Addendum 95-8636

HART Communication
with the X5200
UVIR Flame Detector
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Digital communication with the X5200 allows the operator to monitor the status of the detector, determine factory settings, adjust field settings, and initiate field tests. This addendum provides guidance for establishing HART communication, and describes the HART menu structure when using the X5200 with a HART Handheld Communicator, a PC, or other process interface device that supports DDL.

**NOTE**
A minimum level of understanding with regard to the operation and navigation of the HART Communicator is required. Refer to the instruction manual supplied with the HART Communicator for basic operating instructions.

**INTERCONNECTING THE HART COMMUNICATOR WITH THE DETECTOR**

**Point-to-Point Mode**
The HART Communicator can connect to the X5200 at any wiring termination point in the analog output signal loop. Connect the HART communicator in parallel with the X5200 analog signal or load resistor. The HART connections are non-polarized.

**IMPORTANT WIRING NOTE**
The HART Communicator does not measure loop current directly, but instead reads a voltage signal across a resistance (250 ohms) in the loop. The recommended connection point is across the input impedance of the signal receiver (PLC), which is a nominal 250 ohms. See Figures 1 to 4. If testing/programming on a bench, a 250 ohm load resistor must be used. See Figure 5.

Switch on the HART Communicator. If a device is found, the HART Communicator displays the Main menu. If no device is found, check the connections and verify the presence of a minimum of 250 ohms load resistance in series in the loop.
*Nominal input impedance of PLC = 250 ohms.
Maximum loop impedance including input impedance of PLC = 600 ohms.
**Multidrop Mode**

Optical flame detectors are life safety devices and require the 4-20 mA loop for transmitting important detector status data. They should not be used in conjunction with multidrop mode. If multidrop mode is a requirement, the alarm and fault relay contacts must be connected directly to the safety system or fire panel for signalling purposes.

*NOTE*
This addendum covers HART wiring only. Refer to the device instruction manual for NFPA-72 compliant releasing wiring diagrams.

**HART DEVICE DESCRIPTION LANGUAGE**

The HART protocol incorporates a concept called the Device Description Language (DDL) that enables all suppliers of HART instruments to define and document their products in a single consistent format. This format is readable by handheld communicators, PCs and other process interface devices that support DDL. DDL enables full interoperability of devices, regardless of manufacturer, allowing full functionality from any HART device.

In the event that your Communicator does not establish communications with the X5200, ensure that the appropriate DDLs for the X5200 have been programmed into your Communicator. To review the DDLs programmed into your HART Communicator:

1. From the Main menu, access the Offline menu.
2. From the Offline menu, select New Configuration to access the list of device descriptions programmed into the HART Communicator.
3. Select Det-Tronics and review the list of models to determine if the X5200 DDLs are installed in your Communicator.

If the X5200 DDLs have not been programmed into the Memory Module, you must use the generic interface built into your HART Communicator.

The HART Communication Foundation manages a library of Manufacturer Device Descriptions, which are distributed to programming sites for inclusion in master devices. A complete listing of the HCF DD Library is available for download in manufacturer and device type sequence at www.hartcomm.org.

**DETECTOR WIRING**

Refer to the X5200 instruction manual (form number 95-8546) for complete instructions regarding detector installation and wiring.

*NOTE*
X5200 detectors with HART do not support RS485 communication.

*NOTE*
Power consumption specifications for the HART model are different than the standard model.

**Power Consumption Specifications of X5200 Detector with HART Communication**

Without heater: 2.8 watts at 24 Vdc nominal; 4.8 watts at 24 Vdc in alarm.
3.1 watts at 30 Vdc nominal; 5.4 watts at 30 Vdc in alarm.

Heater only: 8 watts maximum.
Total power: 17.5 watts at 30 Vdc with EOL resistor installed and heater on maximum.

