# TECHNICAL MANUAL

**200852**

## MAX Count Advanced

### 3 PRESET COUNTER with BATCHING and TOTALIZER


**MAX** count Advanced is a Powerful three preset counter with a presettable Batch Counter and a Background Totalizer. **MAX** features guided programming using English prompts for easy setup and operation. **MAX** is clearly the best choice for industrial counting applications.

## FEATURES

- Simultaneous Counter, Totalizer, and Batching
- "ON THE FLY" Preset Programming
- A-B, A+B and Quadrature operation
- Three Preset, Six Decade Main Counter
- Six Decade Start count Preset
- Six Decade Single Preset Batch Counter
- Six Decade Background Totalizer
- 4 Wire / 2 Wire RS-485 Provides LOCAL and REMOTE process Control Capability Modbus RTU protocol
- COUNTER RESET, STOP / HOLD inputs
- BATCH / TOTAL RESET input
- OUTPUT CONTROL input
- Non-Volatile Memory (FRAM) for Counters & Programmed parameters
- Built In Self- Diagnostics
- Eight Alpha Numeric,14 Segments LED display

## KEY SPECIFICATIONS

- DC to 40kHz Operation
- Programmable Input Logic (x1,x2, or x4)
- Five Decade Calibrator
- Three Relay and Three Transistor Outputs
- 10Amp Relay Contact Rating
- Programmable Relay Hold Time xx.xx sec
- +12VDC @ 175mA Transducer Supply
- 85-265 VAC Operation (12VDC Optional)

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Eagle Signal

# OVERVIEW ...



**PLASTIC ENCLOSURE**
- Light Weight
- Easy to assemble

**LED DISPLAY**
- 8 Alpha Numeric, 14 Segments, 0.4" high


**SEALED FRONT PANEL**
- NEMA 4 Rated
- Oil & Water tight
- Easy Cleaning

**PROGRAMMING**
- Data entry through 6 keys
- Menu Selection Programming
- Display prompts are in English
- No internal Programming
- User configurable

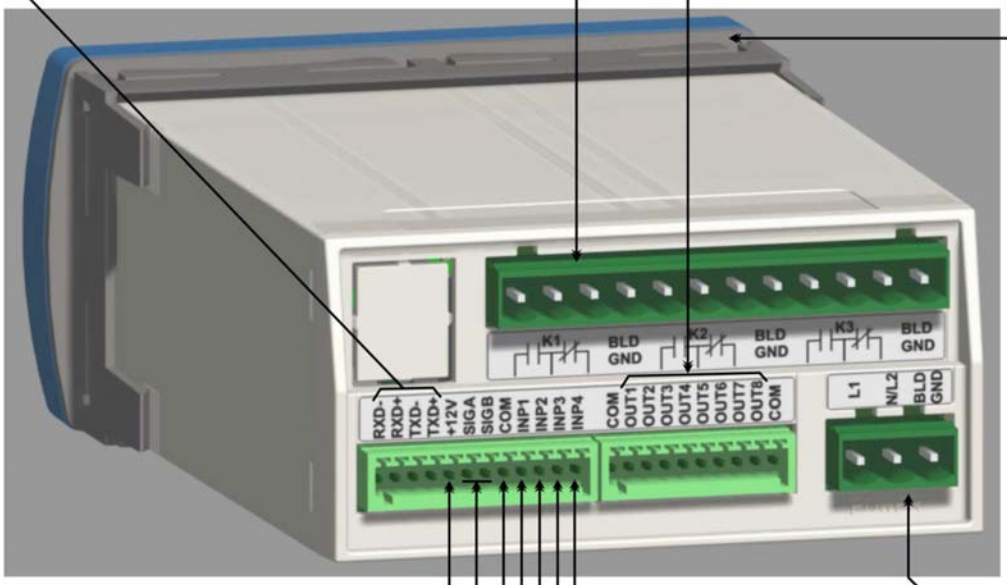
# OVERVIEW ...



**RELAY OUTPUTS**
- Three optional relay outputs in addition to the solid state outputs described at right

**SERIAL DATA I/O**
- 4 Wire / 2 Wire RS-485
- Up to 32 units may be bussed together
  See Page-8, lines 29 - 30 for Programming
  See pages 17-25 for Operation

**SOLID STATE OUTPUTS (OUT1, OUT2, OUT3)**
- Any preset can pick up or drop out any output
- Outputs can latch or have momentary pick up from 0.01 to 99.99 seconds
- All selections are made with keyboard




**Neoprene Gasket Seal**

**TRANSDUCER SUPPLY (+12V)**
- 12 VDC @ 175 mA
- Short Circuit Protected

**SIG A and SIG B INPUTS**
- Operates as A-B, A+B or Quadrature
- Can be open collector or contact

**LOGIC COMMON (COM)**
- Three tiepoints provided
- Isolated from Building Ground

**STOP / HOLD (INP1)**
- Inhibits counting in the STOP mode
- Freezes the display in the HOLD mode
- Level sensitive, 20 Hz response

**BATCH / TOTAL RESET (INP4)**
- Resets Batch cntr in Batch mode
- Resets Totalizer in Total mode
- Edge Sensitive, 20 Hz response

**COUNTER RESET (INP3)**
- Resets the counter to zero in COUNT UP mode
- Sets counter to START COUNT in COUNT DOWN mode
- Edge Sensitive, 20 Hz response

**OUTPUT CONTROL (INP2)**
- Allows remote operation of both Solid State and Relay outputs
- Edge Sensitive, 20 Hz response

**POWER INPUT**
- 85-265 VAC Universal
- 12 VDC optional
- Memory is retained indefinitely when power is off
- Built-in Line Filter

# SPECIFICATIONS ...



**Input Power:** 85-265 VAC, 50-60Hz, 20 VA
12 VDC @ 0.5 A. Optional

**Accessory Supply:** 12 VDC @ 175 mA.

**Main Counter:**

| | |
|---|---|
| Range: | 6 Decades |
| Presets: | 3 Individual with 6 decade range |
| Operation: | A-B, A+B, Quadrature |
| Reset Input: | External and front panel |
| Count Rate: | 40 kHz internal<br>(40kHz external input frequency with x1 logic)<br>(20 kHz external input frequency with x2 logic)<br>(10 kHz external input frequency with x4 logic) |

**Calibrator:**

| | |
|---|---|
| Range: | 5 Decade, 0.0001 to 9.9999 |
| Operation: | Calibrates Main Counter and totalizer |

**Totalizer:**

| | |
|---|---|
| Range: | 6 Decade |
| Operation: | Totalizes calibrated input counts |

**Batch Counter:**

| | |
|---|---|
| Range: | 6 Decade |
| Presets: | 1 with 6 Decade range |
| Operation: | Count UP by detecting Auto Resets of main counter. |
| Output: | Programmable assignment |

**Signal A and B Inputs:**

| | |
|---|---|
| Input Frequency: | DC to 40kHz,<br>(40kHz external input frequency with x1 logic)<br>(20 kHz external input frequency with x2 logic)<br>(10 kHz external input frequency with x4 logic) |
| Input Type: | Single ended, Current Source |
| Input Logic: | x1,x2,x4 |
| Input High Level: | 3.25 VDC min. |
| Input Low Level: | 1.75 VDC max. |
| Input Impedance: | 1.0 kΩ to common |
| Input current: | 3.25mA. steady state |
| Input Response: | 10µs. min high and low time |

**Control Inputs:**

| | |
|---|---|
| Input Frequency: | DC to 20Hz Max. each input.<br>RESET input 100Hz response |
| Input Type: | Single ended, current sinking |
| Input Logic: | Both edge & Level sensitive as defined by input use |
| Input High Level: | 10VDC min. to 20 VDC max. |
| Input Low Level: | 0 VDC min. to 2 VDC max. |
| Input Impedance: | 4.7 kΩ pullup to +12 Vdc |
| Input Current: | 2.5 mA. Steady state |
| Input Response: | 25 ms. make and break time |

**Display:**

| | |
|---|---|
| Decades: | Eight Alpha Numeric, 0.4" red LED |
| Annunciators: | Three Annunciators RUN, SET, PGM |
| Decimal Point: | User programmable<br>Range: x.xxxxx to xxxxxx |

**Keyboard:** Sealed tactile feel, 6 positions

**Program Security:** Program LOCK for lines 3-39

**Control Outputs:**

| | |
|---|---|
| Type: | 3 Solid State,<br>100mA sink max., 24 VDC max.<br>Optional: 3 SPDT Relays, rated<br>10Amp 30VDC/270VAC Resistive |

**Serial Interface:**

| | |
|---|---|
| Type: | RS-485 compatible (4 or 2 wire options with modbus support) |
| Baud Rate: | Selectable; 1200, 2400, 4800 or 9600 |
| Data: | Binary |
| Format: | 1 START Bit, 8 Bit data , 1 STOP Bit |
| Protocol: | ModBus RTU |
| I.D. Number: | Programmable 1 to 32: Allows multidrop systems. |

**Diagnostics:**

| | |
|---|---|
| Test 0: | Keyboard Test |
| Test 1: | FRAM Test |
| Test 2: | Input Test |
| Test 3: | Output Test |
| Test 4: | Display Test |
| Test 5: | Flash Memory Test |
| Test 6: | Date Code Test |
| Test 7: | Serial I/O Test |
| Test 8: | Return to Factory Programming |

**Mechanical:**

| | |
|---|---|
| Enclosure | Plastic Moulded<br>2.0" High x 4.0 Wide x 5.56"Deep |
| Cutout | 1.77"[ 45mm] x 3.62" [92mm] |
| Panel Thickness | 1/16" to 1/4" |
| Panel Depth | 5.68" Minimum |
| Weight | 0.68 lb [308 gm] |

**Environmental:**

| | |
|---|---|
| Operating Temp: | -15°C to +65°C |
| Storage Temp: | -30°C to +85°C |
| Ambient Humidity: | 90% and noncondensing |

