Model iT401
Intelligent Transmitter Series Alarm
Operating guide

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Safety section

The iT401 alarm can be safely operated when the instructions in this manual are carefully followed.

This section summarizes the safety considerations. Reminders, in the form described below, will appear in the detailed instructions to assure operator awareness of these safety considerations. Qualified personnel should operate and maintain this module only after becoming thoroughly familiar with this manual.

WARNING: This symbol is used in the instruction manual where operator safety must be considered. The instruction manual should be consulted and read carefully.

CAUTION: This symbol is used when caution is needed to prevent damage to equipment. It is used where careful attention to certain procedures described in the instruction manual is needed. This symbol is also used to emphasize procedures other than normal operating procedures.

Safety summary

1. Make sure that the iT401 is properly grounded to a good earth ground.
2. Do not expose this equipment to rain or moisture.
3. Lethal AC voltage may be present at some of the iT401 connectors due to relay connection circuits.
4. Use common sense and avoid haste!

CE certification

CE

The iT401 Intelligent Transmitter Series Alarm received CE certification in 2009. All models with a serial number of 02550 or higher are CE certified. Models with a serial number of 02549 or below were manufactured before the product received CE certification.

Contents

1.0 Theory of operation

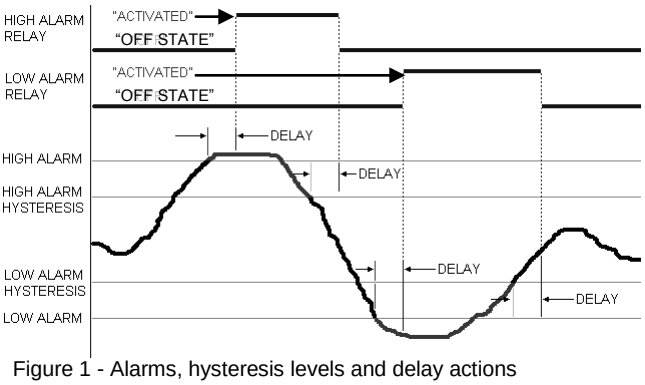


Figure 1 - Alarms, hysteresis levels and delay actions

The iT401 Alarm accepts data from any Wilcoxon Sensing Technologies Intelligent Transmitters (iT100/200, iT30X Series) as well as any standard 4-20mA current loop sensor. It monitors the loop current data and activates up to three form C relays according to user-defined trip levels.

The iT401 allows users to set three independent alarm functions and levels for the monitored signals. Each alarm relay can be independently programmed:

- to alarm for signals increasing above a setpoint (high alarm)
- to alarm for signals decreasing below a setpoint (low alarm)
- to alarm when the bias output voltage (BOV) is outside the span setpoints
- to delay alarming from 0 to 99 seconds to prevent false alarms
- with hysteresis levels at which the alarm shuts off

The alarm levels are set as a percentage of full scale from 1 to 99%. Setting hysteresis to a level of zero (0) turns the alarm relay into a latching relay. When operating as a BOV alarm, the BOV is set as a voltage and the "span" of the alarm window is adjusted in voltage rather than percent of full scale.

2.0 Product description

The iT401 module is a 22mm wide DIN-rail mountable unit. The power required is a nominal +24 VDC which must be supplied through the rear panel TBUS connector.

The iT401 Alarm is designed to operate with the Intelligent Transmitter Series of signal conditioning modules (models iT100 and iT200) and also accepts inputs from the iT30X series.

The iT401 Alarm can also be used as a general-purpose 4-20mA loop sensor alarm module. A signal from any 4-20mA analog sensor can be input to the front terminal block and then monitored with the built-in LED display. See section 3.1 for information about how to make this selection. If the iT401 is operated in this "stand-alone" configuration, power to operate the iT401 is supplied through the iT032 TBUS connector on the rear of the module. A TBUS cable connection terminal (IT033, IT034, or IT035)[1] is also required. The power for the iT401 is connected through these terminals. These connections allow DC power leads to be screwed into the appropriate power slots. See section 3.3.1 for complete details.

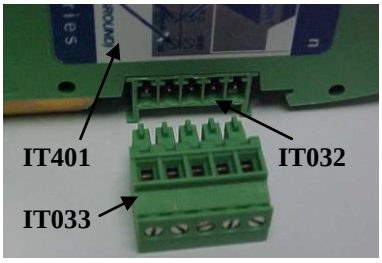


Figure 2 - Alarm module and TBUS connectors

[1] IT033: 5-position cable-connector for TBUS direct-connection, male receptacle, cable comes in left side horizontal
IT034: 5-position cable-connector for TBUS direct connection, female plug, cable comes in right side horizontal
IT035: 5-position cable-connector for TBUS direct connection, female plug, cable comes in right side vertically

2.1 Front panel

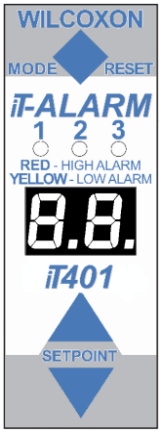


Figure 3 – Front panel

All operating controls for the iT401 are on the front panel of the module. Three embedded membrane switches are used to check the status and make programming changes.

The upper front panel switch is behind the diamond-shaped “MODE/RESET” switch. This switch is used to access the programming mode or reset the latched relays.

Below this pushbutton are three light emitting diode (LED) display lights. Each multi-colored light signifies the state of one of the alarms.

a) A red indicator means the signal has increased above defined alarm levels.
b) A yellow indicator means the signal has decreased below a defined alarm level.
c) An orange indicator means the signal is outside the BOV band limits.

The center of the front panel has a large two-digit LED read-out with two decimal point indicators. During the programming mode, both decimal points are used. In normal operation, while displaying the signal level in percentage of full-scale, neither decimal point will be illuminated. When the display is set to output the equivalent loop input current, the right decimal point will be illuminated.

