

1. ORDERING GUIDE, SERIAL INPUT TRANSMITTER

Configure a model number in this format: **LTS60, CBL04**



Transmitter Type

LTS6...Transmitter with RS232 or RS485 serial data input, 4-20 mA, 0-20 mA or 0-10V isolated analog output, and dual 120 mA solid state relays. Default jumpered for RS232.

LTS6E... Transmitter with Ethernet serial data input, 4-20 mA, 0-20 mA or 0-10V isolated analog output, and dual 120 mA solid state relays.



Power

0.....95-240 Vac \pm 10% or 90-300 Vdc
1..... 12-30 Vac or 10-48 Vdc

ACCESSORIES

CBL04.....RS232 cable, two 3-pin connectors on transmitter end, DB9 connector on computer end.

CBL02.....USB to DB9 adapter cable. Can be used with CBL01 or CBL04.

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3. INTRODUCTION, SERIAL INPUT TRANSMITTER

The LTS6 serial input to analog output transmitter (or serial-to-analog converter) accepts RS232 or RS485 serial data using the Modbus or Custom ASCII protocol, and converts it to an isolated, scalable 4-20 mA, 0-20 mA or 0-10V analog output. The unit fits on a 35 mm DIN rail and is only 22.5 mm (0.89") thick. It is normally powered by AC (85-264 Vac), but can optionally be powered by low voltage AC or DC. All electrical connections are via detachable screw-clamp plugs. A separate manual covers the **LTSE6** serial input to analog output transmitter, which accepts Ethernet data and converts to an isolated, scalable 4-20 mA, 0-20 mA or 0-10V analog output.

The current or voltage transmitter output is jumper selectable and is transformer isolated to avoid ground loops. Either output provides 16-bit resolution of the output span and is ultra-linear to within one bit. The output is scaled to the serial input in software. Output accuracy is $\pm 0.02\%$ of span.

Dual solid state relays rated 120 mA at 140 Vac or 180 Vdc are standard. The relays can respond to the transmitted serial values or to transmitted control characters, which override the internal setpoints. The relays can also be controlled independent of the serial input by applying signals to control inputs 1 and 2.

Isolation to 250V rms is provided for power, signal input, analog output, relay outputs, and serial I/O. Isolation adds safety and avoids possible ground loops.

Default serial settings are for RS232 and full-duplex RS485. Half-duplex RS485 can be selected via jumpers or external wiring.

Transmitter setup is via the unit's serial port using an external PC and Instrument Setup software. This software can be downloaded from our website at no charge. The required 3-wire transmitter-to-PC interface RS232 cable is easy to build and is also available for purchase.

4. RECEIVING & UNPACKING YOUR TRANSMITTER

Your transmitter was carefully tested and inspected prior to shipment. Should the transmitter be damaged in shipment, notify the freight carrier immediately. In the event the transmitter is not configured as ordered or is inoperable, return it to the place of purchase for repair or replacement. Please include a detailed description of the problem.

5. SAFETY CONSIDERATIONS



Warning: Use of this transmitter in a manner other than specified may impair the protection of the device and subject the user to a hazard. Visually inspect the unit for signs of damage. If the unit is damaged, do not attempt to operate.

Caution:

- This unit may be powered with AC (mains) from 95-240 Vac $\pm 10\%$ or 90-300 Vdc with the high voltage power supply option, or 12-30 Vac or 10-48 Vdc with the low voltage power supply option. Verify that the proper power option is installed for the power to be used. This transmitter has no AC (mains) switch. It will be in operation as soon as power is applied.
- The 95-240 Vac or 90-300 Vdc mains connector (P1 Pins 1-3) is colored **green** to differentiate it from other input and output connectors. The 12-30 Vac or 10-48 Vdc mains connector is colored **black**.
- To avoid dangers of electrocution and/or short circuit, do not attempt to open the case while the unit is under power. However, signal wiring changes external to the case can be made safely while the unit is under power.
- To prevent electrical or fire hazard, do not expose the transmitter to excessive moisture.
- Do not operate the transmitter in the presence of flammable gases or fumes. Such an environment constitutes an explosion hazard.
- Secure the transmitter to a 35 mm DIN rail.

Symbols used:



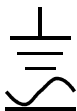
Caution (refer to accompanying documents)



Caution, risk of electric shock.



Equipment protected throughout by double insulation or reinforced insulation.



Earth (ground) terminal.

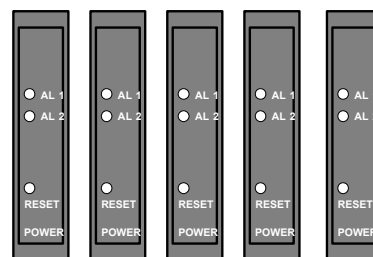


Both direct and alternating current.

Operating environment:

