THE ASTRO LINE SERIES

GEMINI 3300 INSTRUCTION MANUAL

INTRODUCTION

The Gemini 3300 is another unit in our multi-purpose series of industrial control products that are field-programmable to solve multiple applications. This series known as the Astro-Line family of products, is built around the concept that the end user has the capability to program different personalities and functions into the unit in order to adapt to different indication and control requirements.

The Gemini 3300 which you have purchased, has the same high quality workmanship and advanced technological capabilities that have made Red Lion Controls the leader in today's industrial market.

Red Lion Controls has a complete line of industrial indication and control equipment, and we look forward to being of service to you now and in the future.

$C\,E$

CAUTION: Risk of Danger.
Read complete instructions prior to
installation and operation of the unit.

CAUTION: Risk of electric shock.

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GENERAL DESCRIPTION

The Gemini 3300 is a two input, microprocessor-based Batch Counter with two Process Presets, a Batch Preset, and corresponding outputs. The 6-digit display features 0.56" LEDs with negative sign, overflow, display mode, and Process output indicators. The unit is available with a 20 mA Current Loop Communications Option, which makes possible remote or computerized monitoring and modification of the Count Values, Presets and Scale Factor.

Flexibility and usefulness are provided through user programmability. With simple front panel keystrokes and rear panel switch settings, any one of a number of configurations can be selected. Once the selection is made, all or part of the keyboard can be disabled to protect the settings and guarantee that no unwanted changes occur during the measurements.

Each time the power is turned off, the unit automatically saves the settings and data in its special no power memory. When power is restored, the Gemini sets itself back to the operational modes and restores the data it had at power-down. The *"no power"* E^2PROM's life expectancy is at least 100,000 cycles of power being applied to and removed from the unit.

Whenever the power comes on, the Gemini 3300 performs a series of internal diagnostics to verify the integrity of the stored data. There is also a self-test mode and a *"watchdog"* timer to help prevent processor lockup.

The Gemini 3300 can accept uni-directional, bi-directional, or quadrature signals. It also has the capability to double or quadruple *(Quadrature x4)* the resolution of the incoming count signal. There are also modes available for anti-coincidence applications. Both channels of count information are monitored simultaneously, no counts are lost, and the final output can be chosen as the sum or difference of the two input channels.

The Gemini 3300 20 mA Current Loop Communications option provides the capability of two-way serial communications between the Gemini 3300 and a variety of equipment, such as a printer, remote terminal, programmable controller, or host computer. The baud rate can be set to 300, 600, 1200, or 2400 baud. The format for transmitted and received data is 1 start bit, 7 data bits, 1 parity bit *(odd)*, and a stop bit. When utilizing an external power supply *(30 VDC max)*, up to sixteen units can be installed in the loop, each with an individual address. When utilizing the Gemini's 20 mA current source, up to seven units can be installed in a loop. The Count Values, Presets, and Scale Factor can be interrogated or changed by sending the proper command codes and numerical data *(if required)* to the unit. Other functions, such as resetting the various counters, can also be performed. Various *"Print Options"* can be selected to automatically interrogate the Count Values, Presets, and Scale Factor by activating the *"Print Request"* terminal or by sending a *"Transmit Per Print Option" (P)* command.

The relays are mounted on a plug-in board which makes it easy to field upgrade the Gemini 3300. The contacts are rated for 240 VAC or 28 VDC at 5 amps.

The construction of the Gemini 3300 features a metal die-cast bezel, offering maximum durability with a high quality appearance. The sealed front panel meets NEMA 4/IP65 specifications for washdown and/or dust when properly installed. Clamp type pressure plate terminals accept stripped #14 AWG wire without lugs.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use this unit to directly command motors, valves, or other actuators not equipped with safeguards. To do so, can be potentially harmful to persons or equipment in the event of a fault to the unit.

BASIC OPERATION

The Gemini 3300 contains three counters that keep track of the Process Count, Batch Count, and Total Count. When a count edge is received, the Process Counter and the Totalizing Counter are adjusted. When displaying the Process or Total Counts, the processor takes the raw count *(actual number of count edges that have been entered)* and multiplies it by the Scale Factor and Scale Multiplier and the results are displayed. The Batch Count register, which is adjusted each time a batch has been completed is displayed directly.

Both the Process Counter and Batch Counter have six Reset Action modes associated with them. Both of them can be independently configured to operate in Reset to Zero *(up-count)* or Reset to Preset *(down-count)* modes, and in manual or auto reset modes.

The Process Counter displays the value of display units in the current Batch cycle. The Preset 2 Value of the Process Counter determines the number of display units per batch cycle. When the Process Counter reaches Preset 2 (up-count modes) or zero (down-count modes), Output 2, and Relay 2 will activate and the Batch count will be adjusted by one. The Batch

Counter will display the number of batches that have been completed *(up-count modes)* or the number of batches left to complete *(down-count modes)*.

The Total Count is the total number of counts that have been received since the Total was last reset. It can be used to keep a running total of process units on a desired per shift, per day, per week, etc. basis. Like the Process and Batch Counts, the Total can be reset independently of the other two.

The internal precision of the Process and Totalizing Counter is maintained to 9 digits. The internal precision of the Batch Counter is 7 digits.

PROGRAMMING THE GEMINI 3300

When your Gemini 3300 arrives from the factory, it is necessary to program the unit to suit the desired application. It is programmed with the factory settings listed in the *"Factory Settings"* section. All programming is accomplished by using the pushbuttons located on the front panel. The personality, functions, and modes are accessed by pressing the appropriate keys. A function is defined by a two-digit code which appears on the left side of the display. The mode of that function is shown as a one-digit code on the right side of the display. At times there will be a "-" sign modifier to the left of the mode.

Data for the Presets, Scale Factors and Timed Output Values are entered differently. Each digit key controls the digit on the display directly above it. Changing the digits can be done by repeatedly pressing the key beneath the digit position you wish to change or by holding the key down. As you hold it down, or repetitively press it, the value of that digit will change cyclically, counting up to 9, then to 0, and then up again. The 6 numbered keys correspond to the six digits, and the "+/-" key corresponds to polarity.

DISPLAYING THE PROCESS, BATCH & TOTAL COUNT VALUES

The Gemini 3300 can display any of the three count values. There are three annunciators to the left of the display with the designations, P, B, and T. Only one annunciator will be lit at one time. These annunciators correspond to the Process, Batch and Total count values. To display a different value, the *"+/-"* key is repeatedly pressed and released until the annunciator corresponding to the desired count value is displayed. Each time the key is pressed, the display will sequence to the next count value and the appropriate annunciator will light. Once the display has been changed, the unit will display the count value until it is changed again.

MANUAL RESET

There are two different methods by which the Gemini 3300's count values can be manually reset. These methods are as follows:

> Reset by front panel Reset button, "R"
> Rear Reset terminal
> Reset utilizing 2-button reset

The reset operation is affected by three function code settings; The Reset Button, and Reset Terminal Actuation modes *(Function Code 61)*, the Reset Action modes *(Function Codes 62 and 63)*, and the *"Operator Accessible Functions"* modes *(Function Code 66)*. The *"Reset Button and Terminal Actuation Modes"* will determine which counters will be reset when the Reset button or terminal is activated. The Reset Action modes determine whether the Process or Batch Counter will Reset to Zero or Reset to Preset. The *"Operator Accessible Functions"* modes will determine which resetting modes are enabled, when the *"PGM. DIS." (program disable)* terminal is connected to *"COMMON"*. The Reset button can be disabled independently of the Reset terminal by setting the *"DIS./EN.RST."* position of the Input Configuration DIP switches to *"DIS."*.

A 2-button reset method is provided to allow an independent reset for the Process and Batch counters. To reset a counter using this method, the following procedure must be used.

Press the "E" key,
While holding the "E" key also press the
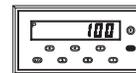
"1" button to reset the Process Counter, or the
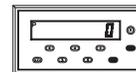
"2" button to reset the Batch Counter.
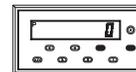
Note: There is no 2-button reset mode for the Total Counter. It can be independently reset by loading a Counter Load Value of 0.

PROGRAMMING FUNCTION CODES

Entering function and mode is easily accomplished by pressing the appropriate digit key. To program the Scale Multiplier, you would enter 45 by pressing the front panel keys, 4 and 5.

The digits on the left side of the display show the function code; the digits on the right side show the current programmed mode.

A new mode selection is made by entering a new number. On some of the entries, you have the option of a plus "+" or minus "-" sign. In the cases where a "+" sign is required, no sign will be displayed. If you do enter a "-" sign *(using the "+/-" key)*, a minus sign will be displayed in front of the appropriate digit.

Pressing the "E" key finalizes the change. The display will now show the count value immediately.

If you do not press the "E" key, the change will not be recorded. The display will remain in the programming mode for 15 seconds, and then return to normal operating mode using the old function and mode settings.

The unit can be programmed with the factory settings by calling up Function Code 41, putting a "-" in front of the mode by pushing the "+/-" key, and entering it.

Refer to the *"Factory Settings"* section for more details.

PROGRAMMING THE PRESETS, SCALE FACTOR, TIMED OUTPUTS & COUNTER LOAD VALUES

The Presets and Scale Factor Values are commonly reprogrammed on a daily basis. As such, single keystroke access has been provided on the front panel.

Pressing the "3" key will call up the Scale Factor.
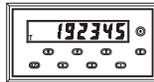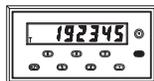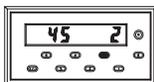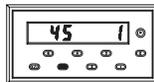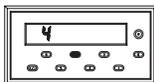
Once the Scale Factor is displayed, changing the digits can be accomplished by repeatedly pressing the key beneath the digit position you wish to change or by holding the key down, allowing the digit to increment automatically.
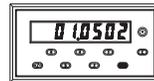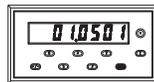
The new value will be entered when the "E" key is pressed.
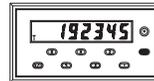
The internal unscaled Process and Total Count Values are multiplied by the Scale Factor Value, which changes the displayed values accordingly.

Presets 1 and 2 are assigned to the Process Counter and the Batch Preset is assigned to the Batch Counter. To call up the Preset for the desired counter, the Gemini 3300 must first be displaying that count value.

To display the Preset 1 Value *(Process Counter)*, the "+/-" key is first pushed *(if necessary)* until the "P" *(Process)* annunciator is lit.
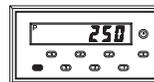
The "1" key is then pushed to call up the Preset 1 Value.
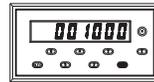
To change the value, the digits can be cycled through in the same manner as discussed for the Scale Factors.

The new value will be entered when the "E" key is pressed.

The Preset 2 Value is changed in the same manner as described above except that the "2" key is pushed instead of "1". To change the Batch Preset, the "1" key is pushed while the Batch Counter is being displayed. The Preset Values can range from 0 to +999999.
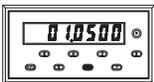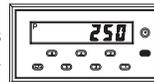
The Timed Output Values are changed by entering two-digit function codes. After the code is entered, the display will show the present Timed Output 1, 2 or B Value in seconds with two decimal place resolution. The Timed Output Values can be set from .01 to 599.99 seconds.
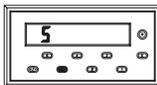
To change the Timed Output 1 Value, enter function code 53 and enter the new value by holding down or repeatedly pressing the key below the digit position you wish to change.
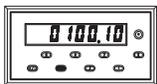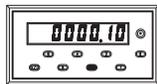
The new value will be entered when the *"E"* key is pressed. The display will immediately return to the count value.
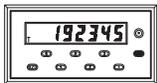
Note: A Timed Output Value of zero cannot be programmed into the Gemini 3300. If a value of 0 is entered into the display, and the "E" key is pressed, the unit will remain in data entry mode. If a new value is not entered, it will time out and the unit will continue to use its previous setting.

As with the other functions, you must press *"E"* to record the changes. For the data entry modes, if you do not press the *"E"* key, a time out of 5 seconds occurs, and the display returns to operating mode without any changes to the value. The only time any change will occur is when the *"E"* key is pressed.

It is possible to change the counter values of the Gemini 3300 by entering a *"Counter Load Value"*. This feature can be enabled or disabled by the programming of the *"Operator Accessible Functions Modes"*, function code 66. The *"Counter Load Value"* is stored when the unit is powered down. To access the Counter Load Value for the desired counter; first, press the *"+/-"* key, if necessary, so that the display is indicating the counter that is to be changed.
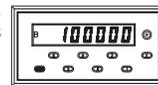
Secondly, press the *"E"* key and while holding it down, press the *"+/-"* key.
The Gemini will now display the Counter Load Value for the Counter that is displayed.
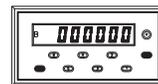
To change the value, press the key under the digit to be changed as explained previously for the Preset.
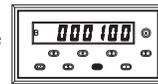
To load the value into the counter, press the *"E"* key. The display will flash momentarily and will display the counter with the new value.
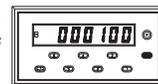
FACTORY SETTINGS
INITIAL FACTORY CONFIGURATION

Keys Struck	Display	Description
4,3	43 1	Count with Inhibit
4,4	44 1	Count on falling edge of Input A
4,5	45 1	Scale Multiplier of 1.0
4,6	46 1	Leading zero blanking and no decimal point
5,2	52 5	Output 1 terminates after Timed Output, Normal Phase
5,3	0000.10	Timed Output 1 Value of 0.1 sec
5,4	54 5	Output 2 terminates after Timed Output, Normal Phase
5,5	0000.10	Timed Output 2 Value of 0.1 sec
6,1	61 4	Reset Process, Batch, and Total Counter
6,2	62 1	Process Counter, Manual Reset to Zero
6,3	63 1	Batch Counter, Manual Reset to Zero
6,4	64 3	Output B terminates at reset. Normal output phase
6,5	0000.10	Timed Output B Value of 0.1 sec
6,6	66 6	Presets, Scale Factor 2-Button Reset, & Counter Load Programming Enabled
3	01.0000	Scale Factor set to 1.0000
1	000100	Preset 1 set to 100 (when Process Count displayed)
2	000200	Preset 2 set to 200 (when Process Count displayed)
1	000010	Preset B set to 10 (when Batch Count is displayed)
E & +/-	000000	Counter Load Values set to 0 (displays value for displayed counter)

Note: Entering a -1 in function code 41 will restore the unit to the factory configuration shown above.