EOL resistor must be ceramic, wirewound type, rated 5 watts minimum, with actual power dissipation not to exceed 2.5 watts.
X5200 ROOT MENU

When HART communication is established, the first menu displayed is the X5200 Root menu:

1) Fire (Yes/No) Indicating "Y" if the device is in a fire alarm status — analog output is at 20 mA, fire alarm relay is actuated and LED is red.

2) Fault (Yes/No) Indicates "Y" if a fault condition exists. Go to "Device Info" and select "Status Info" to determine the nature of the fault.

3) Device Info Menu Provides access to manufacturer and HART information, current device status, factory settings, and history logs.

4) Command Menu This menu allows the operator to initiate a manual Oi test and also to perform various reset/clear functions.

5) Device Setup Menu This menu allows various setup, configuration and calibration functions.

DEVICE INFO MENU

This menu allows access to a variety of "read only" information.

1) General Info Menu Factory information.

2) HART Info Menu HART Specific Variables.

3) Status Info Menu Current operating status and/or diagnostic information.

4) Detector Settings Factory settings relating to relay operation, detector sensitivity and response.

1) Manufacturer  Det-Tronics.

2) Model  X5200.

3) Serial Number  Serial number of device.

4) Part Number  Manufacturer's part number for this device.

5) Manufactured Date  Date of manufacture shown as XX/XX/XX (month/day/year).

6) Snsr Fmwr Ver  Firmware revision level of sensor module.

7) HART Fmwr Ver  Firmware revision level of HART Interface Board (HIB).

8) Real Time Clock  Current time and date settings of real time clock.

9) Write Protect (Y/N)  This indicates whether variables can be written to the device, or whether commands that cause actions to be performed in the device can or cannot occur.
HART INFO MENU

1) Universal Rev  
   HART universal revision.

2) Field Device Rev  
   HART field device revision.

3) Final Asmbl No.  
   A number that is used for identification purposes, and is associated with the overall field device.

4) Tag  
   Text that is associated with the field device installation. This text can be used by the operator in any way.

5) Date  
   Any date chosen by the operator to be used for any purpose.

6) Descriptor  
   Text associated with the field device that can be used by the operator in any way.

7) Message  
   Text associated with the field device that can be used by the operator in any way.

8) Num Req Preams  
   HART specific synchronization messages.

9) HART PV Menu  
   Display HART specific primary variable (PV) items.

10) Condensed Status  
    Device status condensed for HART handheld display.
HART PV MENU

1) PV Unit
   Not implemented for X5200.

2) PV
   Not implemented for X5200.

3) PV SNSR Unit
   Not implemented for X5200.

4) PV USL
   Not implemented for X5200.

5) PV LSL
   Not implemented for X5200.

6) PV MIN SPAN
   Not implemented for X5200.

7) PV DAMP
   Not implemented for X5200.

8) PV AO
   Analog Output. The value that tracks the Digital Value representation, under normal operating modes.

9) PV AO ALRM TYP
   Not implemented for X5200.

10) PV % RNGE
    Percent of Range. The variable that tracks the Digital Value representation with respect to the range defined by the Lower Range Value and Upper Range Value, for normal operating modes. The units of this variable are always in percent.

11) PV XFER FNCTN
    Not implemented for X5200.

12) PV RNGE Unit
    Not implemented for X5200.

13) PV URV
    Not implemented for X5200.

14) PV LRV
    Not implemented for X5200.

15) PV SNSR S/N
    Not implemented for X5200.
CONDENSED STATUS

1) Xmtr Addstatus 0
   Fire Alarm
   UV Alarm
   IR Alarm
   TDSA Alarm
   Quick Alarm
   Oi Cal Active
   Manual Oi Active
   Warmup

2) Xmtr Addstatus 1
   UV Pre Alarm
   IR Pre Alarm

3) Xmtr Addstatus 2
   Fault
   Manual UV Oi Fault
   Manual IR Oi Fault
   Auto UV Oi Fault
   Auto IR Oi Fault
   UV Oi Cal Fault
   IR Oi Cal Fault
   Temperature Out of Range

4) Xmtr Addstatus 3
   Voltage Out of Range Fault
   Manual Oi at Start
   Hardware Fault
   HART Fault
   Modbus Communication Fault
   Incompatible Version

5) Operating Mode
   Fault
   Fire Alarm

6) Operating Mode 2
   Spare
STATUS INFO MENU
This menu (read only) shows extensive status information about the detector.

