MODEL 5882-0400 and MODEL 5882-1400
SINGLE PRESET 5 DIGIT ELECTRONIC CONTROL

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Printed in U.S.A.
The Durant Model 5882 is a versatile, five-digit, single preset, bi-directional count control with both relay and transistor outputs. The control functions either as a "Reset to Preset" control with outputs occurring when the count reaches zero or as a "Reset to Zero" control with outputs occurring when the count is equal to the preset number.

The 5882-1400 Model also features the ability to scale incoming counts. This means that for each pulse received on the count inputs, a fraction or multiple of that pulse is indicated on the display. Scaling is useful to make conversions between different units of measure (inches to centimeters, for example) or to totalize parts produced from multiple part manufacturing processes (such as six parts produced for each operation of a press).

The scale factor can be a number from 0.0001 to 9.9999. This number becomes a factor by which incoming count pulses are multiplied. The result of the multiplication is shown on the front panel display.

A non-volatile memory insures that the setup instructions will not be lost if power is interrupted. Count values will also be retained if a power loss interrupts a process or machine cycle.

Model 58825-400 includes a 1/tau ratemeter function. The word "Rate" is added above the "4" button. Pressing this button toggles the display between count and rate. All count and control functions continue while viewing the rate value. All other features are the same as the 58821-400 model. See page 55 for a full description of the rate feature.

The front panel of the control, Figure 1, is framed by a bezel that seals the panel to the mounting surface. A large, five-digit high visibility red LED display with a programmable decimal point position is located in the upper left portion of the panel. The keyboard has a polycarbonate Lexan front face and consists of ten data keys (0 through 9), "COUNT" key, "RESET" key, "FUNCTION" key and "ENTER" key. The "1" data key also serves as the "PRESET" key. The upper right portion of the front panel contains two yellow LED indicators for Count and Preset operation.

The rear panel, Figure 2, contains screw terminals for use with stripped wire, either solid or stranded from 28 to 14 gauge. The rear panel also contains a plug-in type replaceable relay with two "form-C" contacts.

![Figure 1. 5882 Single Preset 5-Digit Electronic Control](image-url)
The counter provides two-way serial communication with remote devices using standard ASCII code and three selectable Baud rates. Count and preset data can be sent and preset data and print request commands can be received by the control via two 20-milliamper current loops. On Model 5882-1400 the Scale Factor may also be transmitted and received. Optional accessories are available to convert the communication loop to RS232, parallel BCD and multiplexed BCD formats.

The relay and transistor outputs can be timed from 0.01 to 99.99 seconds inclusive, latched until reset complete, unlatched at reset or remain latched until an unlatched input occurs. Outputs can also be operated in the Reverse mode.

The count input circuit provides the user with several options:

1. Separate add and subtract inputs.
2. Count input with up/down control input.
3. Quadrature input.
4. Count doubling in any of the three above configurations.
5. Count up input with count inhibit input.
6. High or low speed operation. Low speed operation provides maximum immunity to contact bounce and noise.

The control is equipped with self-diagnostics which test the internal memories for faults. Should a fault be detected, an indication is given on the display. Displays and indicators are turned on in a patterned sequence for visual examination.
SPECIFICATIONS

POWER REQUIREMENTS:
AC Operation:
115/230 VAC (+10%, -20%) 47-63 Hz

DC Operation:
11-28 VDC

Power:
18 watts

DC POWER OUTPUT:
15 VDC (+1, -2).
150 mA if powered from AC or less than 24 VDC
100 mA if powered from 24 VDC or greater

NOTE: DC power output is only regulated if unit is powered by AC or greater than 18.5 VDC.

ENVIRONMENT:
Operating Temperature:
32 to 130° F (0 to 55° C)

Storage Temperature:
-40 to 160° F (-40 to 70° C)

Operating Humidity:
85% non-condensing relative

PHYSICAL:
Case Dimensions:
5.28" W x 2.62" H x 5.91" D
(136.7mm W x 66.5mm H x 150.1mm D)

Bezel Dimensions:
5.80" W x 3.04" H x 0.17" D
(147.3mm W x 77.2mm H x 4.3mm D)

LIP:
0.2 (6mm)

Panel Cut-out Dimensions:
5.43" W x 2.68" H
(138mm W x 68mm H, DIN)

Mounting Panel Thickness:
0.58" (14.7mm) maximum
(without optional spacer provided)
0.077" (1.96mm) maximum
(with optional spacer provided)

Front panel will provide watertight seal with gasket provided.

Case Material:
Cadon FRX plastic case with Lexan front face overlay

Weight:
2.2 lbs. (1.0 Kg)

Display Size:
5 digits, 0.56" (14.2mm) H
(with programmable decimal point location)

Memory Types:
PROM, RAM, Non-volatile NVRAM

Power Output:
15 VDC, (+1, -2), 100 milliamps
(Output power is available only when the control is powered by AC line.)

COUNTER:
Count Range:
5 digits (0 to 99,999) with rollover

Preset Range:
5 digits (0 to 99,999)

Count Modes:
Count with Add and Subtract inputs
Count with Up/Down direction input
(Hardware doubling for above modes is provided.)
Count with Count Inhibit input
Quadrature
Doubled Quadrature

Count Speed (Model 5882-0400)
0 to 10,000 counts per second (CPS) with Durant Shaft Encoders or solid state sensors with internal pull-up resistor.
0 to 7,500 CPS minimum for sensors with open collector transistor output.
0 to 5,000 CPS when hardware doubling is implemented
0 to 150 CPS when Low Frequency jumpers are installed.

Count Speeds for Model 5882-1400 are shown in Figure 20.
SPECIFICATIONS

COUNT INPUT RATINGS:
The count inputs are designed to work with current sinking sensors (open-collector NPN transistor output with or without passive pull-up resistor) or contact closures to DC Common.

Input Voltage:
High state (Logical "1", sensor off or contact open):
- 10.5 to 24.5 VDC when control is powered by AC line
- 7.0 to 24.5 VDC when control is powered by 11 VDC
- 11.0 to 24.5 VDC when control is powered by 16 VDC

Low state (Logical "0", sensor on or contact closed):
- 0 to 4.5 VDC when control is powered by AC line
- 0 to 3.0 VDC when control is powered by DC supply

Input Impedance:
- 6800 ohms to 15 VDC when control is powered by AC line
- 6800 ohms to 10 VDC when control is powered by DC supply

Input Current:
- 20 mA peak, 3 mA steady state

Input Response:
High State (Logical "1", sensor off or contact open):
- 110μsec minimum at 15 VDC (6,800 ohms to +DC)
- 160μsec minimum at 13.5 VDC (50,000 ohms to +DC)

High Speed (Low Speed jumpers not connected):
- 5.5 msec minimum at 15 VDC (6,800 ohms to +DC)
- 7.5 msec minimum at 13.5 VDC (50,000 ohms to +DC)

Low State (Logical "0", sensor on or contact closed):
High Speed (Low Speed jumpers not connected):
- 20 μsec minimum at 0.1 VDC (0 ohms to DC Common)
- 45 μsec minimum at 1.5 VDC (500 ohms to DC Common)

Low State (Logical "0", sensor on or contact closed):
Low Speed (Low Speed jumpers connected):
- 1.0 msec minimum at 0.1 VDC (0 ohms to DC Common)
- 2.0 msec minimum at 1.5 VDC (500 ohms to DC Common)

CONTROL INPUTS:
Impedance:
- 4.75K ohms to +5 VDC.

Threshold:
- High +3.5 to +22 VDC.
- Low +0.0 to +1.0 VDC.

Response Time:
- Min. High 5.3 mS.
- Min. Low 3.9 mS.

NOTE: The reset and un latch signals will both occur in less than 200 microseconds after the input signal is detected. The start of the print will occur within 2 milliseconds after the input is detected if the unit is not counting.

OUTPUT RATINGS:

Relay Contacts
Type: Form C (SPDT)
U.L./C.S.A. Contact Ratings:
- 10 amps, resistive, @ 24 VDC or 230 VAC
- 1/3 HP @ 115 VAC or 230 VAC
- 150 VDC maximum switched voltage
Mechanical Life: 5,000,000 operations
Electrical Life: 100,000 operations at resistive rating

Transistor Outputs
Type: Open collector NPN transistor with
- Zener diode transient surge protection.
- Load Voltage: 30 VDC maximum
- Load Current: 300 milliamps maximum per transistor. 480 milliamps total for all transistors.

Rev. 50-59:
- Use 90 milliamps per relay coil when calculating total transistor current.

Rev. 60-up:
- Use 5 milliamps per relay coil when calculating total transistor current.
SPECIFICATIONS

TIMEOUT:
Duration: 0.01 to 99.99 seconds
Accuracy: ±0.01 second for timeout values below 1 second
±1 for time values above 1 second

OUTPUT OPERATING MODES:
Turn On:
At preset value (Reset mode)
At zero (Preset mode)

Turn Off:
After timeout
At unlatch input signal
When reset energized (Unlatch At Reset)
When reset deenergized (Latch Until Reset Complete)

Reverse:
Reversed operation of relay and transistor

COUNTER OPERATING MODES:
Reset:
Reset to zero and count to preset

Preset:
Reset to preset and count to zero

Auto Recycle
Maintained Reset
Momentary Reset

DIAGNOSTIC MODES:
ROM Checksum
RAM Bit Test

NVRAM Read/Write Test
NVRAM Store Test
NVRAM Checksum
Watchdog Timer
Display and LED Indicator Test

COMMUNICATIONS:
Interface Type:
Dual port 20 milliamp current loop

Speed:
110, 300 and 1200 Baud, user selectable

Data Type:
Standard ASCII code

Format:
Start bit, 7 ASCII data bits, Parity bit, one or two Stop bits
(Parity for Serial Data Output, no parity for Serial Data Input)

Information Transmitted:
Count value
Preset value
Scale Factor (Model 5882-1400 only)

Information Received:
Print request
Preset value
Scale Factor (Model 5882-1400 only)

SCALE FACTOR (MODEL 5882-1400 ONLY):
Range:
5 digits (0.0001 to 9.9999)
DESCRIPTION OF OPERATING MODES

COUNT MODES
The control has five count modes, which are: Count with separate add and subtract inputs, Count with direction control input, Count up with inhibit control input, Quadrature, and Doubled Quadrature.

Add and Subtract Inputs
The add and subtract mode allows separate signals to simultaneously add and subtract counts. It can be used to indicate material stretch, subtract defective parts from total parts produced, etc.

Count With Directional Control
Count with direction control modes uses one input for incoming count pulses and the other to inform the control whether the pulses should be used to add or subtract counts. Count with direction may be used when an item must be measured or positioned. Many types of sensors or control systems utilize count signals of this nature.

In both of the above count modes, the counter will normally increment or decrement on the falling edge of the incoming count pulses. (The falling edge is defined as the moment in time when the pulse changes state from +DC to DC Common potential.) Doubling allows the counter to increment or decrement on both the falling and the rising edges of the pulse. (The rising edge is defined as the moment when the pulse changes state from DC Common to +DC potential.)

Count With Inhibit Control
The count up with inhibit control mode provides an input which increments the control and an input which causes incoming count pulses to be ignored. This mode can be used when defective material must be ignored or when inspection samples are taken without incrementing the counter. The count up with inhibit control mode may not be doubled.

Quadrature Inputs
Quadrature counting makes use of two count signals which are phase shifted by 90 degrees. The detection of which signal is rising first allows the counter to know in what direction the shaft is turning. When Quadrature count sources are being used, the Double Input must always be connected to DC Common to allow the quadrature signals to be decoded.

Quadrature Input Doubled
Doubled Quadrature is implemented by programming. This mode allows the counter to count on both the rising and falling edges of the incoming count pulses. The number of pulses per revolution of the shaft encoder is effectively doubled, increasing the resolution without any loss of accuracy.

COUNT SCALING
When the 5882-1400 receives a count pulse in any count mode, the 1 pulse is multiplied by the Scale Factor. The 5882-1400 adds the scaled value to the result for count-up pulses and subtracts the scaled value from the result for count-down pulses. The display shows the accumulated total in whole increments.

DECIMAL POINT LOCATION
The location of the decimal point on the display is programmed and may be located between any two digits on the display, or omitted. When a printer is connected to the serial communication output, the decimal point is printed.

The decimal point remains on the display whenever the actual value of the counter or the preset value is being displayed. It is not lit when function codes or other function entries are being displayed. The timeout function automatically displays the decimal point to indicate 0.01 second increments.

COUNTER OPERATING MODES
Reset Mode vs. Preset Mode
Reset mode is used when the counter should start at zero and count up to a preset value. Reset mode implies that when the "RESET" key is pressed or the Reset input is energized, the counter is reset to zero. In most cases when the Reset mode is programmed, the counter is initialized to zero before the process being controlled is started. When the control is in the Reset mode, the transistor and relay output turn on when the counter reaches the preset value (assuming Normal Output mode of operation).

Preset mode is used when the control should start at a preset value and count down to zero. Preset mode implies that when the "RESET" key is pressed or the Reset input is energized, the control is reset to preset; that is, forced to have a value equal to the preset value. In most cases when the Preset mode
DESCRIPTION OF OPERATING MODES

is programmed, the counter is initialized to the preset value before the process is started. When the control is in the Preset mode, the transistor output and relay turn on when the counter reaches zero (assuming Normal Output mode operation).

**Automatic Recycle Operation**

It may be desirable to have the control automatically reset itself for repeated cycles. Programming the Auto Recycle mode causes the control to automatically reset at the end of a cycle. When in the Reset mode and the control reaches coincidence with the preset value, the transistor output and relay turn on and the counter is automatically reset to zero.

When in the Preset mode and the control reaches zero, the transistor output and relay turn on and the counter is automatically reset to the preset value.

**OUTPUT AND RELAY OPERATION**

The relay and transistor output of the control are operated in parallel. Whenever the transistor output is on, the relay is on. When the counter is in the Reset mode and the actual value of the counter reaches the preset value, the transistor output turns on (conducting to DC Common) and the relay energizes. When the counter is in the Preset mode and the actual value of the counter reaches zero, the transistor output turns on and the relay energizes.

Several of the user programmed functions affect the operation of the transistor output and relay. Figure 3 provides a table showing the various functions and their effects on the transistor output and relay. The functions shown are:

- Output and Relay Status Operation (NORMAL/REVERSE)
- Latch Until Reset Complete (LURC)
- Unlatch At Reset (UAR)
- Reset or Preset mode select (RESET/PRESET)

Note that if the transistor output and relay are already off when the event specified occurs and the table indicates that they should be turned off, they remain off. Likewise, if they are on and the table shows that they should turn on, they remain on.

![WARNING]

A POWER OUTAGE CAUSES THE OUTPUT AND RELAY TO TURN OFF REGARDLESS OF THE OPERATING MODE SELECTED. BE SURE THAT THIS EFFECT IS NOT HAZARDOUS TO THE OPERATOR.

**FUNCTIONAL OPTIONS SELECTED**

<table>
<thead>
<tr>
<th>EVENT</th>
<th>RESET MODE</th>
<th></th>
<th>PRESET MODE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NORMAL OUTPUTS</td>
<td>REVERSE OUTPUTS</td>
<td>NORMAL OUTPUTS</td>
<td>REVERSE OUTPUTS</td>
</tr>
<tr>
<td></td>
<td>NORMAL</td>
<td>LURC</td>
<td>UAR</td>
<td>NORMAL</td>
</tr>
<tr>
<td>Counter reaches a Preset value</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Counter reaches zero</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>&quot;RESET&quot; key pressed or Reset input energized</td>
<td>--</td>
<td>OFF</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>&quot;RESET&quot; key released or Reset input deenergized</td>
<td>--</td>
<td>OFF</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Unlatch input energized</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Timeout function (if used) times out</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

"ON" indicates that the Transistor output and relay turn on
"OFF" indicates that the Transistor output and relay turn off
"--" indicates that there is no change

Figure 3. Output and Relay Operation Table
DESCRIPTION OF OPERATING MODES

Once the transistor output and relay are energized, they remain on until unlatched by energizing the Output Unlatch input.

The Timeout function allows the transistor output and relay to remain on for a time period which is user adjustable. The range of time allowable is from 0.01 to 99.99 seconds. At the end of the time duration specified, the transistor output and relay automatically turn off. As the table in Figure 3 shows, this operation is reversed if the Reverse Operation of the transistor output and relay has been programmed. A value of 0.00 causes the Timeout function to be inhibited. In this case the transistor output and relay remain on until the Unlatch input is energized.

The “RESET” key or the Reset input may also be used to turn the transistor output and relay off if the Latch Until Reset Complete function or the Unlatch At Reset function has also been programmed. Unlatch at Reset turns them off when the “RESET” key is pressed or the Reset input is energized. Latch Until Reset Complete turns them off when the “RESET” key is released or the Reset input is deenergized.

If either the Unlatch At Reset or Latch Until Reset Complete mode is selected, the “RESET” key or input, the Unlatch input, or the Timeout function will unlatch the relay and transistor output. In this case the relay and transistor are unlatched by whichever occurs first.

RATE MODE (Model 58825-400 only)
See Page 55.
GENERAL
When mounting, the location selected must provide for adequate air circulation space around the unit. Avoid locating the unit near instruments and/or equipment that generate excessive heat. Figure 4 shows recommended cutout and product dimensions as well as mounting details.

GENERAL WIRING PRACTICES
1. Disconnect all power before wiring terminals. A safety hazard exists if this precaution is not observed. Treat all control and count inputs as hazardous since they may carry line voltage.

