1. ORDERING GUIDE, SERIAL INPUT TRANSMITTER

Configure a model number in this format: **LTSE60**

- **LTSE6**… 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.................................................................................................................. 85-264 Vac or 90-300 Vdc
  1.................................................................................................................. 12-30 Vac or 10-48 Vdc

2. TABLE OF CONTENTS

1. ORDERING GUIDE, SERIAL INPUT TRANSMITTER .......................................................... 2
2. TABLE OF CONTENTS ....................................................................................................... 2
3. INTRODUCTION, SERIAL INPUT TRANSMITTER .............................................................. 3
4. COMPLEMENTARY MANUALS ......................................................................................... 3
5. RECEIVING & UNPACKING YOUR TRANSMITTER ........................................................... 3
6. SAFETY CONSIDERATIONS .............................................................................................. 4
7. TRANSMITTER FIELD WIRING & JUMPER SETTINGS ..................................................... 5
8. PROGRAMMING YOUR TRANSMITTER ............................................................................ 6
9. MODBUS PROTOCOL TRANSMITTER COMMUNICATIONS ............................................ 17
10. CUSTOM ASCII PROTOCOL TRANSMITTER COMMUNICATIONS ................................. 20
11. SPECIFICATIONS, SERIAL INPUT TRANSMITTER .......................................................... 23
12. WARRANTY ...................................................................................................................... 24
The LTSE6 Ethernet input to analog output transmitter (or Ethernet-to-analog converter) accepts Ethernet 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. It 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 is also available for low voltage AC or DC. The LTSE6 utilizes an Ethernet counter transmitter board, but no signal conditioner board.

The current or voltage 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 ±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 independently of the serial input by applying signals to control inputs 1 and 2.

Isolation to 250V rms is provided for power, the Ethernet input, analog output, and relay outputs. Isolation adds safety and avoids possible ground loops.

Transmitter setup is via the Ethernet interface using Node Manager Software on a PC or the Web Server software which is built into each of our Ethernet Nodes.

4. COMPLEMENTARY MANUALS

- **Ethernet Manual.** Covers Ethernet Node discovery and setup using Node Manager PC Software or the Web Server Software built into each Node. Required for use of Ethernet transmitters and normally shipped with this manual.

- **Modbus Communications Manual.** Covers strings and commands to be used with the Modbus protocol (if selected). Intended for programmers.

- **Serial Communications Manual.** Covers strings and commands to be used with Custom ASCII protocol (if selected). Intended for programmers.

5. 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.
6. 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 85-264 Vac or 90-300 Vdc with the high voltage power supply option, 12-30 Vac or 10-48 Vdc with the low voltage power supply option. This transmitter has no AC (mains) switch. It will be in operation as soon as power is applied.
- The 85-264 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.
7. TRANSMITTER FIELD WIRING & JUMPER SETTINGS

**E2 jumpers a + d** set the analog output to 4-20 mA or 0-20 mA current (factory default setting). **E2 jumpers b + c** set the analog output to 0-10V voltage.

**The analog output is sourcing.** Do not put an external voltage source in series with it. Applying an external 24 Vdc source will burn out the analog output board.

**E3 and E4 jumpers** for excitation do not apply, since there is no signal conditioner board.

**E7 a + b jumpers.** Reserved.

**A jumper at E6** as shown sets the transmitter to normal operation as opposed to factory setup.

**Place a jumper at E1** followed by power cycling to reset communications to the default values of 9600 baud, command mode, Custom ASCII protocol, and Address 1. Remove the jumper when done.

**HOW TO OPEN & CLOSE THE CASE**

Changing jumper settings requires opening the case, whose two clamshell halves are held together by 4 nuts and 4 bolts. When opening the case, be careful not to lose the nuts, as these are not captive. When closing the case, make sure that the ventilation grills are properly aligned. Note that most users will never have the need to open the transmitter case, since our transmitters are shipped jumpered for the model number on the label.
8. PROGRAMMING YOUR TRANSMITTER

OVERVIEW

An LTSE6 transmitter is programmed by connecting it to the same LAN as a PC and then running two applications on the PC in sequence: 1) Node Manager Software, and 2) Instrument Setup Software. Node Manager Software is used to discover the Ethernet Node and is required to disable interrogation by the Node of a signal conditioner board that is not part of the LTSE6. Instrument Setup Software also discovers the Ethernet Node and is used to set up essential functions like data extraction from the incoming ASCII string, scaling of the analog output, and relay operation.

USE NODE MANAGER SOFTWARE TO DISABLE INTERROGATION

Download the file NodeMgr_x_x from our website at no charge, double-click on the file name, and follow the prompts to install. Please refer to the Ethernet manual which accompanies the LTSE6 for full Node Manager Software functionality.

Upon launch, Node Manager will automatically discover all of our Nodes on the LAN, including the LTSE6 Node. Select that Node, and “Node Connection Status” for that Node should change to “Connected” on a green background. If the Node does not connect, you will probably have to change Windows permissions. Also verify that no other PC is currently accessing the same Node.
Click on the “Advanced Settings” tab, and change “Parent Meter Interrogation” to “Disabled”. Press “Put” to save this setting in the Node, then press “Quit” to close Node Manager Software.