Occupying the bottom third of the panel are the last two embedded membrane switches. These two triangle shaped switches, separated by the word “SETPOINT,” are used to toggle selections during the programming mode and for changing set points while programming. During normal operation these can be used to display the unit serial number and programming date (see section 5.1).

2.2 Right side label

The label on the right side identifies the connections of the iT401 module. Sixteen terminal connections are available on four plug-in termination connectors.

Three of the connectors are for the 8-Amp, form C relay contact connections. The relay terminal wiring diagram shows the identification of the relay connections. Each of the relay connections are indicated by the number assigned for that relay, a “1”, “2”, or “3” shown on the label. The two connectors on the top of the iT401 are for relay “1” and “2” connections. Relay “3” is the connector just below the front panel.

The fourth (lowest) connector is used for relay reset and external 4-20mA loop wiring connection. It can also serve as a 4-20mA output loop signal repeater for the iT Series vibration transmitter.

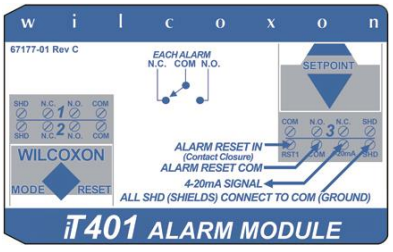


Figure 4 - Right side label

2.3 Left side label

The left side label illustrates the TBUS interconnection wiring when the iT401 is used with any of the iT100/200 Series vibration transmitters.

The TBUS is used to input the 24 VDC power required by the iT401 module. If the iT401 is being used in a "stand-alone mode" without an iT100/200 Series vibration transmitter, the user will have to supply the 24 VDC power to the TBUS connection. See section 3.3.1 of this manual for wiring details.

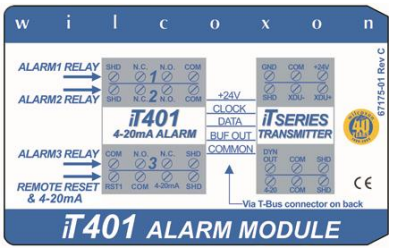


Figure 5 – Left side label

3.0 Installation

3.1 Jumper selection for 4-20mA input / output

The iT401 has an internal jumper that selects whether the 4-20mA loop wiring connection of the iT401 is defined as an "input" or an "output". **The iT401 is shipped with the jumper inside the accessory bag and must be installed before using the iT401.**

When using the iT Alarm with the iT100/200 Intelligent Transmitter, the jumper must be in the "OUT" position so that the 4-20mA termination connections generate an additional 4-20mA output signal repeating the 4-20mA loop output from the iT100/200 transmitter.

When using the iT Alarm with any 4-20mA loop sensor (independent from an iT100/200 Series vibration transmitter) the jumper must be set in the "IN" position (the 4-20mA loop wiring is an "input"). The iT401 does not supply loop power, so the loop power (normally 24 VDC) must be supplied from another source.

Figure 6 – Releasing the latch of the iT401 case

The software must be changed to reflect the jumper setting (see section 4.3 of this manual).

To change the jumper from "IN" to "OUT," open the case of the iT401 by using a small screwdriver to pop the plastic latches. Figure 6 shows a user releasing the latch. There is a latch on the top and bottom of the unit. Slide the face and attached circuit board out to access the jumper. Figure 7 shows the position of the jumper on the circuit board, identified as J10.

After the jumper has been firmly seated in the desired position, close the iT401 by sliding the circuit board back into the slots of the case and pushing the face panel until it snaps into place.

Note: Ensure the circuit board aligns with the TBUS connection slot in the back of the case when re-inserting the board.

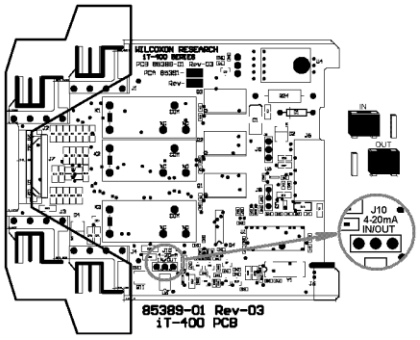


Figure 7 - Jumper for 4-20mA IN/OUT

3.2 Mounting and removal

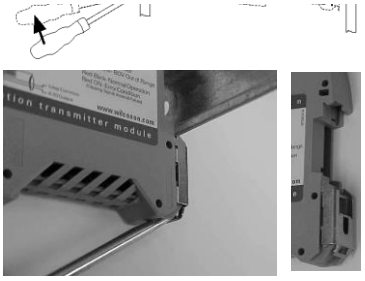


Figure 8 - Installation / removal

The iT401 alarm module mounts to a standard 35mm DIN “T” rail. Each module uses 22.5mm of DIN rail length. A spring-loaded clip on the rear of the module secures the iT401 to the DIN rail.

Mount the module by placing the upper "hook" of the mount onto the DIN rail, aligning the back of the module with the TBUS connector. Gently rock it into place until the latch catches on the lower rail.

Removing the module requires a small, flat-bladed screwdriver with a blade less than ¼ inch (6mm) in width. Insert the blade into the slot that extends below the bottom rear of the module (see figure 8). Gently pry the latch down while lifting the module to release it from the DIN rail and TBUS connector.

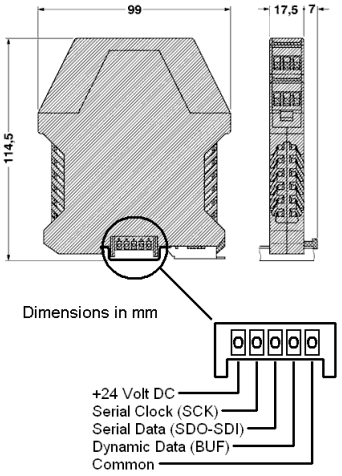
Note: Disconnect the terminal connections from the module before removing the module from the DIN rail. All plug wiring should be well marked to assure proper reconnection when the module is re-installed.