1) Warmup (Y/N)  
Device is in the power-up time delay (warm-up) mode.

2) Fire (Y/N)  
Indicates “Y” if the device is in a fire alarm status — analog output is at 20 mA, fire alarm relay is actuated and LED is red.

3) UV Alarm (Y/N)  
Indicates “Y” if the UV detector is signaling an alarm.

4) IR Alarm (Y/N)  
Indicates “Y” if the IR detector is signaling an alarm.

5) TDSA Alarm (Y/N)  
Indicates “Y” if the IR detector is signaling a TDSA alarm.

6) Quick Alarm (Y/N)  
Indicates “Y” if the IR detector is signaling a quick alarm.

7) UV Pre Alarm (Y/N)  
Indicates “Y” if the UV detector is in a pre-alarm state.

8) IR Pre Alarm (Y/N)  
Indicates “Y” if the IR detector is in a pre-alarm state.

9) Auto UV Oi Fault (Y/N)  
Automatic UV Oi Fault.  Check UV viewing window and Oi reflector plate cleanliness.

10) Auto IR Oi Fault (Y/N)  
Automatic IR Oi Fault.  Check IR viewing window and Oi reflector plate cleanliness.

11) Manual Oi at Start  
Manual Oi at Start.  On power-up a manual Oi was started.  Check the external input wiring.

12) Snsr Hdwr Fault (Y/N)  
Sensor hardware fault.

13) HIB Hdwr Fault (Y/N)  
HART Interface Board hardware fault.

14) Int Comm Fault (Y/N)  
Internal communication fault.

15) Incompatible Fault (Y/N)  
Sensor module firmware version is not compatible with HART Interface Board.

16) Voltage Fault (Y/N)  
Detector operating voltage is out of tolerance.

17) Hardware Menu  
Refer to sub-menu.

18) Oi Menu  
Refer to sub-menu.
**HARDWARE MENU**

1) **Temperature**  
Actual integral temperature of detector (in degrees Celsius).

2) **Temp Range Fault**  
Detector integral temperature out of range —  
Operating range: –40°C to +75°C (–40°F to +167°F).

3) **Voltage**  
Actual detector supply voltage (must be 18 to 30 Vdc).

4) **Volt Fault**  
Supply voltage is out of range. Operating voltage must be 18 to 30 Vdc.

5) **Manual Oi at Start**  
Manual Oi at Start. On power-up a manual Oi was started. Check the external input wiring.

**Oi MENU**

1) **Consecutive UV Oi Fails**  
Allowable number of consecutive UV Oi failures to produce a fault. Factory set to 3 (minutes). This is the time between fault occurrence and annunciation.

2) **Consecutive IR Oi Fails**  
Allowable number of consecutive IR Oi failures to produce a fault. Factory set to 3 (minutes). This is the time between fault occurrence and annunciation.

3) **Oi Calibrate Active**  
Oi calibration is in progress.

4) **UV Oi Cal Fault**  
UV Oi calibration has detected a fault condition.

5) **IR Oi Cal Fault**  
IR Oi calibration has detected a fault condition.

6) **Manual Oi Active**  
A manual Oi test is in progress.

7) **Manual UV Oi Fault**  
Manual UV Oi fault. Check UV viewing window and Oi reflector plate cleanliness.