**Controller Error Codes**

1. Low AC Line Voltage ( Displays LOW AC)
2. Input Frequency Too fast (Displays FREQ MAX)

Pess 

To clear Error Code

**FRAM Error Codes**

1. Run Mode parameters corrupted (FRUNFAIL).
2. Program Mode parameters corrupted (FPGMFAIL).

**Note**: Power cycle to clear the FRAM error

### ANNUNCIATORS
- RUN constantly illuminated in the RUN mode
- SET constantly illuminated in the SETUP mode
- PGM constantly illuminated in the PROGRAM mode


### DOWN KEY
- Sequences down through menu options of RUN or SETUP menu
- Sequences down through menu options of programming menu in the PROGRAM mode
- Decrement the number in edit mode (Highlighted digit)

### UP KEY
- Sequences Up through menu options of RUN or SETUP menu
- Sequences Up through menu options of programming menu
- Increment the number in edit mode (Highlighted digit)

### RIGHT KEY
- Sequences to the right in individual Programming menus or enters edit mode by highlighting the left most digit and sequences highlighting to the right digit in Program menu and in SETUP mode

### RESET / CLEAR
- Reset Main Counter, Batch Counter and Totalizer in the RUN Mode (Lines S,1,2).
- Affects only the currently displayed line.
- Clears display in the SETUP and PROGRAM modes

### RUN/PGM
- Used to switch between the RUN and PROGRAM modes. Acts as an alternate action switch.

### KEY
- Used to enter SETUP mode from the RUN mode.
- Press again to exit SETUP & go to RUN mode.
- Allows the unit to be programmed “on the fly”. Used to direct address lines 3-39 while in PROGRAM mode, press KEY, line number, Key

# PROGRAMMING ...

## RUN MODE:

| LINE | FUNCTION | DESCRIPTION |
|---|---|---|
| S | COUNT VALUE | Indicates current Count |
| 1 | BATCH COUNT VALUE | Indicates current Batch Count. Conditional: Batch Counter (line 12) must be 'ON'. |
| 2 | TOTAL COUNT VALUE | Indicates current Totalizer Count. Conditional: Totalizer (line 13) must be 'ON'). |

## SETUP MODE:

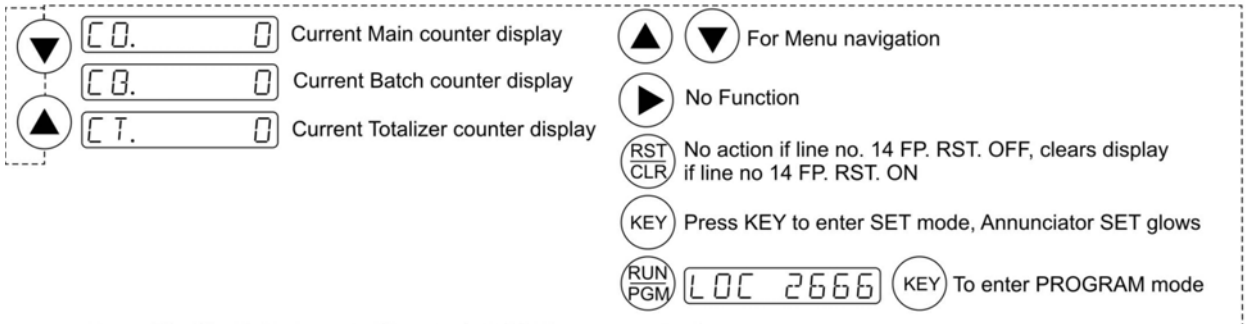
**SETUP MODE (inhibited by the PRESET LOCK being 'ON')**

| | | |
|---|---|---|
| 3 | START COUNT | Numeric Value for "set to a number". Conditional: Direction (line 10) must be 'Down'. |
| 4 | PRESET 1 | Numeric value for Preset 1. Conditional: P1 (line 23) must have assignment. |
| 5 | PRESET 2 | Numeric value for Preset 2. Conditional: P2 (line 24) must have assignment. |
| 6 | PRESET 3 | Numeric value for Preset 3. Conditional: P2 (line 25) must have assignment. |
| 7 | BATCH PRESET | Numeric value for Batch Preset. Conditional: Batch Counter (line 12) must be 'ON' and Batch Preset (line 26) must have assignment. |

## PROGRAM MODE

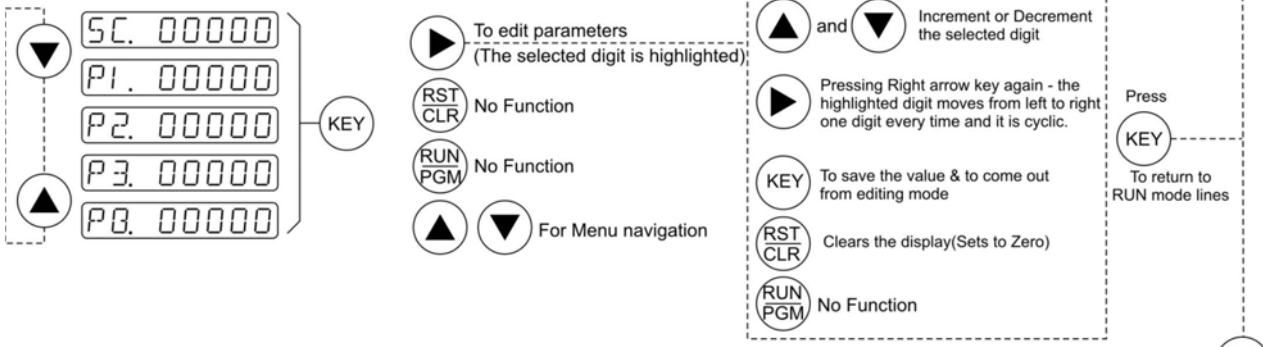
| | | |
|---|---|---|
| 3 | START COUNT | Numeric value for "Set to a number" (for Count Down mode only). |
| 4 | PRESET 1 | Numeric value of Preset 1. |
| 5 | PRESET 2 | Numeric value of Preset 2. |
| 6 | PRESET 3 | Numeric value of Preset 3. |
| 7 | BATCH PRESET | Numeric Value for Batch Preset. |
| 8 | CORRECTION CONSTANT | Numeric constant for inputs A & B. See page-12. |

## RUN MODE

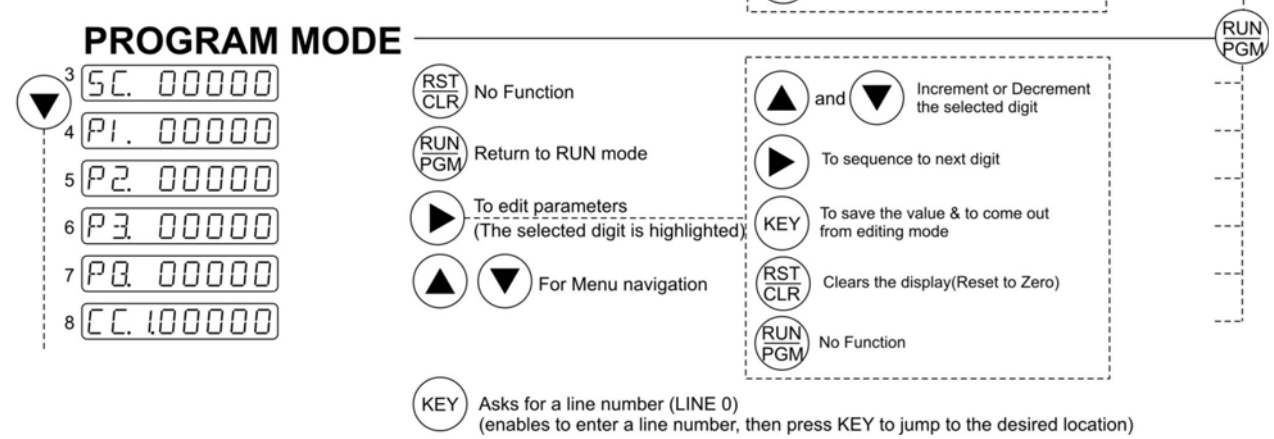



Note: CB, CT will display only if line 12 & 13 "ON" correspondingly.