OPERATOR ACCESSIBLE FUNCTIONS WITH PROGRAMMING DISABLED

(For details on keyboard entry, see preceding section)

One of the important features of the Gemini 3300 is the ability to disable programming. With this ability, accidental bumping of the keys or tampering by unauthorized personnel can be prevented. However, it may be necessary to allow reset and certain programming functions, such as Presets and the Scale Factor Value, to be changed in daily operation. The Gemini 3300, through the use of the *"Operator Accessible Functions"* Modes can enable these functions even when the *"PGM. DIS."* (Program Disable) terminal is connected to *"COMMON"*.

The *"Operator Accessible Functions"* modes are programmed by entering a two-digit function code *(66)* and the desired mode. Unlike other function codes, the mode does not take effect immediately. The *"PGM. DIS."* terminal must be connected to *"COMMON"* in order for the Gemini to disable programming and operate as per the mode programmed.

There are six basic *"Operator Accessible Functions"* Modes available. These modes enable the following functions.

1. NO FUNCTIONS ENABLED
2. PRESET PROGRAMMING ENABLED
3. SCALE FACTOR PROGRAMMING ENABLED
4. SCALE FACTOR AND PRESET PROGRAMMING ENABLED
5. PRESET, COUNTER LOAD PROGRAMMING, AND 2-BUTTON RESET ENABLED
6. PRESET, SCALE FACTOR AND COUNTER LOAD PROGRAMMING, AND 2-BUTTON RESET ENABLED

Note: In all of the modes above, the Reset button and terminal are enabled. All of these modes can be modified with the addition of a "-" sign. The minus sign disables the manual reset, at the front panel and the reset terminal at the rear of the unit.

There is also a rear panel DIP switch which permits disabling of the front panel reset button. This is independent of the rear reset terminal, and can be used in conjunction with any front panel disable mode.

DIAGNOSTICS, SELF TEST, & "WATCHDOG" TIMER

The security of the Gemini 3300 is further enhanced by its self-test diagnostic and *"watchdog"* timer capabilities.

The diagnostics are concerned with the special, no power memory of the Gemini 3300. When power is turned off, all pertinent function settings and measurements are automatically saved. When power is restored, the functions and data are re-instated. This allows you to program the unit once and not have to re-program it until you wish to use it in another mode.

When the function codes and data are saved, computations are made with these values. The result of these computations is stored in the memory to serve as a check against possible error. On power-up the same computations are repeated on the stored data. If the results do not agree with the stored results, a *"P"* will appear on the left side of the display. If this occurs, refer to the *"Troubleshooting Guide"* for directions.

Another error indicator is the "watchdog" timer. In order to insure the software is functioning properly, the program constantly monitors itself. If the proper sequence and timing of internal events does not occur, an *"E"* will appear on the left side of the display. If this occurs, refer to the *"Troubleshooting Guide"* for directions.

The final type of built-in error checking is the front panel initiated self-test. It can be performed at any time, even when the Gemini 3300 is running. It will not interfere with the accumulation of counts or control functions. A function code of *"6", "+/-"* starts the test. At this time, whatever was displayed will disappear and be replaced by a string of decimal points and the overflow indicator. Then the display will show a string of 9's, then 8's etc., until a string of 0's are shown. The self-test will then turn off the overflow indicator and activate the minus "-" sign. Then the unit shows an interlace pattern of -010101, then -212121, followed by 232323 etc., until 898989 is reached. At this time the outputs can be tested by pressing the "1" key for Output 1, the "2" key for Output 2, and the "3" key for Output B.

(The program disable terminal must be disconnected in order to allow activation of the outputs. Also, when testing the output, use caution, so as not to cause any undesirable or hazardous conditions in the system.) An automatic exit will take place after six seconds or immediately if the Program Disable terminal is connected to common. Normal length of display time for each of the patterns is approximately 0.5 sec. Rapidly pressing *"E"* during self-test can speed up the sequence.

INPUT CIRCUITRY & SET-UP

There are two independent input channels on the Gemini 3300. Various types of sensor outputs can be accommodated by appropriate DIP switch set-up. These include: TTL or CMOS logic, current sinking, current sourcing, or dry contact and more.

Channel A consists of a logic input and a separate low level magnetic pickup input.

Channel B is a completely independent count or control input channel. Like Channel A, it can be programmed with DIP switches for a wide variety of logic inputs, and is identical to Channel A in this regard. For a complete detailed description of input set-up, see Appendix "A".

OVERFLOW INDICATION

The Gemini 3300 features an overflow indicator *(LED)* which is located to the left of the sixth digit and above the polarity annunciator. This LED will turn on if the capacity of the display *(6-digits)* is exceeded or if the internal count capacity *(9-digits, 7 digits for batch counter)* is exceeded. Use of extremely small scale multiplier and Scale Factor Value can cause the internal count *(Process and Total)* capacity to overflow before the displayed value would overflow. For example, if a Scale Factor of 0.0001 and a Scale Multiplier of 0.001 is used, for every 10,000,000 count edges received, the display would increment by 1. Before the display reaches 215, the internal counter would overflow. When the capacity of the display is exceeded, the count value will be maintained and will be valid. But if the internal count capacity is exceeded, then this value will no longer be valid. The internal Process and Total count values will overflow after 2,147,483,647 counts have been entered. The count information will become invalid after 4,294,967,295 counts. At this point the counter will change sign and the displayed count will decrement in value.

The internal count capacity for the Batch Counter is 16,777,216. This amounts to overflowing the Batch Counter display over 16 times. If this number is exceeded, the counter will rollover to zero, however, the displayed digits will no longer be valid. It should also be noted that the use of a Scale Factor larger than one could cause the displayed Process or Total value to overflow before 999,999 counts are accumulated.

The Batch and Totalizing counters should not be allowed to operate in the overflowed condition. As soon as, or before the counters overflow, the information should be recorded and the counters reset.

PROGRAMMING INSTRUCTIONS FOR THE GEMINI 3300 BATCH COUNTER

The first part of this section provides detailed descriptions of the function command codes for Input response modes, reset modes, output termination modes, etc. Then, using an actual application example, the programming instructions are "walked through" to give the user a full understanding of the Gemini 3300 programming procedure. The descriptions below give the function command code first, followed by the individual mode identifier. The Function Command Summary in Appendix "D", lists all codes.

CODE 41 - FACTORY SETTINGS

When Code 41 is called up, the unit will display a 1 as the mode. Entering a "-" sign in front of the mode will cause the unit to re-load the factory settings as shown in the *"Factory Settings"* section.

CODE 43 - INPUTS A & B RESPONSE MODES

The Gemini 3300 has six different input response modes that will directly affect the Process Counter and the Total Counter. They are: Count *(A)* with Inhibit *(B)*; Count *(A)* with Up/Down Control *(B)*; Two input anti-coincidence Add *(A)*/Subtract *(B)*; Two input anti-coincidence Add *(A)*/Add *(B)*; Quadrature; and Quadrature x4.

[43 1] COUNT WITH INHIBIT - Input A serves as the count. Input B serves as the Inhibit input. When Input B is low, the counter will ignore the count signal appearing at Input A. When Input B is at a high level, the signal appearing on Input A will be counted. The *"Process Counter Reset Action Modes"* will determine the count direction for the Process Counter. In applications where the Inhibit function is not actually used, the Input B *"SRC/SNK"* position of the *"INPUT CONFIGURATION DIP SWITCH"* should be set to the *"SNK"* position to provide a 7.8 Kohm pull-up resistor. This will set Input B to the Non-Inhibit state.

[43 2] COUNT WITH UP/DOWN CONTROL - In this mode, count direction can be controlled by the second input. Input A serves as the count input and Input B serves as the direction control signal input.
When Input B is at a high level, the counter will count up. When Input B is at a low level, the counter will count down.

[43 3] TWO INPUT ANTI-COINCIDENCE ADD/SUBTRACT - This mode effectively separates count pulses which may simultaneously appear at the two inputs. The Gemini unit processes the count pulses into a string of time-separated pulses, so the internal counter will not lose any count pulses. Input A serves as the add input *(count increments)* and Input B serves as the subtract input *(count decrements)*.

[43 4] TWO INPUT ANTI-COINCIDENCE SUMMING - Input A and B are summed or added in the same manner as above. This mode is uni-directional. The *"Process Counter Reset Action Modes"*, will determine the count direction for the Process Counter.

[43 5] QUADRATURE COUNTING - Quadrature counting modes are primarily used in positioning and anti-jitter applications. The reason this mode works is due to the manner in which two pickups are positioned relative to each other. The signal on Input B is a pulse train signal shifted 90° away from the Input A signal. These two signals are processed by the Gemini as follows:
Input A serves as the count, while Input B serves as the quadrature input. For quadrature with single edge counting, the counter will count in a positive direction when Input A is a negative going edge and Input B is at a low level. The counter will count in a negative direction when Input A is a positive going edge and Input B is at a low level. All transitions on Input A are ignored when Input B is at a high level. These logic rules provide the basis for anti-jitter operation which will prevent false counts from occurring due to back-lash, vibration, chatter, etc.
When two edge counting is used, the quadrature mode works the same as with single edge counting when Input B is low. But when Input B is at a high level, counts at Input A are no longer ignored. Instead the logic rules for Input A are complemented, allowing both edges of Input A to be counted. This doubles the effective resolution of the encoded input.

CODE 43 - INPUTS A & B RESPONSE MODES (Cont'd)

[43 6] QUADRATURE TIMES 4 - This mode takes the quadrature mode, with two edge counting, one step further. In quadrature times 4, both Input A and Input B serve as the count or quadrature input, depending on their state. In one instance, Input A will serve as the count input and Input B will serve as the quadrature input. In another instance, Input A will be the quadrature input and Input B will be the count input. This enables each edge, positive and negative going, of both inputs, A and B, to be counted. This results in a resolution four times greater than in the basic quadrature x1 mode.

CODE 44 - NUMBER OF COUNT EDGES

The Gemini 3300 can be programmed for either single *(negative going edge)* or two edge *(x2)* counting. The number of count edges cannot be set when the count mode is programmed for quadrature x4 operation. The Gemini will ignore any attempt to enter Function Command Code 44 when set for quadrature x4.

[44 1] SINGLE EDGE COUNTING *(x1)* - The unit counts on the negative going *(falling)* edge of the count input signal. The count mode descriptions describe how each mode uses this method of edge counting.

[44 2] TWO EDGE COUNTING *(x2)* - This mode is used when doubling of the count signal input is required. The unit counts on the positive going *(rising)* edge of the count input signal, as well as the negative going *(falling)* edge.

CODE 45 - SCALE MULTIPLIER

There are four Counter B Scale Multipliers that are available. They effectively divide the internal Process and Total Count Values by 1, 10, 100, and 1000 respectively, to yield the displayed values. *(Note: Use of a small scale multiplier in conjunction with a small Scale Factor could cause the internal count value to be exceeded before the 6-digit display value is exceeded.)* See *"Overflow Indication"* section for more details.

[45 1] x1
[45 2] x 0.1
[45 3] x0.01
[45 4] x0.001

CODE 46 - DECIMAL POINT & LEADING ZERO BLANKING

There are six basic modes of decimal point placement for the Process and Total counter of the Gemini 3300. The decimal point is placed to the right of the display digit that corresponds to the mode identifier. *(The right most decimal point, digit 1, is never turned on.)* A "-" sign in front of the mode identifier will inhibit leading zero blanking. The absence of a "-" sign will enable leading zero blanking.

[46 1] 0	
[46 2] 0.0	
[46 3] 0.0 0	LEADING ZERO
[46 4] 0.0 0 0	BLANKING
[46 5] 0.0 0 0 0	
[46 6] 0.0 0 0 0 0	
[46 -1] 0 0 0 0 0	
[46 -2] 0 0 0 0.0	
[46 -3] 0 0 0 0.0 0	LEADING ZERO
[46 -4] 0 0 0.0 0 0	BLANKING INHIBITED
[46 -5] 0 0.0 0 0 0	
[46 -6] 0.0 0 0 0 0	

CODE 52 - OUTPUT 1 TERMINATION MODES

The Gemini 3300 has five *"Output 1 Termination Modes"*, which control the way Output 1 *(O1)* will terminate or reset. An Output 1 response will occur when the Process Counter reaches the Preset 1 Value *(when counting in the "normal" count direction)*. In all modes, Output 1 will terminate immediately when the Process counter is manually reset.

A reverse phase mode is available on the Gemini 3300. This refers to the complementing of the logic state of the output. With normal phase operation, when the Process counter value reaches Preset 1, Output 1 will turn on. The reset condition of Output 1 is output off. In reverse phase operation, Output 1 turns off when Preset 1 is reached. The reset condition of Output 1 is output on. *(Note: The state of the relay, if used, is also reversed.)* A "-" sign in front of the mode identifier will provide for reverse phase operation. The absence of a "-" sign will indicate normal phase operation.

[52 1] TERMINATE AT OUTPUT 2 START - Output 1 *(O1)* will terminate when Output 2 starts. Output 1 is set for normal phase operation.

[52 2] TERMINATE AT OUTPUT 2 END - Output 1 *(O1)* will terminate when Output 2 ends. Output 1 is set for normal phase operation.

[52 3] TERMINATE AT MANUAL RESET - Output 1 *(O1)* activates when the Process Counter Value reaches the Preset 1 value. In this mode, once Output 1 is activated, it does not deactivate until the moment a manual reset occurs. Output 1 is set for normal phase operation.

[52 4] TERMINATE AT MANUAL RESET END - This mode is like the preceding, except Output 1 *(O1)* deactivates when manual reset ends. Output 1 is set for normal phase operation.

[52 5] TERMINATE AFTER TIMED OUTPUT 1 - Once Output 1 *(O1)* has been activated, it will deactivate after the predetermined length of time *(Code 53)* has expired. Manual reset will override the timed output and reset Output 1. Output 1 is set for normal phase operation.

[52 -1]
[52 -2]
[52 -3]   These modes are the same as above with the exception
[52 -4]   that the output is set for reverse phase operation.
[52 -5]

CODE 53 - TIMED OUTPUT 1 VALUE

The Gemini 3300 has the capability of varying the Timed Output 1 Value from 0.01 second to 599.99 seconds. When the code is entered, instead of a single mode identifier digit being displayed, six digits will be shown. Refer to *"Programming the Presets, Scale Factor, Timed Outputs & Counter Load values"* section for more details about entering. The timed output will be terminated if the Process counter is manually reset.