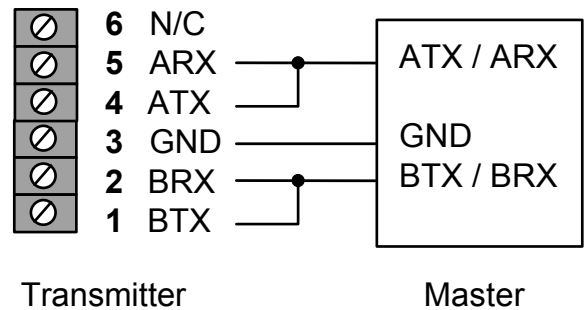
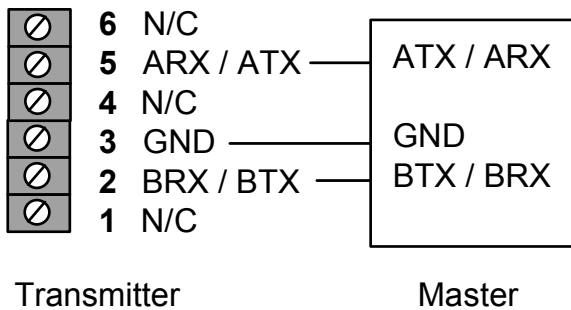
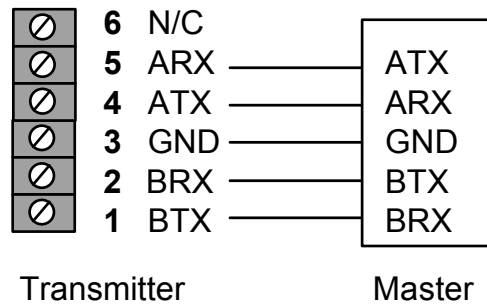
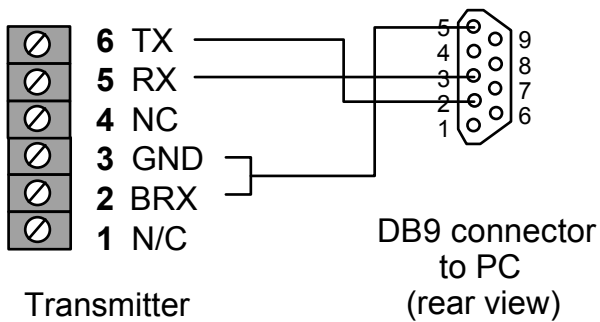
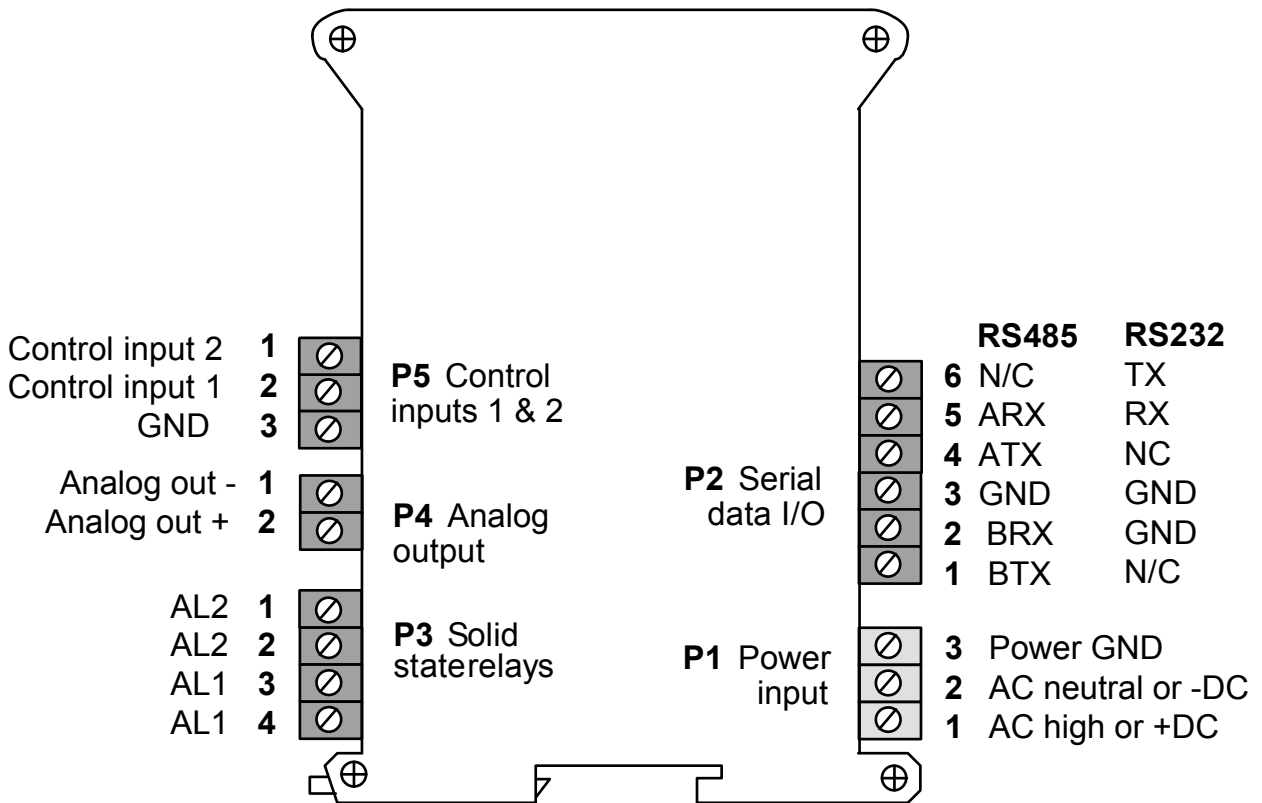
Class II (double insulated) equipment designed for use in Pollution degree 2.

PROVISION FOR COOLING



To avoid overheating, mount transmitters with ventilation holes at top and bottom. Leave a minimum of 6 mm (1/4") between transmitters, or force air with a fan.

