are automatically stored for future use.

Rcal – Field Recalibration
The RIO4000 module can be recalibrated / re-certified using appropriate local standards and the YPC's Rcal feature. Two recalibration methods are available. See the FIELD RECALIBRATION Section of this YPC Operator Instruction Manual for general information on the Rcal feature and initial setup. Once pertinent parameters and options have been entered, move cursor arrow to the Start option on the main Rcal menu and press the Select soft key. This initiates the recalibration type selection display shown below.

```
┌─────────────────────────────┐     ┌─────────────────────────────┐
│ Field Recal                 │     │ Field Recal                 │
│ Field Recal Setup:          │     │ Enter Type of Cal:          │
│ ➡Start                      │     │    Module Only              │
│   Module Bay:  1            │     │ ➡Module + Probe             │
│   Units:  C                 │     │                             │
│   Points:  3                │     │                             │
│   Restore Defaults          │     │                             │
│                             │     │                             │
├─────────────────────────────┤     ├─────────────────────────────┤
│ Up   Down   Select   Back   │     │ Up   Down   Start   Back    │
└─────────────────────────────┘     └─────────────────────────────┘
   Rcal Feature Main Setup Menu          Calibration Type Selection
```

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Module Only method makes use of external precision resistors to calibrate the module's resistance measurement. The module is set up to allow calibration using precision 10 Ω, 100 Ω, or 1000 Ω resistors rated for a total tolerance of 10 PPM. The user selects the best resistor value for the types of RTDs the RIO4000 will be used to calibrate.

One Yokogawa connector (P/N A900442-00026) is needed for each precision resistor used. A10 Ω, 100 Ω, or 1000 Ω precision resistor is connected to pins 3 & 4 and 5 & 6 as though a 4-wire RTD were being connected (many precision resistor are available in a 4-wire configuration). In addition, an Rs resistor corresponding to 10, 100, or 1000 Ω should be connected across pins 1 and 2 of the connector. The Rs resistor allows the YPC to automatically determine which precision calibration resistor is connected. For 10 Ω the Rs value is 14.7 Ω, for 100 Ω the Rs value is 26.1 Ω and for 1000 Ω the Rs value is 825 Ω. Make sure the external precision resistor is securely engaged in the RIO4000 connector. Wiring between the connector and the precision resistor should be of the same size and of the same length. Field calibrations performed using the **Module Only** method should use precision resistors rated for 10 ppm total tolerance at most to replicate the original factory accuracy.

Selecting the Module Only option and connecting a 100 Ω precision resistor causes the following display to appear.

```
┌─────────────────────────────────┐
│ RTD Calibrate                   │
│ Standard: 100   Ω  Cal R        │
│ ➡ Edit Cal Res Value            │
│   Calibrate                     │
│                                 │
│   Cal Res    =  100.000         │
│   Old Ref    =  100.165         │
│   New Ref    =  100.164         │
│   Adjusted   =   99.999         │
│                                 │
│                                 │
│ Up    Down    Select  Back      │
└─────────────────────────────────┘
```

Module Only Recalibration Screen

Cal Res is the actual value of the connected calibration resistor. Edit this value by selecting "Edit Cal Res Value menu option. **Old Ref** is the resistance value from the RIO4000 module memory that was used in the previous calibration. **New Ref** is the present resistance measured by the module with the precision resistor connected. The YPC uses the ratio between **New Ref** and **Cal Res** to determine the new calibration coefficient. Press the **Save** soft key to store the new calibration point. Repeat the process by alternately connecting a 1000 Ω precision resistor and a 10 Ω precision resistor to calibrate the full RIO4000 range.

If the Cal Res value does not need to be edited, the user may move the cursor down to the **Calibrate** option on the **Module Only Recalibration Screen** and press **Select**. The calibration is completed and the following display is shown as confirmation.