As an aid to diagnostics, the Ethernet connector for all of our Ethernet Nodes is provided by an RJ45 jack, where green and amber LEDs on the jack indicate network operation:

1) Following power-up, the green and amber LEDs are on steady until an IP address has been assigned to the Node.

2) Once an IP address has been assigned to the Node, the amber LED is turned off. It will light up whenever the Node detects data packet activity.

3) When the Node has made a TCP connection, the green LED alternates on (1 sec) and off (1 sec), while the amber LED is on steady.

Ethernet cables (CAT5 or better) can be straight-through or crossover. Our Ethernet Nodes automatically adapt for either.
USE INSTRUMENT SETUP SOFTWARE TO SET UP YOUR TRANSMITTER

Download the file ISx_x_x from our website at no charge, double-click on the file name, and follow the prompts to install Instrument Setup Software. Upon launch of that software, the Communications Setup screen will appear following a brief splash screen.

In the Communications Setup screen, select Transmitter LTSE as the Device Type, Ethernet as the Communication Type, any of the protocols listed.
The same Node Discovery screen as for the now closed Node Manager Software will open once you have passed the Windows Firewall. Highlight the Node which is integral with your transmitter Device. If the Node does not connect, you will probably have to change Windows permissions.

Click on the Device Discovery tab, and all Devices attached to your Node will be listed. With an LTSE6 transmitter, the host transmitter will be the only Device listed.

Highlight your Node, and you will be able to assign a descriptive name to it, such as Tank Farm. The default name is the Node’s unique MAC address. You can also use this tab to change your Node’s communication settings. Press Get to retrieve settings from the Node to the PC. Press Put to write settings from the PC to the Node.

Highlight your Device, and you will be able to assign a descriptive name to it, such as Flow Rate. Press “Get” to retrieve settings from the Device to the PC. Press “Put” to write settings from the PC to the Device.
Click on the Advanced Settings tab, and you will be given the opportunity to change the Node’s TCP and UDP Port settings. Press Get to retrieve settings from the Node to the PC. Press Put to write settings from the PC to the Node.

If a browser is to access our Nodes on a remote LAN over the Internet, port forwarding must first be set up for the router that controls the remote LAN. The default port numbers programmed into our Nodes are UDP port 63179 for Node discovery and TCP port 502 for Modbus TCP. If these ports are blocked by the router or by a firewall, different port values can be entered into our Nodes. You or your company’s IT department will then also need to set up the remote router to forward these different port values.

Press the Main Menu Button. A help screen will appear. Click on “OK”, then on “Counter”, then on “Get Setup”, which will download the current setup information from the transmitter Device to the PC. Click on “View”, then on “Setup”. This will open the tab system which allows you to program the non-Ethernet portion of your transmitter.
SETTING UP BASIC OPERATION

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 ALARM OPERATION

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.

The 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.

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.
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.
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.
SETTING UP THE ANALOG OUTPUT

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. Only enter the numerical values. The decimal point is ignored.

The analog output is sourcing. Do not put an external voltage source in series with it. Applying an external 24 Vdc source will burn out the analog output board.

PUTTING YOUR PROGRAMMED SETUP INTO THE LTSE6

After you have completed all of your settings in Instrument Setup Software, click on the Main Menu button. From the Main Menu, click on the Counter tab and do a Put Setup. This will download your setup from the PC into the LTSE6. Then exit Instrument Setup Software completely and disconnect your LTSE6.

Failure to exit Instrument Setup software completely will take the LTSE6 out of the Remote C mode back into the Remote A mode, which allows two-way serial communications between the PC and LTSE6.

Reconnecting the LTSE6 to a PC and using Instrument Setup Software, for example to check on previously programmed settings, will also take the LTSE6 out of the Remote C mode back into the Remote A mode. In that case you will need to reset the LTSE6 to Remote C and do a Put Setup to download your setup from the PC into the LTSE6.
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 downloaded Instrument Setup software:

- 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.

<table>
<thead>
<tr>
<th>Register Address</th>
<th>Data Type</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec</td>
<td>Hex</td>
<td>Hi Word Hex Value</td>
</tr>
<tr>
<td>107</td>
<td>006B</td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>006C</td>
<td></td>
</tr>
<tr>
<td>Lo Word Hex Value</td>
<td>Lo Word Applied to Item3</td>
<td></td>
</tr>
</tbody>
</table>

**FC05: Write Single Coil**
Action command to transmitter

<table>
<thead>
<tr>
<th>Output Address</th>
<th>Output Value</th>
<th>Action Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 01</td>
<td>FF 00</td>
<td>Transmitter Reset (No Response)</td>
</tr>
<tr>
<td>00 03</td>
<td>FF 00</td>
<td>Latched Alarm Reset</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>FC</th>
<th>Action</th>
<th>&gt; 3.5 Char</th>
<th></th>
<th>Byte Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Char</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>05</td>
<td>Request</td>
<td>NoTx</td>
<td>MA</td>
<td>FC</td>
</tr>
<tr>
<td>05</td>
<td>Response</td>
<td>NoTx</td>
<td>MA</td>
<td>FC</td>
</tr>
<tr>
<td>10</td>
<td>Request</td>
<td>NoTx</td>
<td>MA</td>
<td>FC</td>
</tr>
<tr>
<td>10</td>
<td>Response</td>
<td>NoTx</td>
<td>MA</td>
<td>FC</td>
</tr>
</tbody>
</table>
Modbus ASCII Format