6. TRANSMITTER FIELD WIRING



7. PROGRAMMING YOUR TRANSMITTER

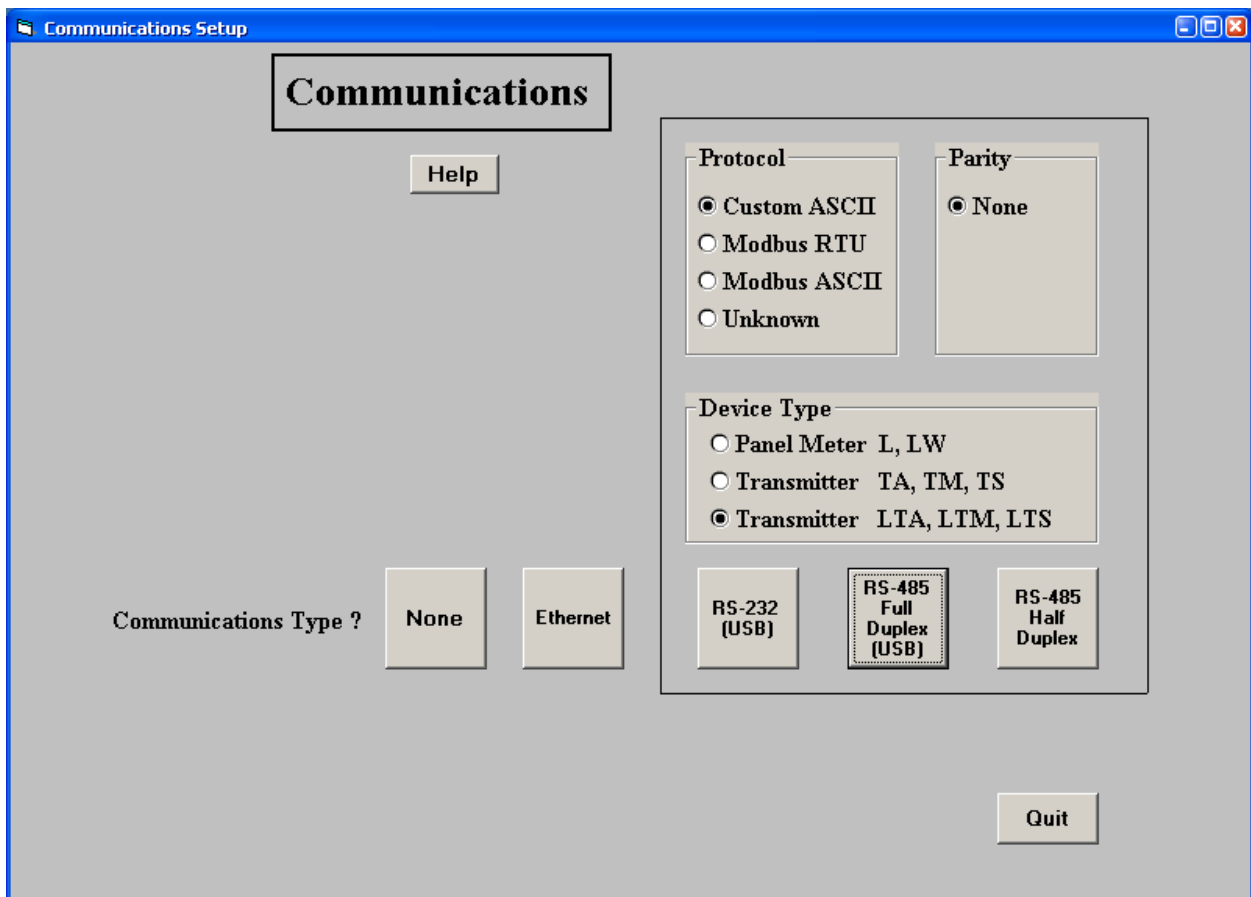
OVERVIEW

Serial input transmitters are programmed using a PC with an RS232 port and Instrument Setup (IS) software, which provides a graphical user interface. The software allows uploading, editing, downloading and saving of setup data.

CONNECTING TO YOUR PC

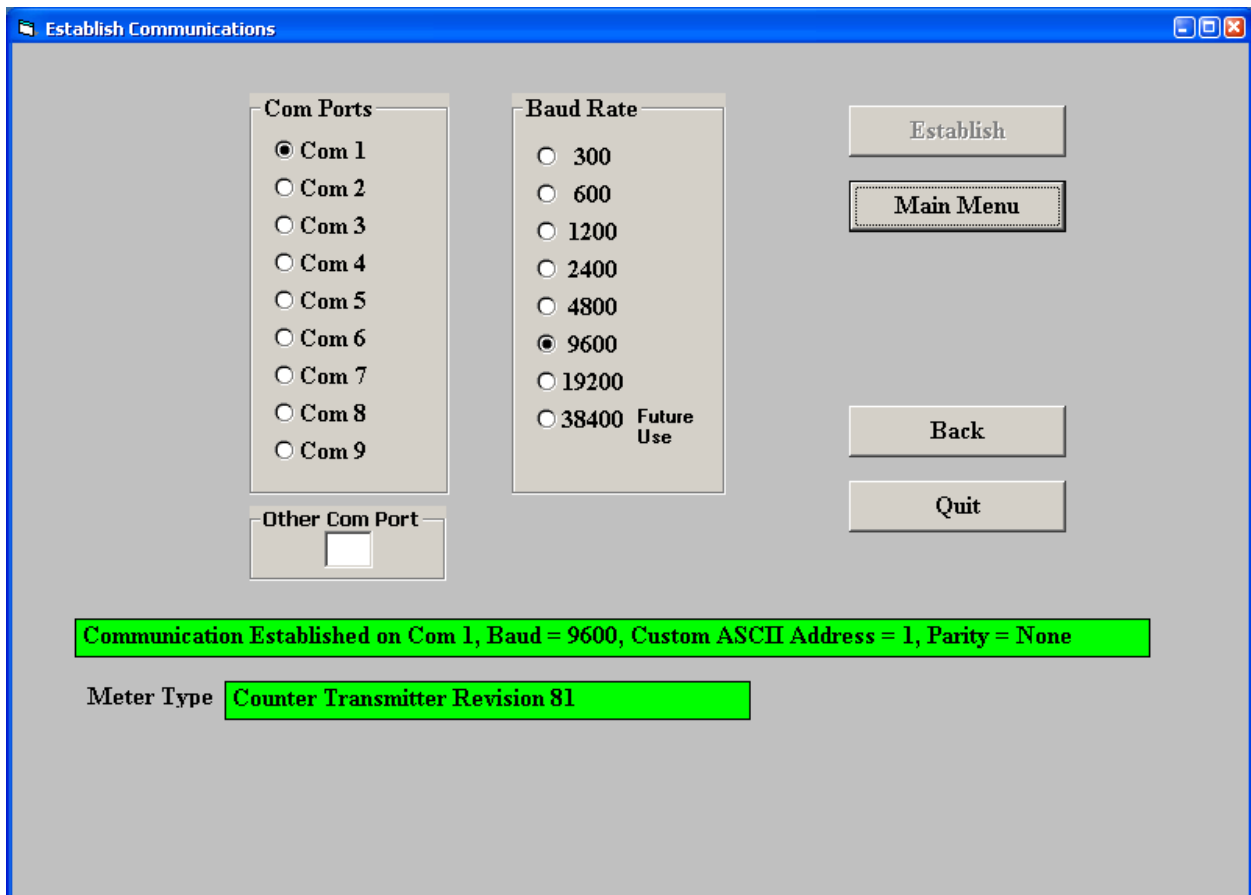
Use a 3-wire RS232 cable (P/N CBL04) to connect your transmitter to the COM port of your PC. Download the file *ISx_x_x.exe* from our website and double-click on the file name. Click on “Install Instrument Setup Software” and follow the prompts. To launch IS software, press on *Start => Programs => IS2 => Instrument Setup* or on the desktop icon that you may have created. Following a brief splash screen, the *Communications Setup* screen will appear.