Note: A Timed Output value of zero cannot be programmed into the Gemini 3300. If a value of 0 is entered into the display and the "E" key is pressed, the unit will not enter the 0, but will stay in the data entry mode. If a new value is not entered, it will time out and the unit will continue to use its previous setting.

CODE 54 - OUTPUT 2 TERMINATION MODES

The Gemini 3300 has five *"Output 2 Termination Modes"*, which control the way Output 2 *(O2)* will terminate or reset. An Output 2 response will occur when the Process Counter reaches the Preset 2 value or zero. In all modes, Output 2 will terminate immediately when the Process Counter is manually reset.

A reverse phase mode is available on the Gemini 3300. This refers to the complementing of the logic state of the output. With normal phase operation, when the Process counter value reaches Preset 2, Output 2 will turn on. The reset condition of Output 2 is output off. In reverse phase operation, Output 2 turns off when Preset 2 is reached. The reset condition of Output 2 is output on. *(Note: The state of the relay, if used, is also reversed.)* A "-" sign in front of the mode identifier will provide for reverse phase operation. The absence of a "-" sign will indicate normal phase operation.

[54 1] TERMINATE AT OUTPUT 1 START - Output 2 *(O2)* will terminate when Output 1 starts. Output 2 is set for normal phase operation.

[54 2] TERMINATE AT OUTPUT 1 END - Output 2 *(O2)* will terminate when Output 1 ends. Output 2 is set for normal phase operation.

[54 3] TERMINATE AT MANUAL RESET - Output 2 *(O2)* activates when the Process Counter reaches the Preset 2 value or zero. In this mode, once Output 2 is activated, it does not deactivate until the moment a manual reset occurs. Output 2 is set for normal phase operation.

[54 4] TERMINATE AT MANUAL RESET END - This mode is like the preceding, except Output 2 *(O2)* deactivates when manual reset ends. Output 2 is set for normal phase operation.

[54 5] TERMINATE AFTER TIMED OUTPUT 2 - Once Output 2 *(O2)* has been activated, it will deactivate after the predetermined length of time *(Code 55)* has expired. Manual reset will override the timed output and reset Output 2. Output 2 is set for normal phase operation.

[54 -1]
[54 -2]
[54 -3]   These modes are the same as above with the exception
[54 -4]   that the output is set for reverse phase operation.
[54 -5]

CODE 55 - TIMED OUTPUT 2 VALUE

The Gemini 3300 has the capability of varying the Timed Output 2 Value from 0.01 second to 599.99 seconds. When the code is entered, instead of a single mode identifier digit being displayed, six digits will be shown. Refer to *"Programming the Presets, Scale Factor, Timed Outputs & Counter Load Values"* section for more details about entering. The timed output will be terminated if the Process Counter is manually reset.

Note: A Timed Output Value of zero cannot be programmed into the Gemini 3300. If a value of 0 is entered into the display and the "E" key is pressed, the unit will not enter the 0, but will stay in the data entry mode. If a new value is not entered, it will time out and the unit will continue to use its previous setting.

CODE 61 - RESET BUTTON & TERMINAL ACTUATION MODES

Since there are three counters integrated into the Gemini 3300, various modes are available to provide the desired reset response to the activation of the front panel Reset button, *"R"*, or rear *"RST"* terminal. The mode selected, determines which counter(s) will reset when the reset button or terminal is activated.

There are two ways the manual reset can act on the unit. The first is a *"maintained"* reset action, in which the unit is held reset as long as the reset button or terminal is activated. If the Process Counter is held in *"maintained"* reset, counting on all three counters will be inhibited. The second is a *"momentary"* action in which the unit resets and starts counting immediately, even though the reset button or terminal may still be activated. A "-" sign preceding the mode identifier indicates *"momentary"* reset action. The absence of a "-" sign indicates *"maintained"* reset action.

[61 1]   RESET PROCESS COUNT ONLY
[61 2]   RESET BATCH COUNT ONLY
[61 3]   RESET PROCESS AND BATCH COUNT
[61 4]   RESET PROCESS, BATCH AND TOTAL COUNT

[61 -1]
[61 -2]   These modes are the same as above with the exception
[61 -3]   that reset is set for *"Momentary"* operation.
[61 -4]

CODE 62 - PROCESS COUNTER RESET ACTION & PRESET TRACKING MODES

The *"Process Counter Reset Action Mode"* determines how the Process Counter can be reset and the type reset action that will occur. In the manual reset modes, reset can only occur by activation of the Reset button, reset terminal *(See "Reset Button & Terminal Actuation Modes" - Code 61)*, 2-button reset, or through serial communications. In the *"Auto Reset"* modes the Process Counter can be reset manually and can also be reset when the Process Counter reaches the Preset 2 value, or zero, or after Timed Output 2, depending on the mode selected.

A Preset tracking mode is also incorporated in Function Code 62. A "-" sign preceding the reset action mode indicates that Preset tracking is enabled. The absence of a "-" sign indicates that Preset tracking is disabled.

If Preset tracking is enabled, whenever the Preset 2 value is changed, the Preset 1 value will also change so that the offset between Preset 2 and Preset 1 remains the same. The amount of offset is changed by changing the Preset 1 value. For example, if Preset 2 is 100 and it is desired that Preset 1 occurs 20 counts before Preset 2, the Preset 1 value would be set to 80. If Preset 2 is then changed to 200, Preset 1 will automatically change to 180, maintaining the same 20 count offset.

The Preset 1 Value cannot be changed when Preset tracking is enabled and the *"PGM.DIS." (Program Disable)* terminal is connected to *"COMMON"*.

[62 1] MANUAL RESET TO ZERO - Manual reset to zero is accomplished by pulling the *"RST."* terminal to *"COMMON"* or, if the front panel reset is enabled, by pressing the front panel reset button, or by using the "Two Button Reset" (pressing the "E" key and the "1" key). Preset tracking is disabled.

[62 2] MANUAL RESET TO PRESET 2 - Manual reset to Preset 2 is accomplished by pulling the *"RST."* terminal to *"COMMON"* or, if the front panel reset is enabled, by pressing the front panel reset button, or by using the *"Two Button Reset" (pressing the "E" key and the "1" key)*. Preset tracking is disabled.

[62 3] AUTOMATIC RESET TO ZERO AFTER TIMED OUTPUT 2 - The Process Counter automatically resets to zero when Timed Output 2 ends. The *"Output 2 Termination Mode"* should be programmed for timed output operation, *[54 5]*, when in this mode. Preset tracking is disabled.

[62 4] AUTOMATIC RESET TO PRESET 2 AFTER TIMED OUTPUT 2 - The Process Counter automatically resets to Preset 2 when Timed Output 2 ends. The *"Output 2 Termination Mode"* should be programmed for timed output operation, [54 5], when in this mode. Preset tracking is disabled.

[62 5] AUTOMATIC RESET TO ZERO AT THE BEGINNING OF TIMED OUTPUT 2 (AT PRESET 2) - In this reset mode, the Process Counter will automatically reset to zero at the beginning of Timed Output 2 *(at Preset 2)*. The Timed Output 2 Value *(Code 55)* must be shorter than the time required for the counter to count to the Preset 2 Value, otherwise, Output 2 will appear to be latched on. The *"Output 2 Termination Mode"* should be programmed for timed output operation, *[54 5]*, when in this mode. Preset tracking is disabled.

[62 6] AUTOMATIC RESET TO PRESET 2 AT THE BEGINNING OF TIMED OUTPUT 2 (AT ZERO) - In this reset mode, the Process Counter will automatically reset to Preset 2 at the beginning of Timed Output 2 *(at zero)*. The Timed Output 2 Value *(Code 55)* must be shorter than the time required for the counter to count to zero, otherwise, Output 2 will appear to be latched on. The *"Output 2 Termination Mode"* should be programmed for timed output operation, *[54 5]*, when in this mode. Preset tracking is disabled.

[62 -1]
[62 -2]
[62 -3]   These modes are the same as above with the exception
[62 -4]   that Preset Tacking is enabled.
[62 -5]
[62 -6]

CODE 63 - BATCH COUNTER RESET ACTION MODES

The *"Batch Counter Reset Action Mode"* determines how the Batch Counter can be reset and the type reset action that will occur. In the manual reset modes, the Batch Counter can only be reset by activation of the Reset button, reset terminal *(See "Reset Button & Terminal Actuation Modes" - Code 61)*, 2-button reset, or through serial communications. In the *"Auto Reset"* modes, the Batch Counter can be reset manually and can also be reset when the Batch Counter reaches the Batch Preset value or zero *(reset to Preset modes)*, or after the Batch Timed Output.

[63 1] MANUAL RESET TO ZERO - Manual reset to zero is accomplished by pulling the *"RST."* terminal to *"COMMON"* or, if the front panel reset is enabled, by pressing the front panel reset button, or by using the *"Two Button Reset" (pressing the "E" key and the "2" key)*.

[63 2] MANUAL RESET TO BATCH PRESET - Manual reset to Batch Preset is accomplished by pulling the *"RST."* terminal to *"COMMON"* or, if the front panel reset is enabled, by pressing the front panel reset button, or by using the *"Two Button Reset" (pressing the "E" key and the "2" key)*.

[63 3] AUTOMATIC RESET TO ZERO AFTER BATCH TIMED OUTPUT - The Batch Counter automatically resets to zero when Batch Timed Output ends. The *"Batch Output Termination Mode"* should be programmed for timed output operation, *[64 5]*, when in this mode.

[63 4] AUTOMATIC RESET TO BATCH PRESET AFTER BATCH TIMED OUTPUT - The Batch Counter automatically resets to Batch Preset when Batch Timed Output ends. The *"Batch Output Termination Mode"* should be programmed for timed output operation, *[64 5]*, when in this mode.

[63 5] AUTOMATIC RESET TO ZERO AT THE BEGINNING OF BATCH TIMED OUTPUT (AT BATCH PRESET) - In this reset mode, the Batch Counter will automatically reset to zero at the beginning of Batch Timed Output *(at Batch Preset)*. The Batch Timed Output Value *(Code 65)* must be shorter than the time required for the counter to count to the Batch Preset Value, otherwise, the Batch Output will appear to be latched on. The *"Batch Output Termination Mode"* should be programmed for timed output operation, *[64 5]*, when in this mode.

[63 6] AUTOMATIC RESET TO BATCH PRESET AT THE BEGINNING OF BATCH TIMED OUTPUT (AT ZERO) - In this reset mode, the Batch Counter will automatically reset to Batch Preset at the beginning of Batch Timed Output *(at zero)*. The Batch Timed Output Value *(Code 65)* must be shorter than the time required for the counter to count to zero, otherwise, the Batch Output will appear to be latched on. The *"Batch Output Termination Mode"* should be programmed for timed output operation, *[64 5]*, when in this mode.

CODE 64 - BATCH OUTPUT TERMINATION MODES

The Gemini 3300 has three *"Batch Output Termination Modes"*, which control the way Batch Output *(OB)* will terminate or reset. A Batch Output response will occur when the Batch Counter reaches the Batch Preset value or zero. In all modes, the Batch Output will terminate immediately when the Batch Counter is manually reset.

CODE 64 - BATCH OUTPUT TERMINATION MODES (Cont'd)

A reverse phase mode is available on the Gemini 3300. This refers to the complementing of the logic state of the output. With normal phase operation, when the Batch counter value reaches the Batch Preset, the Batch Output will turn on. The reset condition of the Batch Output is output off. In reverse phase operation, the Batch Output turns off when the Batch Preset is reached. The reset condition of the Batch Output is output on. A "-" sign in front of the mode identifier will provide for reverse phase operation. The absence of a "-" sign will indicate normal phase operation.

[64 3] TERMINATE AT MANUAL RESET - The Batch Output *(OB)* activates when the Batch Counter reaches the Batch Preset value or zero. In this mode, once the Batch Output is activated, it does not deactivate until the moment a manual reset of the Batch Counter occurs. The Batch Output is set for normal phase operation.

[64 4] TERMINATE AT MANUAL RESET END - This mode is like the preceding, except the Batch Output *(OB)* deactivates when manual reset ends. The Batch Output is set for normal phase operation.

[64 5] TERMINATE AFTER TIMED BATCH OUTPUT - Once the Batch Output *(OB)* has been activated, it will deactivate after the predetermined length of time *(Code 65)* has expired. Manual reset will override the timed output and reset the Batch Output. The Batch Output is set for normal phase operation.

[64 -3]
[64 -4] These modes are the same as above with the exception
[64 -5] that the output is set for reverse phase operation.

CODE 65 - BATCH TIMED OUTPUT VALUE

The Gemini 3300 has the capability of varying the Batch Timed Output Value from 0.01 second to 599.99 seconds. When the code is entered, instead of a single mode identifier digit being displayed, six digits will be shown. Refer to *"Programming the Presets, Scale Factor, Timed Outputs & Counter Load Values"* section for more details about entering. The timed output will be terminated if the Batch Counter is manually reset.

Note: A Timed Output Value of zero cannot be programmed into the Gemini 3300. If a value of 0 is entered into the display and the "E" key is pressed, the unit will not enter the 0, but will stay in the data entry mode. If a new value is not entered, it will time out and the unit will continue to use its previous setting.

CODE 66 - "OPERATOR ACCESSIBLE FUNCTIONS" MODES

The Gemini 3300 has six basic levels of *"Operator Accessible Functions"*. Each of these levels can be modified to enable or disable manual reset. When the *"PGM. DIS." (Program Disable)* terminal is connected to *"COMMON"*, access to all functions is disabled except for those listed below which will remain enabled. All of the function codes and parameters can be interrogated, regardless of the *"Operator Accessible Functions"* mode selected.

A "-" sign in front of the mode identifier will disable the front panel Reset button and the *"RST."* terminal.

Note: The front panel reset button can be independently disabled by using the disable reset DIP switch.

[66 1] NO FUNCTIONS ENABLED EXCEPT RESET - In this mode, manual reset is enabled, but none of the programming functions can be changed.

[66 2] PRESET PROGRAMMING AND RESET ENABLED - In this mode, manual reset and the programming of the Preset Values are enabled.

[66 3] SCALE FACTOR PROGRAMMING AND RESET ENABLED - In this mode, manual reset and the programming of the Scale Factor Value are enabled.

[66 4] SCALE FACTOR, PRESET PROGRAMMING AND RESET ENABLED - In this mode, manual reset and the programming of the Scale Factor and Preset Values are enabled.

