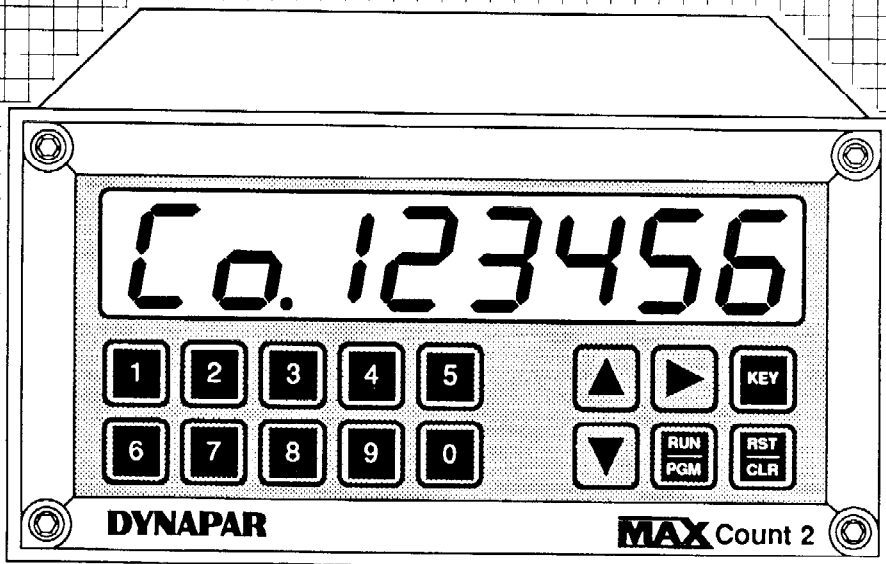# MAX Count 2

3 PRESET COUNTER with BATCHING and TOTALIZER

MAX Count 2 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.
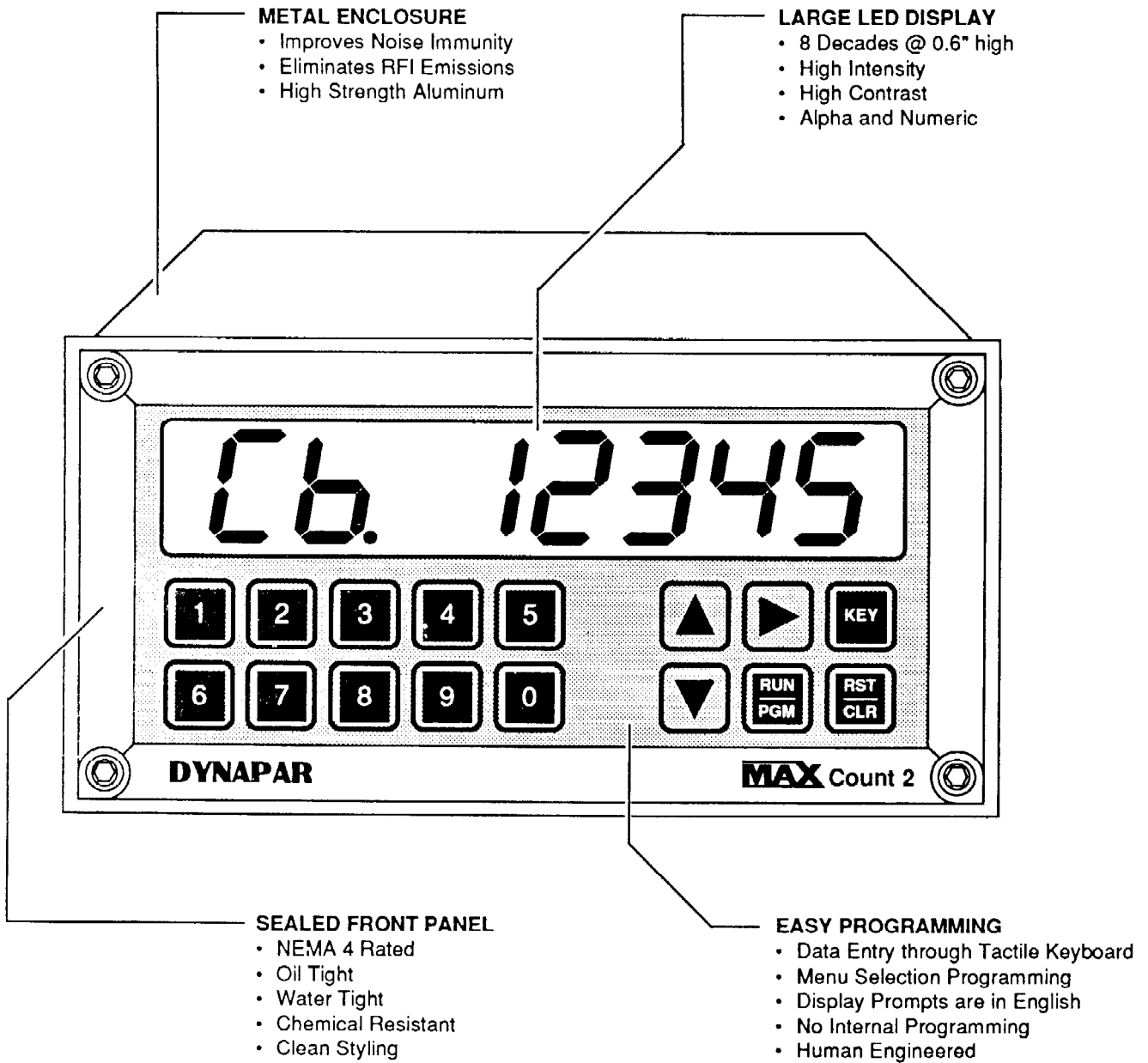
FEATURES

- 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
- Full Duplex RS-422A/485 Provides LOCAL and REMOTE Process Control Capability
- COUNTER RESET, STOP / HOLD Inputs
- BATCH / TOTAL RESET Input
- OUTPUT CONTROL Input
- Non-Volatile Memory for Program & Counters
- Built In Self-Diagnostics

KEY SPECIFICATIONS

- DC to 40 kHz Operation
- Programmable Input Logic (x1, x2, or x4)
- Five Decade Calibrator
- Three Relay and Three Transistor Outputs
- 5 Amp Relay Contact Rating
- Programmable Relay Hold Time XX.XX sec
- +12 VDC @ 175 mA Transducer Supply
- 115/230 Selectable VAC Operation (12 VDC Optional)

INDEX TO CONTENTS

DYNAPAR CORP.

OVERVIEW...

METAL ENCLOSURE
- Improves Noise Immunity
- Eliminates RFI Emissions
- High Strength Aluminum

LARGE LED DISPLAY
- 8 Decades @ 0.6" high
- High Intensity
- High Contrast
- Alpha and Numeric

Display: Cb. 12345

Keys: 1 2 3 4 5 6 7 8 9 0 ▲ ▶ KEY ▼ RUN/PGM RST/CLR

DYNAPAR — **MAX** Count 2

SEALED FRONT PANEL
- NEMA 4 Rated
- Oil Tight
- Water Tight
- Chemical Resistant
- Clean Styling

EASY PROGRAMMING
- Data Entry through Tactile Keyboard
- Menu Selection Programming
- Display Prompts are in English
- No Internal Programming
- Human Engineered