3.3 Wiring

3.3.1 Power

The iT401 can only be powered directly from the TBUS connector at the rear of the module.

The label on the left side of the iT401 module (see figure 5) illustrates the TBUS wiring. When the iT401 is used with iT100/200 Series vibration transmitter modules, a mating connector provides power to the iT401 module. Powering the iT401 from the iT100/200 Series requires two TBUS connectors: one connector is for the iT100/200 Series unit TBUS (IT031, sold separately) and the other for the iT401 module TBUS (IT032, shipped with the iT401).



When the iT401 is used with the iT30X series transmitters or as a stand-alone alarm, the module is powered using a side-entry TBUS power connection terminal connector (IT033, IT034, or IT035). The iT033 screws are positioned for easy tightening and will fit over the male plugs of the iT032 to form a small, compact unit.

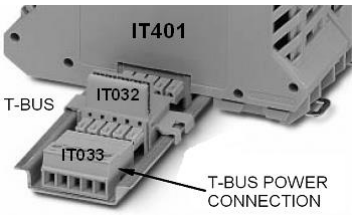


Figure 9 - TBUS connectors

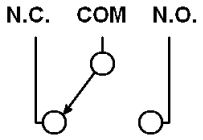
A 24-Volt DC, nominal, supply voltage should be used to power the iT401 module. The power supply positive (+) output connects to the “+24V” terminal. The power supply common (-) output connects to the “Common” terminal (see figure 9).

A good earth ground should connect to the “Common” terminal of the 4-20mA loop input connector on the front of the module. If unsure of a good earth ground, check with a certified electrician to properly identify this connection to ensure the proper safety and operation of the alarm.

WARNING: Do NOT use the “Common” of any of the alarm relay connections for the ground. The relay “Common” terminal is center pole of the two-position switch. It is not connected to any circuit common connection.

3.3.2 Alarm relays

The iT401 has three form C relays (pictured at the right). The “COM” is the center pole of the switch, the “N.C.” is the normally closed contact, and the “N.O.” is the normally open contact. The contacts are rated for 8 Amperes with a resistive load or 1/3 horsepower for inductive loads. Each relay is independently field programmable using the internal software (see Appendix A). The contacts of these relays have 2-kiloVolt isolation from the circuit of the iT401.



3.3.3 External reset

The iT401 module provides for an external reset function. This function is implemented by applying a contact closure to the one terminals labeled “Reset” and one terminal labeled “COM” (see figure 4). The module does not require any programming to implement this capability.

3.3.4 Using the external 4-20mA input

The iT401 may be driven by an external 4-20mA signal, such as Wilcoxon’s 4-20mA loop powered sensors. The user must supply 24-Volt power (see figure 9). This input has a 257-Ohm resistor as the load for the 4-20mA circuit.

To implement the external 4-20mA signal input, select option “4.2.” during the programming of the “Signal Input” selection and change the input jumper position as outlined in section 3.1.

Each 4-20mA loop powered sensor is wired to an iT401 module as shown in figure 10.

The “loop power” connection of the sensor connects directly to the DC power source. The “loop return” connection is connected to the “4-20mA” input of the iT401. The cable shield connects to the “COM” terminal. To avoid potential ground loop problems, the shield should remain isolated at the sensor connection. Wilcoxon cables that are R6W, R6SLI, R6QAI, or R6QI will achieve the shield isolation at the sensor end.

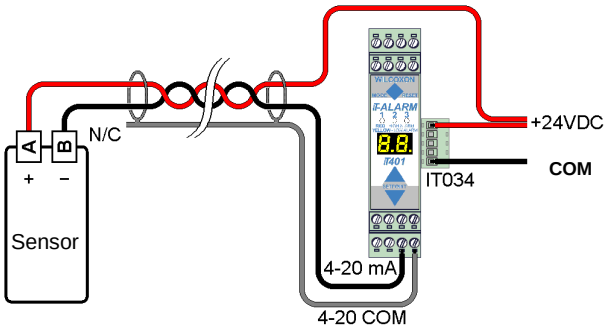


Figure 10 – Wiring illustration of the iT401 connected to a 4-20mA loop powered sensor

4.0 Operation

Upon powering, the iT401 will begin initialization. The display LED segments and alarm LEDs will illuminate in sequence until all segments and decimal points have cycled three times. This sequence takes approximately 60 seconds, which allows the circuit to initialize and stabilize before the alarms become active. The module will then be in the normal operating mode and display the signal level on the front panel two-digit LED. When the iT401 is operating with an iT100/200 Series module, the iT401 will wait for the iT100/200 Series module to complete its initialization sequence before the alarm relays become active. If the user makes no changes to the operating mode settings during this time the module is ready for use. The display will count down from 99 to 0 during this time.

This section describes how to enter the programming mode of operation and how to set any of the programmable items. All settings are entered using the three front-panel membrane switches. The module will revert from the programming mode to the normal display mode if no switches are pressed for more than 10 seconds.

NOTE: If any switch is depressed and held for more than 60 seconds, an error will be generated. This insures any front panel switch that fails in the 'closed' state will be detected.

4.1 MODE / RESET switch

Near the top of the front panel is a switch marked with a diamond-shaped figure. It is labeled "MODE RESET". This switch has multiple purposes.

Depressing and releasing the MODE/RESET switch for two seconds will place the iT401 module into the programming mode.

Once in the programming mode, each time the MODE/RESET switch is pressed and released the iT401 will index to the next program mode setting. If the user holds the MODE/RESET switch, the display will indicate the next program mode to be modified.

Holding the MODE/RESET switch depressed for more than four seconds (while not in programming mode) clears all latched relays regardless of the signal level. The relays will re-latch after the time delay period if the signal continues to exceed the alarm setpoint.