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```
┌─────────────────────────────────┐
│  RTD Calibrate                   │
│                                  │
│                                  │
│   Calibration complete           │
│   Date:  2004-05-20              │
│                                  │
│  Remove Cal Resistor             │
│                                  │
│                                  │
│                                  │
├─────────────────────────────────┤
│  OK                              │
└─────────────────────────────────┘
```

**Module Only Calibration
Confirmation screen**

Module Only cal can also be performed using a User Cable (p/n A900028-90500) and a precision resistor. When the User Cable is connected to the RIO4000, the RIO User Select Screen is displayed. The user can select the 10 Ω, 100 Ω, or 1000 Ω precision resistor options from the list and proceed as above.

Module + Probe method is an alternative for users who need a module and probe reference standard calibrated as a "matched set;" that is, using a specific RIO4000 module with a dedicated RTD probe and cable to achieve the best possible displayed accuracy. This method allows adjustments to be made to the Module + Probe calibration by using an external temperature bath, dry block, Ice Point Calibration Reference Chamber, or other temperature standard. The user can select 1-, 3-, 5- or 9-point calibration options. When calibrating using a temperature bath or dry block, a DIN Class A RTD should be used for best possible "matched set" accuracy.

Please note that 1) all calibrations are executed in °C units and 2) adjustment made to calibration points within a multipoint calibration procedure are temporarily saved point-by-point but not permanently saved until the entire procedure is completed. To erase Rcal data, simple select the "Restore Defaults" option from the Rcal Feature Main Setup Menu shown above.

Selecting the **Module + Probe** option with an RTD connected will cause the following display to appear on the YPC.