[66 5] PRESET, COUNTER LOAD PROGRAMMING, 2-BUTTON RESET AND RESET ENABLED - In this mode, manual reset and the programming of the Presets, Counter Load Values and 2-Button Reset are enabled.

[66 6] PRESET, SCALE FACTOR, COUNTER LOAD PROGRAMMING, 2-BUTTON RESET AND RESET ENABLED - In this mode, manual reset and the programming of the Presets, Scale Factor, Counter Load Values and 2-Button Reset are enabled.

[66 -1]
[66 -2]
[66 -3] These modes are the same as above with the exception
[66 -4] that manual reset (Reset Button & Terminal) is disabled.
[66 -5]
[66 -6]

PRESET VALUES

The Gemini 3300 has three Preset values. Two Presets are assigned to the Process counter and one is assigned to the Batch counter. Whenever the counter value equals the preset value assigned to the display, an output action will occur. This action depends on the previously programmed modes. The preset values may range from 0 to 999,999. *(Refer to "Programming the Presets, Scale Factor, Timed Outputs & Counter Load Values" section for instructions on entering the preset values.)*

The Scale Factor will have a direct effect on the Process Counter preset value being entered. For a Scale Factor Value greater than one, the preset value should be an integer multiple of the Scale Factor. If it is not, the Gemini will automatically adjust the preset value up or down to force it to be evenly divisible by the Scale Factor.

<div align="center">

WITH PROCESS COUNT DISPLAYED -
"1" - PRESET 1 VALUE
"2" - PRESET 2 VALUE

WITH BATCH COUNT DISPLAYED -
"1" - BATCH PRESET

</div>

SCALE FACTOR

"3" SCALE FACTOR - The Scale Factor is accessed by pressing the *"3"* key. The number of pulses counted *(internal Process and total count values)* is multiplied by the Scale Factor, and scale multiplier which will change the displayed value accordingly. A Scale Factor Value of 1.0000 and a Scale Multiplier of 1 would result in a display of the actual number of input pulses that have been counted. The Scale Factor is used primarily for conversion from existing pulses per unit of measure to the required displayed units. This includes conversion from different units of measure *(i.e feet to meters, etc.)*. The Scale Factor Value may range from 0 to +5.9999. Refer to *"Programming the Presets, Scale Factor, Timed Outputs & Counter Load Values"* section for entering instructions. It is important to note that the precision of a counter application cannot be improved by using a Scale Factor greater than one. To accomplish greater precision, more pulse information must be generated per measuring unit. For example, if 5 pulses are being received per foot of material, the precision of 10th of feet cannot be attained by simply programming a Scale Factor of 2.0000, even though the display is reading in 10ths. In this case, the display will increment by two for each count input. Thus if an odd Preset Value was entered, such as 6.7 ft., the Gemini will alter the preset to read in even tenths of feet.

Note: Use of a small Scale Factor in conjunction with a small scale multiplier could cause the internal count value (Process or Total Counter) to be exceeded before the 6-digit counter value is exceeded.

COUNTER LOAD VALUES

The Counter Load Values are provided to allow the user to modify the three counter values. The Counter Load Values of the Gemini 3300 are stored in the unit's non-volatile memory upon power down. Accessing the Counter Load Value for the counter that is currently being displayed is accomplished by pushing the "E" button, and while holding it down, also pushing the *"+/-"* button. See *"Programming the Presets, Scale Factor, Timed Outputs & Counter Load Values"* section for entering instructions.

"E" & "+/-" - Counter Load Value for the currently displayed counter.

PROGRAMMING EXAMPLE

This example depicts a typical application for the Gemini 3300. The programming steps and set-up will be discussed to give the user an understanding on how to configure the Gemini 3300.

A typical industrial application for the Gemini 3300 will require a slow down output, a final stop output, and an end of batch output. The Gemini 3300 can be easily programmed to solve this requirement. Let's look at a textile web process that requires two outputs as the web progresses to the proper length and an output when the desired number of rolls has been processed. A typical length of material for this application is 1,000 feet. A slow down output is needed approximately 100 feet prior to the end of the 1000 foot length. After 100 rolls of material have been processed, the power to the motor drive will be removed to prevent further processing until the unit is reset. A light will also be turned on to indicate to the operator that the run has been completed.

There are a couple of ways to set-up the Process Counter of the Gemini 3300. The Process Counter could be set-up for *"Manual Reset to Preset 2"* operation. Preset 2 would be set to the total length of 1000 and Preset 1 would be set to 100 *(the distance before final cut where the slow down output is to occur)*. If the total length were to change, only Preset 2 would need to be changed. Preset 1 would remain set to 100. If the Process Counter is set up for *"Reset to Zero"* operation, Preset 2 would still be set to 1000, however Preset 1 would need to be set to 900 (1000-100), so that the slow down output would still occur 100 feet before final cut. Normally in up-counting modes this type of application would require that Preset 1 be changed along with Preset 2 every time a different length was to be processed. With the Gemini 3300, this is not necessary. The Gemini 3300 has a *"Preset tracking"* feature which causes Preset 1 to track Preset 2 whenever the Preset 2 value is changed. In this application we choose to utilize the second method of setting up the Process Counter, using *"Reset to Zero"* operation with *"Preset Tracking"*.

The Batch Counter can also be set-up for *"Reset to Zero"* or *"Reset to Preset"* operation.

The accompanying drawing shows an LMPC sensing a 60 tooth gear which is attached to a 2.5 ft. circumference drum. The desired units of display will be feet. Since there is more than one pulse per foot of travel, the pulses input to the Gemini will need to be scaled.
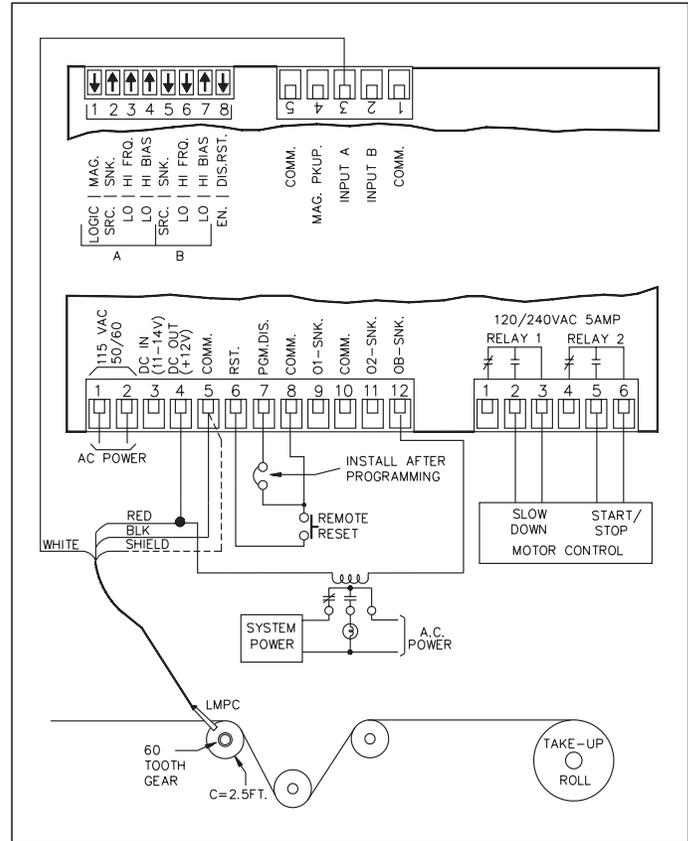
SCALING THE COUNTER

In order to scale the counter, the procedure and formulas in Appendix "E" - *"Scaling for Counting"* are used.

In converting pulse units to *"Display Units"*, it is known that 60 pulses are equivalent to 1 revolution of the feed roll, which is equivalent to 2.5 feet linear travel of the wire screen. The number of *"Display Units"*, therefore is 2.5 and the *"Number of Pulses"* per 2.5 display units is 60.

STEP 1 - Calculate the Total Scaling Factor, "K_T", using Formula #1 of Appendix "E".

$$K_T = \text{Display Units/Number of Pulses}$$
$$K_T = 2.5/60 = 0.0416667$$

STEP 2 - Determine the Number of Count Edges, "NCE", necessary for this application, and calculate the Remaining Scaling required, "K_R", using Formula #2 of Appendix "E".

Since the Total Scaling Factor, "K_T", is less than 1, single edge counting can be used, therefore, the Number of Count Edges, "NCE", is 1.

$$K_R = KT/NCE$$
$$K_R = 0.0416667/1 = 0.0416667$$

STEP 3 - Determine the Scale Multiplier Value, *"SCM"*, and calculate the Scale Factor, *"SF"*, using Formula #3 of Appendix "E".

A Scale Multiplier value of 0.01 is chosen to provide the maximum number of significant digits in the Scale Factor.

$$SF = K_R/SCM$$
$$SF = 0.0416667/0.01 = 4.1667$$

HARDWARE SET-UP

The application drawing shows how the hardware for this system is to be connected. The red, black, and white wires of the LMPC are connected to the DC OUT, COMM., and INPUT A terminals respectively. The shield of the LMPC cable is also connected to COMM. A remote reset button is connected between the RST. and COMM. terminals. After the programming is completed, a jumper is placed between the PGM.DIS. and COMM. terminals of the Gemini 3300. This terminal, in conjunction with the *"Operator Accessible Functions"* mode, will prevent accidental changes in the unit's operating modes. The Normally Open contact of Relay 1 is connected to the slow down actuator and the Normally Open contact of Relay 2 is connected to

the motor control. A 12 VDC external relay *(RLC # RLY10000)* is used to deactivate the motor drive control and turn on the indicator light.

DIP switch 1 is set to the logic position. This allows Input A to function as the count input. Switch position 2 is set to SNK. *(current sinking)*, which provides an internal pull-up resistor to 12 VDC. Position 3 is set to HI FRQ. because of the high count speeds involved. Position 4 is set to HI BIAS for higher noise immunity.

In this application, the *"Count with Inhibit"* Inputs A & B Response mode will be used. The application will not use the inhibit function, so Input B will be set-up in the non-inhibiting state.

STEP BY STEP PROGRAMMING OF THE GEMINI 3300

Refer to the *"Programming the Gemini 3300"* section for instructions on programming the function codes and entering the Scale Factor and Presets.

STEP 1 - Enter Code 43 *(Inputs A & B Response Modes)*, and enter a mode identifier of 1 *(Input A = Count, Input B = Inhibit)*.

STEP 2 - Enter Code 44 *(Number of Count Edges)*, and enter a 1 for single edge counting.

STEP 3 - Enter Code 45 *(Scale Multiplier)*, and enter a mode identifier of 3 for a Scale Multiplier of 0.01.

STEP 4 - Enter Code 46 *(Decimal Point and Leading Zero Blanking)*, and enter a mode identifier of 1 for no decimal points with Lead Zero Blanking.

STEP 5 - Enter Code 52 *(Output 1 Termination Modes)*, and enter mode identifier of 3 for terminate at start of manual reset. Output 1 is the slow down output, which once activated, should remain so until the unit is manually reset.

STEP 6 - Enter Code 54 *(Output 2 Termination Modes)*, and enter a mode identifier of -3 *(terminate at start of manual reset, reverse phase operation)*. This mode was selected so that when the system is powered up, the relay would be in the open condition which is motor drive off. To start the process, the Reset button is pushed which would close the Output 2 Relay *(turn on motor drive)* and would stay closed until Preset 2 is reached, at which time it would open *(turn motor drive off)*.

STEP 7 - Enter Code 61 *(Reset Button and Terminal Actuation Modes)*, and enter a mode identifier of 1 *(Reset Process Counter)*. With this mode, when the Reset button is pushed, only the Process Counter will reset. To reset the Batch or Total Counters, the two button reset, or Total Counter Load Value must be utilized.

STEP BY STEP PROGRAMMING OF THE GEMINI 3300 (Cont'd)

STEP 8 - Enter Code 62 *(Process Counter Reset Action Modes)*, and enter a 1 *(Manual Reset to Zero with Preset Tracking enabled)*.

STEP 9 - Enter Code 63 *(Batch Counter Reset Action Modes)*, and enter a 2 *(Manual Reset to Batch Preset)*.

STEP 10 - Enter Code 64 *(Batch Output Termination Modes)*, and enter a mode identifier of 3 *(Terminate at Manual Reset)*.

STEP 11 - Enter Code 66 *("Operator Accessible Functions" Mode)*, and enter a mode identifier of 5, *(Preset, Counter Load programming, 2-Button Reset and Reset enabled)*. When the *"PGM. DIS." (program disable)* terminal is connected to COMMON, the only changes that will be possible is resetting the unit and changing Preset 2 and Preset B. Preset 1 is locked out when Preset tracking is enabled. The Preset 1 value should be entered before *"PGM. DIS."* terminal is connected to COMMON.

STEP 12 - Press the *"+/-"* key until the Process Count is displayed *(P annunciator is displayed)*. Press *"1"* and enter the value at which the machine is to start slowing down *(900 is used in this application)*.

STEP 13 - Press *"2"* and enter the total length of material to be processed (1000 feet).

STEP 14 - Press the *"+/-"* key until the Batch Count Value is displayed *(B annunciator is displayed)*. Press *"1"* and enter the amount of spools to be wound.

STEP 15 - Press *"3"* and enter a Scale Factor Value of 4.1667

STEP 16 - Connect the *"PGM. DIS."* terminal to *"COMM."* to prevent accidental changes to the program modes.

GEMINI 3300 20 MA CURRENT LOOP COMMUNICATIONS

The Gemini 3300's 20 mA Current Loop Communications Option allows a *"two-way"* serial communications link to be established in order to monitor or change the counter values, Presets and Scale Factor from a remote location. Some typical devices that can be connected with the Gemini 3300 are: a printer, terminal, programmable controller, or host computer. For devices that use RS232, a GCM232 Serial Converter Module is available to convert the 20 mA Current Loop signals to RS232 and vice-versa.

There are two loops that must be established. One for sending commands to the Gemini 3300 and one for receiving the data values from the Gemini 3300. Up to sixteen Geminis or other RLC units with 20 mA serial communication capability, can be connected together in the *"loop"* if a 24 V external current source is utilized. A maximum of seven units can be installed in the loop if the Gemini's 20 mA current source is used. The units are assigned addresses by setting the Serial DIP Switches on each unit. The applications can be as simple as attaching a printer to obtain hard copy of the display information or as involved as using a host computer to automatically set up Presets and Scale Factors on a number of Geminis.