Refer to the program mode table in Appendix A of this guide for the program modes and item setting options.

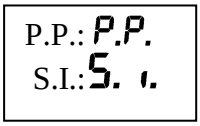
4.2 SETPOINT switches

On the lower part of the front panel are two "SETPOINT" switches. These switches are used to scroll through the selections of each programming mode setting. When in the normal operating mode, these switches can be used to display the serial number and programming date (see section 5.1).

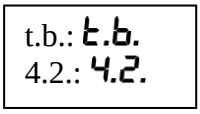
NOTE: The scrolling operation does not implement "roll-over" or "roll-under" while selecting items. The list stops when the selections reach the end of a set of options. Use the opposing switch to go the other direction through a list.

4.3 Entering the programming mode

To put the iT401 in programming mode, depress and hold the MODE/RESET switch until “P.P.” displays on the front panel, and then release. The display will then indicate “S.i.” for one second to indicate that the module is in the “signal input,” or programming, mode. Immediately after this, the display will indicate whether the jumper is set to “input” or “output.”



The display will indicate “t.b.” for the TBUS or “4.2” for the 4-20 mA loop powered sensor setup. To change this setting, use the “SETPOINT” switches to toggle between the two choices. **The user must make sure the jumper is in the corresponding position (see section 3.1).**

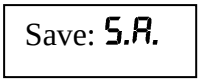


Press the MODE/RESET switch again to select the item indicated by the display and step to the next programming mode selection of the module. Refer to Appendix A for the sequence of the “MODE” selection and a complete listing of each mode’s selections. It is helpful to make a copy of the Appendix B “Programming worksheet guide” to make notations of settings used in the programming mode. Retain the completed Appendix B to document the programmed settings of the module.

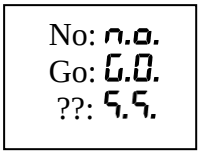
If no front panel switches are pressed for 10 seconds in the programming mode, the module will revert to its normal display mode. If the module reverts to the normal display mode while the user is in the process of programming changes, those changes are not lost unless power is removed. Press the MODE/RESET switch and release it while the “P.P.” is displayed to get back to the programming mode. Step through the programming mode selections until you have returned to where you left off. Continue making programming changes until you reach the last programming option. The last programming entry option is the “Save programming” selection. Section 4.4 outlines the method to save the edited program choices.

4.4 Saving programmed settings

The user can save changes to the settings in memory at the completion of the programming session. The last selection during programming is the “Save programming” selection, indicated on the display by “S.A.” as shown to the right.



Releasing the MODE/RESET switch will display the item option choice, which defaults to “no.” The “no” option means that no changes will be permanently saved. The “Go” option means that all changes will be saved. Toggle through the choices by using the SETPOINT switches. When ready to accept either “no” or “Go,” press the MODE/RESET switch. The display will then indicate the “??” as a last chance to change the storage choice. Press the MODE/RESET switch again to store the settings programmed. Press either SETPOINT switch to toggle between the “no” and “Go” options.



4.5 Alarm setting information

Each level alarm can be defined as either increasing high, decreasing low, or Bias Output Voltage (BOV) alarm types. An individual signal level alarm cannot be defined as both high and low, except for monitoring the bias output voltage. Each alarm relay can also be defined as “OFF”, meaning it is not active for any alarm.

Each alarm is independently set and has individual settings for a time delay of the relay action. Once an alarm limit is exceeded, the delay timer begins. The signal level must exceed the alarm setting, and remain beyond that setting, for the entire duration of the time delay. If the signal level returns to acceptable bounds before the time delay expires, the alarm will not activate and the time resets.

Independent time delays can be set for the activation and de-activation (clearing) of an alarm relay.

Each alarm also allows for a programmed hysteresis value. If the monitored signal can have considerable variance, the user may wish to capture an alarm and hold it until the signal level returns to a much lower (or higher) level than that of the high (or low) alarm level setting.

The alarm relays in the iT401 are always de-energized when the module is off or not powered. Even when the alarm relay is defined as a “latching” relay, it will de-energize and clear if there is a power failure.

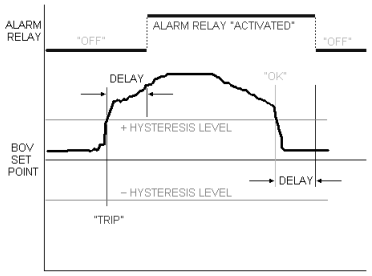


Figure 10 - BOV level and hysteresis

The BOV alarm is intended to monitor the DC bias voltage of the IEPE sensor. The DC voltages are supplied from the iT100/200 transmitter module input, where both a low and a high level of voltage delineate the range of acceptable inputs. An orange LED alarm indicates that the BOV is outside the programmed range.

The BOV set point (S.P. is 1.P., 2.P., or 3.P., for relays 1, 2, and 3, respectively) sets the center voltage for the BOV alarm span. The hysteresis (1.H., 2.H., or 3.H.) defines the span of the alarm band. The BOV level and the hysteresis are set in integer values of DC voltage.

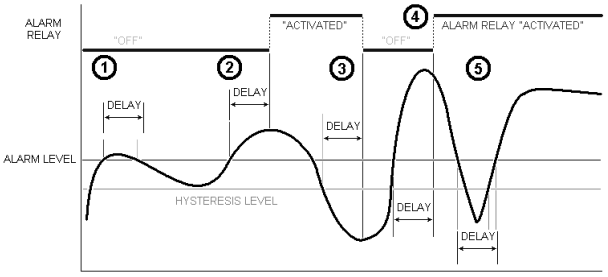


Figure 11 - Complex level alarm illustration

Note: The BOV alarm is not operable when the iT401 is set for 4-20mA loop powered sensor input.