```
┌─────────────────────────────────┐
│  Field Recal                     │
├─────────────────────────────────┤
│  Cal Point:        0%            │
│   Applied:      -20.00 C         │
│                                  │
│   S1:          -19.54   C        │
│   Error:         0.46   C        │
├─────────────────────────────────┤
│  Adj    Abort    Next    Back    │
└─────────────────────────────────┘
```

Probe Only Recalibration

The **Module + Probe** recalibration screen shown above provides the following information:

Cal Point: target calibration temperature expressed in percent of the specified range. The default Calibration Range is -20° C to +80° C (see the following section "Other Recalibration Keys and Functions**"** information on changing the range or any point within the range).

Applied: the target recalibration temperature calculated by the YPC based on the number of calibration points selected in the **Rcal** set-up menu for the default or specified range.

S1/S2/S3: this line shows measured temperature in the sensor bay location of the RIO4000 module.   The temperature applied by the user standard is displayed in °C.

Error: the algebraic difference between the applied temperature and the temperature measured by the "matched set" (RIO4000 module and connected RTD or RTD simulator) expressed in °C.

Adjust the temperature source until the temperature applied matches the **Applied** value displayed. If the "matched set" is accurate, the **Error** value will be very close to zero. If the **Error** value indicated exceeds your requirements, press the **Adj** soft key and enter the actual applied temperature value as indicated by your standard. Press the **Done** soft key and then select **Yes** to save the new data point. This process adjusts that particular point on the calibration curve. Confirm the **Error** value is now within specification (see below).

Field Recal			
Cal Point: 0%			
Applied: -20.00 C			
S1: -20.01 C			
Error: -0.01 C			
Adj	Abort	Next	Back

When the **Error** value is within acceptable limits, press the **Next** soft key. This moves the calibration procedure to the next calibration point. Repeat the procedure outlined above until all points are complete; when the final recalibration point is acceptable, press **Next** to store the data.

After completion of the calibration process for 1, 3, 5, or 9 points, the YPC will inquire if the cal data should be saved. Select **Yes** to accept the recalibration data or **No** for other options.

If Yes was selected, the screen will verify the new calibration by displaying the date and module position number. Press the **OK** soft key. The YPC then returns to the **Measure Mode.** The active calibration is indicated to the right of the measured temperature value.

Choosing **No** opens the **Cal Not Saved** screen. Three options are available:

Field Recal			
Cal Not Saved:			
Exit Cal			
Restart Cal			
Save Cal Data			
Up	Down	Select	Back

Exit Cal: Does not save any calibration data, reverts to the previous calibration in memory, and returns the user to the **Measure Mode.**

Restart Cal: Takes the user back to the **Rcal** set-up screen to begin a new recalibration procedure.

Save Cal: Gives the user a second opportunity to accept the recalibration data.

The user can verify sensor module calibration status by pressing the **Sensr** soft key from the **Measure Mode** display. The calibration data will show the sensor ID information and the most recent calibration date.

Other Recalibration Keys and Functions used on the Module + Probe recalibration type:
Adj: allows the user to redefine the recalibration target points. For example: if the first desired calibration point is a value other than -20° C, apply the desired first temperature with temperature bath, dry block, or RTD simulator and let it stabilize. Press **Adj** and enter the actually applied temperature value (using the **Inc** and **Dec** soft keys; press **Next** to go to the next digit) and press the **Done** soft key. The YPC will prompt the user to save this value. Save the value by selecting **Yes** and then confirm the **Applied** line value matches the S1 value (Error line is close to zero). When satisfied with the indicated **Error**, press the **Next** soft key. This **will** change the calibration temperature value for the point of interest and calibrate the module at the point as well. Perform this adjustment on any calibration point you wish to customize. The customized procedure will be saved in module memory as directed by the user when the procedure is completed.

Abort: Pressing the **Abort** key will immediately cancel all calibration value changes made to that point, reinstate the previous calibration, and return to the **Measure Mode.**