With the Communications Option, the following functions can be performed:
1. Interrogation of the Count Values, Presets, and Scale Factor.
2. Changing of the Count Values, Presets and Scale Factor.
3. Resetting of the Count Values and Outputs.
4. Changing of the viewed display value.
5. Automatic print-out when using a printer and the *"Print Request"* Terminal.

COMMUNICATION FORMAT

Data is sent by switching off and on the current in the 20 mA current loop. Data is received by monitoring the switching action and interpreting the codes that are transmitted. In order for data to be interpreted correctly, there must be identical formats and Baud Rates.

The format that the Gemini 3300 will accept is: 1 start bit, 7 data bits, 1 odd parity bit, and 1 stop bit. The Baud Rates that are available are: 300, 600, 1200 and 2400.

The selection of the Baud Rate is done by setting DIP switches. Refer to the *"Current Loop Installation"* section, for set-up instructions.

FIG. 1: DATA FORMAT-10 BIT FRAME [300, 600, 1200, 2400 Baud]
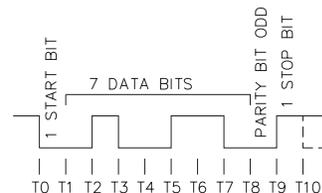
SENDING COMMANDS & DATA TO THE GEMINI 3300

When sending commands to the Gemini 3300, a command string must be constructed. The command string may consist of command codes, value identifiers, and numerical data. Following is a list of commands and value identifiers that are used when communicating with the Gemini 3300.

COMMAND	DESCRIPTION
N (4EH)	Address command; followed by a one or 2 unit address number 1-15 and one of the following commands.
D (44H)	Change display command; followed by E, F, or G. This command changes the viewed display channel on the Gemini 3300 to *"P" (Process Counter)*, *"B" (Batch Counter)*, or *"T" (Total Counter)*.
P (50H)	Transmit per Print Options command.
R (52H)	Reset command; followed by a value identifier *(E, F, or G)*; operates on Process, Batch or Total Counter. A value identifier of M: resets counter*(s)* currently selected in Code 61.
T (54H)	Transmit Value command; followed by a value identifier *(A-G)*; operates on counter values, Presets and Scale Factors.
V (56H)	Change Value command; followed by a value identifier *(A-G)*; operates on count values, Scale Factor, and Presets.

SENDING COMMANDS & DATA TO THE GEMINI 3300 (Cont'd)

VALUE IDENTIFIER	DESCRIPTION	MNEMONIC
A (41H)	Preset 1	(PS1)
B (42H)	Preset 2	(PS2)
C (43H)	Batch Preset	(PSB)
D (44H)	Scale Factor	(SCF)
E (45H)	Process Count	(PRC)
F (46H)	Batch Count	(BAT)
G (47H)	Total Count	(TOT)
M (4DH)	Counter (s) selected in Code 61	N/A

The command string is constructed by using the above commands and value identifiers, along with the data values that are required. Data values may or may not contain the decimal point if a decimal point is programmed into the Gemini 3300. The Gemini 3300 will accept the decimal points, however, it does not interpret them in any way. Leading zeros can be eliminated, however, all trailing zeros must be present. For example, if a Scale Factor of 1.0000 is to be sent, the data value can be transmitted as 1.0000 or 10000. If a "1" is transmitted, the Scale Factor will be changed to 0.0001.

The Address command is used to allow a command to be directed to a specific unit in the Serial Communications Loop. Whenever the unit address is zero, transmission of the Address command is not required. This is done for applications which do not require more than one Gemini. For applications that require several units, it is recommended that each unit in the loop be given a separate address. If they are given the same address, a command such as the Transmit Value Command, will cause all the units to respond at the same time, resulting in erroneous data.

The command string is constructed in a specific logical sequence. The Gemini 3300 will not accept command strings that do not follow this sequence. Only one operation can be performed per command string. Below is the procedure to be used when constructing a command string.

1. If the Gemini 3300, to which the command is to be sent, is assigned an address other than zero, the first two or three characters of the command string must consist of the Address Command (N) and the address number of the unit (1-15).

2. The next character(s) in the command string is the actual command that the Gemini 3300 is to perform and the value identifier if it pertains to the command. (A command such as the Transmit per Print Options, "P", command does not require a Value Identifier.)

3. If the change command is being used, the next characters in the command string is the numerical data value.

4. The last character in the command string is the command terminator (*). This character must be sent in order to tell the Geminis that the command string is complete, so that they can begin processing the command.

Below are some typical examples of properly constructed command strings.

(EX. 1) Change Preset 1 on the Gemini 3300 with an address of 2 to 00123.4.

COMMAND STRING: N2VA1234*

(EX. 2) Have the Gemini 3300, with an address of 13, transmit the Batch Count Value.

COMMAND STRING: N13TF*

As shown, all commands must be terminated with a *"Command Terminator" (* or 2AH)*. The Gemini 3300 will not process the command until the terminator is sent. If illegal commands or characters are sent to the Gemini 3300, they still would need to be terminated by an (*). If they are not terminated, the next command will not be accepted.

When writing application programs in Basic, the transmission of spaces or carriage return and line feed should be inhibited by using the semicolon delimiter with the Print statement. The Gemini 3300 will not accept a carriage return or line feed as valid characters.

When a *"Change Value"* command is sent to the Gemini 3300, a short amount of time is required for the unit to process the data. This time increases with the count rate. During this time, only one additional command may be sent to the Gemini 3300. This may be done 80 msec after the transmission of the *"Change Value"* command. After the second command has been transmitted, the unit will ignore any further commands until 10 msec after both the *"Change Value"* and second command have been processed. It is recommended that a *"Transmit Value"* command follow a *"Change Value"* Command. If this is done, the reception of the data can provide a timing reference for sending another command and will insure that the change has occurred.

The timing diagrams show the timing considerations that need to be made.

FIG. 2: TIMING FOR SENDING COMMANDS

(**) *This is the time that it takes the Gemini 3300 to process the preset. It varies with the Count Rate and Scale Factor Value.*

FIG. 3: TRANSMIT COMMAND TIMING
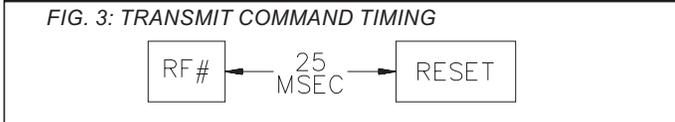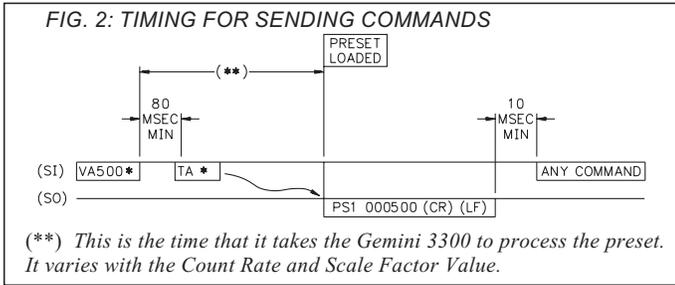
RECEIVING DATA FROM THE GEMINI 3300

Data is transmitted from the Gemini 3300 when a *"Transmit Value"* or *"Transmit per Print Options"* command is sent to the unit, or when the *"PRINT REQ."* terminal is activated. The Gemini 3300 can transmit 7 values: display channels P, B and T, Presets 1 & 2, Batch Preset and Scale Factor. A list of the abbreviations used when the Gemini 3300 transmits the values are shown below.

PRC - Process Count Value
BAT - Batch Count Value
TOT - Total Count Value
PS1 - Preset 1
PS2 - Preset 2
PSB - Batch Preset
SCF - Scale Factor

A typical transmission, with the *"PR.ID" (Print ID)* switch in the up position, is shown below.
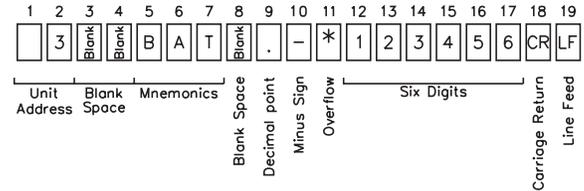
The first two digits transmitted are the unit address followed by two blank spaces. If the unit address is 0, the first locations will be left blank. The next three letters are the abbreviation for the mnemonic value followed by one blank space. The actual values are transmitted last. Negative values are indicated by a "-" sign. For positive values, the "+" sign is not transmitted. Overflowed counter values are shown by an asterisk preceding the most significant digit of the value. The decimal point position will *"float"* within the data field depending on the actual value it represents.

For peripheral control purposes, a single line transmission will have a <CR> attached to the end of the above string. For a *"T"* command or each line of a block transmission, only the above character string is sent. For the last line of a block transmission, a <SP><CR><LF> is attached to the end of the above character string. An example of a typical serial transmission:

3 BAT   1234.56

If the *"Print Request"* terminal initiates the transmission, a 400 msec delay is inserted before the transmission to keep multiple transmissions from overrunning the printer.

When the Print ID switch is in the down position, the unit will not transmit the characters before the data value *(address, Value ID, spaces)* or the 400 msec printer delay. The same above value when transmitted with the "PR.ID" switch in the down position, is transmitted as:

1234.56

Note: When using the Gemini with a printer, with the "Print ID" switch in the down position, some printers may not work, since the printer delay is not transmitted.

PRINT OPTIONS

The various Print Options are used mainly in conjunction with a printer and the Print Request Terminal. They provide a choice of Gemini 3300 data values to be printed when either the Print Request Terminal is activated or the *"Transmit per Print Options" (P)* command is sent to the Gemini 3300. The various Print Options available are:

1. Print Total Counter Value
2. Print Batch Counter Value
3. Print Process Counter Value
4. Print Display P, B, & T
5. Print Display T, Presets 1 & 2, Batch Preset, and Scale Factor
6. Print Display B, Presets 1 & 2, Batch Preset, and Scale Factor
7. Print Display P, Presets 1 & 2, Batch Preset, and Scale Factor
8. Print Display P, B, & T, Presets 1 & 2, Batch Preset, and Scale Factor

A typical printout is shown below. The Print Options are selected by setting S4, S5 and S6 on the Serial DIP Switch. See Page 23 for the various switch settings.

1	PRC	000054
1	PS1	000100
1	PS2	000200
1	PSB	000010
1	SCF	01.0000

CURRENT LOOP INSTALLATION
WIRING CONNECTIONS

It is recommended that shielded (screened) cable be used for serial communications. This unit meets the EMC specifications using Alpha #2404 cable or equivalent. There are higher grades of shielded cable, such as, four conductor twisted pair, that offer an even higher degree of noise immunity.

When wiring the 20 mA current loop, remove the 7-position terminal block *(TBD)*, located on the right side of the top board. Refer to the numbers listed with the terminal descriptions below or on the top label, and install each wire in its proper location on the terminal block. When all connections are made, replace the terminal block into its proper location.

TERMINAL DESCRIPTIONS FOR TERMINAL BLOCK TBD

1. **-20 mA SRC(COMMON)** - Common for 20 mA SRC & Print Request terminal
2. **PRINT REQUEST** - The Print Request Terminal is connected to common to request the Gemini 3300 to transmit according to the Print Options mode that has been selected. *(Minimum Activation time = 25 msec.)*
3. **+20 mA SRC** - The 20 mA SRC terminal provides the source current for one of the loops.
4. **SO- (Serial Out-)**
5. **SO+ (Serial Out+)**
   The Gemini 3300 transmits the requested data on these terminals (SO- & SO+). They are connected in series to the receive input of the device to be connected.
6. **SI- (Serial In-)**
7. **SI+ (Serial In+)**
   The Gemini 3300 receives commands on these terminals (SI- & SI+). They are connected in series with the transmit or output terminals of the device to be connected.

SERIAL DIP SWITCH SET-UP

The Serial DIP switches are accessible through the side of the Gemini 3300. A list of the DIP switch positions and their functions are shown in Figure 4.

BR0 & BR1, BAUD RATE - Set-up is shown in Figure 4, at right. When changing the Baud Rate, the unit should be powered-down and then powered back up again. The unit will only recognize a baud rate change upon power-up, after activating the *"Print Request"* terminal or after a few characters have been sent at the new baud rate *(If the two previous conditions have not occurred, the Gemini will see the characters as erroneous and it will check the baud rate and set itself to operate at the new rate)*.

PR.ID - PRINT ID. - When this switch is in the up position, the Gemini 3300 will print the unit address, data value ID and the data value when a transmission is requested. The unit will also insert a 400 msec delay between transmissions when the "P" command or Print Request terminal is used. This switch position is generally used when the unit is connected with a printer. When the switch is in the down position, the Gemini 3300 will transmit only the data value, without the unit address and data ID. The 400 msec delay, described above, will not be inserted. This switch position usage is intended for applications where the Gemini is communicating with a computer. In these circumstances printing the address and value ID and inserting a 400 msec print delay is usually unnecessary and needlessly slows down communication throughput.

PC0, PC1, & PC2, PRINT OPTIONS - Used to control which values are transmitted when the Print Request terminal is activated or when the Transmit per Print Options command "P" is sent to the Gemini 3300.

AD0, AD1, AD2 & AD3, UNIT ADDRESS - These switches are used to give each unit a separate address when more than one unit is connected in the Loop. See Figure 4, for Switch Set-up.

FIG. 4: DIP SWITCH SET-UP
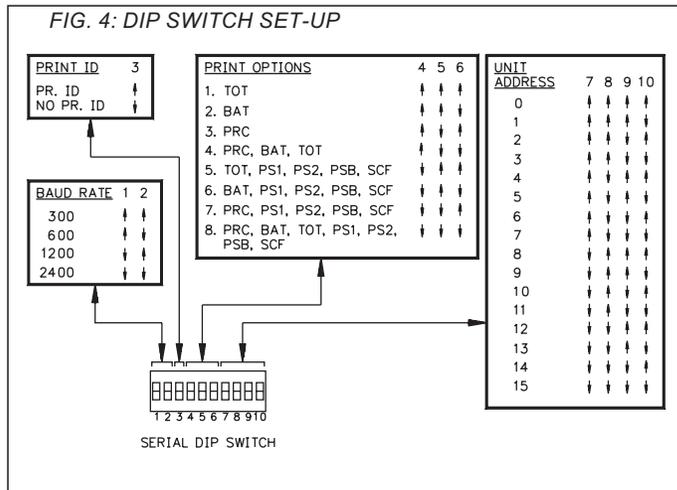
PROCESS MONITORING SYSTEM

Five Gemini 3300s with 20 mA Current Loop Option, are used to monitor and control parts packaging machines in a plant. The units are located at each of the machines in the production area of the building. The communications lines are run to an Industrial computer located in the production offices.