8) **Manual IR Oi Fault**  
Manual IR Oi fault. Check IR viewing window and Oi reflector plate cleanliness.
DETECTOR SETTINGS

This menu shows factory settings relating to relay operation, detector sensitivity and response.

1) UV Mode
   UV Mode: Standard or Arc.

2) IR Mode
   IR Mode: TDSA, Quick, or Both.

3) ARC Rejection
   Detector ARC Rejection setting: Low, Medium, High, or Very High.

4) UV Sensitivity
   Detector UV sensitivity setting: Low, Medium, High, or Very High.

5) IR Sensitivity
   Detector IR sensitivity setting: Low, Medium, High, or Very High.

6) Auto Oi Enabled
   Auto Oi Enabled. If (Y) an Oi test will be conducted periodically without manual input.

7) Fire Relay (NL/L)
   Fire Relay: Latching (L) or Non-Latching (NL).

8) Fault Relay (NL/L)
   Fault Relay: Latching (L) or Non-Latching (NL).

9) Aux Relay (NL/L)
   Aux Relay: Latching (L) or Non-Latching (NL).

10) Heater Disabled
    Heater Disabled. If (Y) the optics heater is not enabled to prevent condensation and icing.

11) Aux Function
    Aux function: Pre Alarm, IR Alarm, UV Alarm, UV or IR Alarm, UV and IR Alarm.

12) Aux IR Function
    Aux IR function: TDSA, Quick, or Both.

13) Aux Relay (NE/NDE)
    Aux Relay: Normally Energized (NE) or Normally De-Energized (NDE).
HISTORY MENU
This menu provides historical information about the detector. Up to 32 events in each of the three categories will be kept in non-volatile memory. When the log is full, the oldest event will be overwritten. The most recent event will be displayed first.

1) Alarm Log
Scroll through 32 Alarm Logs with time, date and temperature stamp.

2) Fault Log
Scroll through 32 Fault Logs with time, date and temperature stamp.

3) General Log
Scroll through 32 General Logs with time, date and temperature stamp.
The Command Menu allows the operator to initiate a manual Oi test and also to perform various reset/clear functions.

1) Start Passive Oi

A passive Oi test command checks the cleanliness of the detector’s optical surfaces. This calibrated Oi test confirms the ability of the detector to respond correctly to UV and IR signals. Fire and fault relays as well as 4-20 mA current loop output are unaffected by this test. A red LED signals a successful test, and an amber LED signals a failed test. The general log will indicate either “Man Oi Pass” or “Man Oi Flt”.

2) Start Active Oi

**CAUTION**

An active Oi test generates an actual Fire Alarm Output. All fire response equipment must be bypassed/disabled prior to testing to prevent unwanted output actuation.

An active Oi test performs an Oi test with all detector outputs fully operational. Fire and fault relays as well as the 4-20mA loop are “live”.

If the test is successful:
- Fire relay = Alarm.
- Fault relay = no fault.
- Current output is 20 mA.
- LED turns red.
- General log indicates “Man Oi Pass”.

If the test is unsuccessful:
- Fire relay = No Alarm.
- Fault relay = Fault.
- Current output is 2 mA.
- LED turns amber.
- Fault log indicates “Man Oi Flt”.

3) Clear Oi Fault

If the cause of the fault has not been corrected, subsequent Oi faults will occur.

4) Reset Latches

Latching relays are reset and LED turns green.

5) Master Reset

This function re-initializes the microprocessor, resets the operating software, and initiates a hardware reset for both the sensor and the HART interface. Latched relays are reset.

6) Clear Data Log

This function resets the HART data log history. To view the logs, go to “Device Info Menu” and select “History Menu”.

7) HART Command Menu

This menu performs various diagnostic and/or service functions.
HART CMD MENU

The HART CMD (Command) Menu allows the operator to perform diagnostic and service functions as follows:

1) Self Test
   Internal tests are performed and any detected problems are reported in “Status Info”.