ESTABLISHING COMMUNICATIONS



In the *Communications Setup* screen, select *Custom ASCII* as the Protocol, as this is the factory default setting. Select *Transmitter LTA, LTM, LTS* as the Device Type. Then click on the *RS-232 (USB)* button. In the resulting *Establish Communications* screen, select your Com Port

and *9600* as the Baud Rate. You will be able to change your protocol and baud rate later under the *Communication* setup tab. Click on *Establish*, and the two fields at the bottom of the screen should turn green and display your communication parameters and the counter-transmitter revision level. Click on *Main Menu*. The computer will remember your communication settings for the next time that you run IS software.



The best way to learn IS software is to experiment with it. From the *Main Menu*, click on *Counter => Get Setup* to retrieve (or get) the existing setup data from your counter-transmitter. Click on *View => Setup* to bring up screens which allow you to easily edit the setup file using pull-down menus and other selection tools. You can download (or put) your edited file into the transmitter by clicking on *Counter => Put Setup*. You can save your setup file to disk by clicking on *File => Save Setup* and retrieve a previously saved file from disk by click on *File => Open*.

After selecting a screen input field, pressing the *F1* key will bring up detailed help information for that field.

SETTING UP BASIC OPERATION

The screenshot shows the 'Input+Display' configuration window. At the top, there are tabs for 'Input+Display', 'Scaling', 'Filter', 'Relay Alarms', 'Communication', and 'Analog Out'. The 'Input+Display' tab is active, showing two radio buttons: 'BASIC' (selected) and 'EXTENDED'. Below these are 'Option' and 'Input Option' dropdown menus, both set to 'None'. The 'Signal Input' section contains 'Mode' (None), 'Function' (None), 'Gate Time' (000.30 Secs), and 'Time Out' (000.00 Secs). The 'Display' section includes 'Type' (Remote A), 'Filter' (Unfiltered), and 'Power-On Total' (Zero Total). A red rectangular area is shown next to a 'Read' button. The 'Control Inputs' section has a pull-down menu with three options: 'Meter Reset', 'Func Reset', and 'Meter Reset'. The 'Calibration' section shows 'Parts per Million' set to '-00048.'

Under the *Input+Display* tab, select 000.00 Secs for *Time Out*. Ignore *Signal Input*, *Gate Time*, *Filter*, and *Power-On Total*, as these parameters do not apply to the serial input transmitter.

Under *Display*, select *Remote A*, *Remote S* or *Remote C*. These items correspond to the Remote A, Remote S and Remote C operating modes, which are explained under the “Custom ASCII Protocol Transmitter Communications” section of this manual.

The *Control Inputs* pull-down menu controls the effect of grounding Control Input 1, Control Input 2, or both. Selections applicable to the serial input transmitter are the following:

- *Meter Reset, Function Reset, Meter Reset* (first row). When this row is selected, grounding Control Input 2 (causes a function reset, which resets latched alarms).
- *Activate Alarm 1, Activate Alarm 2, Activate Alarm 1&2*. When this row is selected, grounding Control Input 1 activates relay 1, grounding Control Input 2 activates relay 2, and grounding both inputs activates Alarms 1 & 2.
- *Tare Enable, Tare if Enabled, Tare* (last row). When this row is selected, grounding Control Input 1 (normally with a permanent connection) enables the Tare function. Momentarily grounding Control Input 2 stores the current digital value as an offset and subtracts this offset from the digital reading sent to the transmitter, resulting in a zero value for alarms and the analog output. This offset will also be subtracted from all new readings sent to the transmitter. To change the offset, momentarily ground Control Input 2 for the new input.

SETTING UP RELAY ALARMS OPERATION

The screenshot shows the 'Relay Alarms' configuration screen with the following settings:

Parameter	Alarm 1	Alarm 2
Setpoint 1	+010000.	+020000.
Deviation 1	+000000.	+000000.
Alarm Source	Item 3	Item 3
Alarm State	High Active	High Active
Relay Alarm State	Active On	Active On
Deviation Type	Hysteresis	Hysteresis
Alarm Type	Non-Latching	Non-Latching
Alarms 1,2 No. Rdgs to Alarm	1 Reading	

An 'Enter Decimal Value' dialog box is overlaid on the right side of the screen, showing the value: + 0 2 0 0 0 0 .

Under the *Relay Alarms* tab, enter the Setpoint 1 and 2 values as well as other parameters applicable to relay operation. Set *Alarm Source* to *Item 3* as illustrated. Please see the “Dual Relay Operation” section of this manual for an explanation of the relay operating modes.

SETTING UP COMMUNICATIONS (REMOTE A & S MODES)

The screenshot shows a software interface with a top navigation bar containing tabs: 'Input+Display', 'Scaling', 'Filter', 'Relay Alarms', 'Communication', and 'Analog Out'. The 'Communication' tab is active. Below the tabs is a section titled 'Serial Communications'. This section contains several configuration options:

- Baud Rate:** 9600
- Address:** 1
- Output Items:** Item 1
- Output Filter:** Unfiltered
- Output Rate:** Read Rate
- Output Mode:** Command
- Incl Alarm Data:**
- Include LF:**
- CR (LF):** At End of All
- Full/Half Duplex:** Full Duplex
- Serial Protocol:** Custom ASCII
- Recognition Char:** Standard *

The above screen will appear under the *Communication* tab if *Remote A* or *Remote S* has been selected as *Display Type* under the *Input+Display* tab. These two modes are not able to extract data from an ASCII string that contains multiple data values and non-numeric characters.