Figure 4. Panel Mounting Dimensions
2. Use shielded cables for count signals, control input and communications signals. Connect shield to common (terminal 2, 3, or 4) of counter to terminate properly.

3. Keep all signal lines as short as possible.

4. Do NOT bundle or route signal lines with power or machine control wiring. Use separate conduit for power and signal wires.

5. Provide “clean” power to the counter. In severe cases, power may have to be filtered or a separate power source used. Do not use the same power source that is supplying the loads.

6. Use 18 ga. minimum (1mm², 600V) and 14 ga. maximum (2.1mm², 600V) wire for AC power wiring.

7. See Figure 8 for the correct fuse to be used in the power input wiring.

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**TERMINAL IDENTIFICATION**

NOTE: Terminals not listed are unidentified and must remain unconnected.

1 - 
2 - OUTPUT UNLATCH
3 - 
4 - 
5 - TRANSISTOR OUTPUT
6 - 
7 - 
8 - DC COMMON
9 - DC COMMON
10 - COUNT INPUT 2
11 - LOW FREQUENCY SELECT 2
12 - DC COMMON
13 - LOW FREQUENCY SELECT 1
14 - COUNT INPUT 1
15 - PROGRAM INHIBIT
16 - PRINT REQUEST/DISPLAY LATCH
17 - RESET
18 - DOUBLE INPUT
19 - 11-16V DC SUPPLY
20 - 15V DC POWER OUTPUT
21 - DC COMMON
22 - RELAY CONTACT NC
23 - RELAY CONTACT COM
24 - RELAY CONTACT NO
25 - AC POWER INPUT
26 - AC POWER INPUT
27 - AC POWER INPUT
28 - AC POWER INPUT
29 - RELAY CONTACT NC
30 - RELAY CONTACT COM
31 - RELAY CONTACT NO
32 - CHASSIS GROUND
33 - SERIAL DATA INPUT -
34 - SERIAL DATA INPUT +
35 - SERIAL DATA OUTPUT +
36 - SERIAL DATA OUTPUT -

Figure 5. Terminal Designations
INSTALLATION INSTRUCTIONS

TERMINAL ASSIGNMENTS AND FUNCTIONS

#2 - RELAY AND TRANSISTOR OUTPUT UNLATCH INPUT
When this input terminal is connected to DC Common through a contact closure or current sinking solid state sensor, the relay and transistor output unlatch. If the relay and transistor output are not energized, connection to this terminal has no effect. If the relay and transistor output have been programmed to time out and the time out period has begun, energization of this input will turn the output “OFF” prematurely. If the Reverse-Outputs mode is selected, this input Latches rather than Unlatches the output and relay.

#5 - TRANSISTOR OUTPUT
The output is an open collector NPN transistor with built-in transient overvoltage protection in the form of zener diode clamping. The transistor is rated at 30 VDC maximum and can sink up to 300 milliamps.

#8, 9, 12 AND 21 - DC COMMON
These terminals are internally connected to the negative side of the DC power supply.

#10 AND 14 - COUNT INPUTS
These two count inputs are used to increment or decrement the counter. Terminal #14 is labeled “COUNT INPUT 1” and terminal #10 is “COUNT INPUT 2.” The table shown in Figure 6 lists the operation of the two count inputs as related to the count function, and indicates how each input causes the counter to operate when a DC Common signal is applied.

#11 AND #13-LOW FREQUENCY SELECT INPUTS
When contact closures are used for count sources, it must be remembered that the contacts will bounce slightly each time they close. This slight bounce can cause extra counts to be entered into the counter. Contact bounce can be eliminated by limiting the allowable frequency response at the count inputs. The low frequency select terminals reduce the count input frequency response from 7500 PPS to 150 PPS when they are connected to DC Common. Terminal #13 is LOW FREQUENCY SELECT for COUNT INPUT 1 (terminal #14) and terminal #11 is LOW FREQUENCY SELECT for COUNT INPUT 2 (terminal #10). Low frequency is selected by placing a jumper between terminal #11 and/or terminal #13 and DC Common. Use the Low Frequency inputs whenever possible to guard against electrical noise and interference.

#15 - PROGRAM INHIBIT INPUT
The PROGRAM INHIBIT terminal, when connected to DC Common through the use of a jumper, prevents all of the programming functions from being changed. Modification of the Preset value can also be prevented with this jumper if Function Code 41, Preset Lock is set to a “1”.

#16 - PRINT REQUEST/DISPLAY LATCH INPUT
When the PRINT REQUEST terminal is connected to DC Common, the current count value, the current preset value or both are immediately transmitted through the SERIAL DATA OUTPUT terminals, #35.

<table>
<thead>
<tr>
<th>COUNT MODE</th>
<th>INPUT 1 (Term. #14)</th>
<th>INPUT 2 (Term. #10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate add and subtract</td>
<td>Subtract counts</td>
<td>Add counts</td>
</tr>
<tr>
<td>Count up with inhibit control</td>
<td>Add counts</td>
<td>Inhibit counts</td>
</tr>
<tr>
<td>Quadrature *</td>
<td>Input A</td>
<td>Input B</td>
</tr>
<tr>
<td>Count with up/down control</td>
<td>Count input</td>
<td>Up/Down control</td>
</tr>
<tr>
<td>Doubled quadrature *</td>
<td>Input A</td>
<td>Input B</td>
</tr>
</tbody>
</table>

*NOTE: For both Quadrature modes, the wires to inputs #1 and #2 may be interchanged to reverse count direction. Terminal #18 must also be tied to DC Common (terminal #8 or #12) for proper quadrature operation.

Figure 6. Count Input Operating Modes
and #36. The data is transmitted once each time the Print Request input is energized. The input must be deenergized and reenergized for each transmission. The type of information transmitted is controlled by the Send Data function.

The terminal also serves to latch the value on the display while the control continues counting. When this terminal is energized, the count value being displayed is stored on the display and remains latched while the input is energized. The display returns to showing the value of the counter when the input is deenergized.

#17 - RESET INPUT
When terminal #17 is connected to DC Common through an external switch, relay, or sensor, the counter is remotely reset. If the counter is programmed to be in the Reset mode, energizing this input returns the counter value to zero. If the counter is programmed to be in the Preset mode, the counter value is changed to the preset value. In either case, if the Unlatch At Reset or Latch Until Reset Complete mode of operation is selected, this input unlatches the transistor output and relay, in addition to resetting the control. The Reset input has the same function as the front panel “RESET” key.

#18 - DOUBLE INPUT
Connecting the Double Input to DC Common selects count doubling for either the Add and Subtract or the Count With Direction Control count modes. When either Quadrature or Doubled Quadrature count mode is selected, the Double Input must be connected to DC Common for proper operation.

#19 - BATTERY OR EXTERNAL 15 VDC SUPPLY
The power source can be either an external battery (11 to 16 volts) or a 15 VDC power supply. Connect this terminal to the positive side of the external low voltage supply and a DC Common terminal to the negative side.

#20 - 15 VDC POWER OUTPUT
This terminal may be used to power external devices such as sensors, a shaft encoder, or indicator lamps. The terminal supplies a regulated 15 VDC (±1V, ±2V) to the loads at a maximum of 100 milliamps. The 15 VDC supply is generated only when the unit is powered by 115 or 230 VAC.

#22 THROUGH #24 AND #29 THROUGH #31 - RELAY CONTACTS
The internal relay provides two 5 amp resistive dry form “C” contacts (DPDT) rated at 115 or 230 VAC. Terminal #23 is common to terminal #22(NC) and terminal #24(NO). Terminal #30 is common to terminal #29(NC) and terminal #31(NO).

#25 THROUGH #28 - AC POWER INPUT
For 115 VAC operation, jumper terminal #25 to #28, and #26 to #27. Connect the AC line power to #25 and #26.

For 230 VAC operation, jumper #26 to #28. Connect the AC line power to #25 and #27.

#32 - CHASSIS GROUND
This terminal must be connected to earth ground to provide proper noise immunity. When shielded cable is used for sensors or communications wiring, connect the shields to this terminal.

When the unit is being used in a mobile, battery-powered application, this terminal MUST be connected to CHASSIS GROUND.

A factory installed green wire connects this terminal to DC Common. This is done to provide added immunity to static discharge and electrical interference. In control systems incorporating several electronic devices, it is accepted practice to provide one SYSTEM grounding point. In this case the green wire as provided may be removed and SEPARATE green wires attached to both Chassis Ground and DC Common for connection to the common system grounding point.

For applications which require isolated DC Common and chassis ground, the green jumper may be removed entirely. However, extra care must be taken to route current carrying wires away from the counter as much as possible. Shields in transducer cables should be connected to chassis ground wherever possible.

#33 AND #34 - SERIAL DATA INPUT
The serial communications input is used to receive new preset values and print requests. The interface utilized is a standard 20 milliamp current loop with a user selectable Baud rate.

Terminal #33 is the negative side of the current loop and #34 is the positive side. When connecting serial
communications between the unit and any other device, note that SERIAL DATA OUT PLUS (SDO+) from the transmitting device is wired to the SERIAL DATA IN MINUS (SDI-) of the counter. Likewise, SDO- from the transmitting device is wired to SDI+ of the counter.

#35 AND #36 - SERIAL DATA OUTPUT
The counter has serial communications output which may be used to transmit the current count value, the preset value, or both. The Baud rate of the 20 milliamp current loop is user selectable. However, the Baud rate selected is the same for serial input and serial output communications.

Terminal #36 is the negative side of the output current loop and terminal #35 is the positive side. When connecting serial communications between the counter and any other device, note that SERIAL DATA OUT PLUS (SDO+) from the counter is wired to the SERIAL DATA IN MINUS (SDI-) of the devices receiving the data. Likewise, SDO- from the counter is wired to SDI+ of the receiving device.

INTERCONNECTION
After determining the desired operating mode, select the appropriate figures 7 through 18 for connection diagrams for the application.
PANEL MOUNTING

The panel mounting kit includes: (1) mounting gasket, (2) mounting clips and (2) screws.

Refer to the dimension diagram in Figure 4 for a drawing of the correct installation of these parts.

The mounting gasket is coated on one side with a contact adhesive and a paper backing. Care should be taken during the gasket installation that the gasket be correctly positioned on the panel at the first attempt. Attempting to re-position the gasket once the adhesive has come in contact with the panel is likely to deform or tear the gasket. This may result in an improper seal. For best results, follow these directions:

1. Stand the counter on a desk or table with its display down, screw terminals up.
2. Remove and discard the center square of the gasket at the scribe marks in the gasket and paper backing. Do not remove the backing from the remaining outer rim.
3. Slide the gasket down the unit until it is in position at the rear of the unit's front bezel. The paper backing side should be up.
4. Insert the tip of a knife between the paper and the gasket and, while holding the gasket down to the unit with the knife, peel off the paper backing.
5. Slide the unit through the panel cutout until the gasket firmly adheres to the panel.
6. Install the mounting clips and screws as shown in the diagram above. Do not overtighten the mounting screws. The screws should be tight enough to firmly hold the unit in place, but not so tight as to squeeze the gasket out from behind the front bezel.
7. A switch shall be included in the building installation:
   - It shall be in close proximity to the equipment and within easy reach of the operator.
   - It shall be marked as the disconnecting device for the equipment.
   - Switches and circuit breakers in Europe must comply with IEC 947.

---

**Figure 7. 115 VAC 47/63 Hz Power Connection**
Figure 8. 230 VAC 47/63 Hz Power Connection

Figure 9. 12 VDC Power Connection
Figure 12. Encoder with Directional Control Count Input Wiring

Figure 13. Add and Subtract Count Input Wiring
Figure 14. Remote Reset Wiring

Figure 15. Latch Until Contact Closure Wiring
Figure 16. Using Transistor Outputs to Drive Loads

Figure 17. Program Inhibit Wiring

NOTE:
JUMPER MAY BE INSTALLED FOR PERMANENT PROGRAM INHIBIT.

KEYLOCK SWITCH

SWITCH MUST BE CLOSED TO PREVENT FROM BEING CHANGED
Figure 18. Serial Communications to Durant Communications Convertor
OPERATION

DISPLAY
The five-digit numeric display normally indicates the counter value. When functions are being programmed, the display indicates either the function code or the data being programmed. When power is applied to the counter, the display flashes at 1/2 second intervals for 4 seconds. The counter will accept counts during this period.

INDICATORS
Two yellow LED indicators in the form of “light bars” are located to the right of the display. These light bars indicate if the information displayed is the count value or preset value. Both are off when functions are being interrogated or modified.

KEYBOARD
Data Entry Keys (0 through 9)
The data entry keys are used to enter preset values, function codes and parameters.

“PRESET” KEY (1)
The “1” key also serves as the “PRESET” key. The “PRESET” key is used to select the preset value for interrogation or modification.

“RATE” KEY (4) (Model 58825-400 only)
The “4” key also serves as a toggle between the count value and the rate value. All count and control functions continue while viewing the rate value.

“COUNT” KEY
The use of this key after an interrogation or modification of an operating function will cause the count to display.

“FUNCTION” KEY
The “FUNCTION” key is used to change the programmable functions. When this key is pressed and followed by 2 digit code, the function to be interrogated or modified is selected.

The “FUNCTION” key permits the programming of all functions except preset.

“RESET” KEY
The “RESET” key is used to reset the counter. If the “Unlatch at Reset” or the “Latch Until Reset Complete” function is programmed, the “RESET” key may be used to unlatch the transistor output and relay.

“ENTER” KEY
When the “FUNCTION” key is pressed and a code is specified, the “ENTER” key is used to terminate and enter the code. The “ENTER” key is also used to terminate and enter a programmed value.

FUNCTION CODES
The control has many different programmable operating modes and selectable options. The user must select which of these functions will be used and how they should operate by specifying a Function Code on the keyboard and entering the correct value choice to select the desired mode. The functions may be reprogrammed at any time if the Program Inhibit terminal (terminal #15) is not connected to DC Common.

While the user is programming the various functions and their entry choices, the counter continues to operate normally, even though the display does not indicate the current value of the counter. This allows the operating parameters to be changed while the process being controlled is running. See Figure 19 for a complete table of the functions and their allowable entry choices.

WARNING
CHANGING FUNCTION CODE VALUES WHILE THE PROCESS IS OPERATING MAY BE HAZARDOUS TO THE OPERATOR AND/OR THE MACHINERY. USE EXTREME CAUTION. IT IS RECOMMENDED THAT THE PROCESS BE STOPPED BEFORE FUNCTION CODE VALUES ARE MODIFIED WHenever POSSIBLE.

If an invalid Function Code is specified, the control ignores the selection and displays the current count value. An invalid Function Code is any code not listed in Figure 19.

If an invalid value is entered in a Function Code, the control ignores the entry and retains the previous setting. An invalid value is any value other than those allowable values listed in Figure 19.
## OPERATION

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>FUNCTION CODE</th>
<th>ENTRY CHOICES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURRENT COUNT VALUE</td>
<td>COUNT KEY</td>
<td>NONE</td>
<td>Shows current count value.</td>
</tr>
<tr>
<td>PRESET 1</td>
<td>PRESET 1 KEY</td>
<td>*0 to 99,999</td>
<td>Defines Preset value. (Factory set value is zero.)</td>
</tr>
<tr>
<td>SCALE FACTOR (Model 5882-1400 only)</td>
<td>5</td>
<td>0.0001 to 9.9999</td>
<td>Defines scale factor value. (Factory set value is 1.0000)</td>
</tr>
<tr>
<td>COUNT OPERATION MODE</td>
<td>60</td>
<td>*0</td>
<td>Count with separate add (Input 2) and subtract (Input 1).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Count up (Input 1) with Inhibit control (Input 2).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>NOTE: This mode cannot be doubled with double input.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Quadrature. NOTE: Double input MUST be connected to DC Common.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Count (Input 1) with up/down control (Input 2).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Doubled Quadrature. NOTE: Double Input MUST be connected to DC Common.</td>
</tr>
<tr>
<td>DECIMAL POINT DISPLAY LOCATION</td>
<td>62</td>
<td>*0</td>
<td>No decimal points are displayed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>0000.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>00.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>0.0000</td>
</tr>
<tr>
<td>RELAY AND TRANSISTOR OUTPUT TIMEOUT OPERATION</td>
<td>30</td>
<td>.00</td>
<td>No timeout. Relay remains closed and transistor output remains on until unlatched via Unlatch input.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.01 to 99.999</td>
<td>Seconds of delay before relay and transistor output unlatch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*10.00</td>
<td>Factory set value.</td>
</tr>
<tr>
<td>RELAY AND TRANSISTOR OUTPUT OPERATION</td>
<td>33</td>
<td>*0</td>
<td>Normal Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Reversed Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(See Figure 3 for description)</td>
</tr>
<tr>
<td>RELAY AND TRANSISTOR OUTPUT LATCH UNTIL RESET COMPLETE</td>
<td>36</td>
<td>*0</td>
<td>No LURC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>LURC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(See Figure 3 for description)</td>
</tr>
<tr>
<td>RELAY AND TRANSISTOR OUTPUT UNLATCH AT RESET</td>
<td>39</td>
<td>*0</td>
<td>No UAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>UAR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(See Figure 3 for description)</td>
</tr>
<tr>
<td>PRESET LOCK</td>
<td>41</td>
<td>*0</td>
<td>Preset is Unlocked</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Preset is Locked when Program Inhibit (terminal 15) is connected to DC Common</td>
</tr>
</tbody>
</table>

NOTE: Choices shown with asterisks are the factory set values.