[OTHER GEMINIS OR RLC PRODUCTS WITH 20 MA CURRENT LOOP CAN BE CONNECTED IN THE SAME LOOP.]

The drawing below shows the Current Loop set-up. Each Gemini 3300 is given an address and the Serial DIP switches are set accordingly. A Baud Rate of 1200 is selected and set in each of the Gemini 3300s. An application program is written, which sends and retrieves data from the units using the Change and Transmit Value commands.

Note: A Serial Converter Module is available for interfacing an RS232 device to Geminis.

TROUBLESHOOTING GEMINI SERIAL COMMUNICATIONS

If problems are encountered when trying to get the Gemini(s) and host device or printer communicating, the following checklist can be used to help find the solution.

1. Check all wiring. Refer to the previous application examples and use them as a guide to check your serial communication wiring. Proper polarity of all Geminis and other peripherals must be observed. If a multimeter or ammeter is available, insert it in series in each Serial loop and check for current flow with all units powered up. If no current is flowing, either the loop is not wired correctly, or some other fault has occurred. If too much current has been sent through a Serial Input or Output, the unit may have been damaged. If a Gemini is suspected, it can be tested for operation by using the Serial Loop-back test described in the next section.

2. If the Gemini is set-up with a *"host computer"*, device or printer, check to make sure that the computer or device is configured with the same communication format as the Gemini. The only communication format the Gemini will accept is; 1 start bit, 7 data bits, odd parity, and 1 stop bit.

3. Check the baud rate settings and make sure all devices in the loop are set to the same baud rate.

4. Check the Gemini's unit address. If the Address command is not used when transmitting a command to the Gemini, the Gemini's address must be set to 0. See *"Sending Commands & Data to the Gemini"* section for command structure.

5. If two-way communications is to be established between the Gemini and a computer, try getting the computer to receive transmissions from the Gemini first. The Gemini's *"PRINT REQ."* terminal can be used to initiate the transmissions from the Gemini.

6. When sending commands to the Gemini, the * *(2Ah)* must terminate the command. NO CARRIAGE RETURNS *(0Dh)* OR LINE FEED *(0Ah)* CHARACTERS SHOULD BE SENT TO THE GEMINI. If they are sent, the Gemini will not respond to the next command.

7. For applications where 1200 Baud or lower is used, the command terminator (*) can be sent before the string to eliminate any illegally transmitted characters.

SERIAL LOOP-BACK SELF-TEST

The Gemini 3300 has a Serial Loop-back Self-test feature. This test enables the user to verify the operation of the Gemini when problems are encountered trying to get the Gemini and *"Host device"* communicating. In this test the Gemini's Serial Input and Output Loops are connected together with the 20 mA source supplying the loop current. The Gemini then transmits data *"to itself"*. If the data is received properly the Gemini 3300 will change its Scale Factor value to 0.1111. To perform the loop-back test, follow the test sequence as described below.

1. With the unit powered down, wire up the serial terminal block, *"TBD"*, as shown in the diagram.

2. Set the Gemini's unit address to 15 *(set switches 7-10 of the Serial DIP Switch in the down position)*.

3. Apply power to the unit. On power-up the Gemini will perform the loop-back test. To check the results: Call up the Scale Factor value by pressing the *"3"* key. If the Serial loop is functioning properly the Scale Factor value will be 0.1111. If this result is not obtained, double check the connections with those shown in the diagram, and the unit address switch positions and repeat step 3.

4. If the connection between the Print Request terminal, *"PRINT REQ."* and *"COMMON"* is disconnected while the unit is under power, the Scale Factor B value will change back to its previous setting.

If the unit does not pass this test, contact your local Red Lion Controls distributor.
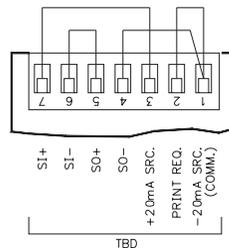
APPENDIX "A" - INSTALLATION & INPUT CONFIGURATION SWITCH SET-UP

Before installing the Gemini 3300 into the panel, the user should first become familiar with the unit. It may also be desirable to program the unit and appropriate DIP switches for the application at hand (Refer to the "Programming and Applications" sections). Once the unit is programmed, the settings will be saved in memory. The Program Disable "PGM. DIS." terminal should be connected to "COMM." to prevent accidental or unauthorized programming changes.

INSTALLATION ENVIRONMENT

The unit should be installed in a location that does not exceed the maximum operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should be cleaned only with a soft cloth and neutral soap product. Do NOT use solvents.

Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.

**PANEL MOUNTING** *(Note, See Appendix "B" for Dimensions)*

The Gemini 3300 meets NEMA 4/IP65 requirements for indoor use, when properly installed. The units are intended to be mounted into an enclosed panel. Two mounting clips and screws are provided for easy installation. Consideration should be given to the thickness of the panel. A panel which is too thin may distort and not provide a water-tight seal. (Recommended minimum panel thickness is 1/8".)

After the panel cut-out has been completed and deburred, remove the backing from the adhesive side of the gasket, and carefully apply the gasket to the panel. DO NOT APPLY THE ADHESIVE SIDE OF THE GASKET TO THE COUNTER BEZEL. Insert the unit into the panel. Install the screws into the narrow ends of the mounting clips as shown in the drawing to the left. Thread the screws into the clips until the pointed end just protrudes through the other side.

Install each of the two mounting clips by inserting the wide lip of the clips into the wide end of the holes located on either side of the case. Tighten the screws evenly, applying uniform compression, thus providing a water-tight seal.

Caution: Only minimum pressure is required to seal panel. Do NOT over tighten mounting screws.
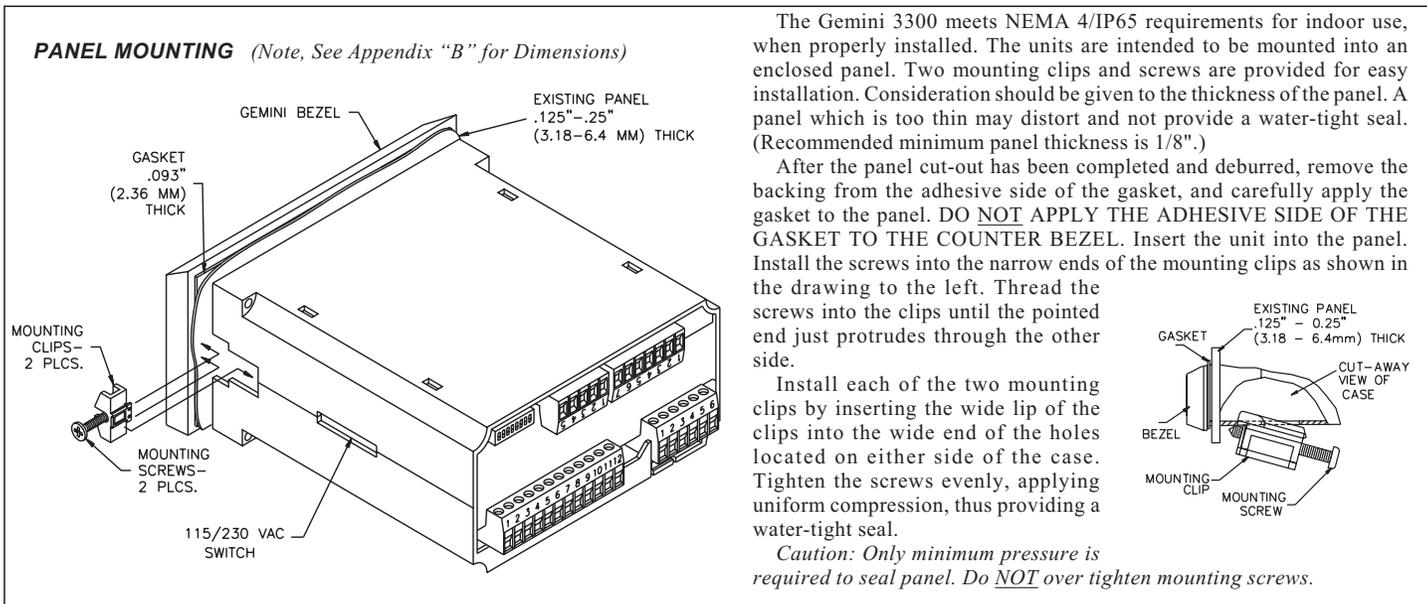
Select AC Power (115/230 VAC)

The AC power to the unit must be selected for either 115 VAC or 230 VAC. The selector switch is located through an access slot on the side of the case (See figure on previous page or label on case). The unit is shipped from the factory with the switch in the 230 VAC position.

Caution: Damage to the unit may occur if the AC selector switch is set incorrectly.

EMC COMPLIANCE INSTALLATION

This unit complies with the Electromagnetic Compatibility (EMC) standards listed in the specifications. Compliance to the EMC standards was demonstrated by means of a test set-up using the following installation methods:

1. Unit mounted in a metal panel connected to earth ground (protective earth).
2. Shielded (screened) cables for Signal and Control inputs with shield drain wire connected to earth ground at the mounting panel only.

   Belden #8451 2 conductor, #22 AWG twisted pair with foil shield and drain wire

   Belden #8771 3 conductor, #22 AWG with foil shield and drain wire

   Alpha #2404 4 conductor, #22 AWG with foil shield and drain wire
3. Metal bezel of unit connected to mounting panel with 9 inch (23 cm) ground lead from rear bezel screw. Test: Immunity to ESD per EN61000-4-2.
4. EMI filter (Shaffner FN610) placed on the DC mains cable for EMI frequencies above 40 MHz when using optional DC power supply. Test: RF Conducted Immunity per ENV 50141.

SHIELD TERMINATION

EMC compliance installation testing had the drain wire for the shielded cable terminated as shown. The drain wire was less than 0.5" (12.7 mm) long.

Metal panel connected to earth ground (protective earth)

Installed Unit

Wires from cables to unit

Drain wires from shielded (screened) cables terminated to metal mounting panel. Drain wires should be as short as possible

Cables from source to unit
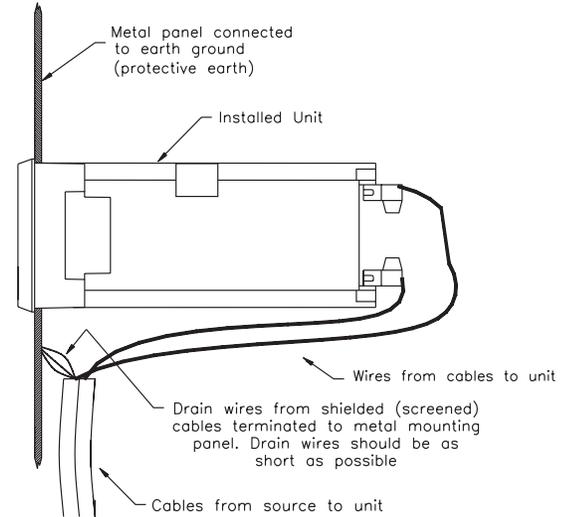
ADDITIONAL EMC INSTALLATION GUIDELINES

Although this unit is designed with a high degree of immunity to ElectroMagnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the unit may be different for various installations. Listed below are some additional EMC guidelines for successful installation in an industrial environment.

1. The unit should be mounted in a metal enclosure, which is properly connected to protective earth.

   a. If the bezel is exposed to high Electro-Static Discharge (ESD) levels, above 4 Kv, it should be connected to protective earth. This can be done by making sure the metal bezel makes proper contact to the panel cut-out or connecting the bezel screw with a spade terminal and wire to protective earth.

2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.

   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).

   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.

   c. Connect the shield to common of the unit and leave the other end of the shield unconnected and insulated from earth ground.

3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.

4. Signal or Control cables within an enclosure should be routed as far away as possible from contactors, control relays, transformers, and other noisy components.

5. In very electrically noisy environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:

   Ferrite Suppression Cores for signal and control cables:
   Fair-Rite # 0443167251 (RLC #FCOR0000)
   TDK # ZCAT3035-1330A
   Steward #28B2029-0A0
   Line Filters for input power cables:
   Schaffner # FN610-1/07 (RLC #LFIL0000)
   Schaffner # FN670-1.8/07
   Corcom #1VR3
   Note: *Reference manufacturer's instructions when installing a line filter.*

6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.

7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.

   Snubbers:
   RLC #SNUB0000

WIRING CONNECTIONS

After the unit has been mechanically mounted, it is ready to be wired. All conductors should meet voltage and current ratings for each terminal. Also cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that power supplied to the unit (AC or DC) be protected by a fuse or circuit breaker. All wiring connections are made on removable plug-in terminal blocks. There is a separate terminal block for the bottom board *(TBA)*, relay board *(TBB)*, count inputs *(TBC)*, and optional Serial Communications *(TBD)*. When wiring the unit, remove the terminal block and use the numbers on the label to identify the position number with the proper function. Simply strip the wire, leaving approximately 1/4" bare wire exposed *(stranded wires should be tinned with solder)*. Insert the wire into the terminal and tighten down the screw until the wire is clamped in tightly. Each terminal can accept up to two 18-gage wires. After the terminal block is wired, install it in the proper location on the PC board. Wire each terminal block in this manner.

AC POWER WIRING

For best results, the A.C. power should be relatively "clean" and within the specified +/-10% variation limits. Drawing power from heavily loaded circuits or from circuits that also power loads that cycle on and off, should be avoided.

The AC power is connected to the bottom left terminals TBA 1 & 2 marked AC PWR. The voltage selector switch, located at the side of the unit, is used to select the proper voltage. The switch is a slide movement type and can be set by using a small screwdriver. If the switch is toward the rear of the unit, it is set for 115 VAC input. If the switch is towards the front of the unit, it is set for 230 VAC input. The switch is in the 230 VAC position when shipped from the factory.

Note: Before applying power to the unit, make sure the AC power selector switch is set for the proper voltage setting.

USING AN EXTERNAL DC POWER SOURCE

The Gemini 3300 can be operated from a D.C. power source that provides 11-14 VDC at the unit's rated power consumption (700 mA). The power source can be a 12 V battery or an external power supply that is capable of supplying the unit's rated current. It is not necessary to provide battery backup to retain count information. The Gemini 3300 has an internal non-volatile memory in which the count and programming information are stored at power-down. Refer to the "Block Diagram" section.