4.6 Alarm module input over-range

If an input signal to the alarm module exceeds the full-scale of 20mA, the front panel LED elements will flash to indicate the over-range condition. If the module is set to display the signal level as a percentage of full-scale, a flashing “99” will display. If the module is set to display the 4-20mA loop current in the display, the display will indicate a flashing current of “20” to “25,” depending on the value of the loop current (25mA is the maximum allowable loop current detection).

5.0 Maintenance and troubleshooting

There is no maintenance the user can perform on the iT401 Alarm module. After troubleshooting, contact Wilcoxon Sensing Technologies technical assistance at 301-330-8811 (see section 6).

Table 1 - Error codes and explanations

Error code displayed	Description of error	Recommended action
E.1.	No valid iT-series transmitter communications for last 30 seconds	Check TBUS connection by gently 'rocking' the modules Ensure case is fully closed
E.2.	No valid 4-20mA input for last 30-seconds (current input less than 3 mA during the last 30 seconds)	Check for 1-5 VDC at 4-20 connector Verify position of J10 jumper
E.3.	Remote-reset detected closed for greater than 60 seconds	Check reset contact closure
E.4.	Mode-button detected held-in for greater than 60 seconds	Release button; if error continues, return module to Wilcoxon Research
E.5.	Setpoint Up-button detected held-in for greater than 60 seconds	Release button; if error continues, return module to Wilcoxon Research
E.6.	Setpoint Down-button detected held-in for greater than 60 seconds	Release button; if error continues, return module to Wilcoxon Research
E.7.	Internal watchdog timer timeout	If error continues, return module to Wilcoxon Research
E.8.	Alarm relay 1 not detected in proper-state within required time	Ensure power supply voltage is over 18 VDC; if error continues, return module to Wilcoxon Research
E.9.	Alarm relay 2 not detected in proper-state within required time	Ensure power supply voltage is over 18 VDC; if error continues, return module to Wilcoxon Research
E.A.	Alarm relay 3 not detected in proper-state within required time	Ensure power supply voltage is over 18 VDC; if error continues, return module to Wilcoxon Research
E.B.	User default memory write error	EEPROM failed to store correctly; if error continues, return module to Wilcoxon Research

Note: Errors can only be reset by de-powering the alarm.

5.1 Displaying serial number and manufacturing date

The serial number and manufacturing date can be accessed in normal mode. Press the up switch of the SETPOINT to display the six-digit serial number in two-digit sequences separated by a display of (--) double-dashes. (A serial number such as 987654 would be displayed in the following sequence: 98, --, 76, --, 54, --.)

The manufacturing date can be displayed in the same fashion by pressing the down switch of the SETPOINT. The manufacturing date and time will display in sequence separated by the (--) double-dashes. (The sequence will be month, day, year, hour, minute as follows: MM, --, DD, --, YY, --, hh, --, mm.)

6.0 Technical assistance

6.1 Technical assistance

For technical assistance, please contact Wilcoxon Sensing Technologies at 301-330-8811, fax to 301-330-8873, or email to info@wilcoxon.com.

6.2 Customer service

To obtain a return goods authorization number, please contact customer service at 301-330-8811, fax to 301-330-8873, or email info@wilcoxon.com.

Appendix A – Programming codes

This table has the programming codes and item selections in the sequence they appear during programming.

Mode	Item	Definition	Description of programming selection	Notes
P.P.		**P**rogramming **P**osition	Appears on display when MODE/RESET is first pressed. Indicates programming mode will begin upon release of MODE/RESET switch	
S.i.		**S**ignal **I**nput	Appears on display for one (1) second, then displays either **t.b.** or **4.2.** (whichever is the current setting)	
	t.b.	**T**-**B**US input	Selects T-BUS connector as signal input. (do NOT use this selection if using the 4-20 mA input for signal)	Default
	4.2.	**4**-**2**0 mA input	Selects the 4-20 mA connector pin for the input signal	
1.t.		Alarm 1, **T**ype		
	L.o.	**L**ow-going	Activates when the signal decreases below the set-point	
	H.i.	**H**igh-going	Activates when the signal increases above the set-point	Default
	b.o.	**B**.**O**.V.	Activates when the sensor DC Bias Output Voltage moves outside the set band (Valid only for signal input source as TBUS)	
	o.F.	**OF**F	Alarm 1 relay will not be active	
1.P.		Alarm 1, Set**P**oint		
	00-99	Alarm type **L** or **H**	Set as percentage (%) of full-scale	Default: 50
	00-24	Alarm type **B**.**O**.	Set as an integer Voltage level	
1.H.		Alarm 1, **H**ysteresis	Defines an alarm clearing ‘dead band’	
	00-99	Alarm type **L** or **H**	Set as % of full-scale (setting ‘99’ results in relay being a ‘latching’ type)	Default: 0
	00-24	Alarm type **B**.**O**.	Set as an integer Voltage span (setting ‘24’ results in relay being a ‘latching’ type)	
1.n.		Alarm 1, O**n** Delay	Time delay before relay activates after level excursion	
	00-99		Set as integer seconds of delay	Default: 10

1.F.		Alarm 1, O**ff** Delay	Time delay before relay de-activates after returning below/above hysteresis level	
	00-99		Set as integer seconds of delay	Default: 10
1.A.		Alarm 1, **A**ctivate	Manual activation of alarm (for test purposes)	
	o.n.	Alarm 1 relay ON	Manually set alarm 1 relay 'ON' [when in the 'ON' state, the normal ten (10) second time limit for switch activation is suspended]	
	o.F.	Alarm 1 relay OFF	Manual relay activation 'OFF'	