MAX
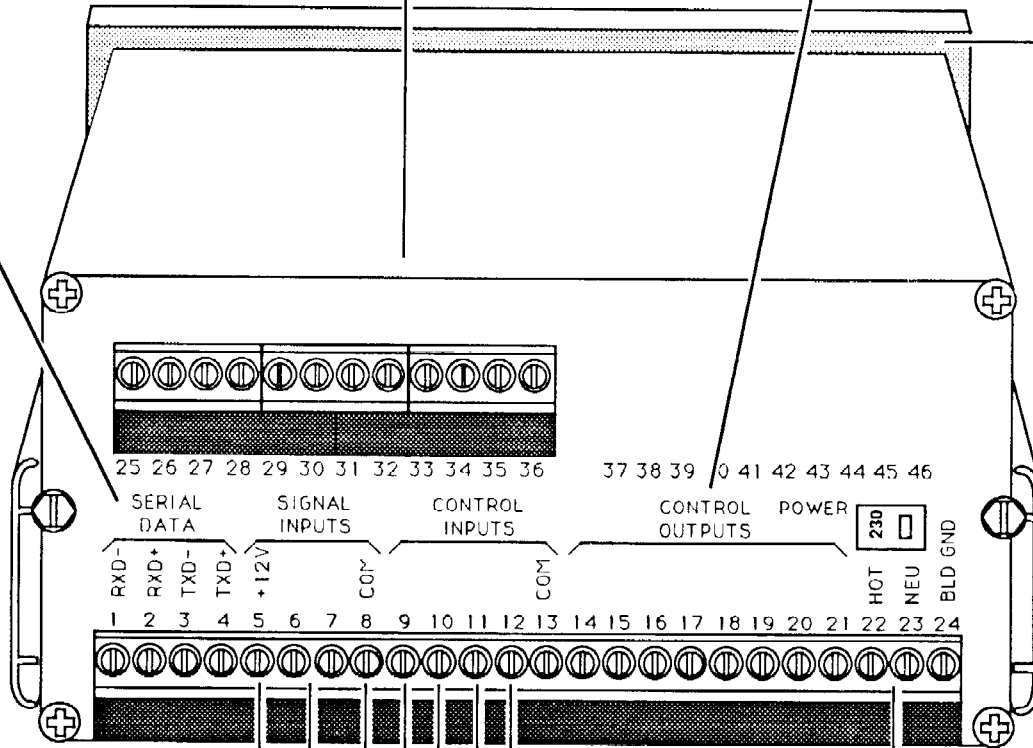
SERIAL DATA I/O
- Full Duplex RS-422A/485 standard
- Up to 32 units may be bussed together
  See lines 35 – 37 for Programming
  See pages 12 – 15 for Operation

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

SOLID STATE OUTPUTS (14, 15, 16)
- Any preset can pick up or drop out any output
- Outputs can latch or have momentary pick up from 00.01 to 99.99 seconds
- All selections are made with keyboard.

NEOPRENE
GASKET
SEAL

25 26 27 28 29 30 31 32 33 34 35 36   37 38 39 0 41 42 43 44 45 46

SERIAL DATA
SIGNAL INPUTS
CONTROL INPUTS
CONTROL OUTPUTS
POWER

RXD- RXD+ TXD- TXD+ +12V COM   COM   HOT NEU BLD GND

1 2 3 4   5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

TRANSDUCER SUPPLY (5)
- 12 VDC @ 175 mA
- Short Circuit Protected

SIG A and SIG B INPUTS (6, 7)
- Operates as A-b, A+b or Quadrature.
- Can be open collector or contact

LOGIC COMMON (8, 13)
- Two tiepoints provided
- Isolated from Building Ground.

STOP / HOLD (9)
- Inhibits counting in the STOP mode.
- Freezes the display in the HOLD mode.
- Level sensitive, 20 Hz response

BATCH / TOTAL RESET (12)
- Resets Batch cntr in Batch mode.
- Resets Totalizer in Total mode.
- Edge Sensitive, 20 Hz response.

COUNTER RESET (11)
- 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 (10)
- Allows remote operation of both Solid State and Relay outputs.
- Edge sensitive, 20 Hz response

POWER INPUT
- 115/230 VAC Selectable
- 12 VDC optional
- Memory is retained indefinitely when power is off.
- Built-in Line Filter

SPECIFICATIONS...

Input Power: 100 to 130 VAC, 50/60 Hz, 20VA
(200 to 260 VAC selectable)
(12 VDC @ 0.3 A. optional)

Accessory Supply: 12 VDC @ 175 mA.

Main Counter:
Range: 6 Decades
Presets: 4 Individual with 6 decade range
Operation: A-b, A+b, Quadrature
Reset Input: External and front panel
Count Rate: 40 kHz internal
(40 kHz external input frequency
with x1 logic)
(20 kHz external input frequency
with x2 logic)
(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 40 kHz,
20 kHz quadrature max.
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: 3.25 mA. steady state
Input Response: 10 μs. min high and low time

Control Inputs:
Input Frequency: DC to 20 Hz max. each input.
RESET input 100 Hz response
Input Type: Single ended, current sinking
Input Logic: Both Edge and Level sensitive as
defined by input use
Input High Level: 10 VDC 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: 8 Decade, 0.6" red LED
Decimal Point: User programmable
Range: XX.XXXX to XXXXXX

Keyboard: Sealed tactile feel, 16 positions

Program Security: Program LOCK of lines 5 – 33

Control Outputs:
Type: 3 Solid State,
100 mA sink max., 24 VDC max.
Optional: 3 SPDT Relays, rated
5 Amp 30VDC/120VAC Resistive
3.5 Amp 120VAC Inductive (.8pf)
3 Amp 240VAC Resistive

Serial Interface:
Type: RS-422A/485 compatible
Baud Rate: Selectable; 300, 600, 1200, 2400
Parity: Selectable; None, Odd, Even
Data: ASCII
Format: Start bit, 7 bit ASCII data, Parity
bit, Stop bit
I.D. Number: Programmable 0 to 98: Allows
multidrop systems.

Diagnostics:
Test 0: Keyboard Test
Test 1: Non-Volatile RAM Test
Test 2: Input Test
Test 3: Output Test
Test 4: Display Test
Test 5: Program Memory Test
Test 6: Date Code Test
Test 7: Serial I/O Test
Test 8: Return to Factory Programming

Mechanical:
Enclosure: Aluminum extrusion with molded
VALOX bezel. 2.91" high x 5.67"
wide x 6.03" deep overall
Cutout: 5.43" ± 0.04" x 2.68" ± 0.03"
Panel Thickness: 1/16" to 1/4"
Panel Depth: 5.68" minimum
Weight: 2.5 lbs.

Environmental:
Operating Temp.: 0° to +50° C. (32° to 122° F.)
Storage Temp: -18° to 85° C (0° to 186° F)
Ambient Humidity: 90% and noncondensing

Controller Error Codes
2. Low AC Line Voltage
3. Input Frequency Too Fast
4. Processor time fully utilized

Press

RST
CLR

to clear error code.
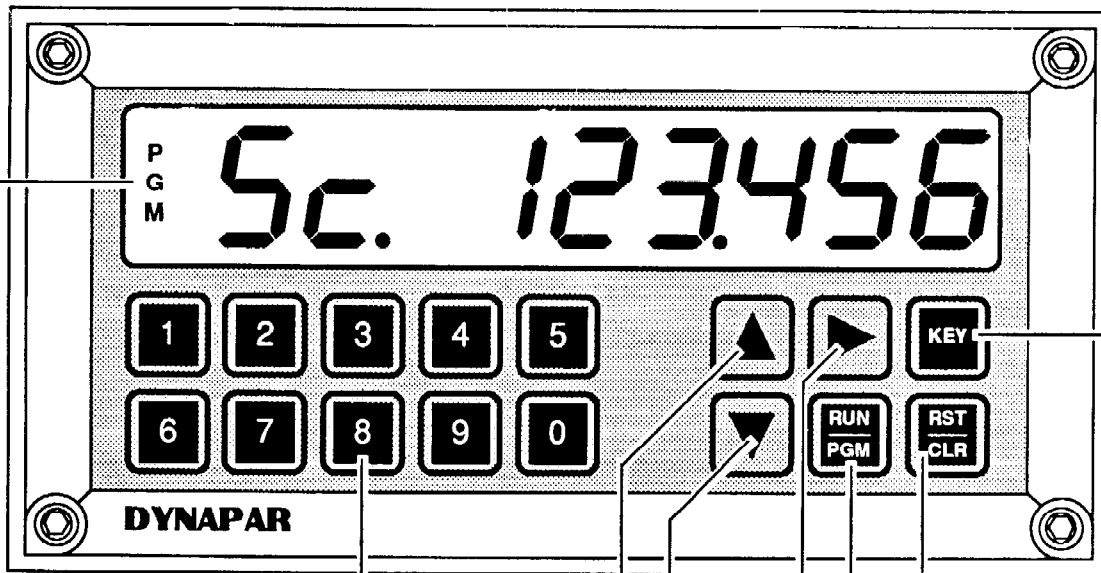
FRONT PANEL CONTROLS...