Under this tab, you can reselect your *Baud Rate*, *Device Address*, *Serial Protocol*, and *Full/Half Duplex*, even though you may have selected different values to establish initial communications with your PC.

Set *Output Mode* to *Command*. Ignore the setting for *CR(LF)*, *Output Items*, *Output Filter*, and *Output Rate*, as these items apply to digital transmission by a counter-transmitter, not to digital-to-analog conversion by the serial input transmitter.

SETTING UP COMMUNICATIONS (REMOTE C MODE)

The above screen will appear under the *Communication* tab if *Remote C* has been selected as *Display Type* under the *Input+Display* tab. This mode is able to extract data from an ASCII string that contains multiple data values and non-numeric characters. Please see the F1 Help screen to the right.

Under this tab, you can reselect *Baud Rate*, *Device Address*, *Serial Protocol*, and *Full/Half Duplex*, even though you may have selected different values to establish initial communications with your PC.

Set *Output Mode* to *Command*. Ignore *CR(LF)*, *Output Items*, *Output Filter* and *Output Rate*, as these items apply to digital transmission by a counter-transmitter, not to digital-to-analog conversion by the serial input transmitter.

APPLICATION HELP

START, STOP, SHOW, SKIP

At the end of the **Display Type** list is **Remote Display "C"**, which is the selection for Masked Remote Display operation. It provides the following four selectable parameters relating to the Remote Display string of data.

- Start Char** - The character designating the beginning of the string.
- Stop Char** - The character designating the end of the string.
- Skip No.** - The number of characters following the **Start Char** to be ignored.
- Show No.** - The number of characters immediately following the ignored characters to be displayed.

Example:
 * A B C D - 1 2 3 . 4 5 E F G # H I J K * etc.

 Start Skip Show Stop
 = * = 4 = 7 = #

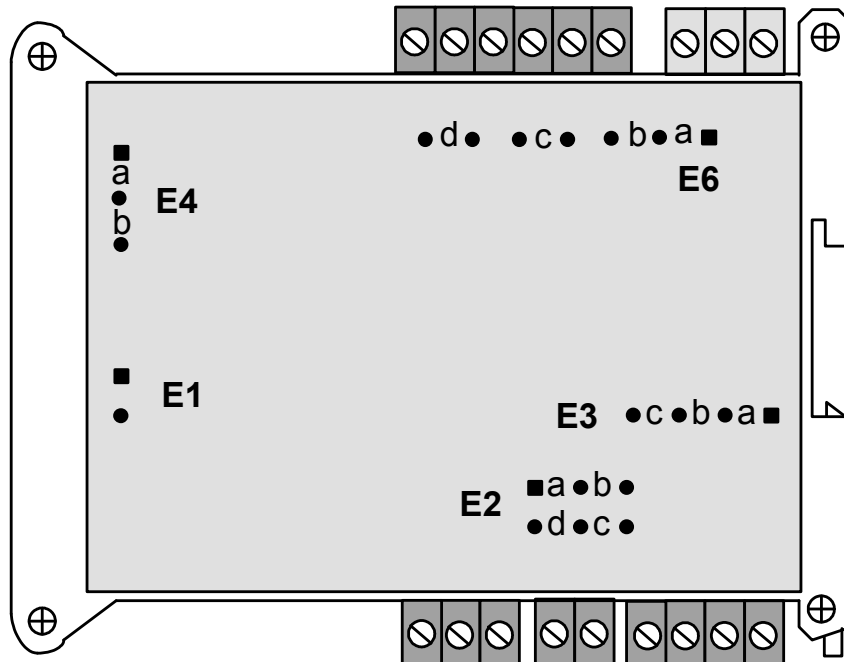
OK

SETTING UP THE ANALOG OUTPUT

The screenshot shows the 'Analog Out' configuration window. It has four tabs: 'Input+Display', 'Scaling', 'Filter', and 'Relay Alarms', with 'Analog Out' being the active tab. The 'Analog Output' section contains four fields: 'Source' (a dropdown menu set to 'Item 3'), 'Lo Range Reading' (a text box containing '+000000.'), 'Range' (a dropdown menu set to '4-20mA Current'), and 'Hi Range Reading' (a text box containing '+100000.'). A blue dialog box titled 'Enter Decimal Value' is overlaid on the window, showing a numeric keypad with the value '+100000.' entered. The dialog box has 'OK' and 'Cancel' buttons.

Under the *Analog Out* tab, set *Source* to *Item 3*. Under *Range*, select *0-20 mA Current*, *0-10V Voltage*, or *4-20 mA Current* as your desired analog output. Type in your *Lo Range Reading* and *Hi Range reading*. These will create the two endpoint values of your analog output range.

8. CHANGING JUMPER SETTINGS



Jumpers at E6 are used to set the input signal to RS232 or RS485. The factory default setting is RS232, which allows direct connection to a PC. As an alternative to using jumpers, the selection of half-duplex RS485 can also be achieved by externally connecting BTX to BRX and ATX to ARX. A termination resistor can be selected if the transmitter is the last device on an RS485 line longer than 200 feet (60 m).

Serial Signal	Duplex	Jumpers	Termination Resistor
RS485	Full	None	E6 a = Transmit E6 c = Receive
	Half	E6 b + d	E6 c
RS232	Full	None	None

Jumpers at E2 are used to select voltage or current output. For 4-20 mA or 0-20 mA current, jumper **E2 a + d**. For 0-10V voltage, jumper **E2 b + c**. The factory default setting is current.

Jumpers at E3 and E4 are used with our counter transmitters to select an excitation output. This capability does not apply to the serial input transmitter, which does not provide a signal conditioner board.

Temporarily placing a jumper at E1 followed by power-up will reset communications to the default values of 9600 baud, command mode, Custom ASCII protocol, and Address 1.

WHEN TO CHANGE JUMPERS

Most users will never have the need to open the transmitter case. Our transmitters are shipped fully jumpered and ready for scaling. The transmitter type is specified by the model number on the transmitter label.