Next: Takes the user to the next calibration point.

Back: In the **Rcal** mode, **Back** aborts the calibration procedure and returns the user to the **Rcal** set-up screen. The previous calibration data is retained. It does not return the user to the previous screen in the calibration procedure.

Specifications
  Input impedance: > 10 megohm
  Warm-up time: ≤ 30 Seconds to full rated accuracy

  Ohm Measurement Accuracy : See Tables 3 and 4 below

  Temperature Effect: ≤ 0.001 ohm / °C

  RTD Measurement Accuracy: See Tables 3 and 4 below
  RTD Simulation Accuracy: See Tables 3 and 4 below

  Resolution: ± 0.1° or ± 1° for RTDs
  Resistance range: 0 – 4000 ohms

  Temperature: Storage: -40° F to 140° F (-40° C to 60° C)
                         Operating: 23° F to 122° F (-5° C to 50° C)
  Connectors – Measure temperature: standard connector for reference RTD or User Cable
                 for general purpose measurements on installed RTDs
               – Simulate resistance: User Cable with connector and four alligator clips
  Power: supplied from YPC (simulate / source mode only)
  Units: °F, °C, °R, °K, ohms
  Weight: 3 ozs

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Table 3: Accuracy for 0.00 to 400.00 Ω

RTD Type	Alpha	Measure Range/Resolution	Measure Accuracy*	Simulate Range/Resolution	Simulate Accuracy
Pt 100 Ω (DIN, IEC, JIS 1989)	.00385	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 850.0° C	± 0.4° C	600.0 to 850.0° C	± 0.6° C
Pt 100 Ω	.00392, .00391, .00389	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 100 Ω	.00393	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 850.0° C	± 0.4° C	600.0 to 850.0° C	± 0.6° C
		850.0 to 962.0° C	± 1.0 ° C	850.0 to 962.0° C	± 1.0 ° C
Cu 10 (Minco)	.004274	-100 to 260° C	± 2° C	-100 to 260° C	± 2° C
Cu 100	.004274	-100 to 260° C	± 1° C	-100 to 260° C	± 1° C
Ni 100	.00618	-60.0 to 160.0° C	± 0.1° C	-60.0 to 160.0° C	± 0.2° C
Ni 120 (Pure)	.006720	-80.0 to 260.0° C	± 0.1° C	-80.0 to 260.0° C	± 0.2° C
Ohms		0.00 to 400.00Ω	± 0.01% of R + 0.075Ω		

* Accuracy based on best 4-wire RTDs; For 2- and 3-wire RTDs add ± 0.1 °C to above statements

Table 4: Accuracy for 0.00 to 4000.00 Ω

RTD Type	Alpha	Measure Range/Resolution	Measure Accuracy*	Simulate Range/Resolution	Simulate Accuracy
Pt 200Ω (DIN, IEC)	0.00385, 0.00392	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 500Ω (DIN, IEC)	0.00385, 0.00391, 0.00392	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 1000Ω (DIN, IEC)	0.00385	-200.0 to 200.0° C	± 0.2° C	-200.0 to 200.0° C	± 0.3° C
		200.0 to 600.0° C	± 0.3° C	200.0 to 600.0° C	± 0.45° C
		600.0 to 630.0° C	± 0.4° C	600.0 to 630.0° C	± 0.6° C
Pt 1000Ω (DIN, IEC)	0.00375	-50.0 to 200.0° C	± 0.2° C	-50.0 to 200.0° C	± 0.3° C
		200.0 to 500.0° C	± 0.3° C	200.0 to 500.0° C	± 0.45° C
Fe 604	.00518	-100.0 to 200.0° C	± 0.2° C	-100.0 to 200.0° C	± 0.3° C
Fe 908	.00527	-100.0 to 200.0° C	± 0.2° C	-100.0 to 200.0° C	± 0.3° C
Fe 1816	.00527	-100.0 to 200.0° C	± 0.2° C	-100.0 to 200.0° C	± 0.3° C
Ohms		0.0 to 4000.0Ω	± 0.01% of R + 0.237 Ω		

* Accuracy based on best 4-wire RTDs; For 2- and 3-wire RTDs add ± 0.1 °C to above statements

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Approvals

Intrinsically Safe Certification from MET Laboratories. MET Laboratories is a Nationally Recognized Test Lab (NRTL). The module is certified by MET Laboratories to comply with standards CSA C22.2 No.1010.1, CSA C22.2 No. 157-92, and UL913 Fifth Edition Rev 2/21/97 for Class I, Division I, Groups A, B, C, and D, T5 hazardous areas.

Restrictions apply – see the Intrinsically Safe Control Drawing shipped with each YPC 4000 Series Modular Calibrator for more details. An uncontrolled copy of this drawing is found in the Appendix of this manual.

CE mark

Accessories for RIO4000

P/N A900028-90500	User cable assembly; RTD connector, 5 ft. copper cable, four (4) alligator clips
P/N A900028-90200	Mating plug connector for use with customer's dedicated RTD
P/N A900028-90201	Pt 100 RTD, DIN Class "A", 0.00385 alpha, 4 leads, 1/4" O.D., SS probe, 10" probe length, 3.5" handle and 5 ft coiled cable with connector for RIO4000 temperature module

Intrinsic Safety Control Document
YPC 4000 Series Portable Modular Calibrator

HAZARDOUS LOCATION

Multifunction Tester YPC 40X0-01-X-01 Series

Intrinsically Safe/Sécúrite Intrinseque Class I; Div 1; Groups A, B, C, D: T5

Exia

WARNINGS/AVERTISSEMENTS:

1. Substituting of Components may impair Intrinsic Safety!
   LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SÉCURITÉ INTRINSÈQUE;

2. Modules must not be installed, removed or replaced.

3. Do not replace, remove or install batteries or mix new with used batteries or of different type or manufacture.