PROGRAM and SETUP MODE INDICATOR
- Constantly illuminated in the PROGRAM mode
- Flashing in the SETUP mode

KEY
- Used to enter SETUP mode from the RUN mode Press again to exit SETUP and go to RUN.
- Allows the unit to be programmed "on the fly".
- Used to direct address lines 9 – 46 while in the PROGRAM mode.

Press [KEY] , Line Number, [▼]

NUMERIC KEYS
- Used to enter data in the SETUP and PROGRAM modes

UP CURSOR
- Selects RUN mode display (lines 1 – 8)
- Moves display toward top of programming menu in the PROGRAM mode

DOWN CURSOR
- Selects RUN mode display (lines 1 – 8)
- Moves display toward bottom of programming menu in the PROGRAM mode

RIGHT CURSOR
- Moves display to the right on the same line of the programming menu in the PROGRAM menu.

RESET / CLEAR
- Resets main Counter , Batch counter and Totalizer in the RUN mode (lines 1, 2, 3). Affects only the currently displayed line
- Clears display in the SETUP and PROGRAM modes

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

PROGRAMMING...

RUN MODE

LINE	FUNCTION	DESCRIPTION
1	COUNT VALUE	Indicates current Count.
2	BATCH COUNT VALUE	Indicates current Batch Count. Conditional: Batch Counter (line 18) must be 'ON'.
3	TOTAL COUNT VALUE	Indicates current Totalizer Count. Conditional: Totalizer (line 19) must be 'ON'.

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

4	START COUNT	Numeric value for "set to a number". Conditional: Direction (line 16) must be 'Down'.
5	PRESET 1	Numeric value for Preset 1. Conditional: P1 (line 29) must have assignment.
6	PRESET 2	Numeric value for Preset 2. Conditional: P2 (line 30) must have assignment.
7	PRESET 3	Numeric value for Preset 3. Conditional: P3 (line 31) must have assignment.
8	BATCH PRESET	Numeric value for Batch Preset. Conditional: Batch Counter (line 18) must be 'ON' and Batch Preset (line 32) must have assignment.

PROGRAM MODE

9	START COUNT	Numeric value for "set to a number" (for Count Down mode only).
10	PRESET 1	Numeric value for Preset 1.
11	PRESET 2	Numeric value for Preset 2.
12	PRESET 3	Numeric value for Preset 3.
13	BATCH PRESET	Numeric value for Batch Preset.
14	CORRECTION CONSTANT	Numeric constant for inputs A & B. See page 8.
15	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.
16	COUNT DIRECTION	Select "reset to zero" for UP or "set to number" for DOWN.
17	DECIMAL POINT	Decimal point position for Count, Total Count, and Presets.
18	BATCH COUNTER	Select ON or OFF.
19	TOTALIZER	Select ON or OFF.
20	FRONT PANEL RESET	Select ON or OFF.
21	PRESET LOCK	Select ON or OFF. Affects entry into SETUP mode (lines 4 - 8 above).
22	COUNTER RETENTION	Select ON or OFF (saves Count value during power outages).
23	RESET TYPE	Select open collector or contact closure input types.
24	STOP/HOLD MODE	Select STOP Count or Display HOLD function via external input.
25	BATCH/TOTAL RESET MODE	Select BATCH reset or TOTALIZER reset functions via external input.
26	OUTPUT 1	Select latched or pulsed operation for output 1.
27	OUTPUT 2	Select latched or pulsed operation for output 2.
28	OUTPUT 3	Select latched or pulsed operation for output 3.
29	P1 ASSIGNMENT	Assign output operations to Preset 1.
30	P2 ASSIGNMENT	Assign output operations to Preset 2.
31	P3 ASSIGNMENT	Assign output operations to Preset 3.
32	BATCH PRESET ASGMNT	Assign output operations to Batch Preset.
33	RESET INPUT ASGMNT	Assign output operations to Reset input.
34	OUTPUT CONTROL ASGMNT	Assigns output operations to Output Control input.
35	BAUD RATE	Selects 300, 600, 1200 or 2400 baud.
36	PARITY	Serial parity bit. Selectable: no parity, odd parity, even parity.
37	ID NUMBER	Serial ID Number. Programs unit serial address. See page 13 for use.

RUN MODE

1 `Co.        0` Current Main Counter display
2 `Cb.        0` Current Batch Counter display
3 `Ct.        0` Current Totalizer Counter display

--- **SETUP MODE** ---

4 `Sc.        0`
5 `P 1.       0`
6 `P2.        0`
7 `P3.        0`
8 `Pb.        0`

`0` thru `9` enter data values

KEY

`PGM` * `▲` and `▼` loads display into memory then scrolls to next line

`RST CLR` clears display

* PGM flashes in SETUP mode
Press

Press `KEY` -------- to return to RUN mode lines

`RUN PGM` `LOC.       0` `2`-`6`-`6`-`6`-`▼` To enter PROGRAM mode.

`RUN PGM`

PROGRAM MODE
FACTORY PROGRAMMING

9   `▼` `Sc.        0`
10 `P 1.       0`
11 `P2.        0`
12 `P3.        0`
13 `Pb.        0`
14 `CC.   1.0000`

`0` thru `9` enter data values

`▲` and `▼` loads display into memory then scrolls to next line

`RST CLR` clears display

`RUN PGM` returns to RUN mode

15 `A-b  ⊣⊦.1` ▶ `A-b  cc.1` ▶ `A⊣-b ⊣⊦.1` ▶ `A⊣-b  oc.1` ▶
    `A-b  oc.2` ▶ `A⊣-b  oc.2` ▶ `quad  oc.2` ▶ `quad  oc.4` this line prompted only for Quadrature models

16 `dir.      uP` ▶ `dir.      dn`
17 `dP.      oFF` ▶ `dP.       .0` ▶ `dP.      .00` ▶ `dP.     .000` ▶ `dP.    .0000`
18 `bAtch.oFF` ▶ `bAtch.  on`
19 `totAL.oFF` ▶ `totAL.  on`
20 `FP.rSt.oFF` ▶ `FP.rSt.  on`
21 `Pr.LOC.oFF` ▶ `Pr.LOC.  on`
22 `Co.rEt.oFF` ▶ `Co.rEt.  on`
23 `rSt. in. ⊣⊦` ▶ `rSt. in.  oc`
24 `StoP.    ⊣⊦` ▶ `HoLd.    ⊣⊦`
25 `bAtch.   ⊣⊦` ▶ `totAL.   ⊣⊦`

> **THE MACHINE OR PROCESS MUST BE STOPPED BEFORE ENTER-ING THE PROGRAM MODE.** Count Retention should only be selected with the full awareness of machine and controller operation. When Co.rEt. (line 22) 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.