2.t.		Alarm 2, **T**ype		
	L.o.	**L**ow-going	Activates when the signal decreases below the set-point	
	H.i.	**H**igh-going	Activates when the signal increases above the set-point	Default
	b.o.	**B**.**O**.V.	Activates when the sensor DC Bias Output Voltage moves outside the set band (Valid only for signal input source as TBUS)	
	o.F.	**OF**F	Alarm 2 relay will not be active	
2.P.		Alarm 2, Set**P**oint		
	00-99	Alarm type **L** or **H**	Set as % of full-scale	Default: 50
	00-24	Alarm type **B**.**O**.	Set as an integer Voltage level	
2.H.		Alarm 2, **H**ysteresis	Defines an alarm clearing 'dead band'	
	00-99	Alarm type **L** or **H**	Set as % of full-scale (setting '99' results in relay being a 'latching' type)	Default: 0
	00-24	Alarm type **B**.**O**.	Set as an integer Voltage span (setting '24' results in relay being a 'latching' type)	
2.n.		Alarm 2, O**n** Delay	Time delay before relay activates after level excursion	
	00-99		Set as integer seconds of delay	Default: 10
2.F.		Alarm 2, O**ff** Delay	Time delay before relay de-activates after returning below/above hysteresis level	
	00-99		Set as integer seconds of delay	Default: 10
2.A.		Alarm 2, **A**ctivate	Manual activation of alarm (for test purposes)	
	o.n.	Alarm 2 relay ON	Manually set alarm 2 relay 'ON' [when in the 'ON' state, the normal 10 second time limit for switch activation is suspended]	
	o.F.	Alarm 2 relay OFF	Manual relay activation 'OFF'	

3.t.		Alarm 3, **T**ype		
	L.o.	**L**ow-going	Activates when the signal decreases below the set-point	
	H.i.	**H**igh-going	Activates when the signal increases above the set-point	Default
	b.o.	**B**.**O**.V.	Activates when the sensor DC Bias Output Voltage moves outside the set band (Valid only for signal input source as TBUS)	
	o.F.	**OF**F	Alarm 3 relay will not be active	
3.P.		Alarm 3, Set**P**oint		
	00-99	Alarm type **L** or **H**	Set as % of full-scale	Default: 50
	00-24	Alarm type **B**.**O**.	Set as an integer Voltage level	
3.H.		Alarm 3, **H**ysteresis	Defines an alarm clearing ‘dead band’	
	00-99	Alarm type **L** or **H**	Set as % of full-scale (setting ‘99’ results in relay being a ‘latching’ type)	Default: 0
	00-24	Alarm type **B**.**O**.	Set as an integer Voltage span (setting ‘24’ results in relay being a ‘latching’ type)	
3.n.		Alarm 3, O**n** Delay	Time delay before relay activates after level excursion	
	00-99		Set as integer seconds of delay	Default: 10
3.F.		Alarm 3, O**ff** Delay	Time delay before relay de-activates after returning below/above hysteresis level	
	00-99		Set as integer seconds of delay	Default: 10
3.A.		Alarm 3, **A**ctivate	Manual activation of alarm (for test purposes)	
	o.n.	Alarm 3 relay ON	Manually set alarm 3 relay ‘ON’ [when in the ‘ON’ state, the normal 10 second time limit for switch activation is suspended]	
	o.F.	Alarm 3 relay OFF	Manual relay activation ‘OFF’	

F.A.		**F**ailure **A**larm	Determines relay to activate when a module failure is detected	
	n.o.	No relay activates		Default
	A.1.	Relay 1 Activate		

	A.2.	Relay 2 Activates		
	A.3.	Relay 3 Activates		
	A.L.	All Relays Activate		
F.r.		**F**ailure Relay **R**eset	Determines relay to forcibly reset when a module failure is detected	
	n.o.	No relay resets		Default
	A.1.	Relay 1 resets		
	A.2.	Relay 2 resets		
	A.3.	Relay 3 resets		
	A.L.	All Relays reset		
d.i.		**Di**splay Units	Set two-digit LED display units	
	o.o.	**Pe**rcent	Sets display as % of full-scale	Default
	4.2.	**4**-**2**0 mA	Sets display as loop milliAmp (integer)	
O.S.		**O**utput **S**imulate	User can set the output current of the 4-20 mA output (when enabled by internal jumper)	
	03-21, or o.F.	Selects current	Set from 3 mA (03) to 21 mA (21), or can be turned off (o.F.)	
r.d.		**R**estore **D**efault	Resets iT401 settings to factory default	
	n.o.	Do **No**t restore	Keep settings from programming session (toggle using ‘setpoint’ select using ‘mode’)	
	G.o.	Restore	Returns all programming settings to factory default settings (toggle using ‘setpoint’ select using ‘mode’)	
	?.?.	Save confirm	Pressing ‘mode’ when “?.?.” is displayed will set selection chosen, pressing ‘setpoint’ will return to above toggle selections	
S.A.		**Sa**ve Programming	See manual section 4.4	
	n.o.	Do **No**t save	Do not save changes made during programming session (toggle using ‘setpoint’ select using ‘mode’)	
	G.o.	Save	Save changes made during programming session (toggle using ‘setpoint’ select using ‘mode’)	
	?.?.	Save confirm	Pressing ‘mode’ when “?.?.”displays will set selection chosen above, pressing ‘setpoint’ will return to above toggle selections	