## SETUP MODE

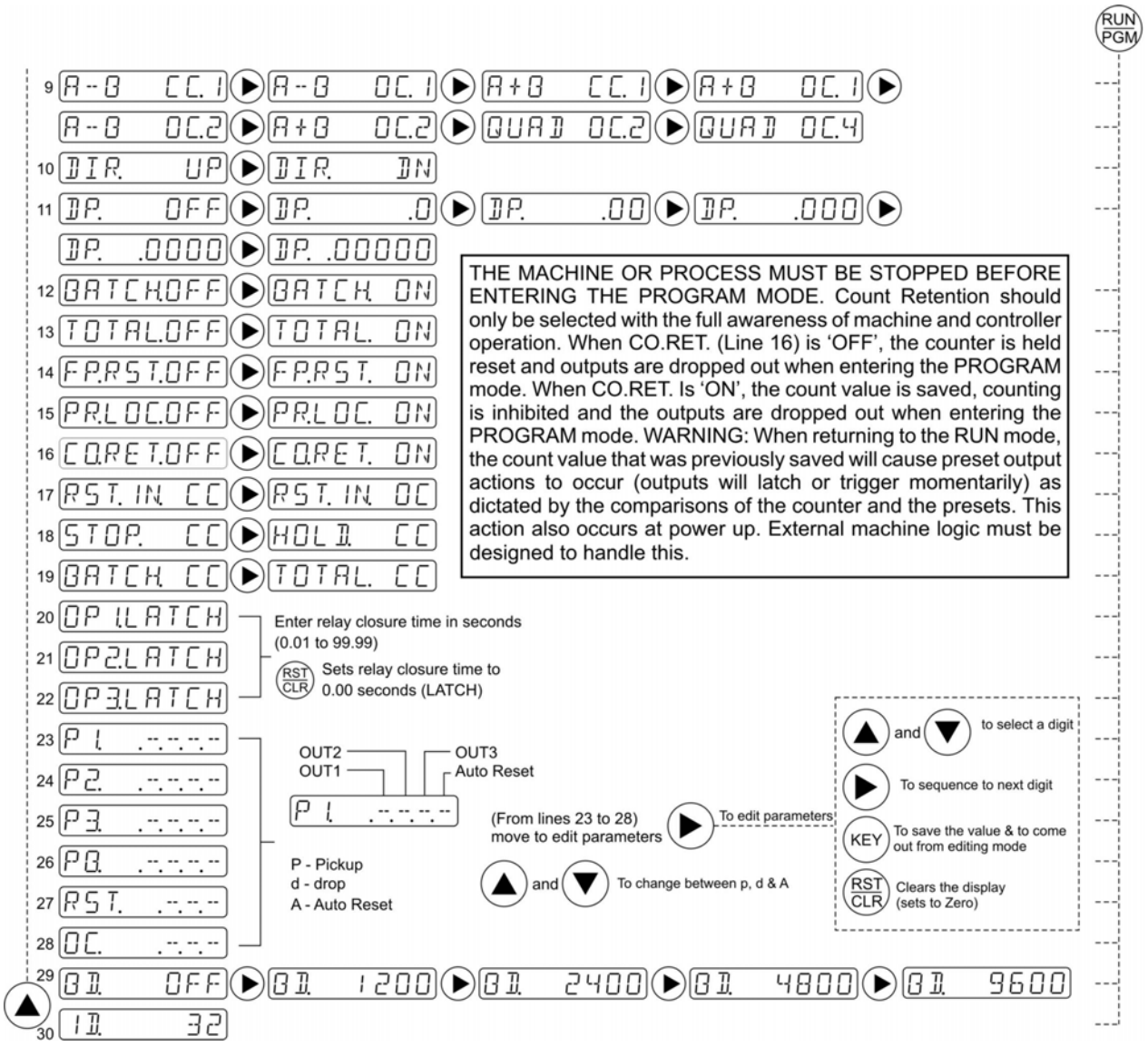



## PROGRAM MODE



| | | |
|---|---|---|
| 9 | INPUT MODE | Selects A-B, A+B X1 for open collector or contact inputs; |
| | | Selects A-B, A+B X2 or Quadrature X2, X4 for open collector inputs |
| 10 | COUNT DIRECTION | Select “reset to zero” for UP or “set to number” for DOWN |
| 11 | DECIMAL POINT | Decimal point position for Count, Total Count, and Presets. |
| 12 | BATCH COUNTER | Select ON or OFF |
| 13 | TOTALIZER | Select ON or OFF |
| 14 | FRONT PANEL RESET | Select ON or OFF |
| 15 | PRESET LOCK | Select ON or OFF. Affects entry into SETUP mode |
| 16 | COUNTER RETENTION | Select ON or OFF (Saves count value during power outages). |
| 17 | RESET TYPE | Select open collector or contact closure input types |
| 18 | STOP / HOLD MODE | Select STOP count or Display HOLD function via external input. |
| 19 | BATCH / TOTAL RESET MODE | Select BATCH reset or TOTALIZER reset functions via external input |
| 20 | OUTPUT 1 | Select latched or pulsed operation for output 1 |
| 21 | OUTPUT 2 | Select latched or pulsed operation for output 2 |
| 22 | OUTPUT 3 | Select latched or pulsed operation for output 3 |
| 23 | P1 ASSIGNMENT | Assign output operations to Preset 1 |
| 24 | P2 ASSIGNMENT | Assign output operations to Preset 2 |
| 25 | P3 ASSIGNMENT | Assign output operations to Preset 3 |
| 26 | BATCH PRESET ASGMNT | Assign output operations to Batch Preset. |
| 27 | RESET INPUT ASGMNT | Assign output operations to Reset Input |
| 28 | OUTPUT CONTROL ASGMNT | Assign output operations to Output control input. |
| 29 | BAUD RATE | Selects OFF,1200, 2400, 4800 or 9600 baud. |
| 30 | ID NUMBER | Serial ID Number. Programs unit serial ID. (01 - 32) |

# PROGRAMMING ...




THE MACHINE OR PROCESS MUST BE STOPPED BEFORE ENTERING THE PROGRAM MODE. Count Retention should only be selected with the full awareness of machine and controller operation. When CO.RET. (Line 16) is 'OFF', the counter is held reset and outputs are dropped out when entering the PROGRAM mode. When CO.RET. Is 'ON', the count value is saved, counting is inhibited and the outputs are dropped out when entering the PROGRAM mode. WARNING: When returning to the RUN mode, the count value that was previously saved will cause preset output actions to occur (outputs will latch or trigger momentarily) as dictated by the comparisons of the counter and the presets. This action also occurs at power up. External machine logic must be designed to handle this.

The **MAX** Count Advanced controller provides a group of diagnostics to self test the controller and field wiring as well as helps the user diagnose machinery malfunctions. Nine diagnostic tests are provided and may be run only while the unit is in the PROGRAM mode. These tests should be done “offline” (user’s process not being controlled). The tests are outlined below along with the keyboard commands to control them.

| LINE | DIAGNOSTIC | DESCRIPTION |
|---|---|---|
| 31 | TEST 0 | Keyboard Test: Display echoes on each key press. |
| 32 | TEST 1 | FRAM Memory Test. |
| 33 | TEST 2 | Input Tests: Test for “Closures” on Inputs. |
| 34 | TEST 3 | Output Test: Press ▶ key to select the Relays 1-3 using ▲and ▼, press ▶ Key to turn ON. Press **CLR** to Turn ‘OFF’. |
| 35 | TEST 4 | Display Test: Illuminates all segments. |
| 36 | TEST 5 | Flash Memory test: Checksum comparison for program memory. |
| 37 | TEST 6 | Version code Test: Displays date code version of firmware. |
| 38 | TEST 7 | Serial Test: Provides loop-back test of the serial transmitter and receiver (will indicate ‘FAIL’ if the loop back connectors are not made). |
| 39 | TEST 8 | Returns controller to the factory programmed state. |

**Test T0**:

Display shows: **T0. RDY**
Press RIGHT key (in line 31)
Then it will display **T0 RUN**
The display with corresponding key press will be as shown below:

| Key | Display |
|---|---|
| ▲ | UP KEY |
| ▼ | DOWN KEY |
| ▶ | RIGHT KEY |
| KEY | Exits from the menu shows T0 RDY |
| RST/CLR | RESET KEY |
| RUN/PGM | RUN KEY |

**Test T1**:

Display shows: **T1. RDY**
Press RIGHT key (in line 32)
Then it will display **PASS/FAIL** indicating the FRAM test. Pass will be displayed if FRAM is ok. If Fail displayed means there is a problem with FRAM call Eagle Signal.
Press **KEY** key to exit from the menu and the display show **T1. RDY**

**Test T2**:

Display shows: **T2. RDY**
Press RIGHT key (in line 33)
Then it will display **IN** and the inputs connected to it (A and B) and it will display the following for the control inputs when externally pulled low.

| Control input | Display |
|---|---|
| **STOP/HOLD** | **1** |
| **BATCH/TOTAL reset** | **2** |
| **Counter reset** | **3** |
| **Output control** | **4** |

Press **KEY** key to exit from the menu and the display show **T2. RDY**

# PROGRAMMING ...

**Test T3**: Display shows: **T3. RDY**
Press RIGHT key (in line 34)
Then the display shows **OUTTST 1** and by scrolling up and down **OUTTST 2, OUTTST 3** are displayed**,** press **RIGHT** key the corresponding Solid State / Relay output ON.
Press **RST/CLR** to make Solid State / Relays output OFF.
Press **KEY** key to exit from the menu and the display show **T3. RDY**

**Test T4**: Display shows: **T4. RDY**
Press RIGHT key (in line 35)
Then all the LED's and annunciators glows indicating that the test is passed.
Press **KEY** key to exit from the menu and the display show **T4. RDY**

**Test T5**: Display shows: **T5. RDY**
Press RIGHT key (in line 36)
Shows FAIL/PASS indicating Flash test whether it is failed or passed.
Press **KEY** key to exit from the menu and the display show **T5. RDY**

**Test T6**: Display shows: **T6. RDY**
Press RIGHT key (in line 37)
It displays the version of the current module. (**VER 1**)
Press **KEY** key to exit from the menu and the display show **T6. RDY**

**Test T7**: Display shows: **T7. RDY**
Press RIGHT key (in line 38)
Shows FAIL/PASS indicating Serial communication is OK (if RXD+ shorted to TXD+ and RXD- shorted to TXD-) or not.
Displays **PASS** if serial communication is OK
Displays **FAIL** if serial communication is not OK.
Press **KEY** key to exit from the menu and the display show **T7. RDY**

**Test T8**: Display shows: **T8. RDY**
Press RIGHT key (in line 39)
Display shows **T8 RUN.** It loads all the factory programmed values.
Press **KEY** key to exit from the menu and the display show **T8. RDY**

**EDITING PARAMETERS:**

Enter the program mode by following the Note mentioned below. Reach a particular line which is required to change by pressing DOWN key then press RIGHT Key, the first digit Highlights, which indicate edit mode. Edit value by using UP and DOWN keys, then press RIGHT key which will highlight the next digit. After entering the value, to confirm or exit from edit mode, press **KEY** key.

**NOTE 1:**
To enter program mode from run mode, Press RUN/PGM key, Then the display shows **LOC 0000,** with the first digit highlighted. Then edit the value by using UP and DOWN key for the first digit as **2**, then press RIGHT key which will take the highlighting to second digit. Enter value as **6**, similarly enter 3$^{rd}$ and 4$^{th}$ digits as **6**. After entering the value for **LOC as 2666**, Press **KEY** key, it will enter to program mode.
If the LOC doesn't match with 2666 then it will return to RUN Mode.