2) Master Reset
   This function re-initializes the microprocessor, resets the operating software, and initiates a hardware reset for both the sensor and the HART interface. Latched relays are reset.

3) Loop Test
   This test allows the operator to manually set the analog signal output to a fixed user defined value. (Range: 0-20 mA).

DEVICE SETUP MENU

This menu allows various setup, configuration and calibration functions. When Write Protect is off, these menus allow the operator to reconfigure or write new variables to the device.

1) Configuration Menu
2) Calibration Menu
3) Write Protect
4) HART Setup
5) Set Real Time Clock

Refer to the appropriate sub-menus for details.
1) Consecutive UV Oi Fails: Allowable number of consecutive UV Oi failures to produce a fault. Factory set to 3 (minutes). This is the time between fault occurrence and annunciation.

2) Consecutive IR Oi Fails: Allowable number of consecutive IR Oi failures to produce a fault. Factory set to 3 (minutes). This is the time between fault occurrence and annunciation.

3) Time Delay: Time Delay before alarm is indicated (0 to 15 seconds). Factory default is 0 seconds.

**Important:** In addition to lengthening the time period between the outbreak of a fire and the fire alarm, a time delay can also affect sensitivity. Consult the factory for guidance before setting a time delay over 5 seconds.

**Note:** FM Approval covers the detector's performance with 0 (zero) time delay only.

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**CALIBRATION MENU**

1) Loop Test: This test allows the operator to manually set the analog signal output to a fixed user defined value. (Range: 0-20 mA).

2) D/A Trim: This function allows adjustment of the 4-20 mA span factor.

3) Calibrate Oi: This procedure calibrates the Oi test signal for the UV and IR sensors.
   1. Bypass/disable all Alarm outputs connected to the detector.
   2. Thoroughly clean the sensor and Oi reflector for the UV and IR sensors. Check the Oi source openings for contaminants and clean as needed.
   3. Cover the detector with the provided cover.
   4. Initiate Oi Calibration. The detector performs the calibration automatically and notifies the operator upon completion. The procedure takes approximately two minutes.
   5. Upon completion of Oi calibration, remove the cover and return all alarm outputs to service.
WRITE PROTECT

This function enables the operator to enable/disable password and write protection capability, as well as to enter or change a password. The device is provided from the factory with Write Protect off. With Write Protect on, the use of a password is required to enable writing to the device.

1) Set Password

The password is used to validate the command to enable or disable writes in the device. (The factory default password is: 1******. Once the password has been changed, the default password is no longer valid.)

To change the password:
1. Select "Set Password" and enter the password. Hit "Send".
2. If enabled, disable Write Protect. Hit "Send".
3. Select "Set Password" and enter NEW password. DO NOT Hit "Send" yet.
4. From within "Set Write Protect" menu, select "Change Password". Hit "Send".

CAUTION
Always record the new password. If the password is forgotten, the device must be returned to the factory for re-programming.

2) Set Write Protect

With Write Protect enabled, variables cannot be written to the device and commands that cause actions to be performed in the device cannot occur.

3) Write Protect (Y/N)

This indicates whether or not Write Protect is enabled.
HART SETUP

This menu allows editing of the following functions:

1) Polling Address
   Address used by the host device to identify a field device.

2) Final Asmby No.
   A number that is used for identification purposes, and is associated with the overall
   field device.

3) Tag
   Text that is associated with the field device installation. This text can be used by the
   operator in any way.

4) Date
   Any date chosen by the operator to be used for any purpose.

5) Descriptor
   Text associated with the field device that can be used by the operator in any way.

6) Message
   Text associated with the field device that can be used by the operator in any way.

SET REAL TIME CLOCK

To set the real time clock, enter the current time and date information into the appropriate fields.

1) Seconds
   0 to 59.

2) Minutes
   0 to 59.

3) Hours
   0 to 23.

4) Date
   1 to 31.

5) Month
   1 to 12.

6) Year
   0 to 99.