RELAY WIRING

To prolong contact life and suppress electrical noise interference due to the switching of inductive loads, it is good installation practice to install a snubber across the contactor. Follow the manufacturer's instructions for installation.

Note: Snubber leakage current can cause some electro-mechanical devices to be held ON.

SERIAL COMMUNICATIONS

The Gemini 3300 can be purchased with a 20 mA Current Loop Communications Option. On these units, refer to the "Current Loop Communications" section of the manual, for wiring and operational procedures of the Serial Loop.

INPUT A & MAGNETIC PICKUP INPUT

The Magnetic Pickup Input and Logic Input A utilize some common circuitry. For this reason the Input A switches are used to set up both the Magnetic and Logic Input A. S1 selects between Magnetic Pickup Input and Logic Input A. WHEN A MAGNETIC PICKUP IS BEING USED, S2 MUST BE IN THE "SNK" POSITION or the unit will not count.

S3 (HI/LO FRQ) and S4 (HI/LO BIAS) do not effect the Magnetic Pickup Input and their settings are inconsequential. When S1 is in the Logic position, the Magnetic Pickup Input is disabled and Input A can be used as a logic input.

Note: A Magnetic Pickup type sensor should not be used unless a signal of sufficient amplitude is provided at all speeds of operation.

INPUT B

Input B is designed specifically for Logic type inputs. When Input A is set up for Logic operation, both Inputs A and B operate identically. DIP switch positions S5, S6, and S7 function the same as S2, S3, and S4.

INSTALLATION & REMOVAL OF THE RELAY BOARD

To install the relay board, locate the relay opening at the lower right-hand corner, on the back of the Gemini 3300. Pull the tab down while sliding the board into the two slots in the housing. The relay board will seat into the unit, allowing the tab to return to its original position. To remove the relay board, pull down on the tab just enough to allow the relay board to slide out. Grasp the terminal block and pull to remove the board.
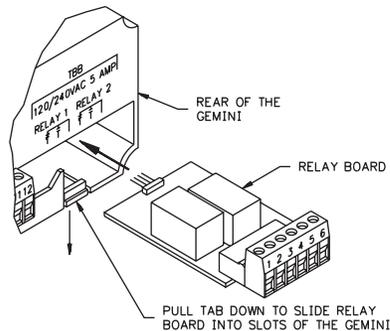
NOTES:

1. SENSOR VOLTAGE AND CURRENT
   The +12 V sensor supply voltage on the "DC OUT" terminal is nominal with +/-25% variation due to line and internal load variations. All RLC sensors will accommodate this variation.
2. HI/LO FRQ SELECTION
   The HI/LO FRQ selection switch must be set on "LO FRQ" when switch contacts are used to generate count input signals. Since the "LO FRQ" mode also provides very high immunity against electrical noise pickup, it is recommended that this mode also be used, whenever possible, with electronic sensor outputs. The "LO FRQ" mode can be used with any type of sensor output, provided count pulse widths never decrease below 5 msec, and the count rate does not exceed 100 cps.
3. V_{IL} and V_{IH} levels given are nominal values +/-10% when counter voltage on "DC OUT" terminal is +12 VDC. These nominal values will vary in proportion to the variations in the "DC OUT" terminal voltage, which are caused by line voltage and load changes.
4. When shielded cable is used, the shield should be connected to "COMM." at the counter and left unconnected at the sensor end.
5. Input B setup is identical to that of Input A. Input B is for logic inputs only.
6. Inputs A and B can accept source pulses from other circuits up to +28 V in amplitude. For voltages above +28 V, a limiting resistor and zener diode should be used to limit the voltage at the input.
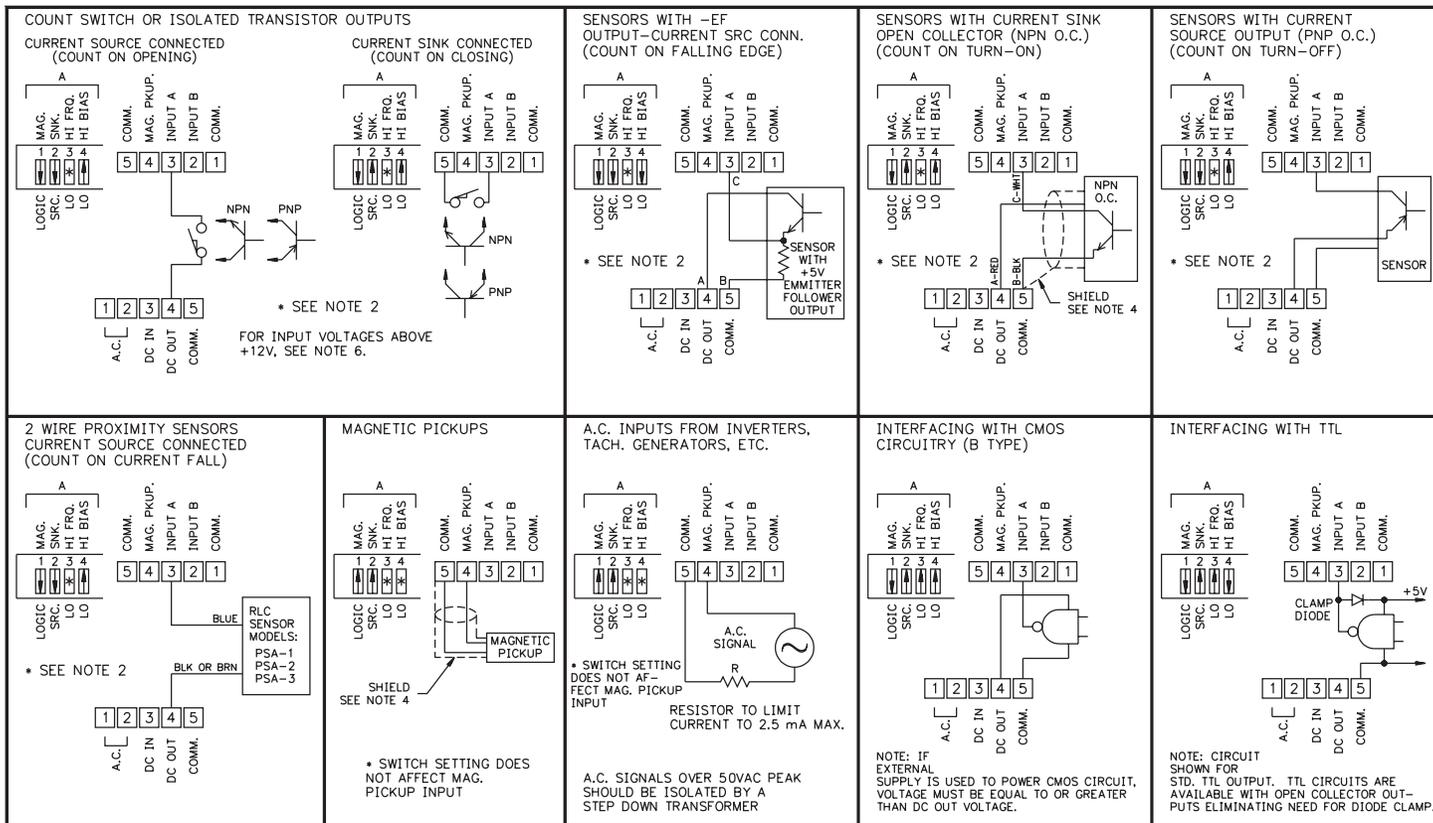
BLOCK DIAGRAM
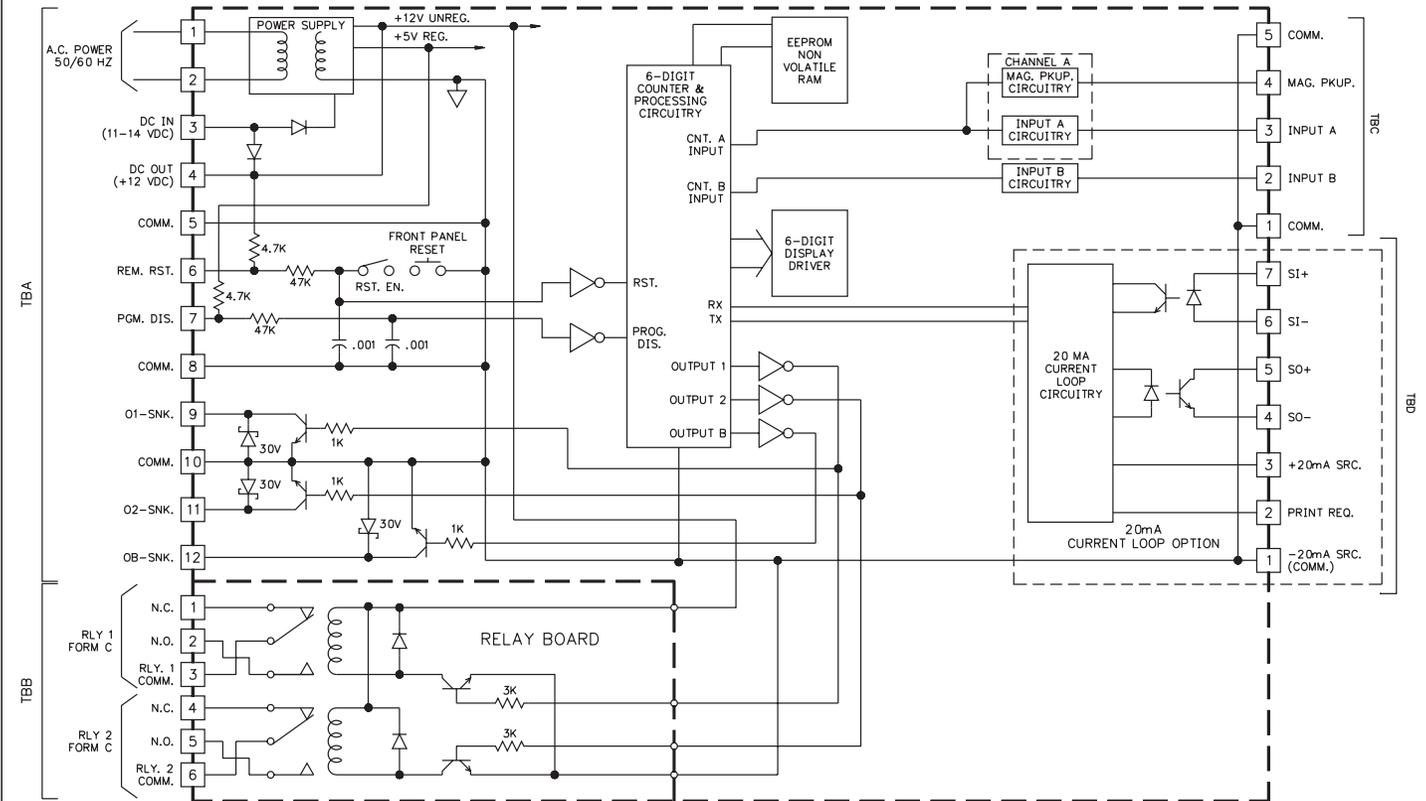
SENSOR INPUT CONNECTIONS & INPUT CONFIGURATION SWITCH SET-UP

The accompanying diagram shows the details of Input A, Input B, and Magnetic Pickup circuit. The schematic circuit for Input B is almost identical to that of Input A, with the exception that Input B does not have the Magnetic Pickup circuitry paralleled with it. The four switches used to set up Input A and the Magnetic Pickup are designated S1, S2, S3, and S4. To set up Input B, use switches S5, S6, and S7. The functions of these switches are as follows:

S1 - MAG: Enables the Magnetic Pickup terminal to be used.
LOGIC: Disables the Magnetic Pickup Input.
Note: SWITCH S2 MUST BE IN THE "SNK" POSITION FOR MAGNETIC PICKUP OPERATION.

S2 - SNK: Provides a 7.8 K pull-up resistor for sensors with current sinking outputs.
SRC: Provides a 3.9 K pull-down resistor for sensors with current sourcing outputs.

S3 - HI FRQ: Removes damping capacitor and allows operation up to the max. count frequency. Min. count ON or OFF time - 50 usec *(U/D or INH.)*, 50% Duty Cycle *(all other "Inputs A & B Response Modes")*.
LO FRQ: Connects damping capacitor for switch contact debounce. Limits count speed to 100 cps max. Min. count pulse ON or OFF time - 5 msec. *(See Note 2, Page 31.)*

S4 - HI BIAS: Sets input trigger levels at mid-range to accept outputs from 2-wire proximity sensors, resistive photo-cells, and logic pulses with full 0 to +12 V swings. ($V_{IL} = 5.5$ V, $V_{IH} = 7.5$ V, *See Note 3, Page 31.*)
LO BIAS: Sets input trigger levels to the low range to accept logic pulses with 0 to 5 V swings. ($V_{IL} = 1.5$ V, $V_{IH} = 3.75$ V, *See Note 3, Page 31.*)

S5 - Same as S2, for Input B.

S6 - Same as S3, for Input B.

S7 - Same as S4, for Input B.

S8 - DIS. RST.: Disables front panel Reset button, *"R"*.
EN. RST: Enables front panel Reset button *"R"*, if *"Operator Accessible Functions"* mode *(Code 66)* has reset enabled.