**NOTE 2:**
While entering the value for a parameter, if the highlighting reaches the right most digit, and upon pressing RIGHT key, the highlighting goes back to the left most digit.

**INPUT MODE PROGRAMMING**
The input mode (line 9) is provided to select all legal combinations of input logic, input mode and sensor type. This allows the user to effectively increase the resolution of the count input transducer. (You cannot program X4 logic with unidirectional input device or X1 logic with Quadrature input device). X2 logic detects the leading and trailing edges of each pulse; X4 logic detects leading and trailing edges of both signals in Quadrature inputs.

**CORRECTION CONSTANT PROGRAMMING:**
The Correction constant (Line 8) has a user programmable range of five decades. This feature allows the user to factor the incoming count into useful engineering units (inches, cm, mm, etc.). The resolution of the count transducer and input logic should be chosen to take advantage of the best instantaneous accuracy of the calibrator. The best instantaneous accuracy is obtained with a correction constant setting not exceeding 1.0000. The general form of the equation for the correction constant is given below.

$$CC = \frac{\text{Displayed Value in Engineering units}}{\text{(Display Resolution) x Input pulses x Input logic (Where input Logics is X1, X2 or X4)}}$$

**BATCH COUNTER and BACKGROUND TOTALIZER OPERATION:**

The Batch counter increments each time an Auto Reset assignment is processed by the controller if the Batch Counter is selected 'ON' (Line 12 of the Program table). The Batch Counter may be reset via the front panel by scrolling to the Batch Counter display line, then pressing the RST/CLR key. The Batch counter may be reset externally by selecting the BATCH/TOTAL input in the Batch Reset(line 19). The Totalizer counts in parallel with the main counter when selected 'ON' (line 13). The Totalizer may be reset via the front panel by scrolling the Totalizer display line, then pressing the RST/CLR key. The Totalizer may be reset externally by selecting the BATCH/TOTAL input as the Totalizer Reset (Line 19).

**SETUP MODE OPERATION:**
The Count and the Batch presets may be dynamically changed while in the RUN mode of operation by entering the SETUP mode. The Counter continues to operate without loss of count while the operator is in the SETUP mode. The SETUP mode is entered by pressing the **KEY** key. Entering the SETUP mode is only allowed if the Preset lock (Line 15) is OFF. The annunciator 'SET' will glow signaling entry into the SETUP mode. The control continues to operate, keeping track of the count and comparing presets.

While in the SETUP mode the CLR/RST, UP and DOWN keys are active allowing the data to be changed as required. You may change any or all the SETUP mode lines. Changes to the operational presets (those used in the RUN mode) are made upon exiting SETUP mode. Any changes that are made in the SETUP mode are saved at any appropriate program lines when the SETUP mode is exited. Exit the SETUP mode by pressing **KEY** key

To display the Start Count (SC) in SET mode, the direction should be made DOWN (DIR DN) in Line 10, and to display the presets P1, P2, P3 and PB the corresponding assignments should be made in Program Mode.

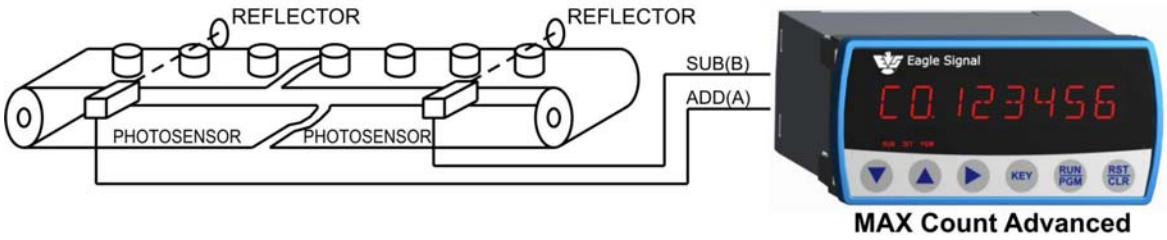
**WARNING:** Use caution when editing presets in the SETUP mode. Preset comparisons will be made with the edited presets upon exiting the SETUP mode and entering RUN mode. Preset comparisons are made as follow: When the Preset changes from > the count value to ≤ the Count value or when the Preset changes form < the count value to ≥ the Count Value. External machine logic circuitry should be designed to handle this.

**STOP/HOLD CONTROL INPUT:**

The STOP/HOLD input is programmable as either a STOP Count or as Display HOLD function (Line 18). When selected as a STOP Count function, a contact closure causes the input counts to the Main and Totalizing Counters to be inhibited (counters will not count). When selected as a Display HOLD function, a contact closure causes the front panel display to be “frozen”, but lets the controller continue to count. The Display HOLD function does not affect data being transmitted via the serial interface.

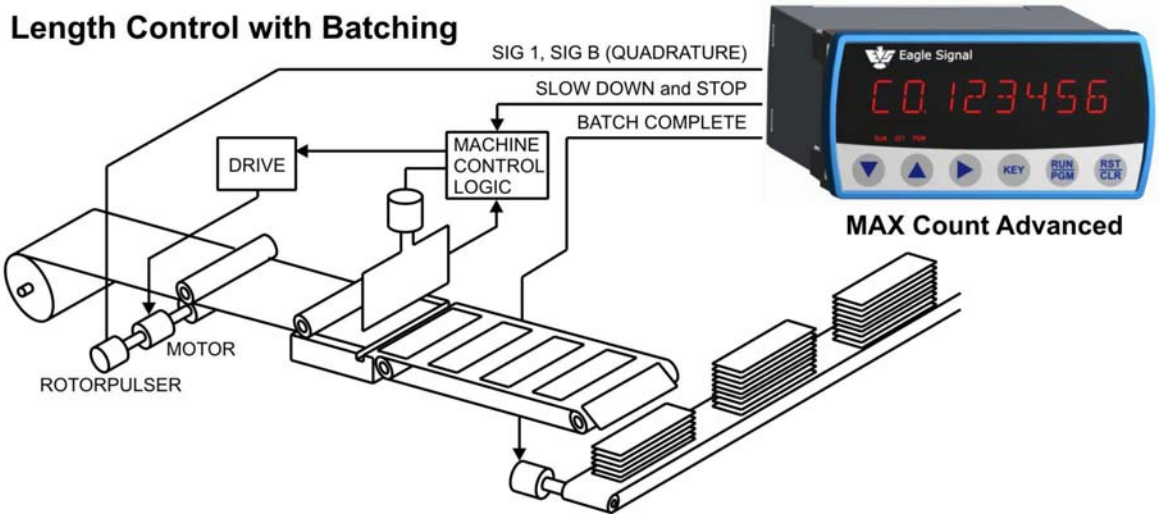
## APPLICATIONS

### Conveyor Loading




MAX Count Advanced

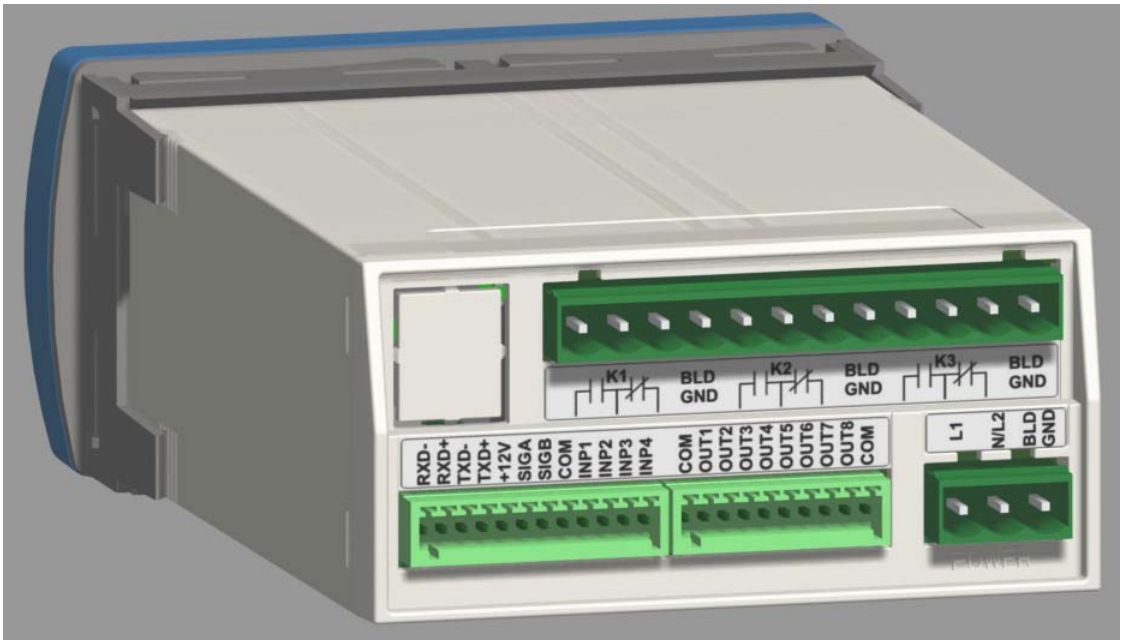
### Length Control with Batching




MAX Count Advanced

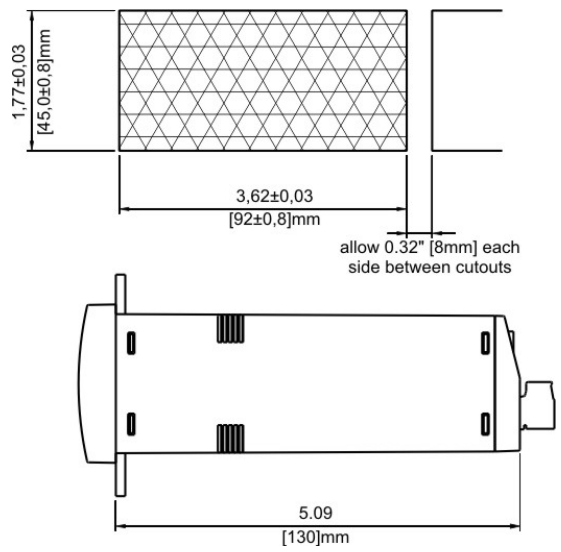
**NOTES:**

**1. Installations must be made in accordance with EAGLE SIGNAL manual 845 - 130.**
**2. For application which require multiple products operation in parallel, see 845 - 130.**
**3. When replacing older products, consult 845 - 130 for information regarding circuitry changes.**




**A. PANEL MOUNTING:**

Make Panel Cutout. Affix adhesive gasket (if required) to panel. Remove the Unit holder and slide unit through the cutout. Slide back the Unit holder.