   Ne PAS REMPLACER, ENLEVE OU INSTALLER DES PILES OU MELANGE NOUVEL AVEC LES PILES UTILISÉES OU DE TYPE OU DE FABRICANT DIFFERENT.

4. RS232 comm. port must not be used.

5. AC/DC Adapter must not be used.

6. Consult manual for media compatibility, max. Pressure or Temperature Range and for additional information regarding Hazardous location use.

7. RTD/Temperature probes must not be installed, removed or replaced.
   Connect to Certified Intrinsically Safe circuit only.
   Vmax=50VDC —— Imax=50mA Ci=0.1uF Li=0
   Vmax=30VDC —— Imax=100mA Ci=1.24uF Li=0
   Vmax=50VDC —— Imax=50uA Ci=0.1uF Li=0

8. Use modules from the following list only:

DDN0100-01-1	DGI2000-01-1	EGI0500-01-1
DDN0200-01-1	DAI0900-01-1	EGI1000-01-1
DDN0400-01-1	DAI2000-01-1	EGI1500-01-1
DDN0200D-01-1	EDN0100-01-1	EGI2000-01-1
DGI0020-01-1	EDN0200-01-1	EAI0900-01-1
DGI0200-01-1	EDN0400-01-1	EAI2000-01-1
DGI0500-01-1	EDN2000-01-1	FDN0020-01-1
DGI1000-01-1	EGI0020-01-1	RTD1000-10-1
DGI1500-01-1	EGI0200-01-1	TIO0110-01-1
		VMA0055-01-1
		RIO4000-01-1

9. To prevent ignition of hazardous atmospheres, batteries must only be changed in an area known to be non-hazardous.
   AFIN DE PRÉVENIR INFLAMMATION D'ATMOSPHÈRES DANGEREUSES, NE CHANGER LES BATTERIES QUE DANS DES EMPLACEMENTS DÉSIGNÉS NON DANGEREUX.
   Batteries approved for intrinsic safe location use are:
   (6)1.5VDC === Alkaline; Duracell PC1500/MN1500 (P/N A900614-00011) or
   (6)1.5VDC === NiMH; Harding Energy Quest HW/HLAAC1400U (P/N A900614-00014)

10. Pi max (Hazardous Location Use) = 2.5 Watts

Note: Capacitance and Inductance values connected to the intrinsically safe circuit are not to exceed the values specified by the entity parameters.

YPC 40X0-01-X-01 Series Intrinsic Safety Control Drawing

Vmax = 50V ===
Imax = 10 mA
Ci=0uF Li=0

TIO0110-01-1 MODULE

Vmax = 55 VDC ===
Imax = 24 mA
Ci=0uF Li=0

Vmax = 55 VDC ===
Imax = 100 mA
Ci=0uF Li=0

VMA0055-01-1 MODULE

Vmax = 10V ===
Imax = 5 mA
Ci=2.8uF Li=0

RIO4000-01-1 MODULE

NON-HAZARDOUS LOCATION

1. Batteries: (6) 1.5 VDC === Alkaline or NIMH, battery replacement, (removal/replacement), shall only be performed in a non-hazardous area. Do not mix new with used batteries or of different type or manufacture.

2. Modules may be removed or replaced.

3. AC/DC adapter may be used, (P/N A900615-00019)

4. RS232 port may be used.

5. RTD/Temperature probes may be used.

6. Max. power dissipation with all modules is 600 mW, normal use, 1.35W max. during DOF downloading, and 2.5Watts Max. with use of any (2) modules and (1) VMA module.

Note: Only (1) VMA module can be used in any given unit.

50 VDC === MAX. TO COMMON.

50 mA DC === Max. to Common.
30 VDC === Max. Hart Comm.

RS232 Comm. to PC.

110-240 VAC 50/60 HZ.

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EJA Rev. 2 Menu Tree

Device
Setup
Press
AO
URV
LRV

- **Process Vars**
  - Pressure Value
  - Pressure Percent
  - Range
  - Analog Output
  - Temperature Value
  - Static Pressure Value
  - Engr Display Unit

- **Sensors**
  - Sensor Trim
    - Zero Trim
    - Lower Sensor Trim
    - Upper Sensor Trim
    - Lower Sensor Trim Point
    - Upper Sensor Trim Point
  - Re Range
    - Pressure Lower Range Value
    - Pressure Upper Range Value
    - Set 4mA Range
    - Set 20mA Range
    - Pressure Lower Range Limit
    - Pressure Upper Range Limit
  - Signal Cond
  - Units
    - Pressure
    - Units
    - H20 Unit
    - Select
      - Pressure Units
      - H2O Unit Select
      - Low Cut Point
      - Low Cut Mode
      - Bi Dir Mode
      - Pressure Output Transfer Function
      - Pressure Damping Value
      - Analog Output Alarm Select

- **Analog Trim**
  - Trim 4mA
  - Trim 20mA

- **Basic Info**
  - Tag
  - Date
  - Descriptor
  - Message
  - ASC Model
  - Ext SW Mode
  - Revisions
    - Universal Revision
    - Transmitter Revision
    - Software Revision
    - Final Assembly
  - Const Mats
    - Module Isolator Material
    - Module Fill Fluid
    - Gasket Material
    - Flange Material
    - Drain Vent Material
    - Flange Type
    - Remote Seal Isolator Material
    - Flange Size
    - Number of Remote Seals
    - Remote Seal Fill Fluid
    - Remote Seal Type

- **Hart Output**
  - Device ID
  - Polling Address
  - Request Preambles
  - Burst Mode Select
  - Burst Command Number

- **Display Cond**
  - Disp Mode
  - Disp Func
  - Engr Disp
    - Engr Display Unit
    - Engr Disp LRV
    - Engr Disp URV
    - Engr Disp Point

- **Write Protect**
  - Write Protect
  - Write Enable 10min
  - New Password

- **Diagnostics**
  - Self Test
    - Self Test
    - Status Display

- **Save Send**
  - Save
  - Send

- **Review /Edit**
  - Variables

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EJA Rev. 1 Menu Tree