26 `o 1. LAtch`
27 `o2. LAtch`
28 `o3. LAtch`

`0` thru `9` enter relay closure time in seconds (00.01 to 99.99)

`RST CLR` sets relay closure time to 00.00 sec (LATCH)

29 `P 1.   .-.-.-`
30 `P2.    .-.-.-`
31 `P3.    .-.-.-`
32 `Pb.    .-.-.-`
33 `rSt.   .-.-`
34 `oc.    .-.-`

Out 2 ─┐ ┌─ Out 3
Out 1 ─┐│ │┌─ Auto Reset
`P 1.   .-.-.-`
KEYS `1` `2`   `0` `3` KEYS
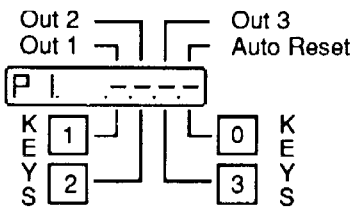
Select field with `1`-`2`-`3`-`0` key

Repeat presses of same key yields assignments
1st keypress = 'P' (pickup)
2nd keypress = 'd' (dropout)
3rd keypress = '—' (no action)

Repeat presses of `0` toggle between A (Auto reset) and no auto reset

35 `bd.      oFF` ▶ `bd.      300` ▶ `bd.      600` ▶ `bd.     1200` ▶ `bd.     2400`
36 `PAr.      no` ▶ `PAr.       o` ▶ `PAr.       E`
37 `id.        0` Enter two digit serial address. Default is 99.

The **MAX** Count 2 controller provides a group of diagnostics to self test the controller and field wiring as well as help 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 "off line" (user's process not being controlled). The tests are outlined below along with the keyboard commands to control them.

LINE	DIAGNOSTIC	DESCRIPTION
38	TEST 0	Keyboard Test: Display echoes each keypress
39	TEST 1	Non-Volatile RAM Memory Test
40	TEST 2	Input Test: Test for "closures" on inputs
41	TEST 3	Output Test: Press keys 1 – 3 to turn outputs 'ON', press CLR to turn 'OFF'.
42	TEST 4	Display Test: Illuminates all segment and digit combinations.
43	TEST 5	PROM Memory Test: Checksum comparison for program memory.
44	TEST 6	Version Code Test: Displays date code version of firmware.
45	TEST 7	Serial Test: Provides loop-back test of the serial transmitter and receiver (will indicate 'FAIL' if the loop back connections are not made).
46	TEST 8	Returns controller to the factory programmed state (left column on page 7).

PROGRAM MODE DISPLAYS of DIAGNOSTICS

38	t0. rdy
39	t1. rdy
40	t2. rdy
41	t3. rdy
42	t4. rdy
43	t5. rdy
44	t6. rdy
45	t7. rdy
46	t8. rdy

Press each key. Display echoes key. Press ▶ last.

PASS Displayed if all OK. FAIL Displayed means problems !!
Call DYNAPAR for help !!

▶ Begins Test

▶ Ends Test

▼ To next Test

Can only be run with the RxD± tied to TxD± (will indicate 'FAIL' if the loop back connections are not made.) Select Baud Rate and ID=00; cycle power before test.

CAUTION: Returns control to the factory programming ! (left column on page 7)

INPUT MODE PROGRAMMING

The Input Mode (line 15) 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 a 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 on Quadrature inputs.

CORRECTION CONSTANT PROGRAMMING

The Correction Constant (line 14) 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.

$$CC = \frac{\text{Displayed Value in Engineering Units}}{(\text{Display Resolution}) \times \text{Input Pulses} \times \text{Input Logic}}$$
(where Input Logic is X1, X2 or X4)

BATCH COUNTER and BACKGROUND TOTALIZER OPERATION

The Batch Counter is incremented each time an Auto Reset assignment is processed by the controller if the Batch Counter is selected 'ON' (line 18 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 BCH/TOT input as the Batch Reset (line 25). The Totalizer counts in parallel with the main counter when selected 'ON' (line 19). The Totalizer may be reset via the front panel by scrolling to the Totalizer display line, then pressing the RST/CLR key. The Totalizer may be reset externally by selecting the BCH/TOT input as the Totalizer Reset (line 25).

SETUP MODE OPERATION

The Count and Batch Presets may be dynamically changed while in the RUN mode of operation by entering the SETUP mode. The counter continues counting without loss of count while the operator is in the SETUP mode. SETUP mode operation affects lines 4 through 8 only. The SETUP mode is entered by cursoring to the desired line (4 – 8) then pressing the KEY key. Entering the SETUP mode is only allowed if the Preset lock (line 21) is off. The 'PGM' will flash signalling entry into the SETUP mode. The control continues to operate, keeping track of count and comparing presets.

While in the SETUP mode the Numeric, CLR/RST, Up Cursor, and Down Cursor keys are active allowing data to be changed as required. Refer to pages 6 and 7 for programming. You may change any or all of the SETUP mode lines (4 – 8). 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 the appropriate program lines when the SETUP mode is exited. Exit the SETUP mode by pressing the KEY key.

> **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 the RUN mode. Preset comparisons are made as follows: when the Preset changes from > the Count value to ≤ the Count value or when the Preset changes from < the Count value to ≥ the Count value. External machine logic circuitry should be designed to handle this.