**Figure 19. Function Code Programming Table**
### Operation

<table>
<thead>
<tr>
<th>Function</th>
<th>Function Code</th>
<th>Entry Choices</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset/Preset Mode Select</td>
<td>80</td>
<td>*0</td>
<td>Reset mode. Counter is reset to zero when the &quot;RESET&quot; key is pressed or the reset input (terminal #17) is energized. Relay and transistor output change state when the value of the counter reaches the preset number.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Preset mode. Counter is reset to the preset number when the &quot;RESET&quot; key is pressed or the reset input (terminal #17) is energized. The relay and transistor output change state when the value of the counter reaches zero.</td>
</tr>
<tr>
<td>Auto Recycle</td>
<td>81</td>
<td>*0</td>
<td>No Auto Recycle. Counter continues to count after coincidence is reached.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Auto Recycle. Counter automatically resets (Reset mode) or presets (Preset mode) at coincidence.</td>
</tr>
<tr>
<td>Reset Input Operating Mode</td>
<td>82</td>
<td>*0</td>
<td>Maintained. Counter remains reset until the reset input is deenergized or the &quot;RESET&quot; key is released.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Momentary. Instantaneously reset when input is energized or when &quot;RESET&quot; key is pressed. Then allows counter to operate normally regardless of whether reset input is held energized or &quot;RESET&quot; key is continuously being pressed.</td>
</tr>
<tr>
<td>Scaler Reset</td>
<td>83</td>
<td>0</td>
<td>Reset Scaler when &quot;RESET&quot; key is pressed or when Reset Input is energized.</td>
</tr>
<tr>
<td>(Model 5882-1400 only)</td>
<td></td>
<td>*1</td>
<td>Reset Scaler as above or when Counter performs Auto Recycle.</td>
</tr>
<tr>
<td>Communications Speed</td>
<td>90</td>
<td>0</td>
<td>110 Baud (Send and receive data at 110 bits per second.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*1</td>
<td>300 Baud.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>1200 Baud.</td>
</tr>
<tr>
<td>Communicating Type</td>
<td>91</td>
<td>*0</td>
<td>Transmit count and preset values when Print Request input is energized or a Print Request incoming communication (ASCII &quot;?&quot;) is received.</td>
</tr>
<tr>
<td>(Model 5882-0400 only)</td>
<td></td>
<td>1</td>
<td>Transmit count only as above.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Transmit preset only as above.</td>
</tr>
</tbody>
</table>

**Note:** Choices shown with asterisks are the factory set values.

*Figure 19. Function Code Programming Table (continued)*
<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>FUNCTION CODE</th>
<th>ENTRY CHOICES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMUNICATING TYPE</td>
<td>91</td>
<td>&quot;Y&quot; Value</td>
<td>Transmit count and preset values when Print Request input is energized or a Print Request incoming communication (ASCII &quot;?&quot;) is received.</td>
</tr>
<tr>
<td>Proper selection of two digits, &quot;XY&quot;, determines combination of values to be transmitted. &quot;00&quot; transmits all values, &quot;13&quot; transmits no values. (Model 5882-1400 only)</td>
<td></td>
<td>*0</td>
<td>ITLE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Transmit count only as above.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Transmit preset only as above.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Allow no transmission of count or preset.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;X&quot; Value</td>
<td>Transmit Scale Factor as above.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*0</td>
<td>ITICAL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Allow no transmission of Scale Factor.</td>
</tr>
<tr>
<td>PRINT ON RESET</td>
<td>92</td>
<td>*0</td>
<td>No Print on Reset. Print when Print Request input is energized or Print Request communication (ASCII &quot;?&quot;) is received.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Print on Reset. Print as above or when Reset input is energized. Then automatically reset. No counts are lost with the Print on Reset option.</td>
</tr>
<tr>
<td>SELF-DIAGNOSTIC MODE</td>
<td>40</td>
<td>*0</td>
<td>Return to normal operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Perform self-diagnostics. Returns to &quot;0&quot; upon successful completion.</td>
</tr>
<tr>
<td>SELECT FACTORY-SET PARAMETERS</td>
<td>43</td>
<td>0</td>
<td>Return to normal operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Reset all function codes to the factory set values.</td>
</tr>
</tbody>
</table>

NOTE: Choices shown with asterisks are the factory set values.

Figure 19. Function Code Programming Table (continued)

NOTE: For ratemeter function codes, see page 62.
When shipped from the factory, the control is programmed with the Function Codes set as indicated in Figure 19 with asterisks (*). When the user changes the values for any or all of the functions, the new values are stored in the non-volatile memory of the counter. This means that the new values are permanently stored until reprogrammed, even if power fails.

If it is desired to return the control to the factory set values after being reprogrammed, enter a value of “1” in function 43.

CHANGING THE PRESET VALUE

The Preset value may be changed at any time regardless of whether the Program Inhibit jumper is installed or not. However, if FUNCTION CODE 41, Preset Lock, is set to “1” and the PROGRAM INHIBIT jumper is installed, the Preset is “locked” and cannot be changed unless the Program Inhibit jumper is first removed.

To change the value of the Preset, follow these steps:

1. Press the “PRESET” key. The display will show the current Preset value. If the value displayed is the same as the desired value, proceed to step 4.

2. Key in the new Preset value. Upon pressing the first key, the current preset value disappears and the digit which was pressed appears. Each successive digit displays as it is pressed.

3. Press the “ENTER” key. The display blanks for a moment and then redispays the new preset. This confirms that the new value has been entered.

4. Press the “COUNT” key. The display returns to showing the current count value.

PREVENTING PRESET MODIFICATION

To avoid accidental change to the preset value, it is recommended that the ability to change the Preset be inhibited whenever possible.

To allow the Preset to be inhibited, function code 41, Preset Lock, must be set to a “1”. In this mode, the Preset value cannot be changed when the Program Inhibit input is energized (see “Inhibiting Program Modifications” below).

DISABLING THE FRONT PANEL RESET KEY

Select the Momentary Reset mode (enter “1” in function 82) and install a jumper from the reset input (terminal 17) to DC Common. This disables the Front Panel Reset key and prevents the operator from accidentally resetting the counter.

The jumper may be replaced by a normally closed contact. In this case, the counter is reset externally by opening and closing this contact.

If power is interrupted, the counter is not reset when power is reapplied.

INHIBITING PROGRAMMING MODIFICATIONS

The function codes and their values may be accessed and modified whenever the control has power applied, including times when the process being controlled is running.

WARNING

CHANGING FUNCTION CODE VALUES WHILE THE PROCESS IS RUNNING MAY BE HAZARDOUS TO THE OPERATOR AND/OR THE MACHINERY. USE EXTREME CAUTION. WHENEVER POSSIBLE, STOP THE PROCESS BEFORE ATTEMPTING TO MODIFY FUNCTION CODE VALUES.

To avoid accidental change to the function code values, it is recommended that the ability to change them be removed by installing a jumper between the PROGRAM INHIBIT terminal and DC Common on the rear of the control. When installed, all of the functions may be interrogated but not modified.
PROGRAMMING PROCEDURES

GENERAL
This section deals with the selection and entry of the function codes and their values. The step-by-step procedure is given for entry of function codes followed by a discussion of the procedure used to determine which combination of features is needed to satisfy a specific application of the control. Once a decision has been made, certain parts of this section may be skipped as indicated.

PROGRAMMING FUNCTION CODES
Function codes may be programmed or interrogated at any time while the control is operating.

⚠️ WARNING
CHANGING FUNCTION CODE VALUES WHILE THE PROCESS IS OPERATING MAY BE HAZARDOUS TO THE OPERATOR AND/OR THE MACHINERY. USE EXTREME CAUTION. WHENEVER POSSIBLE, STOP THE PROCESS BEFORE ATTEMPTING TO MODIFY FUNCTION CODE VALUES.

All functions including the preset value can be protected from accidental change by installing a jumper between the PROGRAM INHIBIT input (terminal #15) and DC Common. Modification to the Preset value is also inhibited in this mode if function code 41 is set to a "1". All functions may be interrogated but not changed with the jumper installed.

To change the operation of a function with the PROGRAM INHIBIT jumper removed, follow these steps:

1. Press the "FUNCTION" key. The display blanks indicating that the key has been pressed.

2. Select the two digit function code for the desired function. For example, press "30" to select the relay and transistor timeout value. The display indicates the two digits pressed for the function code. If more than two digits are pressed, the display only retains the last two digit entries.

3. Press the "ENTER" key. The current value for the specified function is displayed. If the value does not need to be changed, a new function may be chosen by returning to step 1. The "COUNT" key may also be pressed to return to the count value.

4. Press the digit keys for the desired entry. Using the above example, a value of 100 could be entered to select 1.00 seconds of timeout. The display shows the value as the keys are pressed.

5. Press the "ENTER" key to store the new data. The display blanks temporarily as the control stores the information. If the entry is out of range for the selected function, the control ignores the entry and the previous value is retained.

6. The next function to be interrogated or modified may be specified. If no additional functions need to be selected, the control can be returned to displaying the current count value by pressing the "COUNT" key.

SELECTING MODES OF OPERATION
Count Input Mode
Depending on the configuration of the count sensors, the manner in which the counter operates must be selected. If two discrete sensors or contact closures are utilized, the counter should use the Separate Add and Subtract count mode, the Count with Direction Control mode or the Count Up with Inhibit Control mode. If a single channel shaft encoder is being used, the Count with Direction Control mode or Count Up with Inhibit mode can be selected. If the count source is a quadrature shaft encoder, either of the two Quadrature count modes should be used. Program Function 60 according to Figure 19 to select the count mode.

Reset Mode or Preset Mode
When the "RESET" key is pressed or the reset input is energized, should the control start at zero and count to the preset value or start at the preset value and count to zero? If the former is desired, select the Reset mode with Function 80 (enter "0") and proceed with the "Reset Mode Operation" section following. If the latter, select the Preset mode (enter "1") and proceed on to the “Preset Mode Operation” section, skipping the “Reset Mode Operation” discussion which follows.
PROGRAMMING PROCEDURES

Reset Mode Operation

**Normal Output/Reverse Output**

When in the Reset mode, and the counter value reaches the value of the preset, the relay and transistor output turn on. This is considered Normal Output operation. If the relay and transistor output are reversed, they turn off when the counter value reaches the preset value.

The relay output has both normally open and normally closed contacts. When the control is in the Normal Output mode, the relay is deenergized until the Preset is reached. If the Reverse Output mode is selected, the relay operates so the normally closed contacts are held open and the normally open contacts are held closed until the preset is reached.

⚠️ **WARNING**

*A POWER OUTAGE CAUSES THE RELAY AND TRANSISTOR OUTPUT TO TURN OFF REGARDLESS OF THE OPERATING MODE SELECTED. BE SURE THAT THIS EFFECT IS NOT HAZARDOUS TO THE OPERATOR.*

To select Normal or Reverse output operation, specify Function 33 and enter “0” for Normal Outputs or “1” for Reverse Outputs.

**NOTE**

For ease of understanding, the following paragraphs presume Normal Output operation and show Reverse operation within brackets. For example, stating that the relay and transistor output turn ON [OFF] at the preset value indicates that they turn ON in the Normal mode and OFF in the Reverse mode.

**Turning The Outputs OFF [ON]**

Next, determine what should cause the relay and transistor output to turn OFF [ON] after reaching the preset value. Several choices exist:

1. **Timeout Function**

   First, the Timeout Function may be utilized. If the relay and transistor output should turn OFF [ON] after a time delay, specify the length of the time delay for the Timeout Function, Function 30. If the timeout is NOT to be utilized, ensure that the value programmed for Function 30 is 0.00, which disables the Timeout Function.

2. **Unlatch Input**

   Second, the relay and transistor output may be turned OFF [ON] by energizing the Unlatch Input. The Timeout and the Unlatch Input may both be used. In this case, whichever occurs first causes the relay and transistor output to turn OFF [ON].

3. **Unlatch at Reset**

   The third choice is the Unlatch At Reset operation mode. When this mode is enabled by entering a value of “1” in Function 39, the relay and transistor output turn OFF [ON] whenever the RESET key is pressed or the reset input is energized.

4. **Latch Until Reset Complete**

   The fourth choice for turning OFF [ON] the relay and transistor output is the Latch Until Reset Complete operation mode. If this mode is enabled by entering a value of “1” in Function 36, the relay and transistor output turn OFF [ON] whenever the “RESET” key is released or the Reset Input is deenergized.

   If neither the Unlatch At Reset or the Latch Until Reset Complete operation is desired, enter a value of “0” for both Function 36 and Function 39.

   If either the Unlatch At Reset or the Latch Until Reset Complete mode is selected, it usually implies that the Timeout Function is not utilized. However, the Unlatch Input may still be used to turn OFF [ON] the relay and transistor output without resetting the counter.

**Auto Recycle**

Should the control automatically reset to zero when the preset value is reached? If so, enable the Auto Recycle mode by entering a “1” in Function 81.

Note that the Auto Recycle mode has no effect on the relay and transistor output. To turn the relay and transistor output OFF [ON] when the Auto Recycle mode is selected, the Timeout Function must be programmed, the Unlatch Input must be energized or (if either the Unlatch At Reset or the Latch Until Reset Complete mode is selected) the “RESET” key pressed or Reset Input energized.
PROGRAMMING PROCEDURES

If the Auto Recycle mode is not utilized, enter a value of “0” in Function 81.

Reset Input Operating Mode

The next decision involves the manner in which the control responds to the “RESET” key being pressed or the Reset Input being energized. If the Maintained mode is selected (entering “0” in Function 82), the counter is held at zero as long as the key is pressed or the input is energized. When the key is released or the Input deenergized, the counter is allowed to accumulate counts normally. If the Unlatch At Reset mode is selected, the relay and transistor output turn OFF [ON] when the “RESET” key is pressed or the Reset Input is energized. If the Latch Until Reset Complete mode is selected, the relay and transistor output turn OFF [ON] when the key is released or the input deenergized.

If the Momentary mode is selected (entering “1” in Function 82), the counter is instantaneously reset to zero when the “RESET” key is pressed or the Reset Input is energized. Then the counter can accumulate counts normally regardless of whether the key or input is maintained or not. The counter is not reset again until the key is released and pressed again or the input is deenergized and energized again. If the Unlatch At Reset mode or the Latch Until Reset Complete mode is selected, the relay and transistor output turn OFF [ON] at the moment the key is pressed or the input is energized.

Disabling the Front Panel Reset Key

Select the Momentary Reset mode (enter “1” in function 82) and install a jumper from the reset input (terminal 17) to DC Common. This disables the Front Panel Reset key and prevents the operator from accidentally resetting the counter.

The jumper may be replaced by a normally closed contact. In this case, the counter is reset externally by opening and closing this contact.

If power is interrupted, the counter is not reset when power is reapplied.

To continue programming, skip “PRESET MODE OPERATION”, following, and proceed to the “SCALE FACTORS” section on page 30.

Preset Mode Operation

Normal Output/Reverse Output

When in the Preset mode and the counter value reaches the value of zero, the relay and transistor output turn on. This is considered Normal Output operation. If the relay and transistor output are reversed, they turn off when the counter value reaches zero.

The relay output has both normally open and normally closed contacts. When the control is in the Normal Output mode, the relay is deenergized until zero is reached. If the Reverse Output mode is selected, the relay operates such that the normally closed contacts are held open and the normally open contacts are held closed until zero is reached.

⚠️ WARNING

A POWER OUTAGE CAUSES THE RELAY AND TRANSISTOR OUTPUT TO TURN OFF REGARDLESS OF THE OPERATING MODE SELECTED. BE SURE THAT THIS EFFECT IS NOT HAZARDOUS TO THE OPERATOR.

To select Normal or Reversed outputs, specify Function 33 and enter a “0” for Normal Outputs or a “1” for Reversed Outputs.

NOTE

For ease of understanding, the following paragraphs presume Normal Output operation and show Reverse operation within brackets. For example, stating that the relay and transistor output turn ON [OFF] at zero indicates that they turn ON in the Normal mode and OFF in the Reverse mode.

Turning The Outputs OFF [ON]

Next, determine what should cause the relay and transistor output to turn OFF [ON] after reaching zero. Several choices exist:

1. Timeout Function

First, the Timeout Function may be utilized. If the relay and transistor output should turn OFF [ON] after a time delay, specify the length of the time delay for the Timeout Function (Function 30). If the timeout
is NOT to be utilized, ensure that the value programmed for Function 30 is 0.00, which disables the Timeout Function.

2. Unlatch Input

Second, the relay and transistor output may be turned OFF [ON] by energizing the Unlatch Input. Typically, this is the result of an operator action. The Timeout and the Unlatch Input may both be used. In this case, whichever occurs first causes the relay and transistor output to turn OFF [ON].

3. Unlatch At Reset

The third choice is the Unlatch At Reset operation mode. When this mode is enabled by entering a value of “1” in Function 39, the relay and transistor output turn OFF [ON] whenever the “RESET” key is pressed or the Reset Input is energized.

4. Latch Until Reset Complete

The fourth choice for turning OFF [ON] the relay and transistor output is the Latch Until Reset Complete operation mode. If this mode is enabled by entering a value of “1” in Function 36, the relay and transistor output turn OFF [ON] whenever the “RESET” key is released or the Reset Input is deenergized.

If neither the Unlatch At Reset nor the Latch Until Reset Complete operation is desired, enter a value of “0” for both Function 36 and Function 39.

Auto Recycle

Should the control automatically reset to the preset number when zero is reached? If so, enable the Auto Recycle mode by entering a “1” in Function 81.