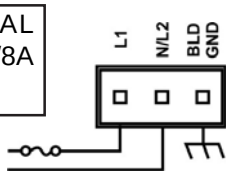



**B. INPUT POWER**

**AC POWER**

Connect AC power to the unit Connect terminal **BLD GND** to BUILDING GROUND!

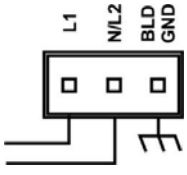
UNIT REQUIRES EXTERNAL FUSE. USE 1/4A. FOR 115V (1/8A FOR 230V) FAST-BL0W




85-265 VAC, 50 / 60Hz, 20 VA

**DC POWER**

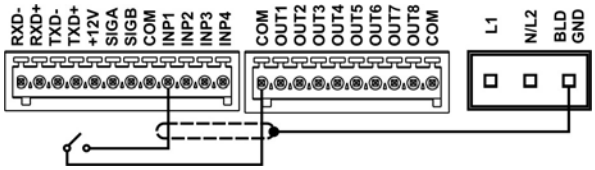
Connect +12 VDC to terminal **L1** and 12 Volt ground to terminal **N/L2**. Connect terminal **BLD GND** to BUILDING GROUND!



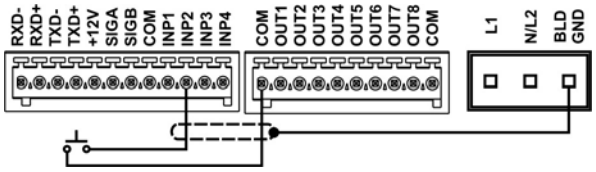

+12 VDC

## C. CONTROL INPUTS

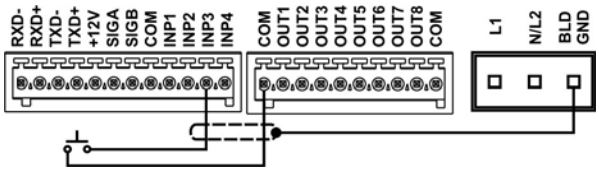
**STOP/HOLD (Term INP1)**
Level sensitive 20 Hz Response 4.7 kΩ to + 12 VDC (Shows '1' during input diagnostic test).



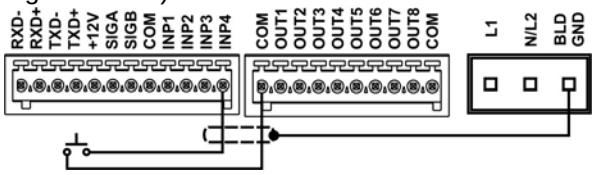

**OUTPUT CONTROL (Term INP2)**
Edge sensitive 20 Hz Response 4.7 kΩ to + 12 VDC (Shows '2' during input diagnostic test).



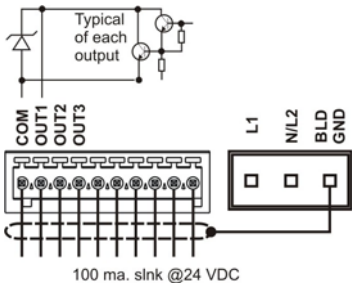

**COUNTER RESET (Term INP3)**
Edge sensitive 20 Hz Response 4.7 kΩ to + 12 VDC (Shows '3' during input diagnostic test).




**BATCH / TOTAL RESET (Term INP4)**
Selected on Line 19 Edge Sensitive 20 Hz Response 4.7 kΩ to + 12 VDC (Shows '4' during input diagnostic test).

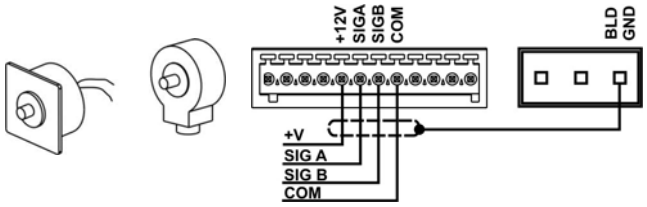



## D. CONTROL OUTPUTS

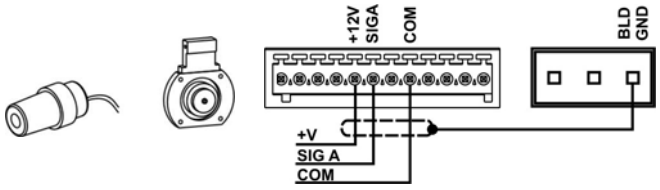



## E. COUNTER INPUTS

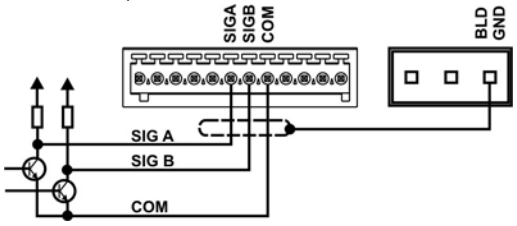
**BIDIRECTIONAL ENCODERS**
**(Type 42, 62 Rotopulser)**
SIG A leads SIG B by 90 deg 1.0 kΩ to COM



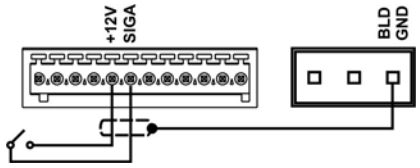

**UNIDIRECTIONAL ENCODERS**
**(Type 53 Pickup, 76 Roto)**
SIG A Adds; SIG B Subtracts 1.0 kΩ to COM



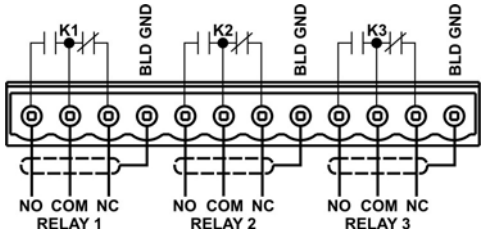

**OPEN COLLECTOR (NPN)**
SIG A Adds; SIG B Subtracts 1.0 kΩ To COM
Customer supplied Pullup Resistor (typ)
2.2 kΩ max. to +12V; 470 Ω max to +5V