```
Device          Process Vars      Pressure Value            Zero Trim
Setup                             Pressure Percent          Lower Sensor Trim
Press                             Range                     Upper Sensor Trim
AO                                Analog Output             Lower Sensor Trim Point
URV                               Temperature Value         Upper Sensor Trim Point
LRV                               Static Pressure Value
                                  Engr Display Unit

                Sensors           Sensor Trim               Pressure Lower Range Value
                                  Re Range                  Pressure Upper Range Value
                                  Signal Cond               Set 4mA Range
                                  Units                     Set 20mA Range
                                                            Pressure Lower Range Limit
                                                            Pressure Upper Range Limit

                                  Pressure Units            Pressure Units
                                  H20 Unit Select           H2O Unit Select
                                  Temperature Units         Low Cut Point
                                  Static Pressure           Low Cut Mode
                                                            Bi Dir Mode
                Analog Trim       Trim 4mA                  Pressure Output Transfer Function
                                  Trim                      Pressure  Damping Value
                                  20mA                      Analog Output Alarm Select

                                                            Module Isolator Material
                                  Tag                       Module Fill Fluid
                                  Date                      Gasket Material
                                  Descriptor                Flange Material
                                  Message       Universal Revision    Drain Vent Material
                Basic Info        ASC Model     Transmitter Revision  Flange Type
                                  Ext SW Mode   Software Revision     Remote Seal Isolator
                                  Revisions     Final Assembly        Material
                                  Const Mats    Number                Flange Size
                                                                      Number of Remote Seals
                                                                      Remote Seal Fill Fluid
                                                                      Remote Seal Type

                Hart Output       Device ID
                                  Polling Address
                                  Request Preambles
                                  Burst Mode Select
                                  Burst Command Number

                Display Cond      Disp Mode            Engr Display Unit
                                  Disp Func            Engr Disp LRV
                                  Engr Disp            Engr Disp URV
                                                       Engr Disp Point

                Write Protect     Write Protect
                                  Write Enable
                                  10min
                                  New Password

                Diagnostics       Self       Self Test
                                  Test       Status Display

                Save Send         Save
                                  Send

                Review /Edit      Variables
```

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