Note that the Auto Recycle mode has no effect on the relay and transistor output. In order to turn the relay and transistor output OFF [ON], the Timeout Function must be programmed, the Unlatch input must be energized or (if the Unlatch At Reset mode or the Latch Until Reset Complete mode is selected) the “RESET” key pressed or Reset Input energized.

If the Auto Recycle mode is not utilized, enter a value of “0” in Function 81.

Reset Input Operating Mode

The next decision involves the manner in which the control responds to the “RESET” key being pressed or the Reset Input being energized. If the Maintained mode is selected (entering “0” in Function 82), the counter is held at the preset value as long as the key is pressed or the input is energized. When the key is released or the input deenergized, the counter is allowed to operate normally. If the Unlatch At Reset mode is selected, the relay and transistor output turn OFF [ON] when the “RESET” key is pressed or the Reset Input is energized. If the Latch Until Reset Complete mode is selected, the relay and transistor output turn OFF [ON] when the key is released or the input deenergized.

If the Momentary mode is selected (entering “1” in Function 82), the counter is instantaneously reset to the preset value when the “RESET” key is pressed or the Reset input is energized. Then the counter is allowed to operate normally regardless of whether the key or input is maintained or not. The counter is not preset again until either the key is released and pressed again or the input is deenergized and energized again. If either the Unlatch At Reset mode or the Latch Until Reset Complete mode is selected, the relay and transistor output turn OFF [ON] at the moment the key is pressed or the input is energized.

Disabling the Front Panel Reset Key

Select the Momentary Reset mode (enter “1” in function 82) and install a jumper from the reset input (terminal 17) to DC Common. This disables the Front Panel Reset key and prevents the operator from accidentally resetting the counter.

The jumper may be replaced by a normally closed contact. In this case, the counter is reset externally by opening and closing this contact.

If power is interrupted, the counter is not reset when power is reapplied.
NOTICE: This section applies only to Model 5882-1400, which has the Scaling ability. For Model 5882-0400, which does not have Scaling, this section should be ignored.

The Model 5882-1400 Control includes the ability to scale incoming counts. This means that for each pulse received on the count inputs, a fraction or multiple of that pulse is counted. Scaling can be used to compensate for wear on measuring wheels, consistent material slippage or material stretch, to make conversions between different units of measure) inches to centimeters, for example) or to totalize parts produced from multiple part manufacturing processes (such as 6 parts produced for each operation of a press).

The scale factor can be a number from 0.0001 to 9.9999. This number becomes a factor by which incoming count pulses are multiplied. The sum of the scaled count pulses is shown on the front panel display.

<table>
<thead>
<tr>
<th>SCALE FACTOR</th>
<th>COUNT SPEED (PULSES PER SECOND)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal Count</td>
</tr>
<tr>
<td>0.0001 to 0.9999</td>
<td>6,250</td>
</tr>
<tr>
<td>1.0000</td>
<td>7,500</td>
</tr>
<tr>
<td>1.0001 to 1.9999</td>
<td>5,000</td>
</tr>
<tr>
<td>2.0000</td>
<td>6,250</td>
</tr>
<tr>
<td>2.0001 to 2.9999</td>
<td>4,250</td>
</tr>
<tr>
<td>3.0000</td>
<td>5,250</td>
</tr>
<tr>
<td>3.0001 to 3.9999</td>
<td>3,750</td>
</tr>
<tr>
<td>4.0000</td>
<td>4,500</td>
</tr>
<tr>
<td>4.0001 to 4.9999</td>
<td>3,250</td>
</tr>
<tr>
<td>5.0000</td>
<td>3,750</td>
</tr>
<tr>
<td>5.0001 to 5.9999</td>
<td>3,000</td>
</tr>
<tr>
<td>6.0000</td>
<td>3,500</td>
</tr>
<tr>
<td>6.0001 to 6.9999</td>
<td>2,750</td>
</tr>
<tr>
<td>7.0000</td>
<td>3,000</td>
</tr>
<tr>
<td>7.0001 to 7.9999</td>
<td>2,500</td>
</tr>
<tr>
<td>8.0000</td>
<td>2,750</td>
</tr>
<tr>
<td>8.0001 to 8.9999</td>
<td>2,250</td>
</tr>
<tr>
<td>9.0000</td>
<td>2,500</td>
</tr>
<tr>
<td>9.0001 to 9.9999</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Figure 20. Table of Scale Factors versus Count Speed
SCALE FACTORS

ENTERING A SCALE FACTOR
Function 5 selects the Scale Factor. Note that any jumper connected to the Program Inhibit terminal on the rear panel of the counter must first be disconnected before the Scale Factor may be modified. To change the Scale Factor, follow these steps:

1. Press the "FUNCTION" key. The display blanks to indicate that the key has been pressed.
2. Press the "5" key. The display indicates this digit.
3. Press the "ENTER" key. The current value for the Scale Factor is displayed. If the value does not need to be changed, proceed on to step 6 below.
4. Press the digit keys for the desired entry. Note that for a Scale Factor of 1 the entry of 10000 must be made since the scale factor is displayed in the X.XXXX format. The display shows the value as each key is pressed.
5. Press the "ENTER" key to store the new data. The display blanks momentarily as the control stores the information. If a zero is entered as the Scale Factor, the counter defaults to the value of 1.0000.
6. The next function to be interrogated or modified may be specified. If no additional functions need to be selected, the counter may be returned to displaying the current count value by pressing the "COUNT" key.

COUNT SPEED VERSUS SCALE FACTOR
The scale factor entered into the counter has a direct effect on the maximum rate at which the counter can receive count pulses. Generally, the larger the scale factor the slower the counter can receive pulses. A table indicating count speed versus scale factor values is given in Figure 20.

In this table, the Normal Count columns represent the speed at which the counter can receive pulses when it is operating in the Add/Subtract, Count with Direction Control or Count Up with Inhibit Control modes. The Quadrature and Doubled Count columns indicate speed whenever the hardware doubling (jumper installed between the Double Input and DC Common) is utilized.

OPERATION OF THE SCALER
When the counter receives a count pulse, the scaler recognizes that fact and multiplies the 1 pulse by the scale factor. The scaled value, which will be a number from 0.0001 to 9.9999 since this is the range of the scale factor, is added to a resultant total. This resultant is shown on the display. However, the result can have up to four decimal places of value. The display only shows whole increments of counts.

For example, a scale factor of 1.2000 is entered into the counter. For each pulse received, 1.2000 is added to the result. But since the display only indicates whole numbers, after the first pulse it shows "1". After 5 pulses it shows "6". This is shown in Figure 21.

<table>
<thead>
<tr>
<th>PULSES RECEIVED</th>
<th>RESULT CALCULATED</th>
<th>DISPLAY VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0000</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1.2000</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2.4000</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3.6000</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4.8000</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>6.0000</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>7.2000</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>8.4000</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>9.6000</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>10.8000</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>12.0000</td>
<td>12</td>
</tr>
</tbody>
</table>

Figure 21. Pulses Received versus Displayed Value Using Scale Factor of 1.2000

The scaler stores any remaining partial count and adds that to the next scaled pulse value when it is received. This allows accumulation of scaled partial counts.

When a Preset is established on a control with scaling, the control activates the related output when the displayed count value reaches the preset value. But when scaling is used, the count value is not necessarily a whole number. The partial count remainder can affect when the output(s) change state.

With the example of Figure 21, a Preset of 11 is entered into the control. After the first pulse the display shows 1 and after the ninth pulse it shows 10. But, the next pulse changes the display to show 12, bypassing the preset of 11. The counter, during
the process of adding the scaled result to the total, actually counts from 10 through 11 to 12. This occurs so swiftly that the value of 11 cannot be seen on the display. However, the counter does recognize coincidence at the value of 11 and changes the state of the output.

As a second example, a Scale Factor of 0.5000 is entered into the control. Figure 22 gives a table of pulses received versus displayed value for this example.

<table>
<thead>
<tr>
<th>PULSES RECEIVED</th>
<th>RESULT CALCULATED</th>
<th>DISPLAY VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.0000</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0.5000</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1.0000</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1.5000</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>2.0000</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>2.5000</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>3.0000</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>3.5000</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>4.0000</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>4.5000</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>5.0000</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>5.5000</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>6.0000</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>6.5000</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>7.0000</td>
<td>7</td>
</tr>
<tr>
<td>15</td>
<td>7.5000</td>
<td>7</td>
</tr>
<tr>
<td>16</td>
<td>8.0000</td>
<td>8</td>
</tr>
</tbody>
</table>

Figure 22. Pulses Received versus Displayed Value Using Scale Factor of 0.5000

A Preset of 5 is entered into the control. From Figure 22, it is evident that the output will turn on when the 10th pulse is received on the count input. It is when the 10th pulse is received that the display changes from 4 to 5. However, if the counter is used in the Reset to Preset mode, the display shows 5 when the Reset key is pressed. The first pulse received changes the display to show 4, and the ninth pulse changes the display to 0. But, it is the TENTH pulse that causes the output to change state. This is because after the ninth pulse, there is a remainder of 0.5000 counts in the counter and, therefore, the value in the counter is not actually zero until after the next pulse.

**HOW SCALE FACTORS AFFECT PROCESSES**

When the use of Scale Factors results in partial count remainders, those remainders can affect the manner in which the process being controlled will function. For example, if a Scale Factor of 1.3000 is entered into a control and a Preset of 15 is utilized, a table as shown in Figure 23 results.

The control is used in the Reset mode. When reset, the counter starts at zero and counts to the Preset value. If the Auto Recycle mode is implemented, the counter recycles when the Preset value is reached. But, with a Preset of 15, the counter has actually accumulated 15.6000 counts. Thus, when it recycles, a value of 0.6000 counts remains. When the next pulse is received, 1.3000 counts is added and the count value is 1.9000. The “Second Cycle Display” column shows the displayed value for the second cycle.

It is obvious from the last column that slightly more counts are accumulated for the second part than were accumulated for the first. If this table were carried out for the third part, we would find that the third part is cut off one pulse too early. Clearly, the carryover of the remaining partial count causes problems in these types of applications.

As a solution, a function code has been provided which allows the choice of whether the remaining partial count is carried over into the next cycle or not. Function 83, Scaler Reset on Recycle, allows selection of this option. If Function 83 has a value of “0” entered, the scaler is not reset when an Auto Recycle occurs. If a value of “1” is entered, the scaler is reset each time an Auto Recycle occurs. This forces any remaining partial count to be reset to zero, eliminating the problem described above. The unit is shipped from the factory with the Scaler Reset on Recycle Mode enabled (Function 83 has a value of “1”).

It should be noted that the remaining partial count is typically an extremely small part of the total length of the part being produced (typically less than 1%). In those applications where the measurement system may be chosen, the rule of thumb is that the measurement device should have a minimum of twice the resolution (generate at least twice as many pulses per unit of measure) as the desired part accuracy.

For example, if a 10.00 inch part is to be made and the tolerance of the part may be plus or minus 0.02 inches, the measurement system should generate at least one pulse for each 0.01 inches of material.
## SCALE FACTORS

<table>
<thead>
<tr>
<th>PULSES RECEIVED</th>
<th>RESULT CALCULATED</th>
<th>DISPLAY VALUE</th>
<th>SECOND CYCLE RESULT</th>
<th>SECOND CYCLE DISPLAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.3000</td>
<td>1</td>
<td>1.9000</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2.6000</td>
<td>2</td>
<td>3.2000</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>3.9000</td>
<td>3</td>
<td>4.5000</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>5.2000</td>
<td>5</td>
<td>5.8000</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>6.5000</td>
<td>6</td>
<td>7.1000</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>7.8000</td>
<td>7</td>
<td>8.4000</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>9.1000</td>
<td>9</td>
<td>9.7000</td>
<td>9</td>
</tr>
<tr>
<td>8</td>
<td>10.4000</td>
<td>10</td>
<td>11.0000</td>
<td>11</td>
</tr>
<tr>
<td>9</td>
<td>11.7000</td>
<td>11</td>
<td>12.3000</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>13.0000</td>
<td>13</td>
<td>13.6000</td>
<td>13</td>
</tr>
<tr>
<td>11</td>
<td>14.3000</td>
<td>14</td>
<td>14.9000</td>
<td>14</td>
</tr>
<tr>
<td>12</td>
<td>15.6000</td>
<td>15</td>
<td>16.2000</td>
<td>16</td>
</tr>
</tbody>
</table>

Figure 23. Pulses Received versus Display Value Using Scale Factor of 1.3000

being measured. Thus, after the display shows 10.00 inches (1000 counts), there may be a remaining partial count of 0.400 due to the use of a Scale Factor. The percentage of error is calculated by 0.400/1000. This yields 0.04% error.

Even though the error is so small, compensation should still be made for the extra partial count at the end of a part by entering a “1” in Function 83. This is because the error is cumulative; that is, each successive part grows longer by 0.004 inches. Eventually, this cumulative error will cause the part to be out of tolerance.

Typically, those applications which require Function 83 to have a value of “1” are cut-to-length applications. When the application is performing a repetitive process such as punching equally spaced holes in a single part, the scaler should retain partial counts for the next measurement. In these cases, Function 83 should be set to “0”.

Whenever the Reset key is pressed or the Reset Input is energized, the scaler is always reset, eliminating any remaining partial counts. This is regardless of the value entered in Function 83.

## CALCULATING THE SCALE FACTOR

There are four general categories of applications which require scaling. The method of calculating the scale factor differs for each. The categories are:

1. Allowances for wear of measurement devices and material stretch applications.

2. Unit conversions (Typically when the measurement system is set up for measuring in one unit and the part must be made in another, i.e., inches versus millimeters.)

3. Scaling of pulses received from flowmeters or other sensors which produce a non-standard number of pulses per unit of measure.

4. Allowing multiple parts to be made for each operation of a machine.

A discussion of the means of calculating the scale factor for each category and special problems involved follows.

### Allowances for Wear or Stretch

Over a period of time a measuring wheel will begin to wear. The wheel allows accurate measurement only when its circumference is a known, fixed value. Thus, as the wheel wears, the error in the measurement increases because the circumference of the wheel becomes less and less. Scaling provides a means to compensate for the decreasing wheel circumference. This allows the useful life of the measuring wheel to be extended, decreasing cost.

In applications where the material stretches or shrinks by a fixed amount, scaling allows compensation for gained or lost material. These applications require that the amount of stretch or shrinkage be known, measurable or calculable and that it be consistent from machine cycle to machine cycle.

In either case, the scale factor is calculated by using the formula:
**SCALE FACTORS**

![Diagram of a measuring wheel setup](image)

**Figure 24. Wheel Wear Correction Application**

**Measured or Calculated Distance**
Scale Factor = Theoretical Distance

In the above formula, the Theoretical Distance is the distance that would be measured if the measuring wheel were new or within design tolerance of new. For stretch or shrinkage applications, it is the amount of material fed into the process before the stretching or shrinkage occurs.

The Measured or Calculated Distance is the length which results upon completion of the part or process.

For example, if the counter is intended to produce 12.00 inch parts but the parts come out of the machine only 11.93 inches long, the Measure Distance is 11.93 inches. (The Theoretical Distance in this example is 12.00 inches.) Figure 24 shows graphically what takes place in this application.

The shaft encoder in Figure 24 produces 600 pulses per revolution. Doubling is used in the counter to result in 1200 pulses per revolution. The measurement wheel is intended to have a 12.00 inch circumference. This should result in 1 pulse per 0.01 inches. Since a 12.00 inch is desired, a Preset of 1200 is entered into the counter with a scale factor of 1.0000.

However, when the process is run, the parts consistently come out of the machine only 11.93 inches long. The counter is counting 1200 pulses and the output of the counter is energized at that time. Obviously, the wheel is not the 12.00 inch circumference which it should be. Rather than replacing the measurement wheel, a scale factor can be entered to compensate for the discrepancy. Using the formula on the previous page, the scale factor is calculated by:

\[
\text{Scale Factor} = \frac{11.93\, \text{" (Measured)}}{12.00\, \text{" (Theoretical)}} = 0.9942
\]

With this scale factor entered, the display still shows 12.00 counts for each part, but each pulse received is worth only 0.9942 counts. Thus, more than 1200 pulses are received by the counter for each part being produced and the part is made to the correct length.
For applications where the material is stretched or shrunk, the measurement device may be located on the front end of the process where the unaffected material is fed in. Yet the counter can have a scale factor entered which allows it to measure the finished parts. Figure 25 shows a typical process which results in material stretch.

Again, a 12.00 inch part is desired. A Preset of 12.00 is entered into the control with a scale factor of 1.0000 and a sample part is produced. When it is measured, it is found to be 12.37 inches long. The scale factor needed to produce a 12.00 inch part is calculated by plugging these values into the formula:

\[ \text{12.37" (Measured)} \]
\[ \text{Scale Factor} = 12.00" \text{ (Desired)} \]
\[ = 1.0308 \]

When the scale factor of 1.0308 is entered into the control, parts are produced at 12.00 inches as desired. Since the material is stretched in the process, each pulse received by the counter is worth 1.0308 counts. Thus, less than 1200 pulses need to be received to produce each 12.00 inch finished part and display 1200 counts.

**Unit Conversions**

In some cases, the measurement system is set up to measure in one engineering unit but the parts made are produced in a different engineering unit. This may be the difference between ounces and gallons, inches and feet, feet and yards, inches and millimeters, quarts and liters or any other combination. In these applications, the scale factor may be chosen from the table given in Figure 26 or calculated using any standard conversion factor carried out to four decimal places.