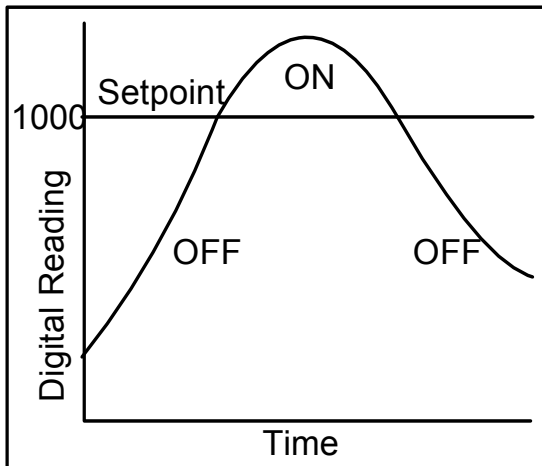
The selection serial signal (RS232 or RS485) can be achieved by jumpers on the main board or by external wiring, as documented on the previous page. The factory default setting for the serial signal level is RS232.

HOW TO OPEN & CLOSE THE CASE

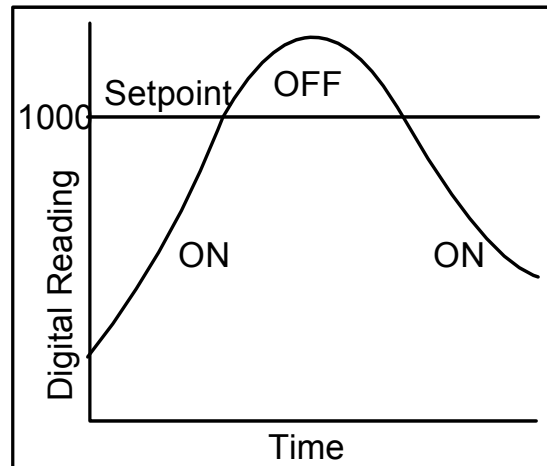
The two clamshell halves of the case are held together by 4 nuts and 4 bolts. Removing these allows opening the case. Be careful not to lose the nuts, which are not captive in the case. When closing the case, make sure that the ventilation grills are properly aligned.

9. DUAL RELAY OPERATION

The optional dual solid state relays can operate in a basic alarm mode, in a hysteresis band mode, or in a deviation band mode, as explained below. Setpoint operation is referenced to the digital reading that is received as serial data. For example, temperature alarm or control would be referenced to a setpoint in °C or °F.

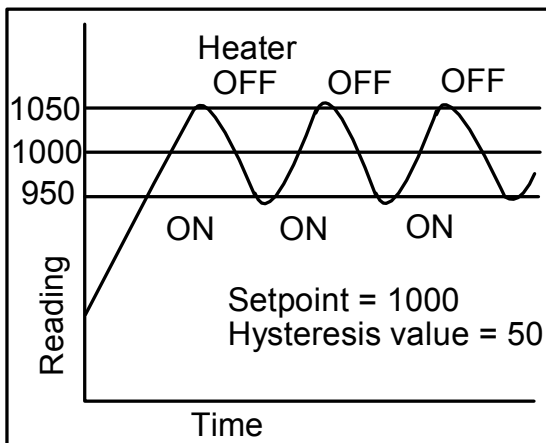


Active High Basic Alarm

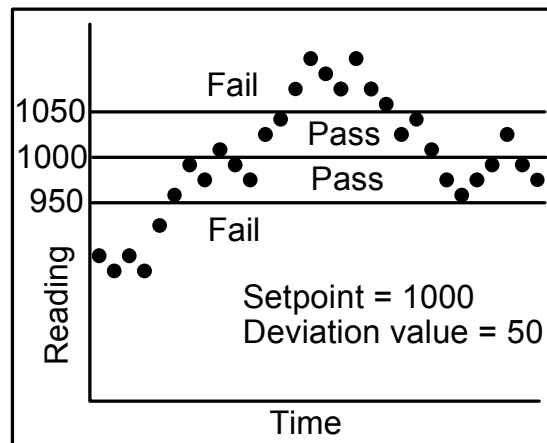


Active Low Basic Alarm

A basic alarm changes state automatically when the reading rises above a specified limit, and changes back automatically when the reading falls below that limit. A red LED indicates the relay is in an alarm condition, which can be active high or active low, as programmed.



Hysteresis Band Alarm



Deviation Band Alarm

A hysteresis band alarm controls relay action symmetrically around a setpoint. The relay closes (or opens) when the reading goes above the setpoint plus one hysteresis value, and opens (or closes) when the reading falls below the setpoint less one hysteresis value. A narrow hysteresis can be used to minimize relay chatter. A wide hysteresis band can be used for on-off control applications.

A deviation band alarm controls relay action symmetrically around a setpoint. The relay actuates when the reading falls within the deviation band, and de-actuates when the reading falls outside. A deviation value (such as 50 counts) is set up around both sides of the setpoint to create the deviation band. Passbands around a setpoint are often used for component testing.

Control Input 1 causes a master reset when tied to ground if selected to do so with the *Control Inputs* drop-down box under the *Relay Alarms* tab. This resets latched alarms and the analog output. Control Input 2 is not used with the serial input transmitter.

10. MODBUS PROTOCOL TRANSMITTER COMMUNICATIONS

1. GENERAL

The Modbus capability conforms to the Modbus over Serial Line Specification & Implementation guide, V1.0. Both the Modbus RTU and Modbus ASCII protocols are implemented:

Modbus RTU

Baud Rate..... 300, 600, 1200, 2400, 4800, 9600 or 19200
Data Format 1 start bit, 8 data bits, 1 parity bit, 1 stop bit (11 bits total)
Parity..... None, Odd, Even (if None, then 2 Stop bits for 11 total)
Address..... 0 for broadcast, 1-247 for individual devices

Modbus ASCII

Baud Rate..... 300, 600, 1200, 2400, 4800, 9600 or 19200
Data Format 1 Start bit, 7 Data bits, 1 Parity bit, 1 Stop bit (10 bits total)
Parity..... None, Odd, Even (if None, then 2 Stop bits for 10 total)
Address..... 0 for broadcast, 1-247 for individual devices

2. FRAMING

Modbus RTU: Message frames are separated by a silent interval of at least 3.5 character times. If a silent interval of more than 1.5 character times occurs between two characters of the message frame, the message frame is considered incomplete and is discarded. Frame Check = 16 bit CRC of the complete message excluding CRC characters.