Appendix B – Programming worksheet guide

Mode	Item	Setting	Default	Description
S.i.	t.b. or 4.2.		t.b.	Selects the input to be from the T-BUS or the 4-20 mA connector pin
1.t.	Lo, Hi, bo		Hi	Alarm type as Low, High, or BOV
1.P.	00-99, 00-24		50	Alarm trip point (level) as % for signal, voltage for BOV
1.H.	00-99, 00-24		0	Hysteresis as level, % for signal, voltage for BOV
1.n.	00-99		10	Time delay for relay activation in seconds
1.F.	00-99		10	Time delay for relay de-activation in seconds
1.A.	o.n. or o.F.			Manual activation of relay, toggles relay for testing purposes
2.t.	Lo, Hi, bo		Hi	Alarm type as Low, High, or BOV
2.P.	00-99, 00-24		50	Alarm trip point (level) as % for signal, voltage for BOV
2.H.	00-99, 00-24		0	Hysteresis as level, % for signal, voltage for BOV
2.n.	00-99		10	Time delay for relay activation in seconds
2.F.	00-99		10	Time delay for relay de-activation in seconds
2.A.	o.n. or o.F.			Manual activation of relay, toggles relay for testing purposes
3.t.	Lo, Hi, bo		Hi	Alarm type as Low, High, or BOV
3.P.	00-99, 00-24		50	Alarm trip point (level) as % for signal, voltage for BOV
3.H.	00-99, 00-24		0	Hysteresis as level, % for signal, voltage for BOV
3.n.	00-99		10	Time delay for relay activation in seconds
3.F.	00-99		10	Time delay for relay de-activation in seconds
3.A.	o.n. or o.F.			Manual activation of relay, toggles relay for testing purposes
F.A.	n.o., A.1-A.L.		n.o.	Activates relay(s) in the event of modules failure
F.r.	n.o., A.1-A.L.		n.o.	Forcibly resets (clears) alarm relay(s) on module failure
d.i.	o.o. or 4.2.		o.o.	Selects display as % full-scale or the 4-20 loop current
o.S.	o.F., 03-21		o.F.	Simulates 4-20 mA output loop (when enabled by jumper)
r.d.	n.o. or G.o.			Restore factory default settings
S.A.	n.o. or G.o.			Save user-programmed settings to memory

Appendix C – Additional display and programming notes

Programming mode:

P.P. Entering programming mode
(the left-column of Appendices A and B is only displayed while holding-in Mode-Button)
("S.i." displayed after releasing Mode-Button)

S.i. Source for signal input
- 4.2. 4-20mA input currently selected
- t.b. TBUS data (from iT-series transmitter) currently selected

1.t. Alarm#1, Type of alarm

L.o. Alarm activates when 4-20mA signal is lower than trip-point

H.i. Alarm activates when 4-20mA signal is higher than trip-point

b.o. Alarm activates when BOV is outside of hysteresis range

o.F. Alarm has no function (always off except for error setting)

Note: b.o. only displays if S.i. (source) is set for TBUS data

1.P. Alarm#1, trip-Point (%)
- 00 Minimum programmable setting, 0% or 0V
- 99 Maximum programmable setting, 99%
- 24 Maximum programmable setting, 24V

Programmable to any percentage between 00 and 99 for H.i. or L.o.
Programmable to any integer voltage between 00 and 24 for b.o.

1.H. Alarm#1, Hysteresis (allowable operation span from trip-point)
- 00 Minimum programmable setting, 0% or 0V
- 99 Maximum programmable setting, 99%
- 24 Maximum programmable setting, 24V

Programmable to any percentage between 00 and 99 for H.i. or L.o.
Programmable to any integer voltage between 00 and 24 for b.o.

1.n. Alarm#1, Alarm turn-on delay (fault must exist for this time to activate)
- 00 Minimum programmable setting, 0-seconds
- 99 Maximum programmable setting, 99-seconds

Programmable to any integer second between 00 and 99

Note: Internal signal interrogation takes 1-second, so actual delay is 01-second to 100-seconds after fault

1.F. Alarm#1, Alarm turn-off delay (fault must clear for this time to reset)
- 00 Minimum programmable setting, 0-seconds
- 99 Maximum programmable setting, 99-seconds

Programmable to any integer second between 00 and 99

Note: Internal signal interrogation takes 1-second, so actual delay is 01-second to 100-seconds after no-fault condition

1.A. Alarm#1, manually activate alarm
- o.n. Alarm#1 is manually-activated
- o.F. Alarm#1 is not manually-activated

Note: Alarm will be on or off based on current state of alarm (allowing scroll-through programming without changing state). Alarm will be left on or off until the end of programming-mode

2.t. Alarm#2, Type of alarm
- L.o. Alarm activates when 4-20mA signal is lower than trip-point
- H.i. Alarm activates when 4-20mA signal is higher than trip-point
- b.o. Alarm activates when BOV is outside of hysteresis range
- o.F. Alarm has no function (always off except for error setting)

Note: b.o. only displays if S.i. (source) is set for TBUS data

2.P. Alarm#2, trip-Point (%)
- 00 Minimum programmable setting, 0% or 0V
- 99 Maximum programmable setting, 99%
- 24 Maximum programmable setting, 24V

Programmable to any percentage between 00 and 99 for H.i. or L.o.
Programmable to any integer voltage between 00 and 24 for b.o.

2.H. Alarm#2, Hysteresis (allowable operation span from trip-point)
- 00 Minimum programmable setting, 0% or 0V
- 99 Maximum programmable setting, 99%
- 24 Maximum programmable setting, 24V

Programmable to any percentage between 00 and 99 for H.i. or L.o.
Programmable to any integer voltage between 00 and 24 for b.o.

2.n. Alarm#2, Alarm turn-on delay (fault must exist for this time to activate)
- 00 Minimum programmable setting, 0-seconds
- 99 Maximum programmable setting, 99-seconds

Programmable to any integer second between 00 and 99

Note: Internal signal interrogation takes 1-second, so actual delay is 01-second to 100-seconds after fault

2.F. Alarm#2, Alarm turn-off delay (fault must clear for this time to reset)
- 00 Minimum programmable setting, 0-seconds
- 99 Maximum programmable setting, 99-seconds

Programmable to any integer second between 00 and 99

Note: Internal signal interrogation takes 1-second, so actual delay is 01-second to 100-seconds after no-fault condition

2.A. Alarm#2, manually activate alarm
- o.n. Alarm#1 is manually-activated
- o.F. Alarm#1 is not manually-activated

Note: Alarm will be on or off based on current state of alarm (allowing scroll-through programming without changing state). Alarm will be left on or off until the end of programming-mode

3.t. Alarm#3, Type of alarm
- L.o. Alarm activates when 4-20mA signal is lower than trip-point
- H.i. Alarm activates when 4-20mA signal is higher than trip-point
- b.o. Alarm activates when BOV is outside of hysteresis range
- o.F. Alarm has no function (always off except for error setting)

Note: b.o. only displays if S.i. (source) is set for TBUS data

3.P. Alarm#3, trip-Point (%)
- 00 Minimum programmable setting, 0% or 0V
- 99 Maximum programmable setting, 99%
- 24 Maximum programmable setting, 24V

Programmable to any percentage between 00 and 99 for H.i. or L.o.
Programmable to any integer voltage between 00 and 24 for b.o.