**CONTACT CLOSURE / SWITCH**
SIG A Adds; SIG B Subtracts 1.0 kΩ To COM



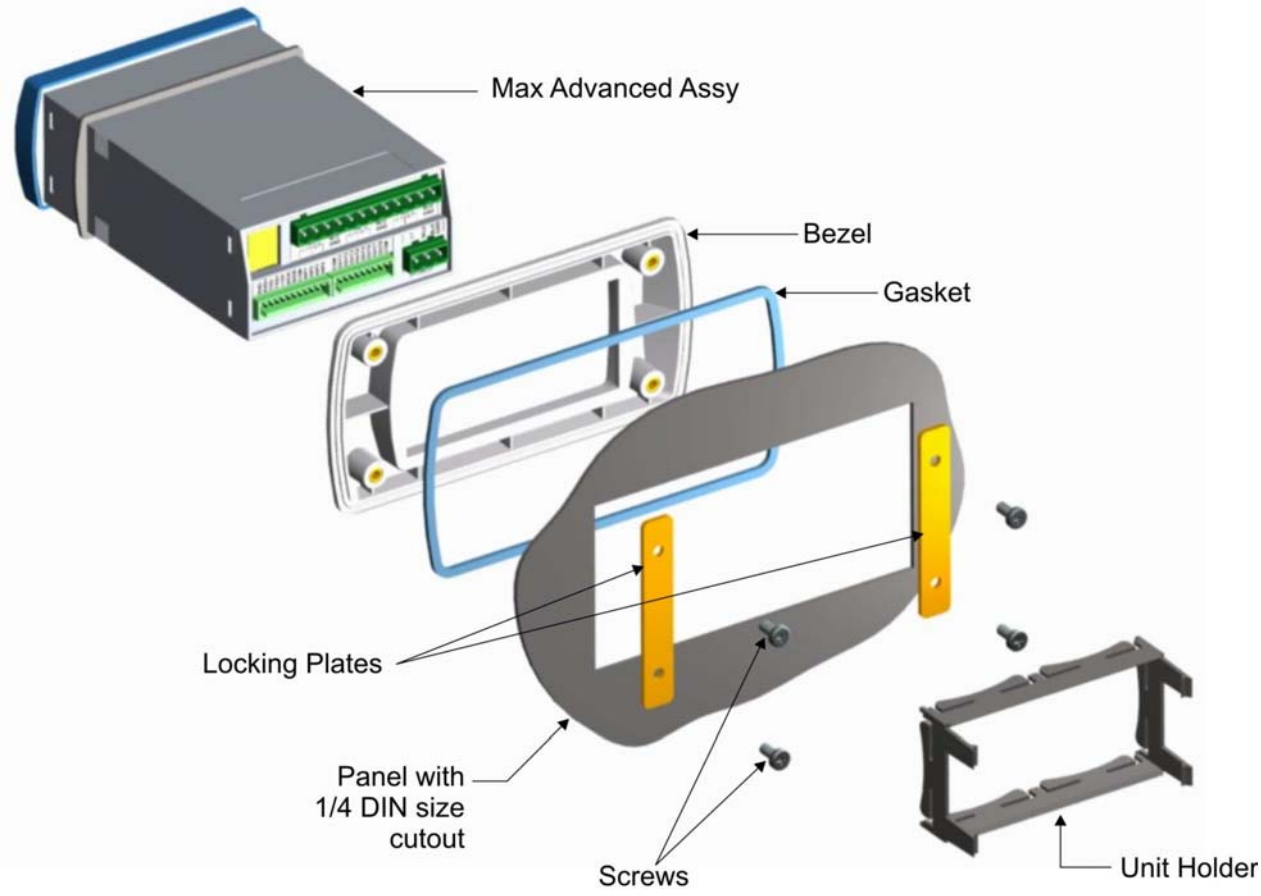

## F. RELAY OUTPUTS

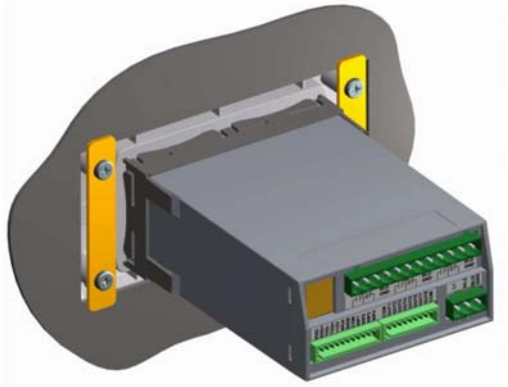



**GENERAL WIRING RULES:**
1. Use only Shielded cables for all signal wiring.
2. Separeat signal and load switching wiring.
3. Supply AC power through a separately fused circuit
4. Terminal connector plug accepts 20 - 28AWG wires

**Replacement Arrangement: (To Mount MAX Count Advanced in 1/4 DIN panel cutout )**
Follow these steps to mount **MAX** Count Advanced in place of existing Max Sr. Products, Panel cutout Size of 5.43" x 2.68".

a) Affix adhesive gasket (if required) to panel.
b) Insert Large Bezel from front size.
c) Match the locking plates to the mounting holes of the bezel from inside and drive the screws.
d) Remove the Unit holder of the **MAX** Count Advanced and slide unit through Large Bezel from front and slide back the unit holder.



Rear View

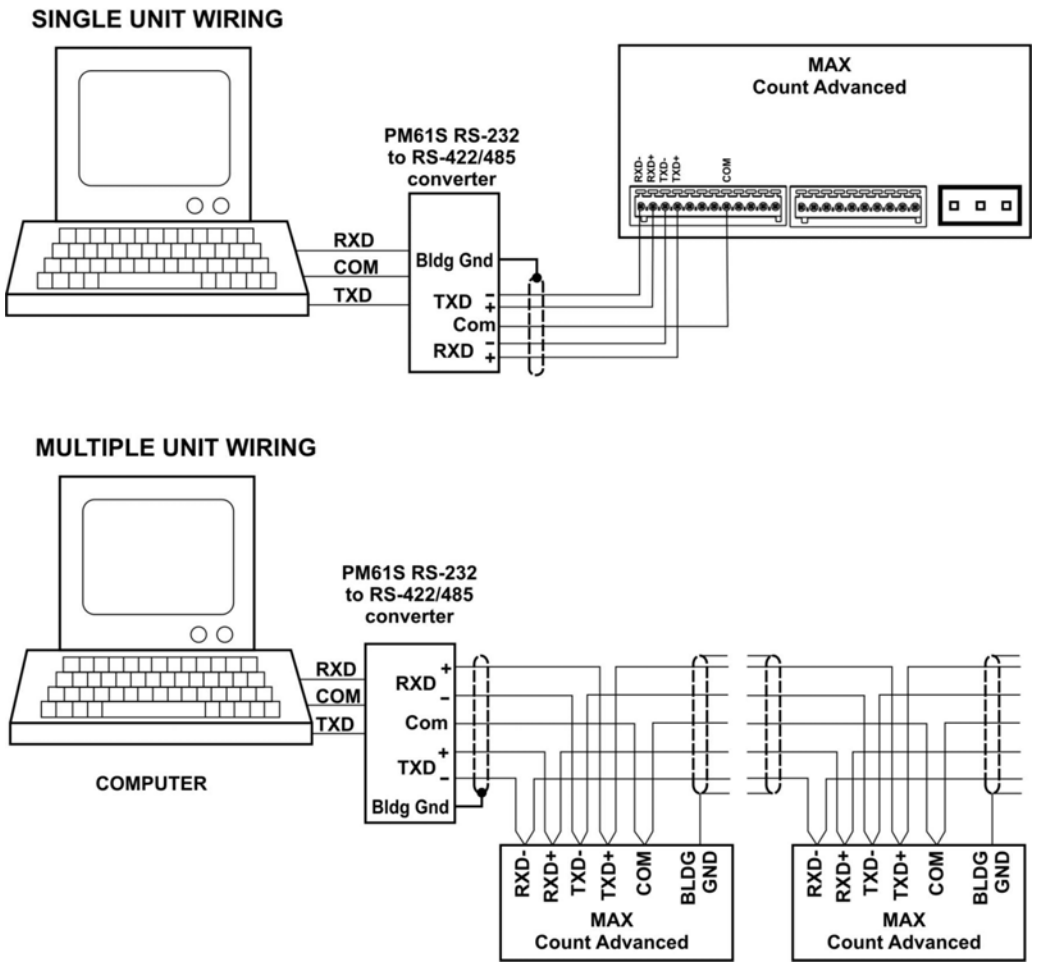

Front View

## OVERVIEW

The **MAX** Count Advanced is equipped with an RS-485 Serial interface for remote data collection, programming and networking applications. Front panel keyboard and some external control inputs are supported. Additionally, facilities are provided for individual (local) and group (global) control of single and multiple unit configurations respectively in a bus oriented system. Knowledge of serial communications is required by the user who wishes to use the remote capabilities or to integrate the control into a larger system.

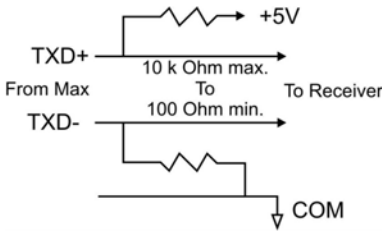
Two applications will be discussed. The first consists of a single **MAX** Count Advanced and a display terminal. It explains the use of the serial commands that mimic the keyboard operation and some control inputs. These are the LOCAL commands. Next, an application of multiple units under the control of a host computer will be discussed. The GLOBAL commands will be discussed in this section.

## SERIAL CONNECTIONS




### TERMINATION

The RS-485 receivers require the termination to minimize the effects of noise while the bus is not being driven. The **MAX** and PM61 products incorporate the terminations shown on the right internally. When connection is made to RS-485 device other than a **MAX** or PM61, the receiver should be terminated as shown.



**CABLE SELECTION**

The **MAX** serial interface uses a simple interconnect scheme and low cost wiring making it superior to parallel data transfer schemes. Through three (3) wire pairs, remote operation at distances up to 5,000 feet can be implemented. The following general guidelines should be observed.

1. Use #24 AWG twisted pair, overall shielded cable.
2. Use a "daisy chained" connection scheme for bus systems.
3. If a "multidrop" system is used, keep the drop length at 10% of the main line.
4. Tie the cable shield to BUILDING GROUD at the MAX end of the cable.
5. Crimp both the wires to a common lug for Multiple unit wiring.

RECOMMENDED CABLE TYPES:

Belden #9503
Alpha #5493

## PROTOCOL : Modbus RTU

Modbus is the one of the industrial standard protocol. There are two types of Modbus implementation, one is 'ASCII' and other is 'RTU', since RTU (Remote Terminal Unit) is the more popular, **MAX** Count Advanced has supported 'Modbus RTU' Protocol.
Modbus RTU protocol is supported by almost all industrial standard automation products like PLCs , Motor Drives, DCS, and SCADA etc.
Modbus is a Message based master-slave type protocol, where as there is a one master on a multi-drop communication bus and several slaves connected which are addressed as per their unique slave id. The master sends a query to slaves to read the data from slave as well as writes data on the slave.

**Following is the serial port specifications:-**

Baud Rate:- Programmable as OFF (OFF= no communication) or 1200, 2400, 4800, 9600
Data format:- 8 bit , no parity, 1 start bit, 1 stop bit

Supported Modbus Queries: **MAX** Count Advanced supports the three types of modbus commands,
1. Command 03 (Read Holding Register)
2. Command 16 (WRITE Holding Registers)
3. Command 04 (Read Input Register)

**Description of modbus commands:-**

**Command 03 (Read Holding Register)**
Read Multiple Holding Registers.
This command will allow the master to read Programmed Parameters like presets settings etc. Using this command maximum 2 numbers of 16 bit integers can be read together in single query. That means, 3 or more holding register read can not be done in a single query. Multiple queries can be sent for different address to read the data from instrument. Since most of the variables are 32 bit long integers, the modbus master need to read two concurrent integer words and combine them to form a 32 bit long integer for processing.

Following is an example of how to do it.

Assume that the value of the Start Counts SC is 123456. The Hex value will be 1E240H. The Holding Register address of SC is (40000 : 40001) and hence, address 40000 will contain 01h (Most Significant word) and address 40001 will contain E240h value (Least significant word).

**Note:**
**Ensure to switch OFF & ON the unit after editing the programming parameters through the MODBUS commands.**

1 PLC: Programmable Logic controller,
2. DCS Distributed Control Systems
3. SCADA: Supervisory controls & Data Acquisition.