STOP/HOLD CONTROL INPUT

The STP/HLD input is programmable as either a STOP Count or as Display HOLD function (line 24). 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 effect data being transmitted via the serial interface.
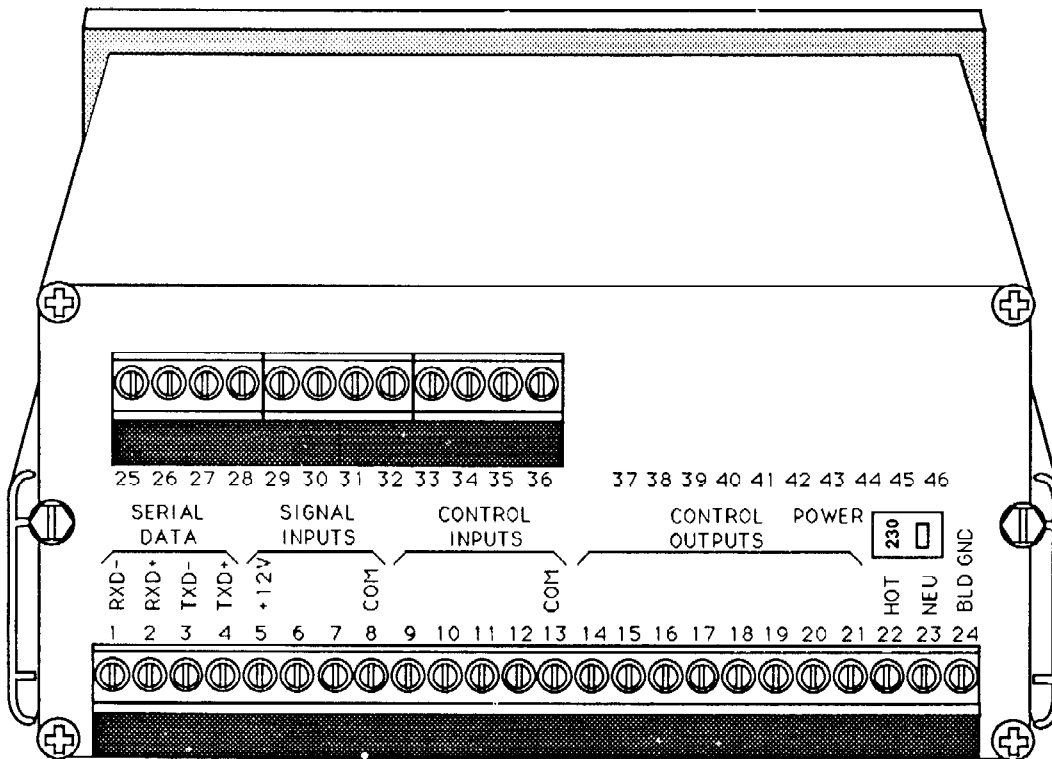
APPLICATIONS
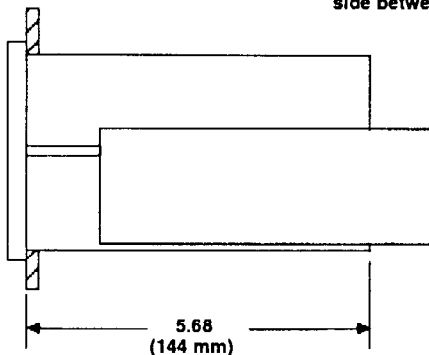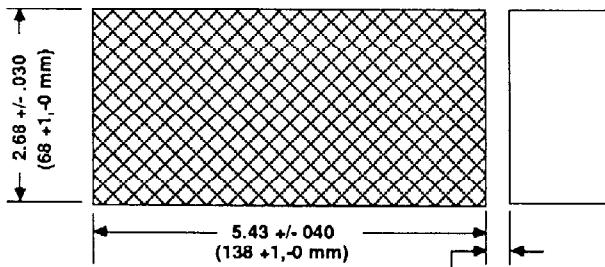
Conveyor Loading
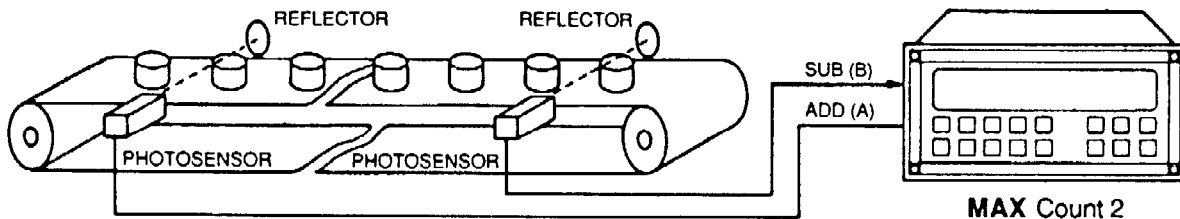
Length Control with Batching
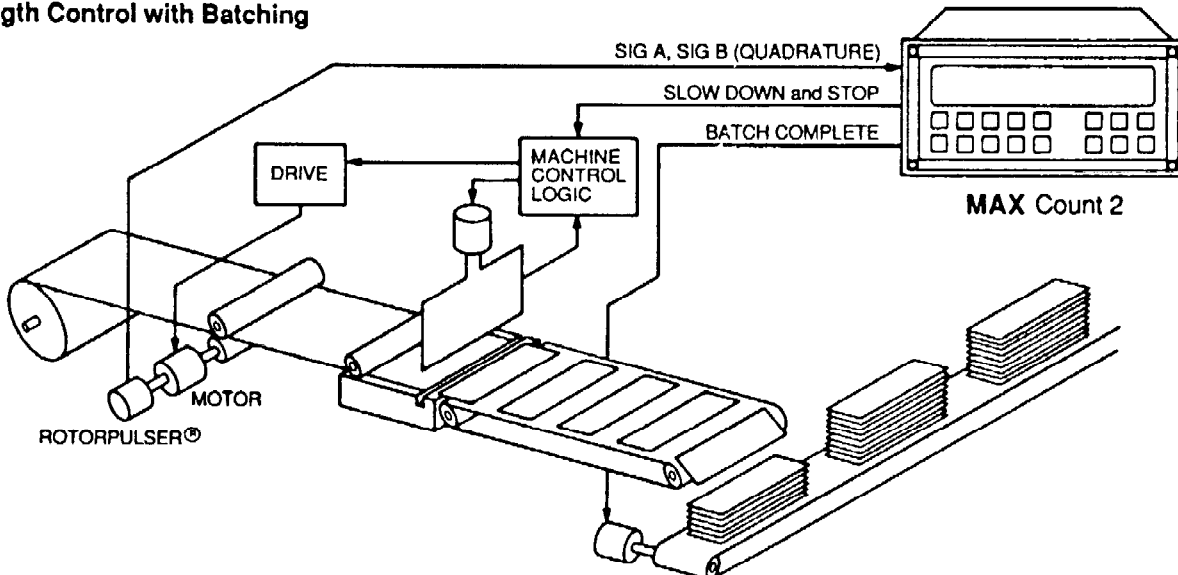
NOTES:
1. Installations must be made in accordance with DYNAPAR manual 845 – 130.
2. For application which require multiple products operating in parallel, see 845 – 130.
3. When replacing older products, consult 845 – 130 for information regarding circuitry changes.

25 26 27 28 29 30 31 32 33 34 35 36   37 38 39 40 41 42 43 44 45 46

SERIAL DATA | SIGNAL INPUTS | CONTROL INPUTS | CONTROL OUTPUTS | POWER

RXD– RXD+ TXD– TXD+   +12V   COM   COM   HOT NEU BLD GND

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

A. PANEL MOUNTING

Make panel cutout. Affix adhesive gasket (if required) to panel. Remove panel straps and slide unit thru cutout. Slide panel straps into enclosure guides. Thread 5/8" long hex washer head screws into guides using a 3/16" hex driver and tighten securely.

2.68 +/-.030 (68 +1,-0 mm)

5.43 +/- 040 (138 +1,-0 mm)

allow 0.32" (8mm) each side between cutouts

5.68 (144 mm)

B. INPUT POWER

AC POWER (for MC2-00-S-00 only)

Connect AC power to the unit. Select 115 or 230 VAC with a slotted screwdriver through the cutout. Connect terminal #24 to BUILDING GROUND!

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

115/230 VAC, 50/60Hz, 20VA

HOT NEU BLD GND
22 23 24
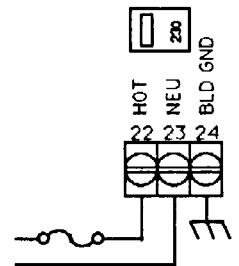
DC POWER (for MC2-00-D-00 only)

Connect +12 VDC to terminal 22 (HOT) and 12 volt ground to terminal 23 (NEU). Connect terminal #24 to BUILDING GROUND!

HOT NEU BLD GND
22 23 24

+12VDC

INSTALLATION...
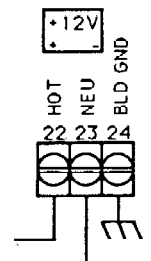
C. CONTROL INPUTS

STOP / HOLD (TERM 9)

Level Sensitive
20 Hz Response
4.7 kΩ to +12 VDC
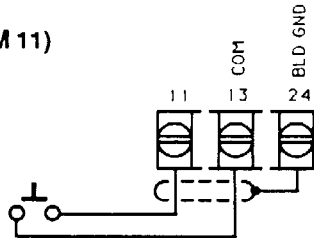(Shows '1' during input
diagnostic test.)
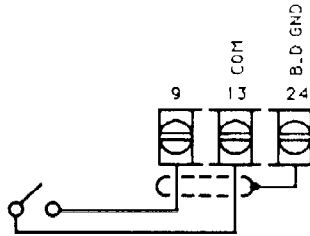
OUTPUT CONTROL (TERM 10)

Edge Sensitive
20 Hz Response
4.7 kΩ to +12 VDC
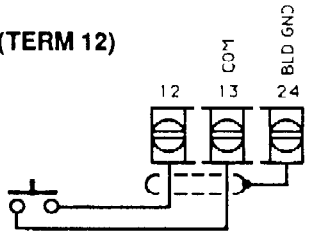(Shows '2' during input
diagnostic test.)
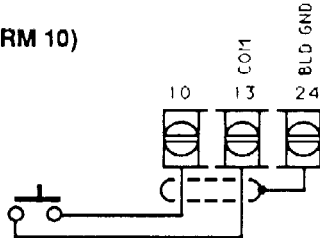
COUNTER RESET (TERM 11)

Edge Sensitive
20 Hz Response
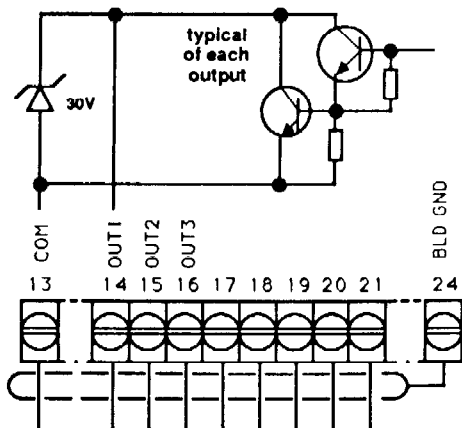4.7 kΩ to +12 VDC
(Shows '3' during input
diagnostic test.)