3.H. Alarm#3, Hysteresis (allowable operation span from trip-point)
- 00 Minimum programmable setting, 0% or 0V
- 99 Maximum programmable setting, 99%
- 24 Maximum programmable setting, 24V

Programmable to any percentage between 00 and 99 for H.i. or L.o.
Programmable to any integer voltage between 00 and 24 for b.o.

3.n. Alarm#3, Alarm turn-on delay (fault must exist for this time to activate)
- 00 Minimum programmable setting, 0-seconds
- 99 Maximum programmable setting, 99-seconds

Programmable to any integer second between 00 and 99

Note: Internal signal interrogation takes 1-second, so actual delay is 01-second to 100-seconds after fault

3.F. Alarm#3, Alarm turn-off delay (fault must clear for this time to reset)
- 00 Minimum programmable setting, 0-seconds
- 99 Maximum programmable setting, 99-seconds

Programmable to any integer second between 00 and 99

Note: Internal signal interrogation takes 1-second, so actual delay is 01-second to 100-seconds after no-fault condition

3.A. Alarm#3, manually activate alarm
- o.n. Alarm#1 is manually-activated
- o.F. Alarm#1 is not manually-activated

Note: Alarm will be on or off based on current state of alarm (allowing scroll-through programming without changing state). Alarm will be left on or off until the end of programming-mode.

F.A. Failure alarm activation selection
- n.o. No alarm activates in the event of a failure
- A.1. Alarm#1 activates in the event of a failure (internal or external)
- A.2. Alarm#2 activates in the event of a failure (internal or external)
- A.3. Alarm#3 activates in the event of a failure (internal or external)
- A.L. All alarms activate in the event of a failure (internal or external)

Note: In the event of an internal or external failure, the selected alarm will activate (if the failure isn't catastrophic). An error code will be displayed if the module is still functional. Error codes or failure alarms can only be reset by removing power.

F.r. Failure alarm reset selection
- n.o. No alarm is forcibly reset in the event of a failure
- A.1. Alarm#1 is forcibly reset during a failure (internal or external)
- A.2. Alarm#2 is forcibly reset during a failure (internal or external)

A.3. Alarm#3 is forcibly reset during a failure (internal or external)
A.L. All alarms are reset in the event of a failure

Note: Only options not contradicting setpoints for "F.A." are shown

Note: In the event of an internal or external failure, the selected alarm will reset (if the failure isn't catastrophic)

Note: An alarm that is not selected for failure-activation or failure-reset, will remain in the state it was before the failure

d.i. Display % or 4-20mA
- o.o. Normal operation shows integer %-of-full-scale, 00-to-99 (default)
- 4.2. Normal operation shows input signal in terms of integer 4-20mA

o.S. Output simulation
- o.F. 4-20mA output off (default)
- 03. 4-20mA minimum output setpoint (3mA)
- 21. 4-20mA maximum output setpoint (21mA)
- Programmable to any integer mA between 03 and 21

Note: Output of a 3-21mA current requires internal jumper J10 to be in the "output" position, and requires the module be assembled with certain required components (not all modules are assembled with redundant 4-20mA output capability). Check your documentation to see which model you purchased, or look for the existence of U6 and Q11 (located below jumper J10). Only units with U6 and Q11 have 4-20mA output capability

Note: 4-20mA output, if changed, will remain constant until unit exits programming mode and returns to normal program execution

r.d. Restore manufacturer defaults
- n.o. Do not restore manufacturer programming defaults (default)
- G.o. Restore manufacturer defaults
  - ?.?. Are you sure??

Note: "?.?." is displayed after pressing Mode-Button if "G.o." was last-selected option. Pressing Mode-Button while "?.?." is displayed will execute current selection and return unit to normal operation. Pressing the Up-Button or Down-Button will return to "n.o." programming position.

Note: Pressing Mode-Button while "?.?." is displayed will return unit to manufacturer-defaults, setting both operation and user-programmed setpoints back to default settings. User should re-examine all programming modes to ensure proper module operation.

S.A. Save current user defaults
- n.o. Do not permanently save User programmed defaults (default)
- G.o. Save User defaults
  - ?.?. Are you sure??

Note: "?.?." is displayed after pressing Mode-Button if "G.o." was last-selected option. Pressing Mode-Button while "?.?." is displayed will permanently store all user setpoints to non-volatile memory. Pressing the Up-Button or Down-Button will return to "n.o." programming position. The module will return to normal operation after saving defaults.

Note: Saving User defaults is not a requirement, the module will retain any changes made during programming for as long as the unit is powered, and returns to normal program execution after 10-seconds of button inactivity (except where noted above). Simply remove and re-apply power to the module to return programming to the last saved User configuration, or select item "r.d." to restore manufacturer defaults.

Normal Module Operation:

00	minimum 0% of full-scale signal
99	maximum 99% (or greater) of full-scale signal
xx	integer xx% of full-scale signal from 00% to 99%
04.	(typical) minimum zero-scale, 4mA (note right decimal point)
20.	(typical) maximum full-scale, 20mA (note right decimal point)
xx.	integer xxmA signal, from 00. to 25.