**Command 03…**
Format of command as per above example where SC is having 123456 value
Following will be a query from master followed by the response from the slave.

| Byte No | Hex Value | Description | Remarks |
|---|---|---|---|
| 1 | 01 | Slave ID | Should be matching with Slave ID set on the instrument |
| 2 | 03 | Command to read holding reg. | Address of the register to read |
| 3 | 00 | Starting Address Hi byte | 0000= SC Hi, 0001 = SC Lo etc |
| 4 | 00 | Starting Address Lo byte | |
| 5 | 00 | Number of Registers Hi byte | Number of registers to read in single command. Can not be greater than 0002 for **MAX** products. |
| 6 | 02 | Number of Registers Lo byte | |
| 7 | CRC Lo | CRC Lo byte | 16 bit CRC, Data validation code |
| 8 | CRC Hi | CRC Hi byte | |

Following will be the Response from the instrument. Multiple slave units may be connected to Modbus RS485 bus, the instrument with Slave ID=1 will respond to this query.

| Byte No | Hex Value | Description | Remarks |
|---|---|---|---|
| 1 | 01 | Slave ID | Should be matching with Slave ID set on the instrument |
| 2 | 03 | Command to read holding reg. | |
| 3 | 04 | Number of bytes of data being sent | |
| 4 | 00 | Hi byte of requested register (40000 in this case) | |
| 5 | 01 | Lo byte of requested register (40000 in this case) | Data of the requested register |
| 6 | E2 | Hi byte of requested register (40001 in this case) | |
| 7 | 40 | Lo byte of requested register (40001 in this case) | |
| 8 | CRC Lo | CRC Lo byte | 16 bit CRC, Data validation code |
| 9 | CRC Hi | CRC Hi byte | |

**Command 16: (WRITE Holding Registers)**

This Command is used to write/Edit programmable Parameters. Following example illustrates how to write P1 the values 345678 .
P1 setting value 345678 = 5464E hex.

Following is the Query through which SC and P1 values will be edited

| Byte No | Hex Value | Description | Remarks |
|---|---|---|---|
| 1 | 01 | Slave ID | Should be matching with Slave ID set on the instrument |
| 2 | 16 | Command to Write holding register | |
| 3 | 00 | Hi byte of requested register (40000 in this case) | For 2 number of registers, 4 bytes of data . will be sent |
| 4 | 00 | Lo byte of requested register (40000 in this case) | |
| 5 | 00 | Hi byte of requested number of registers. | Number of registers to update (Max 2) |
| 6 | 02 | Lo byte of requested number of registers. | |
| 7 | 00 | Hi byte of Data integer | Data for register 40000 |
| 8 | 05 | Lo byte of Data integer | |
| 9 | 46 | Hi byte of Data integer | Data for register 40001 |
| 10 | 4E | Lo byte of Data integer | |
| 11 | CRC Lo | CRC Lo byte | 16 bit CRC, Data validation code |
| 12 | CRC Hi | CRC Hi byte | |

Following will be the Response from the instrument. Multiple slave units may be connected to Modbus RS485 bus, the instrument with Slave ID=1 will respond to this query as follows.

| Byte No | Hex Value | Description | Remarks |
|---|---|---|---|
| 1 | 01 | Slave ID | Should be matching with Slave ID set on the instrument |
| 2 | 16 | Command to Write holding reg. | |
| 3 | 00 | Hi byte of requested register (40000 in this case) | |
| 4 | 00 | Lo byte of requested register (40000 in this case) | |
| 5 | 00 | Hi byte of requested number of registers. | |
| 6 | 02 | Lo byte of requested number of registers. | |
| 7 | CRC Lo | CRC Lo byte | 16 bit CRC, Data validation code |
| 8 | CRC Hi | CRC Hi byte | |

3. Command 04 (Read Input Register)
Command 04 works in similar way as command 03 except it reads input registers like counts Co, Cb, Ct which are the process parameters, instead of programmable parameters like in command 03. The query and response is exactly same as command 03, except that the command field will have 04 instead of 03 and the data transaction will be related to input registers instead of holding registers. The process parameters like Co,Cb,Ct can not be edited.

Following is the Modbus Address Table for Input registers:-

| Address | Description | Remarks |
|---|---|---|
| 30000 | Co Hi | MSB of the main counter |
| 30001 | Co Lo | LSB of the main counter |
| 30002 | Cb Hi | MSB of the Batch counter |
| 30003 | Cb Lo | LSB of the Batch counter |
| 30004 | Ct Hi | MSB of the Totalizer counter |
| 30005 | Ct Lo | LSB of the Totalizer counter |

Following is the Modbus Address Table for Holding registers:-

| Address | Description | Remarks |
|---|---|---|
| 40000 | Start Count Hi | MSB of the Start count .The start count value should not exceed 999999(F423Fh).If the value exceeds, the start count will be replaced by the default value 000000. |
| 40001 | Start Count Lo | LSB of the Start count. The start count value should not exceed 999999(F423Fh).If the value exceeds, the start count will be replaced by the default value 000000. |
| 40002 | Preset 1 Hi | MSB of the Numeric value of the Preset 1 value of 3 relays / Solid State Output. The preset 1 value should not exceed 999999(F423Fh). If the value exceeds, the Preset 1 value will be replaced by the default value 000000. |
| 40003 | Preset 1 Lo | LSB of the Numeric value of the Preset 1 value of 3 relays / Solid State Output. The preset 1 value should not exceed 999999(F423Fh). If the value exceeds, the Preset 1 value will be replaced by the default value 000000. |
| 40004 | Preset 2 Hi | MSB of the Numeric value of the Preset 2 value of 3 relays / Solid State Output. The preset 2 value should not exceed 999999(F423Fh). If the value exceeds, the Preset 2 value will be replaced by the default value 000000. |
| 40005 | Preset 2 Lo | LSB of the Numeric value of the Preset 2 value of 3 relays / Solid State Output. The preset 2 value should not exceed 999999(F423Fh). If the value exceeds, the Preset 2 value will be replaced by the default value 000000. |
| 40006 | Preset 3 Hi | MSB of the Numeric value of the Preset 3 value of 3 relays / Solid State Output. The preset 3 value should not exceed 999999(F423Fh). If the value exceeds, the Preset 3 value will be replaced by the default value 000000. |
| 40007 | Preset 3 Lo | LSB of the Numeric value of the Preset 3 value of 3 relays / Solid State Output. The preset 3 value should not exceed 999999(F423Fh). If the value exceeds, the Preset 3 value will be replaced by the default value 000000. |

| | | |
|---|---|---|
| 40008 | Batch Preset Hi | MSB of the Numeric value of the Batch Preset assignment of 3 relays. The Batch preset assignment value should not exceed 999999(F423Fh). If the value exceeds the Batch Preset assignment will be replaced by the default value 000000. |
| 40009 | Batch Preset Lo | LSB of the Numeric value of the Batch Preset assignment of 3 relays. The Batch preset assignment value should not exceed 999999(F423Fh). If the value exceeds the Batch Preset assignment will be replaced by the default value 000000. |
| 40010 | Correction Cnst Hi | MSB of Numeric Constant for inputs A & B. The Correction Cnst value should not exceed 999999(F423Fh). If the value exceeds, the Correction Cnst value will be replaced by the default value 100000. |
| 40011 | Correction Cnst Lo | LSB of Numeric Constant for inputs A & B. The Correction Cnst value should not exceed 999999(F423Fh). If the value exceeds, the Correction Cnst value will be replaced by the default value 100000. |
| 40012 | Input Mode Hi | MSB of the Numeric value. Default value 0. |
| 40013 | Input Mode Lo | LSB of the Numeric value used to select the A-B, A+B X1 for open collector or contact inputs: selects A-B, A+B X2 or Quadrature X2, X4 for open collector inputs. The Input mode value should not exceed 7. If the value exceeds, it will be loaded with AMINUSB_CONTACT_X1. |
| 40014 | Counter Dir Hi | MSB of the Numeric value. Default value 0. |
| 40015 | Counter Dir Lo | LSB of the count direction. The value of the count direction is either 0(direction UP) or 1(direction DWN). If the value given is greater then 1 then the default value of 0(direction UP) is loaded. |
| 40016 | Decimal Point Hi | MSB of the Numeric value. Default value 0. |
| 40017 | Decimal Point Lo | LSB of the Decimal point position for count, Total count and presets. The value of Decimal point position should not exceed 5 .If the value exceeds it will be replaced by 0. In **MAX** series, a decimal point to be displayed is programmable, which makes long integer to appear as float. For Example if the Counter value displayed is 123.456, it is stored as 123456 in modbus register and treated by embedded software as 123456 only. The decimal point is just placed on 7 segment display to appear it to be 123.456. While reading these all values one has to consider decimal point applicable (i.e. 2nd position, 3rd positions etc.) if Modbus value is read as 123456, and decimal point is on 2nd position, then actual display on PC screen should be 1234.56. The software has to divide the value by 100 and display it as “%6.2f” format. While writing the values the same thing should be done. If user enters 1234 (can be 1234.00) as a value and if decimal point is on 2nd position, then it is interpreted as 1234.00 and 123400 value should be written. The software should read decimal point register to determine decimal point position. |

| | | |
|---|---|---|
| 40018 | Batch Count Enable Hi | MSB of the Numeric value. Default value 0. |
| 40019 | Batch Count Enable Lo | LSB of the Numeric value used to select the batch counter enable. The value can be either 0(BATCHOFF) or 1(BATCH ON). If the value exceeds, the default value of 0 is loaded. |
| 40020 | Total Count Enable Hi | MSB of the Numeric value. Default value 0. |
| 40021 | Total Count Enable Lo | LSB of the Numeric value used to select the Totalizer counter enable. The value can be either 0(TOTAL_OFF) or 1(TOTAL_ON). If the value exceeds, the default value of 0 is loaded. |
| 40022 | Frnt Panel Rst Hi | MSB of the Numeric value. Default value 0. |
| 40023 | Frnt Panel Rst Lo | LSB of the Numeric value used to select the Front Panel reset. The value can be either 0(FRNT_PANL_RST_OFF) or 1 (FRNT_PANL_RST_ON). If the value exceeds, the default value of 0 is loaded. |
| 40024 | Preset Lock Hi | MSB of the Numeric value. Default value 0. |
| 40025 | Preset Lock Lo | LSB of the Numeric value used to select the editable option of the set up mode parameters. The value can be either 0 (PRST_LOC_OFF) or 1(PRST_LOC_ON). If the value exceeds, the default value of 0 is loaded. |
| 40026 | Cntr Retention Hi | MSB of the Numeric value. Default value 0. |
| 40027 | Cntr Retention Lo | LSB of the Numeric value used to select the Counter retention. The value can be either 0 (CNTR_RETN_OFF) or 1 (CNTR_RETN_ON). If the value exceeds, the default value of 0 is loaded. |
| 40028 | Reset Type Hi | MSB of the Numeric value. Default value 0. |
| 40029 | Reset Type Lo | LSB of the Numeric value used to select the open collector or contact closure input types. The value can be either 0 (RESET_CC) or 1 (RESET_OC). If the value exceeds, the default value of 0 is loaded. |
| 40030 | Stop_Hold_Mode Hi | MSB of the Numeric value. Default value 0. |
| 40031 | Stop_Hold_Mode Lo | LSBof the Numeric value used to select the Stop count or display Hold function via external input. The value can be either 0 (STOP_MODE) or 1(HOLD_MODE). If the value exceeds, the default value of 0 is loaded. |
| 40032 | Batch_Total_Rst Hi | MSB of the Numeric value. Default value 0. |