**Scaling Pulses Received From Flowmeters or Other Sensors**

Typically, flowmeters generate large numbers of pulses for each unit of measure. Additionally, the number of pulses per unit is usually not easily divisible or massaged to allow a standard counter to increment in a common engineering unit.

The scale factor to be entered into the counter is easily calculated by using the formula:

\[ \text{Scale Factor} = \frac{1 \text{ (Unit of Measure)}}{\text{Pulses Produced per Unit of Measure}} \]
SCALE FACTORS

<table>
<thead>
<tr>
<th>MEASUREMENT SYSTEM MEASURES IN:</th>
<th>DISPLAY MUST SHOW QUANTITY IN:</th>
<th>SCALE FACTOR TO BE USED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inches</td>
<td>Centimeters</td>
<td>2.5400</td>
</tr>
<tr>
<td>Centimeters</td>
<td>Inches</td>
<td>0.3937</td>
</tr>
<tr>
<td>Feet</td>
<td>Yards</td>
<td>3.0000</td>
</tr>
<tr>
<td>Yards</td>
<td>Feet</td>
<td>0.3333</td>
</tr>
<tr>
<td>Feet</td>
<td>Meters</td>
<td>0.9144</td>
</tr>
<tr>
<td>Yards</td>
<td>Meters</td>
<td>0.3048</td>
</tr>
<tr>
<td>Meters</td>
<td>Feet</td>
<td>3.2808</td>
</tr>
<tr>
<td>Meters</td>
<td>Yards</td>
<td>1.0936</td>
</tr>
<tr>
<td>Gallons (US)</td>
<td>Liters</td>
<td>3.7854</td>
</tr>
<tr>
<td>Gallons (Imp.)</td>
<td>Liters</td>
<td>4.5428</td>
</tr>
<tr>
<td>Liters</td>
<td>Gallons (US)</td>
<td>0.2642</td>
</tr>
<tr>
<td>Liters</td>
<td>Gallons (Imp.)</td>
<td>0.2201</td>
</tr>
<tr>
<td>Quarts (US)</td>
<td>Liters</td>
<td>0.9463</td>
</tr>
<tr>
<td>Liters</td>
<td>Quarts (US)</td>
<td>1.0567</td>
</tr>
</tbody>
</table>

Figure 26. Unit Conversion Scale Factor

For example, a flowmeter might produce 146 pulses per gallon of flow. If the counter is to count gallons of flow, the incoming pulses must be divided by 146. If the display should indicate whole gallons of flow accumulated, the scale factor is determined by:

\[
\text{Scale Factor} = \frac{1}{146} = 0.0068
\]

If the display should rather show gallons and tenths of gallons, the scale factor may be multiplied by 10 to yield 0.0685. (Note that in this case the decimal point on the counter should be placed between the first and second digits for proper indication of units.)

When the output from other sensors must be scaled, the same formula can be used to calculate the scale factor. It is sometimes easier to change the definition of the terms in order to find the scale factor, however. For example, a quadrature shaft encoder which produces 600 pulses per revolution is used to indicate rotation of a shaft. Usually, rotation is given in degrees with 360 degrees per revolution. If the doubled Quadrature count mode is used, 1200 pulses per revolution are received by the counter. This results in 3.3333 pulses per degree of rotation.

Given this information, finding the scale factor necessary for proper operation can be confusing. But if the terms of the formula are changed as:

\[
\text{Desired Display Value} = \frac{\text{Actual Pulses Received}}{360(\text{Counts Per Revolution})}
\]

With the Scale Factor of 0.3000, the display will indicate 360 degrees per revolution from a 1200 PPR encoder.

Allowing Multiple Parts per Machine Operation

If a single machine operation causes one pulse to be received by the counter and that single machine operation produces several parts simultaneously, the scale factor is simply the number of parts produced per pulse. For example, if six parts are produced per cycle of the machine, a scale factor of 6.0000 should be entered into the control.

In this example, if one of the six cavities requires repair and is not producing parts, the scale factor may be reduced from 6.0000 to 5.0000. This adjustment can be made without resetting the counter. The machine must be stopped, the Program Inhibit jumper removed if installed, and the Scale Factor changed. Then the Program Inhibit jumper may be reinstalled and the process started up again. This allows in-process service and adjustment of machine malfunctions without losing track of how many parts have been produced so far.

It may be desirable in this type of application to have the Program Inhibit terminal wired to a key-lock switch, allowing easier adjustment when needed.

An additional consideration in this application is that even if the Preset is set to a multiple of six and only five parts are made per cycle, the Preset does not need to be adjusted. This is true because the counter checks the preset for each of the five increments per cycle individually and will energize the output when coincidence is established. However, in this example, up to four extra parts may be produced when the output is energized.
Several types of information may be transmitted or received by the control. The serial communications capability allows the count value, either the preset value or both to be printed, remotely displayed, or sent to a host computer or other peripheral device for processing. The characteristics of the communication are controlled by function codes.

COMMUNICATION FORMAT

The control uses a 20 milliamp current loop type of electrical interface for serial communications. The control has a separate 20 milliamp current loop for incoming communications and another loop for outgoing communications.

Since serial communication (either in or out) is done through only two wires, each character transmitted or received must be generated by a series of on and off states called bits. Each character has its own unique code or sequence of bits that allows the receiving device to understand what character it is receiving. The character “5”, for example, has a series of bits which are different from the series of bits for the character “6”. In fact, eight individual bits are needed to express a single character. Seven bits identify the character itself and the eighth is used for error checking to allow the receiving device to make sure that the previous seven are correct when they are received. This eighth bit is called the parity bit and shows “even parity” to the receiving device when transmitting data. When the counter is receiving serial data, it ignores the parity bit.

There are several different standard rates at which serial communications occur. Each is a function of the number of bits transmitted per second. The term which defines transmission rate is “Baud,” which is understood to mean “bits per second.”

The standard transmission rates the control can be set up to use are 110 Baud, 300 Baud, and 1200 Baud.

While each character requires eight individual bits to be uniquely expressed, a few additional bits must be sent between characters. These are called “start” and “stop” bits. The “start” bit signifies that this is the beginning of the character and the next eight bits are the character itself. After the character is transmitted, either one or two “stop” bits are sent to indicate that the character has been completely transmitted. When the control is operating at 110 Baud, two “stop” bits are sent and at 300 or 1200 Baud one is sent. Thus, at 300 Baud, for example, each character requires ten bits to be transmitted: one “start” bit, eight data bits and one “stop” bit. If information is being communicated at 300 Baud, 30 characters per second are communicated since a total of ten bits per character are required.

The standard set of codes used by the control for communicating information serially is called the ASCII character table. ASCII stands for American Standard Code for Information Interchange. The control uses ASCII codes for all its communications.

A typical character transmitted or received is shown in Figure 27. In this figure, the character is shown with the “start” bit, seven data bits, the even parity bit, and one “stop” bit.

SENDING DATA

Data transmission can be initiated by either of two methods. The first is by connecting the PRINT REQUEST terminal (terminal #16) to DC Common. The second is by a special code transmitted to the control via the serial communications.

Once a transmission has been initiated, the counter will first transmit the “Carriage Return” and “Line Feed” characters (described in the following paragraphs and illustrated in Figure 28) followed by the numeric information selected for printing. The “Carriage Return” and “Line Feed” characters cause the printer to provide spacing between printouts.

When the control transmits either the actual value or the preset value through the SERIAL DATA OUTPUT (SDO) terminals, it sends the characters “0” through “9” as necessary to express the value. It transmits the most significant digit (MSD) first. For example, if the current value of the counter is 1357, the control sends the ASCII code for “0” since the most significant digit is blank and has a value of zero, then the code for “1”, then the code for “3”, then “5”, and finally “7”.

After the entire value has been transmitted, the control sends two more characters. These are called “Carriage Return” (CR) and “Line Feed” (LF). A printer, host computer or other peripheral uses these characters to identify when a transmission is complete. In the case of the printer, the “CR” instructs it to return the printing carriage and the
“LF” tells it to advance the paper one line. The “CR” and “LF” are transmitted after each value the control sends.

By selecting the associated value for the Communications Type function (Function 91) the control can transmit the counter value, the preset value or both. Before the value(s) are sent, the control sends an identifier which indicates what information is to follow. When the control is connected to a printer, these identifiers are also printed. The label “CNT” is printed before the value of the counter and “PS1” is printed before the preset value. If a decimal point has been specified by programming Function 62, the decimal point is inserted into the printout at the appropriate place.

Figure 28 shows graphically how a typical value is transmitted. Each block shown consists of the bit organization as indicated in Figure 27.

Figure 29 shows sample printout when the control has been set up to print both the counter and preset values with a decimal point before the second digit.
If both the count value and the preset value are to be transmitted, the count value is always transmitted first.

The control can be programmed to automatically transmit the count and/or preset values when it is reset. This mode is selected by entering a "1" in Function 92. Upon pressing the "RESET" key or having the Reset input energized, the control internally stores the count value, then resets the counter. Once the control is reset, the stored count value is transmitted. This allows the count value to be recorded while the process is running without losing any counts. For proper operation, the count value must be allowed to be transmitted by entering a value of "0" or "1" in Function 91.

When the Print on Reset mode is selected, the Print Request input may be energized or the ASCII "?" received through serial communication to cause a printout without resetting the counter.

RECEIVING DATA
The control can receive a command through the serial communications input which instructs it to automatically transmit the information of the counter or preset (depending on Function 91). This command has the same effect as energizing the Print Request input. The ASCII character "?" asks the control to send its data.

In addition, the value of the preset can be changed through the serial communication input when a new value is received from a remote preset peripheral, a host computer or another compatible peripheral.

The new value must be preceded by the ASCII character "A" which informs the control that a new preset value is forthcoming. After the 1 to 5 digits for the new preset are received, the ASCII character "*" must be received to tell the control that the end of the preset value has been received. When the "*" is received, the new preset is automatically entered.

A sample command to change the Preset via serial communications is shown in Figure 31. Note that each block shown contains the bit organization as indicated in Figure 28.

The Baud rate of the incoming serial communications is the same rate as set for the outgoing communications. Any serial data the control receives is ignored if it is not either preceded by an "A" or a "?". The control ignores any decimal points which are received during a transmission of a new preset, but inserts the decimal point automatically after the new preset has been entered upon receipt of the "*".

SERIAL COMMUNICATIONS SET-UP

Communications Speed
If the control is to communicate to or from another device, it must be set up to do so. The first question is: what speed of communication is required by the other device? There are three possible answers.
acceptable: 110 Baud, 300 Baud, and 1200 Baud. One of these three speeds should be chosen based on the capabilities of the other transmitting or receiving device. For example, if the Durant President Printer is to be receiving information from the control, 1200 Baud should be selected by entering a value of “2” in Function 90. Note that the President printer must also be set up to receive at this rate.

If one of the several standard 5880 series peripherals is connected, see the Installation/Operation manuals for these devices to determine the necessary communication speed setting.

Communication Type

If the control is to transmit information to a receiving device, the second question is: what information does the receiving device need to know? The control allows one of three answers. Either the current count value, or the preset value, or both may be transmitted. Enter a value of “1”, “2” or “0”, respectively, in Function 91 to select.

<table>
<thead>
<tr>
<th>FUNCTION 91 Value “XY” (two digit entry)</th>
<th>“X”</th>
<th>Scale Factor</th>
<th>“Y”</th>
<th>Count</th>
<th>Preset</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>√</td>
<td>0</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>11</td>
<td>√</td>
<td>1</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>2</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td></td>
<td></td>
<td>(No Transmission)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 31. Function 91 codes for the 5882-1400

Transmitting Scale Factors

For Model 5882-1400, the Scale Factor can be transmitted with other values when a printout is generated. Function 91, Communicating Type is enhanced in the 5882-1400 to provide transmission control of the Scale Factor. Figure 31 shows the selection values for Function 91 in the model 5882-1400. Use this table to select which of the values will be transmitted.

When the Scale Factor is printed, the value is preceded by the identifying label “SCA”, indicating Scale Factor. A sample printout of all values from a model 5882-1400 control is given in Figure 32.

Receiving Scale Factors

A Scale Factor can also be sent to one of these controls through serial communications. In this case, the Scale Factor must be preceded by an ASCII “S”. The Scale Factor itself can be up to five digits long in ASCII characters and followed by an ASCII “*”. For example, a Scale Factor of 5.0000 is transmitted as “S50000*”.

Print on Reset

The third question concerning serial communication is:

When the control is reset, should it also print? If the control should automatically print when reset, enter a value of “1” in Function 92 to select the Print on Reset mode.

If a printout is not desired when the control is reset, enter a “0” in Function 92.
APPLICATION EXAMPLES

GENERAL
This section provides several typical applications for the control. Each gives a description of the process, details how the process works, and indicates which features are utilized to satisfy the requirements. Where necessary, a sketch and/or wiring diagram is also provided.

Application examples utilizing the Durant series 5682 counter are given as a means of illustrating control applications. Consequently, complete information sufficient for installation and operation purposes is not necessarily given. The information has been checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies.

MATERIAL CUT-TO-LENGTH APPLICATION
Description
Continuously moving roll-formed material must be cut to a length adjustable by the operator. The material is dispensed from a roll, fed through straightening rollers and into the roll former. The means of cutting is a “flying shear” which shears the formed material at the end of the line.

Operation
The shear requires approximately 1 second to complete a shearing operation. The counter must be reset at the same time the shear is energized to allow the next part to be measured accurately. The material is measured by a 600 pulse per revolution, single channel shaft encoder and 12" circumference measuring wheel combination which results in 1 pulse per .02" of dispensed material.

Set-up
Since a single channel shaft encoder is utilized and the measurement system produces one pulse per .02" of material, the control is set up to use DOUBLING. This increases the measurement resolution to one pulse per .01", making the entry of preset information much simpler. Since the Count Up with Inhibit Control mode does not allow doubling, the Count With Direction Control mode is selected by entering a “2” in Function 60. The decimal point is located to allow the display to indicate hundredths of inches by entering a “2” in Function 62.

The control should start at zero and count up to the preset value. The Reset mode of operation is selected by entering a value of “0” in Function 80. The relay output of the control is used to energize the shear. The shear remains unenergized until the Preset is reached. Then it must remain energized for 1.00 second. The Normal Output mode is selected by entering “0” in Function 33 (Output Status Operation) and the 1 second time-out by entering “1.00” in Function 30 (Output Time-out). A “0” is entered in Function 36 to disable the Latch Until Reset Complete mode and in Function 39 to disable the Unlatch at Reset mode.

Since the control must reset at the moment that the Preset is reached, a “1” is entered in Function 81 to select the Auto Recycle mode. The “RESET” key on the front panel may be held depressed to hold the counter reset as material is being dispensed for elimination of defects, quality control sample or starting a new roll of material. Thus, the Maintained Reset mode is selected by entering a “0” in Function 82 (Reset Input operating mode).

No communication is to be done to or from other devices so Functions 90 and 91 are left unchanged, and Function 92 is set to “0”.

Wiring for this application is shown in Figure 33.

BATCH QUANTITY CONTROL APPLICATION
Description
Ball bearings are dispensed into a shipping container. While the batch is being dispensed, the container is shaken by a shaker table to settle the bearings so that the operator may seal it. The dispensing gate is not allowed to operate after the container has been filled. The operator must press a pushbutton after positioning a new container to begin the next cycle.

Operation
A proximity detector is used to sense the bearings. It is desired that the control indicate the quantity of bearings yet to be dispensed. The count starts at Preset and counts down to zero. The output relay controls the dispensing gate. Pressing the “RESET” key on the counter resets the counter and latches the relay, energizing the dispensing gate. When zero is reached, the relay unlatches, turning off the
dispensing gate. On power-up, the relay must be off to prevent bearings from being dispensed.

Set-up
The counter must count down; thus, the Separate Add and Subtract Count mode is selected by entering a “0” in Function 60. Count Input 2 (count up) is left unconnected while input 1 (count down) is wired to the output of the proximity detector. The count being displayed is in whole units so a “0” is entered in Function 62 selecting no decimal point. Low Frequency for Input 2 is connected to DC Common to increase the noise immunity of the unconnected input.

Preset mode is selected by entering a “1” in Function 80 since the control must start at the Preset value and count down to zero. Since the relay must energize when the process is started and deenergize when zero is reached, a value of “1” is entered in Function 33, selecting Reverse Output operation and the NORMALLY OPEN contacts of the relay are used to control the dispensation gate and the motor of the shaker table. This is preferred to using the NORMALLY CLOSED contacts with Normal Output.
operation since a power outage causes the output and relay to turn off (which would energize the dispensation gate) regardless of the operating mode selected. Using the Reverse Output mode and the NORMALLY OPEN contacts insures that the shaker table and the dispensation gate will be off whenever power is applied.

The relay must stay unlatched until the “RESET” key is pressed, providing the lockout of the dispensing gate operation. Thus, no timeout is desired and a value of 0.00 seconds is entered in Function 30 (Output Time-out operation). The Latch Until Reset Complete mode is desired so a “1” is entered in Function 36. This allows the relay to turn

---

**Figure 34. Batch Quality Control Application Wiring**
on when the "RESET" key is pressed, which starts the next cycle. The Unlatch at Reset mode is disabled by entering a "0" in Function 39. The Auto Recycle mode is disabled by entering a "0" in Function 81. The Reset input must instantaneously reset the counter when energized. Function 82, Reset Input Operating Mode, is set momentarily by entering "1".

No communication is to be done to or from other devices so Functions 90 and 91 are left unchanged, and a value of "0" is entered in Function 92.

Wiring for this application is shown in Figure 34.