Modbus ASCII: The message begins immediately following a colon (:) and ends just before a Carriage Return/ Line Feed (CRLF). All message characters are hexadecimal 0-9, A-F (ASCII coded). The system allowable time interval between characters may be set to 1, 3, 5 or 10 seconds. Frame Check = 1 byte (2 hexadecimal characters) LRC of the message excluding the initial colon (:) and trailing LRC and CRLF characters.

3. ELECTRICAL INTERFACE

Two-wire (plus common) half-duplex RS485 or RS232 signal levels are jumper selectable on the transmitter main board. The RS485 selection provides a jumper selection for insertion of a line termination resistor. Please see Section 14. In case of a long line (greater than 500 ft) to the first device, a termination resistor should be selected for the first device. In case of a long line between the first and last devices, a termination resistor should be selected for the first and last devices. Never add termination resistors to more than two devices on the same line.

4. COMMUNICATIONS SETUP

Parameters selectable via Instrument Setup software, distributed on CD ROM:

Serial Protocol Custom ASCII, Modbus RTU, Modbus ASCII
 Modbus ASCII Gap Timeout..... 1 sec, 3 sec, 5 sec, 10 sec
 Baud Rate..... 300, 600, 1200, 2400, 4800, 9600, 19200
 Parity No parity, odd parity, even parity
 Device Address 0 to 247

5. SUPPORTED FUNCTION CODES

FC10: Write Multiple Registers (FC10 = 16 dec)

Writes internal registers containing input data for analog output and relays.

Register Address		Data Type	Destination
Dec	Hex		
107	006B	Hi Word Hex Value	Hi Word Applied to Item3
108	006C	Lo Word Hex Value	Lo Word Applied to Item3

FC05: Write Single Coil

Action command to transmitter

Output Address	Output Value	Action Command
00 01	FF 00	Transmitter Reset (No Response)
00 03	FF 00	Latched Alarm Reset

6. MESSAGE FORMATTING

MA = Device Address DD = Data (Hex) CL = CRC Lo Byte
 FC = Function Code WW = Data (On/Off) CH = CRC Hi Byte
 RA = Register Address SF = Sub-Function CR = Carriage Return
 NR = Number of Registers EC = Error Code LF = Line Feed
 NB = Number of bytes LRC = ASCII Checksum

Modbus RTU Format

FC	Action	> 3.5 Char	Byte Number										
			1	2	3	4	5	6	7	8	9	10	11
05	Request	NoTx	MA	FC	RA	RA	WW	WW	CL	CH			
05	Response	NoTx	MA	FC	RA	RA	WW	WW	CL	CH			
10	Request	NoTx	MA	FC	RA	RA	NR	NR	NB	DD*	DD*	CL	CH
10	Response	NoTx	MA	FC	RA	RA	NR	NR	CL	CH			

Modbus ASCII Format

FC	Action	Byte Number												
		1	2	3	4	5	6	7	8	9	10	11	12	13
05	Request	:	MA	FC	RA	RA	WW	WW	LRC	CR	LF			
05	Response	:	MA	FC	RA	RA	WW	WW	LRC	CR	LF			
10	Request	:	MA	FC	RA	RA	NR	NR	NB	DD*	DD*	LRC	CR	LF
10	Response	:	MA	FC	RA	RA	NR	NR	LRC	CR	LF			

11. CUSTOM ASCII PROTOCOL TRANSMITTER COMMUNICATIONS

All setup parameters are entered into the transmitter via Instrument Setup (IS) software, including the serial communication format, digital address, operating mode, analog output scaling, and relay operating modes and setpoints.

1. SERIAL COMMUNICATION FORMAT

The Custom ASCII serial communication format for both RS232 and RS485 is the following:

Modes.....Full Duplex (separate transmit and receive lines) or Half Duplex (RS485 only).

Baud Rate300, 600, 1200, 2400, 4800, 9600, 19200 selectable with IS software.

Data Format8 data bits, no parity, 1 stop bit

2. DATA FORMAT

The basic input data format consists of 9 or 10 ASCII characters, such as +9999.99A<CR>. The first character is always a plus or minus sign. There are 6 numeric digits. A decimal point is always required, even when it follows the last digit. The letter A is an optional alarm character. <CR> is the carriage return character. A line feed <LF> character at the end of the string is ignored.

3. NETWORK CONFIGURATIONS

Using the Custom ASCII protocol, serial input transmitters can operate in a point-to-point mode using RS232 or RS485, or in a multi-point mode using RS485:

The point-to-point mode is a direct connection between a computer (or other digital device) and the transmitter. It is suggested that address 1 be selected for the point-to-point mode.

The multi-point mode is a connection from a host computer to multiple transmitters bused together with their inputs and outputs connected in parallel. It is necessary to set up each device on the bus with a different address from 1 to 31. To command a particular device, its address is used in conjunction with the command, and only that device will respond. The outputs of all devices on the bus are set to a high impedance state, except the device being addressed. Zero (0) is a special address to which a device responds only internally (e.g. Reset), but it does not transmit any response on the output lines. All devices may be commanded simultaneously with a 0 address, and there will not be any output response contention.

4. OPERATING MODES

The serial input transmitter has three serial input modes, which are dedicated to the analog output and relays based on serial data received via RS232 or RS485:

Remote A Addressable remote units (up to 31 units)

Remote S Single remote unit

Remote C Single remote unit programmed to select specific data from a data string.

Remote A is an addressable input mode that uses the K command letter. It can convert remote data on one or more transmitters having the command address in a multi-point configuration or a single transmitter having the command address in a point-to-point configuration.