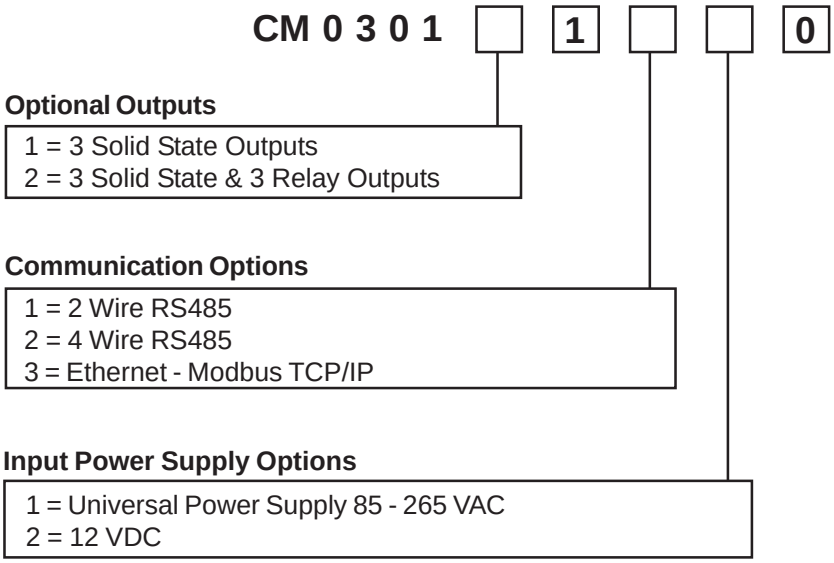
| | | |
|---|---|---|
| 40033 | Batch_Total_Rst Lo | LSB of the Numeric value used to select the batch reset or totalizer reset function via external input. The value can be either 0(BATCH_RST) or 1 (TOTALISER_RST). If the value exceeds, the default value of 0 is loaded. |
| 40034 | Out_1 Hi | MSB of the Numeric value. Default value 0. |
| 40035 | Out_1 Lo | LSB of the Numeric value used to select the latched or pulsed operation of Output 1. The value should not exceed 9999(270Fh). If the value exceeds, the output 1 value will be replaced by the default value 0000. |
| 40036 | Out_2 Hi | MSB of the Numeric value. Default value 0. |
| 40037 | Out_2 Lo | LSB of the Numeric value used to select the latched or pulsed operation of Output 2. The value should not exceed 9999(270Fh). If the value exceeds, the output 2 value will be replaced by the default value 0000. |
| 40038 | Out_3 Hi | MSB of the Numeric value. Default value 0. |
| 40039 | Out_3 Lo | LSB of the Numeric value used to select the latched or pulsed operation of Output 3. The value should not exceed 9999(270Fh). If the value exceeds the output 3 value will be replaced by the default value 0000. |
| 40040 | P1_Assign Hi | MSB of the Numeric value. Default value 0. |
| 40041 | P1_Assign Lo | LSB of the Numeric value used to select assign output operation for preset 1.In this Menu '-' refers to 1 ,'p' refers to 2 and 'd' refers to 3. The first integer (LSB) refers to AUTO reset. Its value can be 1 or 2 . 1 refers to '-' and 2 refers to Auto reset. The second integer refers to Relay 1.The third integer refers to Relay 2.The last integer refers to relay 3. The relay can be either left ideal('-') or can be picked up('p') or can be dropped('d'). Refer preset assignment example mentioned in page-25 |
| 40042 | P2_Assign Hi | MSB of the Numeric value. Default value 0. |
| 40043 | P2_Assign Lo | LSB of the Numeric value used to select the assign output operation for preset 2. In this Menu '-' refers to 1 ,'p' refers to 2 and 'd' refers to 3. The first integer (lsb) refers to AUTO reset. Its value can be 1 or 2 . 1 refers to '-' and 2 refers to Auto reset. The second integer refers to Relay 1.The third integer refers to Relay 2.The last integer refers to relay 3. The relay can be either left ideal('-') or can be picked up('p') or can be dropped('d'). Refer preset assignment example mentioned in page-25 |
| 40044 | P3_Assign Hi | MSB of the Numeric value. Default value 0. |

| | | |
|---|---|---|
| 40045 | P3_Assign Lo | LSB of the Numeric value used to select the assign output operation for preset 3. In this Menu '-' refers to 1 ,'p' refers to 2 and 'd' refers to 3. The first integer (lsb) refers to AUTO reset. Its value can be 1 or 2. 1 refers to '-' and 2 refers to Auto reset. The second integer refers to Relay 1.The third integer refers to Relay 2.The last integer refers to relay 3. The relay can be either left ideal('-') or can be picked up('p') or can be dropped('d'). Refer preset assignment example mentioned in page-25 |
| 40046 | Batch_Preset_Assign Hi | MSB of the Numeric value. Default value 0. |
| 40047 | Batch_Preset_Assign Lo | LSB of the Numeric value used to select the assign output operation for Batch preset. In this Menu '-' refers to 1 ,'p' refers to 2 and 'd' refers to 3. The first integer (lsb) refers to AUTO reset. Its value can be 1 or 2 . 1 refers to '-' and 2 refers to Auto reset. The second integer refers to Relay 1.The third integer refers to Relay 2.The last integer refers to relay 3. The relay can be either left ideal('-') or can be picked up('p') or can be dropped('d'). |
| 40048 | Rst_Input_Assign Hi | MSB of the Numeric value. Default value 0. |
| 40049 | Rst_Input_Assign Lo | LSB of the Numeric value used to select the assign output operation for reset input. In this Menu '-' refers to 1 ,'p' refers to 2 and 'd' refers to 3. The first integer refers to relay 1.The second integer refers to relay 2.The last integer refers to relay 3. The relay can be either left ideal('-') or can be picked up('p') or can be dropped ('d'). |
| 40050 | Out_Ctrl_Assign Hi | MSB of the Numeric value. Default value 0. |
| 40051 | Out_Ctrl_Assign Lo | LSB of the Numeric value used to select the assign output operation for output Control input. In this Menu '-' refers to 1 ,'p' refers to 2 and 'd' refers to 3. The first integer refers to relay 1.The second integer refers to relay 2.The last integer refers to relay 3. The relay can be either left ideal('-') or can be picked up('p') or can be dropped('d'). |
| 40052 | Baud _Select Hi | MSB of the Numeric value. Default value 0. |
| 40053 | Baud _Select Lo | LSB of the Numeric value used to select the Baud rate for Serial communication. The value can not exceed 4.If the value exceeds, the default value 0 is loaded which terminates the communication. |
| 40054 | Serial _ID Hi | MSB of the Numeric value. Default value 0. |
| 40055 | Serial _ID Lo | LSB of the Numeric value used to program the serial ID (01-32). The value should not exceed 32. If the value exceeds, the Serial ID will be replaced by 32. |

**Preset assignmnet example:**
If we want to set Autoreset and keep relay1 ideal, drop relay 2 and pick up relay 3 then the value to be given is the 2312 it hex equivalent is 908h.which should be loaded in to the 40041. If any of the integer value exceeds, 3 then all the integers will be loaded with 1111(457h).

# ORDERING INFORMATION ...






## WARRANTY

Standard products manufactured by the Company are warranted to be free from workmanship and material for a period of one year from the date of shipment, and products which are defective in workmanship or material will be repaired or replaced, at the option of the Company, at no charge to the buyer. Final determination as to whether a product is actually defective rests with the company. The obligation of the company hereunder shall be limited solely to repair and replacement of products that fall within the foregoing limitations, and shall be conditioned upon receipt by the company of written notice of any alleged defects or deficiency promptly after discovery within the warranty period, and in the case of components or units purchased by the company, the obligation of the company shall not exceed the settlement that the company is able to obtain from the supplier thereof. No products shall be returned to the company without its prior consent. Products which the company consents to have returned shall be shipped F.O.B. the Company's factory. The Company cannot assume responsibility or accept invoices for unauthorized repairs to its components, even though defective. The life of the products of the Company depends, to a large extent, upon the type of usage thereof, and THE COMPANY MAKES NO WARRANTY AS TO FITNESS OF ITS PRODUCTS FOR SPECIFIC APPLICATIONS BY THE BUYER NOR AS TO PERIOD OF SERVICE UNLESS THE COMPANY SPECIFICALLY AGREES OTHERWISE IN WRITING AFTER THE PROPOSED USAGE HAS BEEN MADE KNOWN TO IT.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

SERVICE

If this product requires service, call Eagle Signal for an RMA (Return Material Authorization) number, pack it in a sturdy carton and ship prepaid to: Service Dept. at address below.

Include
1. Description of the problem
2. Name of the responsible person
3. Purchase order number
4. Return shipping instructions.

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