WIRE RESPOOLING APPLICATION

Description

Finished electrical wire must be rewound from a very large roll onto smaller rolls in order to remove sections with faulty insulation, nicks or cuts, lumps, splices, or high potential insulation failures. The wire has been previously marked to indicate the location of the fault and it is known how much good wire exists between faults. The operator decides what combination of roll sizes may be rewound between faults and enters preset values correspondingly.

Figure 35 is a sketch of the wire respooler.

The operator loads the correct size of small spool onto the rewinder, attaches it to the end of the wire from the large roll, sets the length of wire to be wound (typically 500', 1000', 5000', etc.) and presses a "START" button. When the preset length of wire is rewound, brakes on both spools are energized. When the wire has come to rest, the operator presses a "RELEASE" button to disengage the brakes so that the wire on the finished roll may be cut and fastened. The operator cuts out the bad section of wire, unloads the full small spool, attaches the end of the wire from the large spool to the next small spool and repeats the process.

The rewinding may be stopped manually by the operator and the wire direction reversed to allow removal of a visually detected fault not previously marked.

The operator requests a printout from the counter whenever a small spool is finished or an unmarked fault is removed. The printed value of the counter is attached to the spool to indicate how much wire is on that spool so that it may later be properly marked or respooled, as necessary.

Figure 35. Wire Respooling Application Sketch
APPLICATION EXAMPLES

Operation
The control is reset by the operator by pressing the RESET key on the front panel when a new large roll is installed on the rewinder. The relay output of the counter controls the brakes of both spools when the Preset value is reached. A separate contact from the relay operates each brake. A set of contacts from a manual control switch parallels the output relay to allow manual operation of the brakes.

An encoder measures the wire and produces one pulse per foot of wire dispensed. Since the operator may manually stop the rewinding and reverse it to remove a visually detected fault, the encoder used is a Quadrature type. This allows the control to count in both directions, tracking the actual movement of the wire in either direction.

A Durant President printer is wired to the serial communications output of the control to provide the printout to be attached to the respooled wire. To provide fastest response, 1200 Baud is specified as the serial communications speed.

Set-up
The Quadrature counting mode is selected by entering a value of “1” in Function 60 and connecting the Double input to DC Common on the rear of the counter. The display indicates “whole feet” of wire so a “0” is entered in Function 62, specifying no decimal point.

The control starts at zero and counts to the Preset value. This is necessary since the operator may manually stop the wire, cut out a bad section and request a printout to attach to the small spool showing how much wire has been wound. Reset mode is selected by entering “0” in Function 80. The relay turns on when the Preset is reached to energize the brakes. The Normal Output mode is selected by entering “0” in Function 33. Since the brakes are manually released, no timeout is desired, and a value of “0.00” is entered in Function 30 (Output Timeout). The Unlatch input is used to deenergize the relay. Resetting the counter should not unlatch the relay (in most cases the relay is already unlatched when the RESET key is pressed). Thus, the Latch Until Reset Complete and Unlatch at Reset modes are disabled by entering a “0” in Function 36 and Function 39.

The control should not self reset. The Auto Recycle mode is disabled by entering a “0” in Function 81. The RESET INPUT on the rear panel is used to start the control from zero when a cut has been made. The RESET INPUT may be used to cause the control to print, then reset whenever a printout is requested. In this case, the counter is not reset until the value of the counter has transmitted. A value of “1” is entered into Function 92 to select Print on Reset. The Maintained mode for the Reset Input is selected by entering a “0” in Function 82 (Reset Input operating mode).

Serial Communication to a printer requires the transmission speed to be selected. Since the President printer is capable of receiving data at the 1200 Baud rate, the control is set to transmit at 1200 Baud by entering a value of “2” in Function 90 (Communications Speed). Only the actual value of the counter need be printed. A “1” is entered in Function 91 (Communications Type) to select that the count only is transmitted when requested.

Wiring for this application is shown in Figure 36.

PRODUCTION INCENTIVE MONITOR APPLICATION

Description
Piece parts are made on a machine which involves operator assistance. The operator is paid on an incentive basis for the quantity of parts produced per hour over a minimum base quantity. Each operation of the machine produces one part. It is desired to monitor the operator’s output on an hourly basis and provide a hard copy printout of parts-per-hour produced.

A lamp on the operator station is lit when the operator surpasses the base quantity of parts for a given hour. This informs the operator that the parts produced during this time are incentive parts; that is, additional pay is received for parts produced while the lamp is lit. At the end of the hour, the lamp is extinguished and the count of parts is reset to zero.

Operation
A switch is mounted on the machine which indicates when a part has been produced. Each time the switch closes, the counter increments. The base quantity of parts is entered in the Preset. Whenever
Figure 36. Wire Respooling Application Wiring
the quantity is exceeded, the output relay is energized, lighting the lamp.

A contact closure from the plant’s master clock system signals the beginning of each hour. This signal is used to cause the control to print, reset the counter to zero and unlatch the relay, extinguishing the lamp if it has been energized. The serial communications output of the control is connected to a printer which is located in the foreman’s office and keeps an hourly record of the machine.

The printout indicates not only the quantity of parts produced, but also the base quantity against which the operator is working. This allows the difference between the two values to be easily calculated and used in the generation of the incentive pay.

**Set-up**

The contact closure from the machine should cause the control to count up. One side of the contact is wired into INPUT 2 (terminal 10) and the other side to DC Common. The separate Add and Subtract count mode is selected by entering a “0” in Function 60. Since the counter should start at zero and count to the Preset, a “0” is entered in Function “80” selecting Reset mode. The display indicates whole parts so a decimal point is not desired and a “0” is entered in Function 62.

The output relay turns on at the Preset value and off when the Unlatch Input is energized. The Normal Outputs mode is selected by entering a “0” in Function 33. Since the relay remains energized until remotely unlatched, no timeout is desired and a value of “0.00” is entered in Function 30. Latch Until Reset Complete and Unlatch at Reset modes are not required, thus a “0” is entered in Function 36 and Function 39.

A “0” is entered in Function 81 since the control should not Auto Recycle. The counter should instantaneously reset upon energization of the Reset Input since incoming count pulses should not be ignored at any time. The momentary mode is selected by entering a “1” in Function 82, Reset Input Operation mode.

The Preset value and the Count value are to be printed. A “0” is entered in Function 91 (Communications Type) to specify this. The values are transmitted to a Durant President printer which is capable of receiving information at 1200 Baud. The control is set to 1200 Baud by entering a “2” in Function 90, Communications Speed. The President printer must also be set up to receive at 1200 Baud. Since the counter must print whenever it is reset, Print on Reset mode is selected by entering a “1” in Function 92.

The wiring diagram and sample printout for this application is given in Figure 37.

**STOPPED MOTION DETECTOR APPLICATION**

**Description**

A conveyor line transports parts from one workstation to the next automatically. If one workstation falls behind or jams, the conveyor stops. A "stopped motion" detector is required to signal the maintenance personnel that the automatic line has a problem.

**Operation**

A shaft encoder is mounted to a shaft on the conveyor such that as the conveyor moves, the encoder rotates. The number of pulses per revolution of the encoder is dependent on the speed of the conveyor. It must be noted that at maximum conveying speed, the shaft encoder should not generate more pulses per second than the control will recognize. A Preset value of “1” is entered into the control. Each time the counter receives a pulse, the output and relay are energized. The timeout feature is utilized to deenergize the relay.

The timeout value is chosen to allow the slowest desired speed of the conveyor to occur without allowing the relay to deenergize. For example, if the shaft encoder produces 1 count every 17 milliseconds (58.9 pps) when the conveyor is running at its slowest speed, a Preset value of 17 or higher could be entered. When the machine is set in motion, the output relay energizes and remains energized until motion stops for a period longer than the timeout value. An alarm is wired to the Normally Closed side of the relay on the control and will sound when the relay deenergizes.

**Set-up**

The Count with Direction Control mode is selected by entering a “2” in Function 60. No decimal point is needed and a “0” is entered in Function 62.
Figure 37. Production Incentive Monitor Application Wiring
(Decimal Point location). The Reset mode is selected by entering a “0” in Function 80. A “0” is entered in Function 33 selecting Normal Outputs mode. Latch Until Reset Complete and Unlatch at Reset modes are not needed. A “0” is entered in both Function 36 and Function 39 for this purpose.

Auto Recycle mode is desired since the counter should automatically reset to zero whenever a pulse is received. A “1” is entered in Function 81 to specify this. The Reset key and input are not used so Function 82 (Reset Input Operating mode) is left unchanged. No communication takes place so Functions 90 and 91 are left unchanged and a “0” is entered in Function 92.

Wiring for this application is shown in Figure 38.
GENERAL

Most problems encountered when applying the control are due to wiring errors, improperly set Function codes, and sensors which are not correctly installed. This section provides guidelines for the detection and correction of these types of problems. Additionally, a description of the diagnostic program included in the control is discussed.

![CAUTION]

BEFORE APPLYING POWER TO THE EQUIPMENT, RECHECK ALL WIRING TO INSURE PROPER CONNECTIONS. MAKE SURE THE AC LINE VOLTAGE IS CONNECTED ONLY TO SCREW TERMINALS #25, #26, #27 AND #28. CONNECTING AC POWER TO ANY OTHER SIGNAL TERMINALS WILL CAUSE SEVERE DAMAGE TO THE CONTROL.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSES</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display does not light when AC power is turned on.</td>
<td>1. No power applied on terminals #25, #26, #27 and #28. 2. Terminals #25, #26, #27 and #28 are improperly jumpered. 3. Short between terminals #19 or #20 and DC Common.</td>
<td>1. Check wiring, fuses and primary AC power source. 2. Check jumper installation. 3. Immediately disconnect AC power supply, check wiring.</td>
</tr>
<tr>
<td>Counter does not increment or decrement when sensor is activated.</td>
<td>1. Sensor malfunction, improperly installed or connected. 2. Incorrect count mode selected for type of sensor being used. 3. Reset input (terminal #17) connected to DC Common. 4. Low frequency select terminals (terminals #11 and #13) connected to DC Common when sensor generates count pulses less than 1 msec long.</td>
<td>1. Check sensor wiring, installation and operation. 2. Check function code diagram (Fig. 19) for proper value selection for Function 60. 3. Check wiring. 4. Disconnect low frequency terminals.</td>
</tr>
<tr>
<td>Counter counts in wrong direction.</td>
<td>1. Quadrature shaft encoder outputs A and B reversed. 2. Add and Subtract signals reversed.</td>
<td>1. Reverse wiring on inputs 1 and 2 (terminals #14 and #10). 2. Reverse wiring on inputs 1 and 2 (terminals #14 and #10).</td>
</tr>
</tbody>
</table>

Figure 39. Troubleshooting
### Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Remedies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter counts in wrong direction (continued)</td>
<td>3. Improper count mode selected for sensor configuration utilized. 4. Polarity of up/down control signal reversed when Count With Direction Control mode is selected.</td>
<td>3. Check Function Code diagram (Fig. 19) for proper value selection for Function 60. 4. Invert up/down control signal on terminal #10 with an external relay or transistor.</td>
</tr>
<tr>
<td>Counter accumulates too many counts.</td>
<td>1. Electrical noise causing extra counts. 2. Loose wires between sensors and count inputs. 3. Sensor generating extra pulses due to vibration, oscillation, chatter or jitter.</td>
<td>1a. Check sensor lead installation to insure they are not bundled with other power wiring. 1b. Connect low frequency select terminals (terminals #11 and #13) to DC Common if pulses from the sensor are longer than 1 msec. 1c. Use shielded cable for wiring sensors to Count Inputs (terminals #10 and #14) and connect the shield to terminal #32. 2. Check external sensor wiring. 3. Check sensor mounting and motion of machine to determine if these characteristics cause extra count. Use Quadrature encoders where applicable.</td>
</tr>
<tr>
<td>No printout or incorrect printout is generated when the control is connected to a printer.</td>
<td>1. No AC power applied to printer. 2. Printer improperly set up. 3. Serial communications output incorrectly wired to printer. 4. Baud rates of control and printer not set up to the same value.</td>
<td>1. Check AC power connections and fuse in printer. 2. Check printer DIP switches for correct set up. (See printer operation manual.) 3. Check the SDO+ (terminal #36) on control is connected to SDI- on printer and SDO- (terminal #35) is connected to SDI+. 4. Check that the Baud rates of the control and the printer are the same.</td>
</tr>
</tbody>
</table>

*Figure 39. Troubleshooting (continued)*
TROUBLESHOOTING

CHECK-OUT PROCEDURE
If the control does not perform satisfactorily, check all connections, proceed through the troubleshooting chart on the previous pages, and check all function codes for proper set-up according to the table given in Figure 19. If these tests proceed correctly and the control is still not properly functioning, remove ALL wiring from the back of the control and proceed through the following steps. If the control fails to function in any of the steps, return it to Durant Products, 901 South 12th Street, Watertown, WI 53094, Attention: Repair Department. Enclose a letter describing the malfunction.

Power Input
Connect 115 VAC between terminals #25 and #26. Jumper terminal 25 to terminal 28 and jumper terminal 26 to terminal 27. The display should flash for a short period of time and then remain lit. Place electrical tape over terminals 25 through 28 to prevent electrical shock during the next tests.

Keyboard
Press the “FUNCTION” key, the display should blank. Press “43” which the display should indicate. Press ENTER, the display should show “0”. Press “1” which the display should indicate. Press “ENTER”, the display should flash “0” and the “COUNT” indicator for a short period of time then remain lit.

Count Up
Make a momentary connection between terminals #10 and #12. The display should increment several counts. Make a connection with a short piece of wire between terminals #11 and #12 and repeat the count test between terminals #10 and #12. Retain the connection between terminals #11 and #12.

Count Down
Make a momentary connection between terminals #14 and #12. The display should decrement several counts. Make a connection with a short piece of wire between terminals #13 and #12 and repeat the count test between terminals #14 and #12. Retain the connection between terminals #13 and #12. Decrement the counter until the display indicates less than “5”.

Preset
Press the “RESET” key and the display should show “0”. Press the “5” key, which the display should indicate. Press the “ENTER” key. The display should blank for one half second then remain lit. Press the “COUNT” key, the display should indicate the previous count value. Make a momentary connection between terminals #10 and #12 at least five times. You should hear the output relay actuate.

Relay Timeout
Ten seconds after the relay actuates, you should hear it release.

Reset
Press the “RESET” key. The display should show “0”.

Unlatch
Again, make a momentary connection between terminals #10 and #12 at least five times. Before the ten second timeout elapses, make a momentary connection between terminals #2 and #8. You should hear the output relay release. Press the “RESET” key again.

Latch Until Reset Complete
Press the “FUNCTION” key, press “36”, then press “ENTER”. The display should indicate “0”. Press the “1” key, then “ENTER”. The display should show “1”, blank for one half second then remain lit. Press the “FUNCTION” key, press 30, then press “ENTER”. The display should show “10.00”, press the “0”, then “ENTER”. The display should show “0.00”, blank for one half second then remain lit. Press the “COUNT” key, the display should indicate “0” and the COUNT indicator lit. Make a momentary connection between terminals #10 and #12 at least five times. You should hear the output relay activate. Press the “RESET” key. The display should display “0” and you should hear the relay release.

Auto Recycle
Press the “FUNCTION” key, press “81”, then press “ENTER”. The display should indicate “0”. Press the “1” key, then “ENTER”. The display should show “1”, blank for one half second, then remain lit. Press the “COUNT” key, the display should indicate “0” and the COUNT indicator lit. Make a momentary connection between terminals #10 and #12 five
times. You should hear the output relay activate and the display should show "0".

**Power Outage**
Disconnect the AC power. You should hear the relay release.

**INTERNAL DIAGNOSTICS**
The control has several internal diagnostic routines which allow it to self-test various operational characteristics. When power is applied, the control tests its memory to determine if it has retained all of the values and function code parameters previously entered. It also tests to insure that all of the internal memory is functional. During these self-tests, the display is blanked. Since the tests are performed very quickly, the user usually does not notice the short delay on power-up.

The user also has the ability to initiate the control self-test diagnostics at any time. Function code 40 is used to initiate the diagnostics. If the control fails any of the diagnostic routines, either on power-up or upon manual command, the display will flash a number indicating which of the six self-tests failed. If no failures are found, the control returns automatically to normal operation.

**NOTE**
The self-diagnostics should not be performed while the process being controlled is running. The control responds to count pulses but ignores any incoming control signals while the diagnostics are operating.

**Description of the Diagnostics**
The diagnostics while are included and their related test numbers are as follows.

- #1 - ROM (Read Only Memory) 16 Bit Checksum
- #2 - Internal RAM (Random Access Memory) Bit Test
- #3 - Non-Volatile RAM Read/Write Bit Test
- #4 - Non-Volatile RAM Store Test
- #5 - Non-Volatile RAM 8 Bit Checksum
- #6 - Watch Dog Timer (1.3 Seconds) Timeout

**ROM (Read Only Memory) 16 Bit Checksum - Test #1**
This test determines if the permanent memory which controls how the control operates is good.

**Internal RAM (Random Access Memory) Bit Test - Test #2**
This routine tests the temporary workspace memory used for normal operation and communication. If a failure occurs, the counter may change or lose values or operating characteristics unexpectedly.

**Non-Volatile RAM Read/Write Bit Test - Test #3**
This test checks the memory which permanently stores the operating characteristics and values when a power outage occurs.

**Non-Volatile RAM Store Test - Test #4**
This test insures that the non-volatile memory accurately stores and retrieves the programmed operating characteristics and values upon a power outage. If a failure of this type occurs, the counter will operate correctly but could change its values or operating characteristics upon a power failure or power drop-out.