BATCH / TOTAL RESET (TERM 12)

Selected on Line 25
Edge Sensitive
20 Hz Response
4.7 kΩ to +12 VDC
(Shows '4' during input
diagnostic test.)

D. CONTROL OUTPUTS

typical
of each
output

30V

COM OUT1 OUT2 OUT3 BLD GND
13   14 15 16 17 18 19 20 21 24

100 ma. sink @ 24 VDC

E. COUNTER INPUTS

BIDIRECTIONAL ENCODERS
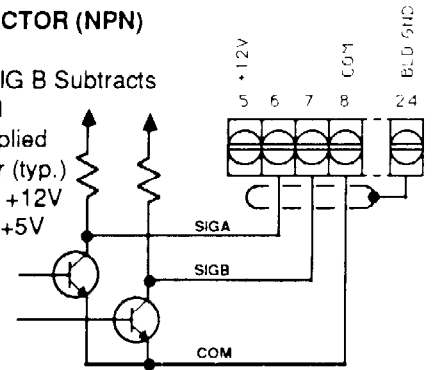(Type 42, 62 Rotopulser®)

SIG A leads SIG B by 90°
1.0 kΩ to COM

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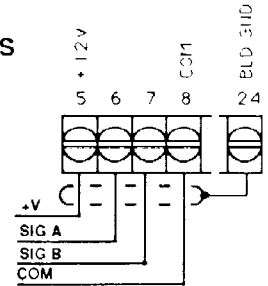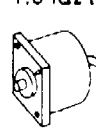
UNIDIRECTIONAL ENCODERS
(Type 53 Pickup, 76 Roto®)
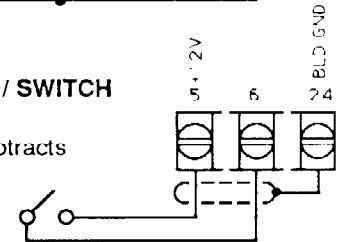
SIG A Adds; SIG B Subtracts
1.0 kΩ to COM

+V
SIG A
COM
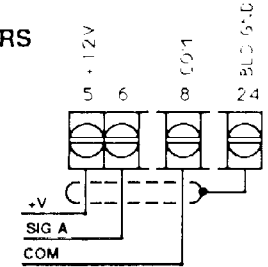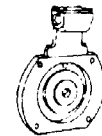
OPEN COLLECTOR (NPN)

SIG A Adds; SIG B Subtracts
1.0 kΩ to COM
Customer Supplied
Pullup Resistor (typ.)
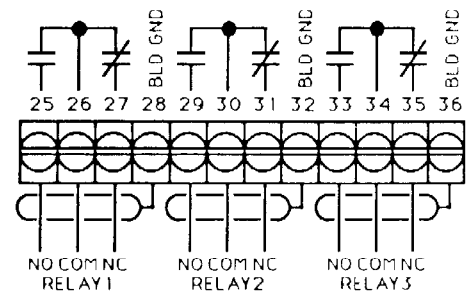2.2 kΩ max. to +12V
470 Ω max. to +5V

SIG A
SIG B
COM

CONTACT CLOSURE / SWITCH

SIG A Adds; SIG B Subtracts
1.0 kΩ to COM

F. RELAY OUTPUTS

25 26 27 28 29 30 31 32 33 34 35 36

NO COM NC   NO COM NC   NO COM NC
RELAY 1   RELAY 2   RELAY 3

GENERAL WIRING RULES:
1. Use only Shielded cables for all signal wiring.
2. Separate signal and load switching wiring.
3. Supply AC power through a separately fused circuit.

OVERVIEW

The **MAX** Count 2 is equipped with an RS-422A/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 and the ASCII data format 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 2 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

**SINGLE UNIT WIRING**
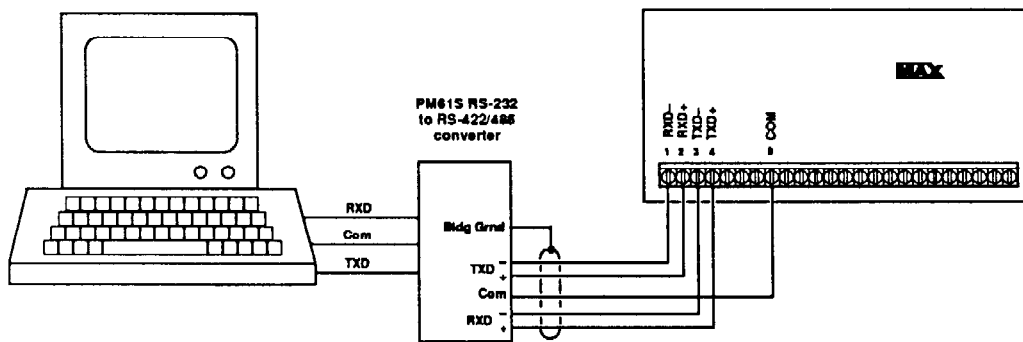
MULTIPLE UNIT WIRING
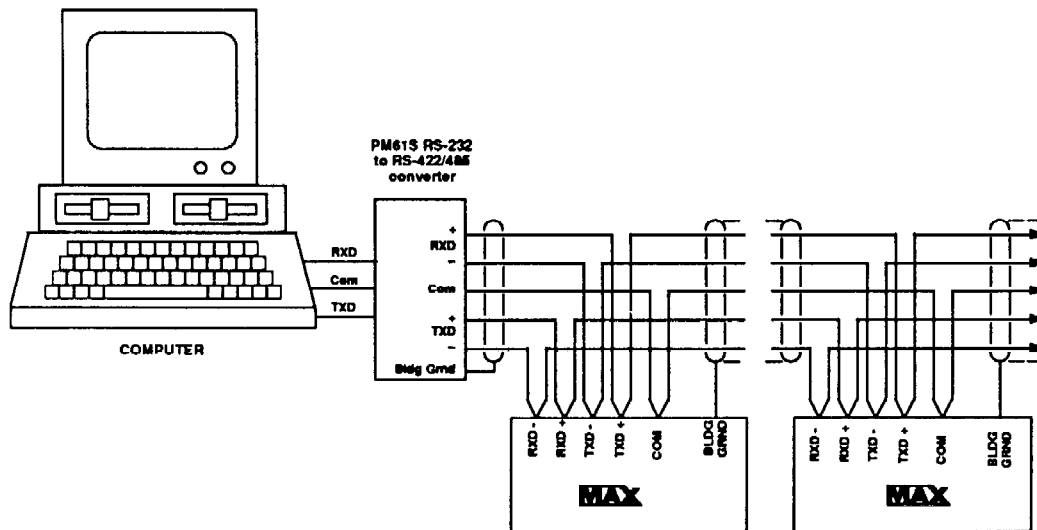
TERMINATION

The RS-422A/485 receivers require 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 a RS-422/485 device other than a MAX or PM61, the receiver should be terminated as shown.
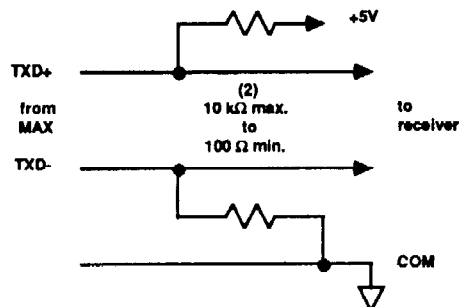
CABLE SELECTION

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 GROUND at the **MAX** end of the cable.