Remote S is not addressable, and data representing a value to be retransmitted as an analog output is received via a point-to-point connection. The value is stored where it may be selected for Alarm comparisons. If a Coded Alarm character is included, it overrides the internal alarm comparisons.

Remote C is used to extract data from an ASCII string that contains multiple data values and non-numeric characters. It can accommodate selected Start and Stop characters. Any number of characters after the start character can be masked off up to the beginning of the desired data. From 1 to 6 numeric characters can be selected for the data (8 characters if sign and decimal point are included). The following parameters determine the operation:

1. Start character. This can be any ASCII character in the received string. It must be at a fixed number of characters from the beginning of the desired data, which must have a fixed number of characters. Enter 00 if no start character is available. The stop character then becomes the start character.
2. Stop character. Set to 00 if no stop character is available. Note: Only either the start or stop character can be set to 00. The start and stop characters cannot be any character included in the data string.
3. Skip No. Number of characters following the Start character to be ignored.
4. Show No. Number of characters following the ignored characters to be processed.



Warning: Instrument Setup (IS) software sets the mode to Remote A when first accessing the transmitter or performing a *Get Setup* command. This is because the transmitter will not communicate with the host PC using IS software in the Remote C mode. The user must reset the mode to Remote C prior to executing a *Put Setup* command, which will load the setup information into the transmitter.

If you desire the transmitter to operate in the Remote C mode and you later need to perform a *Get Setup* command to change a setup parameter, do not forget to change the transmitter back from Remote A to Remote C prior to performing a *Put Setup* command.

Remote A Data Format: *#KSDDDDDD.A<CR>

- * = Recognition character. Another command recognition character may be chosen to make the transmitter compatible with an existing system. The transmitter will still respond to an asterisk.
- # = Device address. See Address Codes table on next page.
- K = Command letter.
- S = Sign of value (optional), space (or +) for positive, - for negative value.
- D = Data. Number of digits can be 1-6.

- . = Decimal point (optional).
- A** = Alarm Character (optional). A = no alarms, B = alarm 1 active, C = alarm 2 active, D = alarms 1 & 2 active.
- <CR>** = Carriage return character

Remote S Data Format: SDDDDDD.A<CR>

- S** = Sign of value (optional), space (or +) for positive, - for negative value.
- D** = Data. Number of digits can be 1-6.
- . = Decimal point (optional).
- A** = Alarm Character (optional). A = no alarms, B = alarm 1 active, C = alarm 2 active, D = alarms 1 & 2 active.
- <CR>** = Carriage return character

Remote C Data Format: STXXXSDDDDDD.SP

- ST** = Start character
- XXX** = Data to be ignored (Skip No.)
- S** = Sign of value (optional), space (or +) for positive, - for negative value.
- D** = Data. Number of digits can be 1-6 (Show No.)
- . = Decimal point (optional).
- SP** = Stop character

CHAR 2 - Address Codes for Remote A

A Serial Communications Address Code from 1 to V follows the “*” to indicate the device address number from 1 to 31.

Device #	Address Code	Device #	Address Code	Device #	Address Code
1	1	12	C	23	N
2	2	13	D	24	O
3	3	14	E	25	P
4	4	15	F	26	Q
5	5	16	G	27	R
6	6	17	H	28	S
7	7	18	I	29	T
8	8	19	J	30	U
9	9	20	K	31	V
10	A	21	L		
11	B	22	M		

12. SPECIFICATIONS, SERIAL INPUT TRANSMITTER

Serial Data Input

Signal Levels..... RS232, full-duplex RS485, half-duplex RS485 (selectable)
Protocol Modbus RTU, Modbus ASCII, Custom ASCII (software selectable)
Serial Connector Detachable dual 3-position plugs

Analog Output (standard)

Output Levels..... 0-20 mA, 4-20 mA or 0-10V
Voltage or Current Selection Via jumpers
Compliance at 20 mA..... 10V (0-500 ohm load)
Compliance at 10V..... 2 mA (5 kohm minimum load)
Output Resolution..... 16 bits (65,535 steps)
Output Error..... < 0.02% of full span
Output Update Rate Determined by serial input rate. Approx 75/sec max at 19200 baud

Dual Relay Output (standard)

Relay Type Two solid state relays, SPST, normally open, Form A
Load rating 130 mA at 140 Vac or 180 Vdc
Relay modes Active high or low, latching or non-latching, hysteresis or band deviation

Power & Electrical

Power to Transmitter 95-240 Vac \pm 10% or 90-300 Vdc (standard power)
12-30 Vac or 10-48 Vdc (low voltage power option)
Power Isolation..... 250 Vrms between power, analog output, signal input, and serial I/O

Transmitter Setup

Transmitter setup Instrument Setup software using PC and CBL04 cable

Mechanical

Case Dimensions 129 x 104 x 22.5 mm
Case Mounting..... 35 mm DIN rail per EN 50022
Electrical Connections..... Detachable screw plug connectors

Environmental

Operating Temperature 0°C to 55°C
Storage Temperature -40°C to 85°C
Relative Humidity..... 95% from 0°C to 40°C, non-condensing

13. WARRANTY

Laurel Electronics Inc. warrants its products against defects in materials or workmanship for a period of one year from the date of purchase.

In the event of a defect during the warranty period, the unit should be returned, freight prepaid (and all duties and taxes) by the Buyer, to the authorized Laurel distributor where the unit was purchased. The distributor, at its option, will repair or replace the defective unit. The unit will be returned to the buyer with freight charges prepaid by the distributor.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from:

1. Improper or inadequate maintenance by Buyer.
2. Unauthorized modification or misuse.
3. Operation outside the environmental specifications of the product.
4. Mishandling or abuse.

The warranty set forth above is exclusive and no other warranty, whether written or oral, is expressed or implied. Laurel specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

EXCLUSIVE REMEDIES

The remedies provided herein are Buyer's sole and exclusive remedies. In no event shall Laurel be liable for direct, indirect, incidental or consequential damages (including loss of profits) whether based on contract, tort, or any other legal theory.