⚠️ **CAUTION**

TO INSURE PROPER OPERATION CHECK ALL FUNCTION CODE VALUES BEFORE STARTING THE PROCESS. NOTE THAT A TEMPORARY POWER INTERRUPTION MAY CHANGE THE VALUES OF FUNCTION CODES DURING THE PROCESS IF TEST #4 HAS FAILED.

**Non-Volatile RAM 8 Bit Checksum Test - Test #5**
A checksum test is performed on the non-volatile memory to insure that none of the information stored was changed while the control was unpowered. If this test fails, check all function code values and the values of the counter and preset to insure they are correct. Then disconnect and reconnect power to perform this test again. If the test fails the second time, return the counter for repair.

**Watch Dog Timer (1.3 Seconds) - Test #6**
While the control is operating, an internal Watch Dog Timer is incremented every millisecond. Under
normal operation, the control automatically resets the Watch Dog Timer at least once per second. If the control would malfunction during operation, the Watch Dog Timer may time out (depending on the type of malfunction) and an error code of “6” flashes on the display. If this type of failure occurs, run the diagnostics using Function 40. Excessive electrical interference may cause this type of failure without damage to the control or the operating characteristics. If the diagnostics find no other fault, it is reasonable to assume that the control is fully operational, unless this failure is recurring.

OPERATION OF DIAGNOSTICS
When power is applied, the control begins by performing tests #1, #2, #3 and #5. If all of these pass, the counter is ready to operate as indicated by flashing the count value on the display at one half second intervals for four seconds, then remaining lit.

To select the self-diagnostic mode, specify Function code 40 and enter a value of “1”. The control immediately turns on all display segments and LED indicators for 2 seconds. Then the displays blank and the control steps through all five tests. If all five pass, the control begins a display and LED test routine. This routine sequences through flashing the numbers “0” through “9” on the displays, alternates the Preset and Count LED indicators and moving the decimal point from digit to digit. When the display sequence is finished, the control shows the count value and the Count indicator is lit.

Performing the diagnostic routines does not affect the Function code parameters. Thus, when the diagnostics are finished, the control retains all of the operational characteristics previously programmed.

WHAT TO DO IF THE CONTROL FAILS A DIAGNOSTIC TEST
If the control flashes a single digit number continuously on power-up or when the self-diagnostics are performed, it indicates which one of the tests has failed. When the number displayed is “4”, “5”, or “6”, the control can be allowed to operate by pressing the FUNCTION key to clear the display.

WARNING
RUNNING THE COUNTER AFTER A FAILURE HAS BEEN DETECTED CREATES A SERIOUS RISK TO THE OPERATOR AND/OR MACHINERY.

As a minimum safety precaution, the Function code Default mode (Function 43) should be selected (enter a value of “1”) and the Function codes reprogrammed. This will insure that the failure has not altered any of the operating characteristics of the counter. Selecting the default parameters with Function 43 also performs the power-up self test, which could give another failure indication (for tests #1, #2 or #3). If this occurs, return the control for repair immediately.

Address units to be repaired to:
Durant Products
901 South 12th Street
Watertown, WI 53094

ATTENTION: REPAIR DEPARTMENT
RATEMETER OPERATION (MODEL 58825-400 ONLY)

GENERAL DESCRIPTION
Model 58825-400 has a 1/Tau ratemeter added to all of the other functions of the count control. The counter and ratemeter features of this unit operate simultaneously at all times.

The ratemeter allows an indication of the speed of the process based on the period of the pulses received at the count inputs. The ratemeter uses only up-count pulses when the counter is used in the Reset to Zero mode, and only down-count pulses when it is used in the Reset to Preset mode. The ratemeter function determines the frequency of the pulses by a calculation which measures the amount of time that elapses between pulses. Ratemeters which use this type of rate calculation are known as “One-over-Tau” ratemeters. The calculation includes a multiplication by an adjustable constant or “Meter Factor” in order to have the ratemeter display a value in units of measurement that relate to the process such as Feet Per Minute, Revolutions Per Minute, Products Per Hour, Inches Per Second, etc.

For higher frequency operations, the ratemeter will average a number of pulses in order to maintain a display update time within the range of 0.5 to 3 seconds. The calculation is based on a sample of 1, 3, 10, 30, 100, 300, 1000, or 3000 pulses. The sample size can be selected automatically or manually.

For lower frequency operations, the ratemeter will allow a sample time of up to 90 seconds. This means that a valid rate display can be obtained when the input frequency is as low as one pulse every 90 seconds (0.011 Pulses Per Second).

These units can be programmed to power up with either COUNT or RATE displayed. Pressing the COUNT key displays the count value and pressing the “4” key displays the RATE value. The unit can also be programmed to automatically alternate the display between COUNT and RATE. The RATE function can be programmed to fix the decimal point in a specified position or allow it to float. In the floating decimal point mode, the display will show four significant digits.

When the serial communication feature of the 5882 is used, the RATE value is transmitted with the prefix “RTE” followed by the rate value, including the decimal point in the proper location, if applicable.

SPECIFICATIONS
Models which have the ratemeter option have slightly reduced maximum count speed. Note that the values below are replacements for the values found in the specification section of this manual.

The maximum count speed of scaled President counters is determined by the Scale Factor selected. The table below shows the maximum count speed for different scale factors and count modes.

<table>
<thead>
<tr>
<th>SCALE FACTOR</th>
<th>ADD/SUB</th>
<th>QUAD OR DOUB</th>
</tr>
</thead>
<tbody>
<tr>
<td>.0001 - .9999</td>
<td>4.20 kHz</td>
<td>2.10 kHz</td>
</tr>
<tr>
<td>1.0000</td>
<td>7.50 kHz</td>
<td>3.75 kHz</td>
</tr>
<tr>
<td>1.0001 - 1.9999</td>
<td>3.45 kHz</td>
<td>1.72 kHz</td>
</tr>
<tr>
<td>2.0000</td>
<td>6.25 kHz</td>
<td>3.12 kHz</td>
</tr>
<tr>
<td>2.0001 - 2.9999</td>
<td>3.02 kHz</td>
<td>1.51 kHz</td>
</tr>
<tr>
<td>3.0000</td>
<td>5.25 kHz</td>
<td>2.62 kHz</td>
</tr>
<tr>
<td>3.0001 - 3.9999</td>
<td>2.77 kHz</td>
<td>1.39 kHz</td>
</tr>
<tr>
<td>4.0000</td>
<td>4.50 kHz</td>
<td>2.25 kHz</td>
</tr>
<tr>
<td>4.0001 - 4.9999</td>
<td>2.50 kHz</td>
<td>1.25 kHz</td>
</tr>
<tr>
<td>5.0000</td>
<td>3.75 kHz</td>
<td>1.87 kHz</td>
</tr>
<tr>
<td>5.0001 - 5.9999</td>
<td>2.40 kHz</td>
<td>1.20 kHz</td>
</tr>
<tr>
<td>6.0000</td>
<td>3.50 kHz</td>
<td>1.75 kHz</td>
</tr>
<tr>
<td>6.0001 - 6.9999</td>
<td>2.28 kHz</td>
<td>1.14 kHz</td>
</tr>
<tr>
<td>7.0000</td>
<td>3.00 kHz</td>
<td>1.50 kHz</td>
</tr>
<tr>
<td>7.0001 - 7.9999</td>
<td>2.50 kHz</td>
<td>1.25 kHz</td>
</tr>
<tr>
<td>8.0000</td>
<td>2.75 kHz</td>
<td>1.37 kHz</td>
</tr>
<tr>
<td>8.0001 - 8.9999</td>
<td>2.00 kHz</td>
<td>1.37 kHz</td>
</tr>
<tr>
<td>9.0000</td>
<td>2.50 kHz</td>
<td>1.25 kHz</td>
</tr>
<tr>
<td>9.0001 - 9.9999</td>
<td>1.80 kHz</td>
<td>900 Hz</td>
</tr>
</tbody>
</table>

Figure 40. Maximum Count Speeds

RATE INDICATION ACCURACY: ±.1% or ±1 least significant digit, whichever is greater.

MINIMUM COUNT INPUT FREQUENCY FOR VALID RATE INDICATION: 1 pulse per 90 seconds (0.011 Hz).
OTHER SIGNIFICANT CHANGES OVER MODELS 58820-400 AND 58821-400

The Presidents with Rate have the addition of a "Rate" LED which is lit whenever the Rate value is being displayed. Additionally, the "4" key is used to display the Rate value and is so labeled.

The count value can be "frozen" on the display whenever the "Count" key is pressed and held. When the key is released, the display updates continuously to the current Count value, as normal. This allows a reading to be taken as a process is operating, since it effectively stops the display without affecting operation of the process and/or control functions.

The display does not latch when a serial communications interrogation of the counter is performed, nor does it latch when a Print on Reset function is initiated. The display will only latch when the Print Request/Display Latch terminal on the rear panel is energized or when the "Count" key is pressed and held.

RATEMETER THEORY OF OPERATION

The ratemeter function of the President counters calculate the rate to be displayed by measuring the time it takes for two consecutive pulses to be received on one of the count inputs. For count modes where the count function is resetting to zero and counting up, the ratemeter uses pulses that increment the count display. If a decrementing pulse is received by the counter, it is ignored by the ratemeter. Likewise, for count modes where the count function is resetting to the Preset and counting down, the ratemeter uses pulses that decrement the count display. If an incrementing pulse is received by the counter in this case, it is ignored by the ratemeter.

On units with count scaling, the rate function can be programmed to incorporate or ignore the COUNT scale factor. This capability is referred to as RATE TRACKING. To simplify the ratemeter explanations which follow, it will be assumed that the RATE TRACKING feature is programmed in the INPUT PULSE MODE (ignore scale factor).

Figure 41 shows how the ratemeter measures the time between pulses. The Rate is calculated by using the formula: Rate = 1/Pulse Time.

METER FACTORS

In order to allow the ratemeter display to show a value that relates to the process and represents the desired units of measurement (i.e., Feet Per Minute, Tons Per Hour, Sheets Per Second, Parts Per Hour, etc.), the ratemeter adjusts the rate value by a meter factor. This is done by using the formula:

\[
\text{Display Value} = \frac{\text{Rate (in Pulses Per Second)}}{\text{Meter Factor}}
\]

IMPORTANT: The Meter Factor can be almost any value. However, it is possible to select a value which will cause the Rate display to overflow. This means that the display is not capable of showing all of the significant digits of the resultant Rate value. Usually, this is caused by the combination of a large meter factor and a high pulse rate on the count inputs.

The Ratemeter indicates the overflow condition by lighting all of the decimal points on the display when
the Rate value is being viewed. The value shown on the display is the correct Rate value except that the most significant digit or digits are not visible because they have been effectively rotated off the display to the left. The error display is reset when the overflow condition ceases to exist, which would result when the incoming pulse rate is reduced, or the Meter Factor is changed.

In addition to the error display when an overflow condition occurs, the message “RTE MU_ER” (which stands for Rate Multiplier Error) is transmitted through the serial communications port whenever a print request is made. A print request is initiated by energizing the Print Request terminal on the rear of the counter or by sending an ASCII “?” to the counter through the serial communications port.

**Automatic Period Averaging**

When the pulses are presented to the counter at faster frequencies, the ratemeter automatically accumulates time for a number of pulses so that a greater accuracy of the measurement can be achieved. The ratemeter will switch from timing one pulse to accumulating the time for a group of 3, 10, 30, 100, 300, 1000, or 3000 pulses, depending on the frequency of the input. The ratemeter selects the appropriate range to allow the display update time to remain within the range of 0.5 to 3 seconds. This avoids display flicker for high frequency signals and allows a faster update time for very slow signals.

The Figure 42 shows how time is accumulated for a series of pulses when the pulse frequency is sufficiently high to cause the ratemeter to use an averaging range of 3. The rate is then calculated by using the formula:

\[
\text{Pulse Quantity} = \frac{\text{Rate}}{\text{Accumulated Time}}
\]

**Forced Period Averaging**

In some applications, it may be desirable to bypass the automatic selection of the period averaging. Typically, this is true when the pulses being generated by the process are not equally spaced. An example of this is when products or boxes are being placed on a conveyor somewhat randomly and it is desired to know the parts per hour being produced. In this case, measuring individual times between consecutive items will yield a rate display that will vary directly with the varying space between the items. But, by averaging the time it takes for 10 or 30 items to pass by on the conveyor, the display can show AVERAGE parts per hour and remain fairly stable.

While it is possible to select the MINIMUM number of pulses to average, the ratemeter will still automatically adjust to a higher averaging range if it receives pulses too quickly for the selected range. The manual selection only picks the minimum number of pulses to average. The ratemeter will never automatically adjust to an averaging range lower than that selected manually.

When an averaging range is selected manually, the ratemeter does not update the display until the selected quantity of pulses has been received. For example, if a range of 10 is selected manually and

![Figure 42. Measuring Pulse Time for Period Averaging](image-url)
pulses are being received at a rate of one per second, the display will not update for 10 seconds.

**IMPORTANT:** When a Forced Period Averaging value is used, the number of pulses which are to be averaged must be received within 90 seconds. If 90 seconds elapses before the minimum average quantity of pulses has been received, an error condition is generated.

For example, if an Averaging Range of 300 is selected, 300 pulses must be received within 90 seconds for the ratemeter to be able to generate a rate display. If the pulse quantity is not satisfied within 90 seconds, the ratemeter will display an error condition indicated by having the display digits blank and all of the decimal points lit. The error display is reset the next time that the ratemeter updates the display.

In addition to the error display when an Averaging Range error condition occurs, the message "RTE AV.ER" (which stands for Rate Averaging Error) is transmitted through the serial communications port whenever a print request is made. A print request is initiated by energizing the Print Request terminal on the rear of the counter or by sending an ASCII "?" to the counter through the serial communications port.

**Zero Indication Timeout**

For very low frequency count signals (less than 1 pulse per second), the display on the ratemeter updates every time it receives a pulse. It is capable of providing an accurate rate display value when the pulse rate is as slow as one every ten seconds. However, when the pulses stop completely, the ratemeter must have some means of knowing when to set the display to zero.

For this purpose, the Zero Indication Timeout is included. This internal timer is reset each time a pulse is received. But, if no pulse is received before the timer completes its time duration, the ratemeter sets the display to show zero. The time value is adjustable from 1 to 90 seconds in one second increments.

**CONFIGURATION PROCEDURE**

**Decimal Point**

Decide at which location on the display the decimal point should be located when the rate value is displayed. Then refer to the table in Figure 43 and enter the value for the desired location in Function code 63.

If you choose to have the ratemeter automatically locate the decimal point, enter a value of "9" in Function Code 63. When this option is selected, the ratemeter automatically locates the decimal point to maintain at least four significant digits of display value. The decimal point will shift right or left as the pulse rate increases or decreases.

<table>
<thead>
<tr>
<th>Func. 63</th>
<th>Decimal Point Location</th>
<th>DP#</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>(NONE) XXXXX.</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>XXXX.X</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>XXX.XX</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>XX.XXX</td>
<td>1000</td>
</tr>
<tr>
<td>4</td>
<td>X.XXXX</td>
<td>10000</td>
</tr>
<tr>
<td>9</td>
<td>Floating-4 significant digits</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 43. Decimal Point Location**

**Calculating the Meter Factor**

The meter factor required to obtain a desired resulting display can be calculated by using the formula:

\[
\text{M.F.} = \frac{\text{# Seconds Per Time Unit} \times \text{DP#}}{\text{# Input Pulses Per Item}} \\
\text{x2 if Count Doubling is Used}
\]

Where:

- **# SEC. PER TIME UNIT:** Items per Second=1, Items per Minute=60, Items per Hour=3600.
- **DP# (DECIMAL POINT NUMBER):** Number determined by Decimal Point Location. Refer to Figure 43.
- **# INPUT PULSES PER ITEM:** Number of pulses per item. Double this value if Count Doubling is used. Items can be Revolutions, Feet, Gallons, etc.

The Meter Factor must then be expressed in scientific notation. This means that it must be expressed as a number less than "1" raised to a power of 10. For example, a meter factor of 10.34 would be expressed as 0.1034 times ten to the second power (since the decimal point was shifted
two positions to the left). The resultant value entered into the Meter Factor Function Code (Function 64) would be 10342. Note that the last digit is always the power of ten and the display would show this value as “1034.2” with the decimal point flashing once per second.

**Example 1:**

A rotating shaft normally operates at approximately 600 RPM. A magnetic proximity sensor is used to monitor the shaft and produces one pulse per revolution. The display should show whole RPM (Func 63 = 0).

\[
\begin{align*}
\text{TIME UNIT:} & \quad \text{Minute} = 60 \text{ secs.} \\
\text{DP\# (XXXX.)} & = 1 \\
\text{PULSES PER REV} & = 1 \\
\end{align*}
\]

\[
60 \times 1
\]

Meter Factor = \( \frac{1}{60} = 0.000 \times 10^2 \)

Function 64 should be programmed as “6000.2”

**Example 2:**

Using the process from Example 1, it is desired to fix the decimal point such that the display would read “600.0” RPM.

\[
\begin{align*}
\text{TIME UNIT:} & \quad \text{Minute} = 60 \text{ secs.} \\
\text{DP\# (XXX.X)} & = 10 \\
\text{PULSES PER REV} & = 1 \\
\end{align*}
\]

\[
60 \times 10
\]

Meter Factor = \( \frac{1}{600} = 0.000 \times 10^3 \)

Function 64 should be programmed as “6000.3”

**Example 3:**

A flowmeter monitors movement of a liquid through a pipe. The flowmeter generates 20 pulses per gallon. Calculate the meter factor to display the Flow Rate in whole gallons per minute (Func 63 = 0).

\[
\begin{align*}
\text{TIME UNIT:} & \quad \text{Minute} = 60 \text{ secs.} \\
\text{DP\# (XXXX.X)} & = 1 \\
\text{PULSES PER GAL} & = 20 \\
\end{align*}
\]

\[
60 \times 1
\]

Meter Factor = \( \frac{1}{20} = 3 = 0.300 \times 10^1 \)

Function 64 should be programmed as “3000.1”

**Forced Averaging Range**

Normally, the ratermeter should be allowed to automatically select the averaging range to provide a consistent update time for the display value. However, in irregular processes where the pulses are spaced at random intervals, the ratermeter will show widely varying values when it is operating at low speeds. In these applications, it is advisable to establish the minimum number of pulses to average, to avoid a fluctuating display value.