RECOMMENDED CABLE TYPES: Belden #9503
                                      Alpha #5493

SINGLE UNIT OPERATION

The operator can monitor the control locally via the front panel keyboard and display. The serial interface extends these monitoring activities to a remote location. The connection of a remote display terminal is straightforward. The baud rate and parity for both devices must be the same. The ID number should be set to '0' (line 37 in the program table).

When power is applied to the **MAX** control, it will start a continuous serial transmission of the Count, Batch or Total:

MAX	R:	Co.	123.456
MAX	R:	Cb.	1234
MAX	R:	Ct.	31.234

where 'R' is the RUN mode prompt.

The DOWN cursor ('D' character) is used to scroll down through the eight RUN mode lines. For example:

terminal 'D'	**MAX**	R:	Sc.	123.456
terminal 'D'	**MAX**	R:	P1.	100.012
terminal 'D'	**MAX**	R:	P2.	654.321

Similarly, the UP cursor ('U' character), is used to scroll up. For example:

terminal 'U'	**MAX**	R:	Pb.	1500
terminal 'U'	**MAX**	R:	P3.	200.000
terminal 'U'	**MAX**	R:	P2.	654.321

In the RUN mode the UP and DOWN cursors cause new lines to be transmitted.

We have seen how the **MAX** control works for remote viewing; we will now see how programming may be done from a remote location.

You may program only one **MAX** control at a time. If the unit is in program mode via the front panel keyboard then it will not respond to the serial input. To enter the PROGRAM mode you must first send the RUN/PGM ('P') character. The control will "answer" by transmitting the LOCK entry line as shown in the facing column.

terminal: 'P'	**MAX**	R:	LOC.	0

The control remains active (in the RUN mode) until the proper lock combination is entered. Each numeric entry is entered from right to left "calculator style". The character sequence 2-6-6-6 would produce the following display on the terminal.

terminal: '2'	**MAX**	R:	LOC.	2
terminal: '6'	**MAX**	R:	LOC.	26
terminal: '6'	**MAX**	R:	LOC.	266
terminal: '6'	**MAX**	R:	LOC.	2666

When this combination is correctly entered with a down cursor ('D' character), the control exits the RUN mode and enters the PROGRAM mode and returns with the following.

terminal: 'D'	**MAX**	P:	Co	123.456

Note that the PROGRAM ('P') prompt is now shown. You are at the top of the PROGRAM table (line 9) as shown on page 7. Once the PROGRAM mode has been entered it is possible to program any line in the table. Refer to the COMMAND CHARACTER table for the keyboard equivalent serial characters. A programming example is shown below.

terminal: 'C'	**MAX**	P:	P1.	.000
terminal: '4'	**MAX**	P:	P1.	.004
terminal: '5'	**MAX**	P:	P1.	.045
terminal: '6'	**MAX**	P:	P1.	.456
terminal: '7'	**MAX**	P:	P1.	4.567
terminal: '8'	**MAX**	P:	P1.	45.678
terminal: '9'	**MAX**	P:	P1.	456.789

The first serial entry ('C') clears the data field for the current line. As can be seen in the COMMAND CHARACTER table, this character mimics the RST/CLR key. Numeric data entry is self explanatory.

By using the COMMAND CHARACTERS, all of the lines in the PROGRAM table may be similarly programmed. The **MAX** control is returned to the RUN mode by sending another RUN/PGM ('P') command.

MULTIPLE UNIT OPERATION

For multiple unit systems (up to 32 units) a special addressing scheme is implemented in order that no conflicts arise on the serial bus. Each unit is given a unique serial address (ID number entered on line 37). Such a system application is shown on page 12. All units are programmed with the same baud rate and parity. It is advised that the initial ID number programming be done before the units are bussed together.

To control one **MAX** Count 2 in a bus oriented system the host must first address it by sending an ADDRESS COMMAND SEQUENCE. This is shown below.

host: (ESC) A nn   (where **nn** is unit number 1 to 99)

This escape code sequence will suspend the transmission from all units including the one that is addressed. The addressed unit will respond to all subsequent commands while the other units just "listen" on their receive input and turn their transmit output off.

To receive data from an addressed unit the host sends it a command to resume transmission using the RESUME control character, (CTRL Q).

If you wish to suspend data transmission you may do so by using the SUSPEND control character, (CTRL S).

In some cases the host may want to send many commands to a **MAX** control without waiting for responses. This may be done by first suspending transmission (CTRL S) then by requesting a single UPDATE.

host: (ESC) U

SETUP MODE OPERATION

The SETUP mode may be entered directly from the RUN mode by cursoring to the desired SETUP line (4 – 8) using the 'D' command character then sending the 'L' command character which mimics the KEY keyboard key. This action will place the control in the SETUP mode allowing the user to change the data in lines 3 through 8 in the program table. Serial entry into the SETUP mode has the same operational requirements and restrictions as if it were entered via the front panel keyboard. Refer to page 9 for a complete operational description.

Preset setpoints are changed using the numeric, RST/CLR and DOWN cursor keys. The SETUP mode is exited by sending another 'L' command character at which time the controls reverts back to the RUN mode.

REMOTE OPERATION

Some of the unit's CONTROL inputs are effectively duplicated by serial commands, so it is possible to implement a single or multiple unit system with remote capability. Such a system can be used for multiple machine, multiple axis or multiple section applications. Keep in mind the addressing requirements for multiple unit systems previously discussed.

Two types of commands are available, LOCAL and GLOBAL. LOCAL commands affect only the unit that is currently addressed. GLOBAL commands on the other hand affect all units regardless of address. In this way it is possible to command many units to begin control at the same point in time. The table below lists the LOCAL and GLOBAL commands that are supported.

LOCAL and GLOBAL COMMANDS			
Control Command	LOCAL	GLOBAL	Comments
OUTPUT CONTROL	(ESC) LO	(ESC) GO	Simulates Output Control input
BATCH RESET	(ESC) LB	(ESC) GB	Resets Batch to zero
COUNTER RESET	(ESC) LR	(ESC) GR	Reset Counter to zero
TOTAL RESET	(ESC) LT	(ESC) GT	Reset Totalizer to zero

PRINTER INTERFACE (ID = 99)

MAX Count 2 provides a special serial ID number (99) for interfacing directly with 20 column or wider printers. In this mode of operation the Count, Batch Count, and Total Count displays may be printed on demand. The print output is initiated by a contact closure between pins 2 and 8 on the terminal strip. This contact closure is accepted only if its closure time is greater than 60ms. The user's printer must be capable of buffering at least three (3) lines of characters (60 ASCII characters). Match the baud rate (line 35) and the parity bit (line 36) of the control to the printer being used. Program the serial id number (line 37) to '99'. The print format will be as follows:
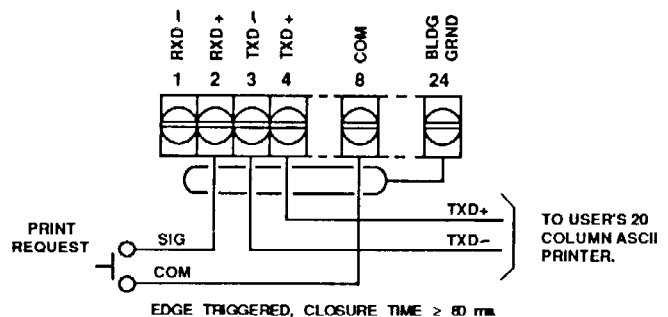
R: Co. 1 2 3 . 4 5 6
R: Cb.   5 0 0 †
R: Ct. 7 6 5 . 4 3 2 †
(where 'R' is the RUN mode prompt)
† these lines are displayed only if the Batch Counter and the Totalizer are turned 'ON' (lines 18 and 19 respectively).