<table>
<thead>
<tr>
<th>FC</th>
<th>Action</th>
<th>Byte Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>05</td>
<td>Request</td>
<td>1: MA FC RA RA WW WW LRC CR LF</td>
</tr>
<tr>
<td>05</td>
<td>Response</td>
<td>2: MA FC RA RA WW WW LRC CR LF</td>
</tr>
<tr>
<td>10</td>
<td>Request</td>
<td>3: MA FC RA RA NR NR NB DD* DD* LRC CR LF</td>
</tr>
<tr>
<td>10</td>
<td>Response</td>
<td>4: MA FC RA RA NR NR NB DD* DD* LRC CR LF</td>
</tr>
</tbody>
</table>

Message Examples for Device Address = 01, No Parity

<table>
<thead>
<tr>
<th>Example</th>
<th>Action</th>
<th>Modbus RTU</th>
<th>Modbus ASCII</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Send -12.34 to LTSE</strong></td>
<td>First send decimal point, address 0057 as 00 03.</td>
<td>Ser_4 = 010 Addr = 001</td>
<td>Ser_4 = 020 Addr = 001</td>
</tr>
<tr>
<td>Request</td>
<td>01100069000204FFFFFFFB2E59</td>
<td>01100069000284crlf</td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td>01100069000291D4</td>
<td>01100069000284crlf</td>
<td></td>
</tr>
</tbody>
</table>

** 1234 decimal = 000004D2 hex. -1234 = FF FF FB 2E in 4-byte 2’s complement hex. Decimal point is ignored.

**RTU**: Bolded last 4 characters indicate the CRC (added automatically by the device).

**ASCII**: Bolded last 2 characters indicate the LRC ((added automatically by the device).
10. 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 Rate .......... 300, 600, 1200, 2400, 4800, 9600, 19200 selectable with IS software.
- Data Format ...... 8 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.

<table>
<thead>
<tr>
<th>Device #</th>
<th>Address Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>11</td>
<td>B</td>
</tr>
<tr>
<td>12</td>
<td>C</td>
</tr>
<tr>
<td>13</td>
<td>D</td>
</tr>
<tr>
<td>14</td>
<td>E</td>
</tr>
<tr>
<td>15</td>
<td>F</td>
</tr>
<tr>
<td>16</td>
<td>G</td>
</tr>
<tr>
<td>17</td>
<td>H</td>
</tr>
<tr>
<td>18</td>
<td>I</td>
</tr>
<tr>
<td>19</td>
<td>J</td>
</tr>
<tr>
<td>20</td>
<td>K</td>
</tr>
<tr>
<td>21</td>
<td>L</td>
</tr>
<tr>
<td>22</td>
<td>M</td>
</tr>
<tr>
<td>23</td>
<td>N</td>
</tr>
<tr>
<td>24</td>
<td>O</td>
</tr>
<tr>
<td>25</td>
<td>P</td>
</tr>
<tr>
<td>26</td>
<td>Q</td>
</tr>
<tr>
<td>27</td>
<td>R</td>
</tr>
<tr>
<td>28</td>
<td>S</td>
</tr>
<tr>
<td>29</td>
<td>T</td>
</tr>
<tr>
<td>30</td>
<td>U</td>
</tr>
<tr>
<td>31</td>
<td>V</td>
</tr>
</tbody>
</table>
11. SPECIFICATIONS, ETHERNET INPUT TRANSMITTER

Ethernet Data Input

- Serial protocols: Modbus (TCP, RTU or ASCII) and Custom ASCII
- Serial connector: RJ45
- Data rates: 300 to 9600 baud

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: 120 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 ±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

- Ethernet Node Discovery: Node Manager Software in host PC
- Transmitter Setup: Instrument Setup Software in host PC

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
12. 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 defective unit may be returned to the seller, which may be Laurel or a Laurel distributor. The seller may then repair or replace the defective unit at its option. In the event of such a return, freight charges from the buyer shall be paid by the buyer, and freight charges from the seller shall be paid by the seller.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from:

1. Improper installation or miswiring.
2. Improper or inadequate maintenance.
3. Unauthorized modification or misuse.
4. Operation outside the environmental specifications.
5. 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 implied warranties of merchantability and fitness for a particular purpose.

Any electronic product may fail or malfunction over time. To minimize risks associated with reliance on Laurel products, users are expected to provide adequate system-level design and operating safeguards. Laurel’s products are intended for general purpose industrial or laboratory use. They are not intended nor certified for use in life-critical medical, nuclear, or aerospace applications, or for use in hazardous locations.

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.