Selection of the averaging range will depend on how fast the process is running and how much variation will be seen in the spacing of the pulses. In most cases where minimum averaging is required, the range will be selected by trial and error to minimize the amount of fluctuation of the display value. Start at a low average range and gradually increase until the display seems moderately stable from update to update.

To select an average range, refer to Figure 44 and enter the appropriate value into Function Code 65.

<table>
<thead>
<tr>
<th>Minimum Pulse Average Qty.</th>
<th>Function 65 Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No minimum (automatic)</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>300</td>
<td>5</td>
</tr>
<tr>
<td>1000</td>
<td>6</td>
</tr>
<tr>
<td>3000</td>
<td>7</td>
</tr>
</tbody>
</table>

**Figure 44. Average Ranges and Function 65 Values**

**IMPORTANT:** Selecting a forced averaging range defeats the ability of the ratermeter to maintain an update time of between 0.5 and 3 seconds at lower pulse rates. The display will be updated only after the selected number of pulses have been received, unless the pulse frequency is adequately fast to cause the ratermeter to select a higher averaging range automatically.
RATEMETER OPERATION (MODEL 58825-400 ONLY)

Example 4:

A bottling process produces approximately 4000 bottles per hour. The bottles are transferred on a conveyor. The bottles may be spaced unequally on the conveyor as they pass the sensor. Typically, the rate of 10 bottles can be averaged to determine and display the average production rate. Therefore, the Minimum Forced Averaging Range is adjusted to “10” by entering a value of “2” in Function Code 65.

Calculate the Meter Factor required to display Bottles Per Hour. Use the Floating Decimal Point feature (Func 63 = 9).

**TIME UNIT:** Hour = 3600 secs.
**DP# (FLOATING)** = 1
**PULSES PER BOTTLE** = 1

\[
3600 \times 1
\]

Meter Factor = 1 = \(3600 = 3.600 \times 10^4\)

Function 64 should be programmed as “3600.4”

Example 5:

Calculate the Meter Factor for a system that is using a 600 pulse per revolution encoder with a 1 foot circumference measuring wheel to monitor the travel of material through a roll former. The counter is in a DOUBLED count mode so that each count is equivalent to .01 inch. The desired rate display is Feet Per Minute with a floating decimal point (Func 63 = 9).

**TIME UNIT:** Minute = 60 secs.
**DP# (FLOATING)** = 1
**PULSES PER FOOT** = 1200

\[
60 \times 1
\]

Meter Factor = 1200 = .05 = \(.0500 \times 10^6\)

Function 64 should be programmed as “0500.0”

RATE TRACKING

The RATE TRACKING feature of this device allows the user to select whether or not the displayed rate is affected by the COUNT SCALE FACTOR. When Function 68 is set equal to 1 (SCALED COUNT MODE) the rate is affected by the COUNT SCALE FACTOR. When Function 68 is set equal to 0 (INPUT PULSE MODE) the COUNT SCALE FACTOR is ignored by the ratemeter.

In applications where the scale factor is being used to convert pulses to engineering units, it is desirable to use the SCALED COUNT MODE. Any changes that are made to the scale factor are automatically taken into account by the ratemeter. In other words, it is not necessary to re-calculate the Meter Factor each time the Scale Factor is changed when using the SCALED COUNT MODE.

Example 6:

Re-calculate the Meter Factor required for example 3 if the Rate Tracking feature is set to the SCALED COUNT MODE (Func 68=1) and the Count Scale Factor is set to count in whole gallons. Remember, the application involves a flow meter that generates 20 pulses per gallon and it is desired to have the counter count in whole gallons while displaying the rate in whole gallons per minute (Func 63=1).

**COUNT SCALE FACTOR** (Func 5) = 20 (PULSES) = .0500

THE METER FACTOR FORMULA FOR THE SCALED COUNT MODE IS:

\[
\text{M.F.} = \frac{\# \text{ SECONDS PER TIME UNIT} \times \text{DP#}}{\# \text{ SCALED COUNTS PER ITEM}}
\]

**TIME UNIT:** Minute = 60 secs.
**DP# (FLOATING)** = 1
**SCALED COUNTS PER ITEM** = 1

\[
60 \times 1
\]

Meter Factor = 1 = \(60.00 = 6.000 \times 10^2\)

Function 64 should be programmed as “6000.2”

If changes are made to the Count Scale Factor for calibration purposes, the Meter Factor will remain “6000.2”.

Power-Up Display Value

In some applications, the normal operating display desired is the Rate display rather than the Count value. The President counters normally power up with the Count value on the display. This would require an operator to press the “Rate” key each time the machine was turned on in order to monitor the rate.
President Ratemeters have the ability to allow the power-up display to be either the Count value or the Rate value. This is done by changing the value of Function Code 67. If it has a value of “0”, the counter will power up showing the Count value. If it has a value of “1”, the Rate will be displayed on power up.

Regardless of which value is showing after power up, the Count value can be viewed by pressing the “Count” key and the Rate value by pressing the “Rate” key. Once one of these keys is pressed, that value will remain on the display until a different selection is made or until power is removed from the counter.

**Alternating Display**

It is possible to program the President Ratemeters to automatically alternate the display between Count and Rate. This allows both items to be monitored without the need to select them from the keyboard. The length of time each item is displayed before switching to the other is selectable from 1 to 9 seconds. Program Function 69 with a number from 1 to 9 to select the Alternating Display mode and the length of time each item is displayed. For example, when Function 69 = 3, Count and Rate will each be displayed in alternating 3 second intervals.

**Communications Type**

President Ratemeters have the ability to transmit the Rate value through the serial communications output. This is in addition to all of the other values that can otherwise be transmitted. If the serial communications output is utilized, refer to the section of the Function code table (Figure 46) dealing with Function Code 91. For the specific model of counter you have to select the desired combination of values to be communicated. Note that when the Rate value

### IN CASE OF DIFFICULTY

This section deals with difficulties that may be encountered specifically with the Ratemeter function. For problems with functions other than the Ratemeter, refer to the “Troubleshooting” section of the Operator’s Manual.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSES</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate display shows a value with all of the decimal points being lit. Displayed value seems incorrect.</td>
<td>Meter Factor set at too high a value for the range of input frequency.</td>
<td>Adjust Meter Factor to a lower value. Typically, this can be accomplished by changing units of measurement of the display value. (i.e., items/minute instead of items/hour).</td>
</tr>
<tr>
<td>Rate display is blank except all decimal points are lit.</td>
<td>Forced Averaging is being used and input frequency is low such that the average quantity is not satisfied within 90 seconds.</td>
<td>Adjust Forced Averaging (Function Code 65) to a lower value.</td>
</tr>
<tr>
<td>Rate display value is incorrect.</td>
<td>1. Improper Meter Factor selected for desired display 2. Incorrect exponent for Meter Factor entered.</td>
<td>1. Recalculate the Meter Factor and enter in Function Code 64. 2. Be sure that the least significant digit of Meter Factor is exponent.</td>
</tr>
<tr>
<td>Rate Display is always zero.</td>
<td>Count pulses being received on incorrect input for operational mode selected.</td>
<td>Insure that pulses are additive when Counter is set to Reset to Zero mode and subtractive when Counter is set to Reset to Preset mode.</td>
</tr>
</tbody>
</table>

**Figure 45. Ratemeter Function Troubleshooting Table**
RATEMETER OPERATION (MODEL 58825-400 ONLY)

is printed, it is preceded by the characters “RTE” which identify Rate. Model 58825-400 has additional function codes which are associated with the operation of the Ratemeter. Selection and modification of these Function Codes utilize the same procedures as the other Function Codes.

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>FUNCTION CODE</th>
<th>ENTRY CHOICES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratemeter Value</td>
<td>Rate Key</td>
<td>None</td>
<td>Shows current Rate value.</td>
</tr>
<tr>
<td></td>
<td>(&quot;4&quot; key)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ratemeter Decimal</td>
<td>63</td>
<td>0</td>
<td>No decimal point is displayed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>XXXX.X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>XXXX.X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>XX.XXX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>X.XXX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*9</td>
<td>Floating decimal point. (Decimal Point is automatically located to maintain four significant digits of display value.)</td>
</tr>
<tr>
<td>Ratemeter Meter Factor</td>
<td>64</td>
<td>0001.1 to 9999.9</td>
<td>.0001 times 10^1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.9999 times 10^9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Factory set value (.1000 times 10^1)</td>
</tr>
<tr>
<td>Minimum Forced</td>
<td>65</td>
<td>*0</td>
<td>Automatic averaging selection (Ratemeter selects appropriate range.)</td>
</tr>
<tr>
<td>Averaging Range</td>
<td></td>
<td>1</td>
<td>Average 3 pulses minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Average 10 pulses minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Average 30 pulses minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>Average 100 pulses minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Average 300 pulses minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Average 1000 pulses minimum</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Average 3000 pulses minimum</td>
</tr>
<tr>
<td>Ratemeter Zero Indication</td>
<td>66</td>
<td>1 to 90</td>
<td>Seconds of time delay before display resets to zero when no pulses are received on the count input.</td>
</tr>
<tr>
<td>Timeout</td>
<td></td>
<td>*10</td>
<td>Factory set value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Display Rate Value on Power-Up.</td>
</tr>
<tr>
<td>Rate Tracking</td>
<td>68</td>
<td>*0</td>
<td>INPUT PULSE MODE (Rate is calculated from Unscaled Count signal - Scale Factor does NOT affect Rate).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Scaled COUNT MODE (Rate is calculated from Scaled Count signal - Scale Factor does affect Rate).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>COINCIDENCE MODE (Rate is calculated from the time period between coincidence outputs of the counter. This allows piece rates to be displayed when the counter is being used to measure out the pieces.</td>
</tr>
</tbody>
</table>

**Figure 46. Model 58825-400 Additional Function Codes**

*NOTE: Values shown with asterisks are the factory set values.*
### RATEMETER OPERATION (MODEL 58825-400 ONLY)

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>FUNCTION CODE</th>
<th>ENTRY CHOICES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Operation</td>
<td>69</td>
<td>*0</td>
<td>MANUAL MODE (Press &quot;COUNT&quot; key to display Count. Press &quot;4&quot; key to display Rate.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-9</td>
<td>ALTERNATING MODE (Display automatically alternates between Count and Rate displays. Number entered is the number of seconds each item is displayed before alternating.)</td>
</tr>
<tr>
<td>Transmit Data Select</td>
<td>91</td>
<td>TENS DIGIT</td>
<td>Select a two-digit value for Function 91 which transmits the desired data. The options are shown below.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*0</td>
<td>Transmit Rate &amp; Scale Factor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Transmit Rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Transmit Scale Factor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Omit Rate &amp; Scale Factor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UNITS DIGIT</td>
<td>*0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Transmit Count</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Transmit Preset</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Omit Count and Preset</td>
</tr>
</tbody>
</table>

*NOTE: Values shown with asterisks are the factory set values.*

---

### METER FACTOR FORMULAS

**Input Pulse Mode (Function 68 =0)**

\[
\text{M.F.} = \frac{\# \text{ Secs. Per Time Unit} \times \text{Decimal #}}{\text{Input Pulses per Item} \times 2 \text{ if Count Doubling Used}}
\]

**Scaled Count Mode (Function 68 = 1)**

\[
\text{M.F.} = \frac{\# \text{ Secs. Per Time Unit} \times \text{Decimal #}}{\# \text{Scaled Counts per Item}}
\]

<table>
<thead>
<tr>
<th>Function 63</th>
<th>Decimal Point Location</th>
<th>Decimal #</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>XXXXX (None)</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>XXXX.X</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>XXX.XX</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>XX.XXX</td>
<td>1000</td>
</tr>
<tr>
<td>4</td>
<td>X.XXXX</td>
<td>10000</td>
</tr>
<tr>
<td>9</td>
<td>Floating-4 significant digits</td>
<td>1</td>
</tr>
</tbody>
</table>

*Figure 47. Meter Factor Formulas*
Figure 48. 58825-400 Block Diagram
## TRANSDUCERS

<table>
<thead>
<tr>
<th>Medium Duty Shaft Encoder</th>
<th>Heavy Duty Shaft Encoder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Channel--381500-XXX</td>
<td>Single Channel--48370-XXX</td>
</tr>
<tr>
<td>Quadrature -- 38151-XXX</td>
<td>Quadrature--48371-XXX</td>
</tr>
</tbody>
</table>

60, 100, 120 and 600 PPR are stocked ratios for encoders. Any number from 001 to 600 is available. Substitute the desired PPR for “XXX” in the part numbers.

<table>
<thead>
<tr>
<th>12” Measuring Wheels with 3/8” Bore</th>
<th>Rotary &amp; Lineal Contactor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum Rimmed 20156-301</td>
<td>ES-9513-RS</td>
</tr>
<tr>
<td>Rubber Rimmed 20154-301</td>
<td></td>
</tr>
<tr>
<td>Urethane Rimmed 20144-301</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector for Encoder</th>
<th>Mounting Bracket for ES-9513-RS</th>
</tr>
</thead>
<tbody>
<tr>
<td>29729-300</td>
<td>40460-400</td>
</tr>
<tr>
<td></td>
<td>Shown with ES-9513-RS and 12” measuring wheel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector with 10 Foot Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>29665-300</td>
</tr>
</tbody>
</table>
Serial to Parallel BCD Communications Converter 58801-410

The Serial to Parallel BCD Communications Converter (SPCC) is a serial to parallel BCD adaptor which provides a means of interfacing a Durant counter to a ladder logic based Programmable Control. The SPCC converts the serial data from the counter’s 20ma current loop to eight digits of binary coded decimal data for use by the Programmable Control. The BCD output is connected to the I/O structure of the PC. Several options, conveniently selected by a four position DIP switch, eliminates the need for a special configuration for each different application. The SPCC has a self contained power supply which requires 120VAC power.

Parallel BCD To Serial Communications Converter 58801-411

The Parallel BCD to Serial Communications Converter (PSCC) is a parallel BCD to serial adaptor which provides a means of interfacing a Durant counter with a ladder logic based Programmable Control. The PSCC converts eight digits of binary coded decimal data from a PC to serial data to be input to the Durant counter through the counter’s 20ma current loop. The BCD input is connected from the I/O structure of the PC. Several options, conveniently selected by a four position DIP switch, eliminates the need for a special configuration for each different application. The PSCC has a self contained power supply which requires 120VAC power.

Simultaneous Input Processor

The Simultaneous Input Processor (SIP) is used as an accessory with Durant counters to insure that all counts are recorded when multiple sources of count signal are required (counts can occur simultaneously).

<table>
<thead>
<tr>
<th>Number of Inputs</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Input</td>
<td>49990-408</td>
</tr>
<tr>
<td>16 Input</td>
<td>49990-416</td>
</tr>
</tbody>
</table>

Timer Module 48160-440

The Durant Timer Module, 48160-440, provides a series of timed output pulses at a rate selectable by the user. The selection is made by setting a DIP switch located on the side of the module. A variety of pulse rates, from 1,000 pulses per second to 10 pulses per minute, can be set on the switch. The timer module will convert any Durant electronic counter or count control with a high speed (5000 Hertz) input into a timer.
Input Signal Conditioner 48160-400
The Model 48160-400 Signal Conditioner converts a wide range of input signals to a level that is compatible with Durant Electronic Controls. It will accept differential inputs from 50 millivolts to 400 volts and ground referenced inputs from 2.4 volts to 100 volts.

Relay Module
This unit has two relays that may be operated by transistors that are rated to carry at least .075A in a 12-volt circuit. Each relay has DPDT contacts for controlling external loads. The relays are plug-in type for easy replacement. The 12-volt power for the relays is provided from the AC input.

120 VAC input power 51611-400
240 VAC input power 51611-401

Desk Mounting Kits
These attractive desk mounting kits fit the Durant Series 5880 count controls for installation on any flat surface. The convenient two piece “snap together” design requires no tools for assembly. Four non-skid rubber feet prevent the control from sliding on the mounting surface. Standard conduit knockouts are provided on the rear of the kit for wiring to the process. The 58802-410 kit fits the 58810-400 Totalizer. The 58802-420 kit fits all other 5880 series count controls.

58802-410
58802-420

REPLACEMENT PARTS

Replacement Relay Revision 60 - up
Eaton No.: 38133-202
Aromat No.: JW1FEN-B-DC5V

Front Panel Gaskets
All Controls 28720-216
Totalizer (58810-400) 28720-215

Front Panel Spacer
Adapter to JiC enclosures
All Controls 38820-400
Totalizer (58810-400) 38810-400

Mounting Clip 48433-200
Screw 29801-187