EDGE TRIGGERED, CLOSURE TIME ≥ 60 ms

FORMATS and PROTOCOL

CHARACTER FORMAT

The serial interface sends and receives information by characters consisting of 10 bits. The RS-422A/485 interface requires a 0.2V minimum differential across + and – terminals. A logic high (mark) is a positive differential and a logic low (space) is a negative differential. (NOTE: Connection to EIA-422/485 equipment that uses the opposite polarity requires swapping the + and – connections at the other equipment.)

The character format is as follows:
- Start bit ("low" logic level)
- ASCII data (7 bits), least to most significant
- Parity bit (programmable)
- Stop bit ("high" logic level)

```
HIGH ─┐   ┌──┬──┬──┬──┬──┬──┬──┬──┬──┐
      │ S │D0│D1│D2│D3│D4│D5│D6│ P │ S
LOW  ─┴───┴──┴──┴──┴──┴──┴──┴──┴───┘
```
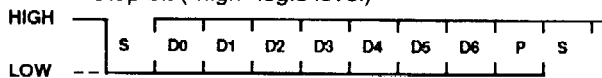
PARITY BIT (see note at bottom of column.)

The parity bit is programmable as "Odd", "Even", or "No" parity. Odd and Even parity force the total number of data bits to be even or odd for data that is transmitted by the **MAX** control. Incoming parity is always compared to the calculated parity. Characters with parity errors are discarded. If No parity is selected incoming parity is ignored. Characters are transmitted with Odd or Even parity as selected on line 23 of the program table. If No parity is selected then "high" bit is added as an extra Stop bit.

**BAUD RATE** (see note at bottom of column.)

Select the baud rate to match the device communicating with the control. You may select: 300, 600, 1200 or 2400 baud on line 22 of the program table. Baud rate is common to both transmitter and receiver.

LINE FORMAT

The **MAX** control transmits only complete lines. The driver is turned off when not transmitting causing the bus to enter a "float" state. Ignore data on the bus during this "float" time. Unless otherwise commanded, the **MAX** control continuously transmits the Count Value. The line format is as follows:
- a carriage return at the beginning of a line.
- a prefix indicating RUN, SETUP or PROGRAM
- a unique line mnemonic
- a five digit data field with decimal point
- a carriage return at the end of the line
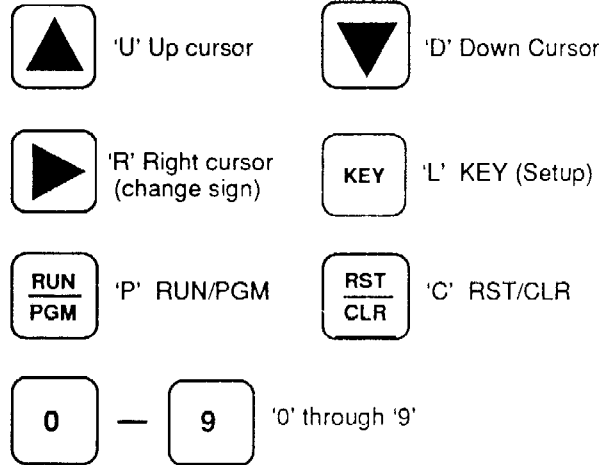a total of 23 characters maximum for any single line.

(cr)	R	:	(sp)	C	0	.	1	2	3	.	4	5	6	(sp)	(sp)	(cr)
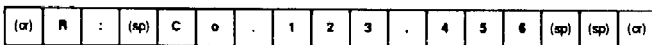
NOTE:
To make changes in Parity or Baud Rate power must first be removed then reapplied after program changes to either are made. Both Parity and Baud Rate are initialized when the control "powers up".

COMMAND CHARACTERS

Command Characters mimic the operation of the front panel keyboard. Below is a list of the serial equivalents of the front panel keys.

▲ 'U' Up cursor   ▼ 'D' Down Cursor

▶ 'R' Right cursor (change sign)   KEY 'L' KEY (Setup)

RUN/PGM 'P' RUN/PGM   RST/CLR 'C' RST/CLR

0 — 9 '0' through '9'

CONTROL CHARACTERS

Two control characters are used to start and stop the transmission from the **MAX** control. They are shown below:

(CTRL) S Suspends transmission following the completion of a line being sent. The driver will then be turned Off.

(CTRL) Q Resumes transmission from a unit that had been turned Off. The RUN mode line currently selected will be continuously updated.

ESCAPE CODE SEQUENCES

Escape code sequences are a group of special commands used for bus oriented systems. Every **MAX** control recognizes these commands. The two listed below are in addition to those listed in the table of LOCAL and GLOBAL commands on page 14.

(ESC) A nn The Address command is used to select a single control within a system. Only that unit whose serial I.D. number matches the two digit serial address (nn) will be selected. Only that unit will respond to subsequent serial commands. All units, even the addressed one, suspend transmission.

(ESC) U The Update command instructs the currently addressed unit to transmit a single line only.
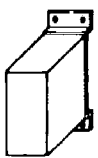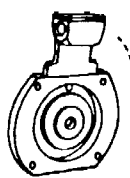
PROTOCOL

The **MAX** will "buffer" up to 16 Command and Control Characters (but not Escape Code Sequences), listed above, sent in "burst mode".

Those characters are read, in order, every 20 msec. The protocol should be careful not to overflow the receive buffer. Additionally, Escape Code Sequences should not be sent until the buffer has emptied and all characters have been processed.
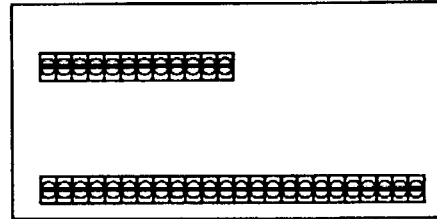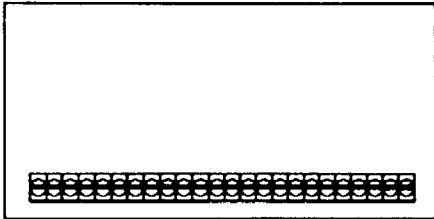
MC2-00-S-00: A-B & A+B In; S.S. Out; 115/230 VAC
MC2-00-D-00: A-B & A+B Inp; S.S. Out; 12 VDC
MC2-10-S-00: A-B, A+B, & Quad In; S.S. Out; 115/230 VAC
MC2-10-D-00: A-B, A+B, & Quad In; S.S. Out; 12 VDC

MC2-01-S-00: A-B & A+B In; S.S. & Relays; 115/230 VAC
MC2-01-D-00: A-B & A+B Inp; S.S. & Relays; 12 VDC
MC2-11-S-00: A-B, A+B, & Quad In; S.S. & Relays; 115/230 VAC
MC2-11-D-00: A-B, A+B, & Quad In; S.S. & Relays; 12 VDC

PANA MOUNT ACCESSORIES

A   B

MODEL	DESCRIPTION	PKG
PM21	Dual Differential Line Receiver	A
PM25	Dual Magnetic to Open Collector Converter	B
PM26	Dual High Voltage Opto-Isolator to Open Collector Converter (for AC Tach inputs)	B
PM61	RS232 to RS-422A/485 Converter	A

TRANSDUCERS

Types 42, 625, 525, 523 Rotos

Type 53Z Pickup

Type 60, 60P Roto

Type 76Z, 77Z Rotos

WARRANTY

Standard products manufactured by the Company are warranted to be free from defects in 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 Dynapar 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 problem
2. Name of responsible person
3. Purchase order number
4. Return shipping instructions