CHANNEL A

CHAN. B

-33-
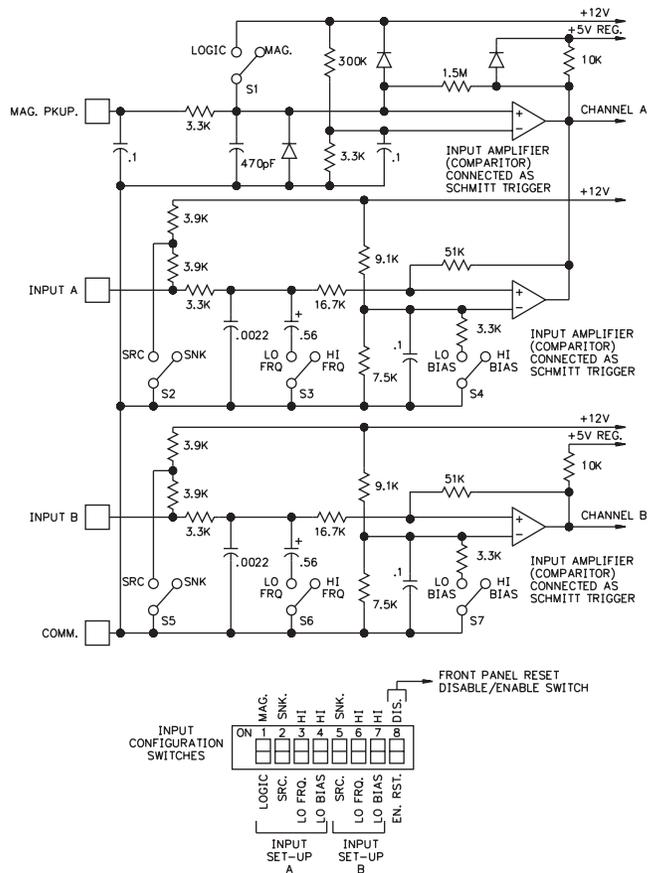
APPENDIX "B" - SPECIFICATIONS & DIMENSIONS

1. **DISPLAY:** 6-digit 0.56" (14.2 mm) High LED display.
2. **POWER REQUIREMENTS:**
   AC Power: Switch Selectable 115/230 VAC , ±10%, 50/60 Hz, 20 VA
   DC Power: 11 to 14 VDC @ 0.7 amp maximum
3. **SENSOR POWER:** +12 VDC (±25%) @ 100 mA.
4. **MEMORY:** Non-volatile E^{2}PROM memory retains all programming information, count values, and Counter Load Values when power is removed or interrupted.
   Power Cycles (ON/OFF): 100,000 minimum
   Data Retention: 10 yrs. minimum
5. **INPUTS A AND B:** Switch selectable to accept count pulses from a variety of sources including switch contacts, outputs from CMOS or TTL circuits, and all standard RLC sensors.
   Current Sourcing: Unit provides pull-down resistor for sensor with current sourcing outputs. (Max. input voltage = 28 VDC @ 7 mA.)
   Current Sinking: Unit provides pull-up resistor for sensors with current sinking outputs. (Max. sensor current = 1.6 mA.)
   Debounce: Damping capacitor provided for switch contact debounce. Limits count speed to 100 Hz maximum and input pulse widths to 5 msec. minimum.
   Lo Bias: Input trigger levels V_{IL} = 1.5 V, V_{IH} = 3.75 V
   Hi Bias: Input trigger levels V_{IL} = 5.5 V, V_{IH} = 7.5 V

Note: Bias levels given are ±10% @ 12 VDC. They vary proportionally with sensor supply voltage at "DC OUT" terminal.

6. **MAGNETIC PICKUP INPUT:**
   Sensitivity: 150 mV peak (typical @ 12 VDC)
   Hysteresis: 100 mV
   Input impedance: 26.5 KΩ @ 60 Hz
   Maximum Input Voltage: ±50 Vp
7. **MAXIMUM COUNT RATES:**

MODE	X1	X2	X4
Uni or Bi-directional	10 KHz	6.5 KHz	
Anti-Coincidence	9 KHz	5 KHz	
Quadrature	4.25 KHz	4.25 KHz	3 KHz

8. **CONTROL INPUTS:**
   Reset - Active low (V_{IL} = 1.5 V max.) internally pulled up to +12 VDC (I_{SNK} = 3 mA) activation and deactivation response time = 10 msec.
   Program Disable - Active low (V_{IL} = 1.5 V max.) internally pulled up to +5 VDC (I_{SNK} = 1 mA).
   Print Request - (GEM331xx only) Active low, (V_{IL} = 1.5V max.), internally pulled up to +5 VDC (I_{SNK} = 1mA).

DIMENSIONS In Inches (mm)

Note: Mounted units require a clearance of 6.8" (W) behind the panel.
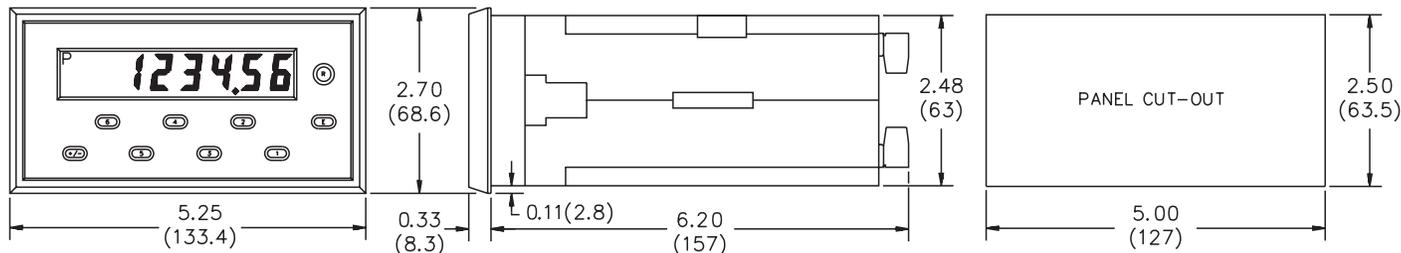
APPENDIX "B" - SPECIFICATIONS & DIMENSIONS (Cont'd)

9. **SERIAL COMMUNICATIONS (Optional):**
   Type - Bi-directional 20 mA current loop, 20 mA source provided. *(Powers up to 7 units in a loop with internal current source.)*
   Baud Rate - Programmable 300 to 2400.
   Maximum Address - 16 units (0 to 15). *(Actual number in a single loop is limited by serial hardware specifications.)*
   Data Format - 1- bit frame, Odd parity *(one start bit, 7 data bits, one odd parity bit, and one stop bit.)*
   Serial Hardware Specifications
       SO - Output Transistor Rating: $V_{MAX} = 30$ VDC, $V_{SAT} = 1$ V_{MAX} @ 20 mA. (Can address 16 units in a loop)
       SI - Input Diode Rating: $V_F = 1.25$ V_{TYP}; 1.5 V_{MAX}
       Note: The compliance voltage rating of the source mst be greater than the sum of the voltage drops around the loop.

10. **OUTPUTS:**
    Solid-State - Current sinking NPN open collector transistors. $I_{SNK} = 100$ mA maximum @ $V_{CE} = 1$ V. $V_{OH} = 30$ VDC maximum *(Internal Zener diode protection).*
    Relays - Mounted on a field replaceable PC board. Form C contacts rated at 5 amps @ 120/240 VAC or 28 VDC *(resistive load)*, 1/8 H.P. @ 120 VAC *(inductive load)*.
    Relay Life Expectancy - 100,000 cycles at Max. Rating. *(As load level decreases, life expectancy increases.)*
    Programmable Timed Outputs - The timed outputs can be set from 0.01 to 599.99 seconds, ±(0.05% + 10 msec.).

11. **CERTIFICATIONS AND COMPLIANCES:**
    SAFETY:
        IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1.
        IP65 Enclosure rating (Face only), IEC 529
        Type 4 Enclosure rating (Face only), UL50

ELECTROMAGNETIC COMPATIBILITY:
Immunity to EN 50082-2

Electrostatic discharge	EN 61000-4-2	Level 2; 4 Kv contact[1]
		Level 3; 8 Kv air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m
		80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4	Level 4; 2 Kv I/O
		Level 3; 2 Kv power[2]
RF conducted interference	EN 61000-4-6	Level 3; 10 V/rms
		150 KHz - 80 MHz
Power frequency magnetic fields	EN 61000-4-8	Level 4; 30 A/m

Emissions to EN 50081-2

RF interference	EN 55011	Enclosure class A
		Power mains class A

Notes:
1. Metal bezel of unit connected with ground from rear bezel screw to metal mounting panel.
2. When the unit is DC powered, a power line filter (RLC#LFIL0000 or equivalent) was installed, so as not to impair the function of the unit.
Refer to the EMC Compliance Installation section of the manual for additional information.

12. **CONSTRUCTION:**
    Metal die-cast bezel, plastic case. This unit is rated for NEMA 4/IP65 indoor use. Installation Category II, Pollution Degree 2

13. **ENVIRONMENTAL CONDITIONS:**
    Operating Temperature: 0 to 50°C
    Storage Temperature: -40 to 70°C
    Operating and Storage Humidity:
        85% max. relative humidity (non-condensing) from 0°C to 50°C.
    Altitude: Up to 2000 meters

14. **WEIGHT:** 2.1 lbs. (0.9 Kg)

APPENDIX "C" - TROUBLESHOOTING GUIDE

The majority of difficulties arising with the Gemini 3300 are related to incorrect hook-up and programming set-up. Always check all connections, function codes, Scale Factor, and Presets as a first step in troubleshooting.

Before applying power, double check all wiring. Improper AC voltage or AC connections may result in permanent damage to the unit.

For further technical assistance, contact technical support at the appropriate company numbers listed.

PROBLEM	POSSIBLE CAUSE	REMEDIES
NO DISPLAY	1. Power off, improperly connected, or power brown-out.	1. Check the 115/230 VAC switch, all wiring, verify power.
P ON DISPLAY	1. Data error on power-up.	1 a. Press "E" key. b. Check all function codes.
E ON THE DISPLAY	1. Data error detected by processor.	1 a. Press "E" button. b. Check all function codes. c. Check signal lines for possible noise sources.
NO RESPONSE TO FRONT PANEL	1. Panel disabled.	1. Consult manual on "Operator Accessible Functions" modes.
UNIT DOES NOT COUNT	1. No input. 2. Input selected incorrectly. 3. Count inhibited. 4. Scale factor/multiplier too small.	1. Check sensors/connections. 2. Check rear panel DIP switches. 3. Check Function Code 43, "Input A and B Response" modes. 4. Check Scale Factor Value and scale multiplier values.
UNIT WILL NOT ACCEPT THE DESIRED PRESET	1. When a Scale Factor greater than 1 is used, the Preset Values (Process) must be evenly divisible by the scale factor.	1. Unit automatically adjusts preset to be evenly divisible by the scale factor.

APPENDIX "C" - TROUBLESHOOTING GUIDE (CONT'D)

PROBLEM	POSSIBLE CAUSE	REMEDIES
UNIT COUNTS INCORRECTLY	1. Input type incorrectly selected. 2. Inputs incorrectly connected or loose connections. 3. Electrical interference. 4. Wrong "Inputs A & B Response Mode" 5. Scale factor incorrect.	1. Check rear panel DIP switches. Turn on LO FRQ. switch for count speed of less than 100 cps. 2. Check sensors/input connections. 3. Check connections and wiring for noise sources. 4. Verify functions and modes. 5. Change Scale Factor Value.
UNIT WILL NOT RESET	1. Front panel reset disabled. 2. Reset disabled.	1. Check rear panel DIP switches. 2. Check Function Code 61 or 66.
DATA VALUES AND FUNCTIONS WON'T CHANGE OR NOT RECORDED	1. Front panel locked out. 2. Incorrect programming procedure ("E" not pressed).	1. Consult manual on "Operator Accessible Functions" mode (66). 2. Consult section on programming functions in sequential order.
UNIT COUNTS WHILE RESET IS ACTIVATED	1. Reset mode set for "momentary reset".	1. Change reset mode to "Maintained" reset (61).

Note: For Serial Communication problems refer to "Troubleshooting Gemini Serial Communications" section.

APPENDIX "D" - GEMINI 3300 BATCH COUNTER MODE FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
41		LOAD FACTORY SETTINGS	
	+/-	Batch Counter	(-) Loads factory set code values*
43		INPUTS A & B RESPONSE MODES (counter only)	
	1	Count with Inhibit	Input A = Count, Input B = Inhibit
	2	Count with Up/Down Control	Input A = Count, Input B = Up/Down
	3	Add/Subtract	Input A = Add, Input B = Subtract
	4	Anti-Coincidence Add/Add	Input A = Add, Input B = Add
	5	Quadrature	Input A = Count, Input B = Quadrature
	6	Quadrature x4	Input A = Count & Quad, Input B = Count & Quad
44		NUMBER OF COUNT EDGES	Cannot be programmed in Quad x4.
	1	Single Edge Counting (x) 1	Count on falling edge of count input.
	2	Double Edge Counting (x2)	Count on both edges of count input.
45		SCALE MULTIPLIER	
	1	1	
	2	0.1	
	3	0.01	
	4	0.001	
46		DECIMAL POINT & LEADING ZERO BLANKING	
	-	(+) Leading Zero Blank Enabled	
	-	(-) Leading Zero Blanking Disabled	*
	+/-1	No Decimal Point	
	+/-2	Decimal Point Right of Digit 2	
	+/-3	Decimal Point Right of Digit 3	
	+/-4	Decimal Point Right of Digit 4	
	+/-5	Decimal Point Right of Digit 5	
	+/-6	Decimal Point Right of Digit 6	
*Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.			

APPENDIX "D" - GEMINI 3300 BATCH COUNTER MODE FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
52		OUTPUT 1 TERMINATION	
	-	(+) Normal Phase	Output normally "OFF", turns "ON" at preset.
	-	(-) Reverse Phase*	Output normally "ON", turns "OFF" at preset.*
	+/-1	Terminate at Output 2 Start	
	+/-2	Terminate at Output 2 End	
	+/-3	Terminate at Manual Reset	
	+/-4	Terminate at Manual Reset End	
	+/-5	Terminate at Output 1 Time Delay	
53	NA	TIMED OUTPUT 1 VALUE	Range 0.01 to 599.99 sec.
54		OUTPUT 2 TERMINATION MODES	
	-	(+) Normal Phase	Output normally "OFF", turns "ON" at preset.
	-	(-) Reverse Phase*	Output normally "ON", turns "OFF" at preset.*
	+/-1	Terminate at Output 1 Start	
	+/-2	Terminate at Output 1 End	
	+/-3	Terminate at Manual Reset	
	+/-4	Terminate at Manual Reset End	
	+/-5	Terminate at Timed Output 2	
55		TIMED OUTPUT 2 VALUE	Range 0.01 to 599.99 sec.
61		RESET BUTTON & TERMINAL ACTUATION MODES	
	-	(+) Maintained	Unit remains reset at long as reset is activated
	-	(-) Momentary*	Unit will reset instantly and will start counting again even if reset is still activated
	+/-1	Reset Process Counter	
	+/-2	Reset Batch Counter	
	+/-3	Reset Process and Batch Counter	
	+/-4	Reset Process, Batch and Total Counter	
*Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.			

APPENDIX "D" - GEMINI 3300 BATCH COUNTER MODE FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
62		PROCESS COUNTER RESET ACTION & PRESET TRACKING MODES	
	-	(+) Preset Tracking Disabled	
	-	(-) Preset Tracking Enabled	Preset 1 tracks Preset 2
	+/-1	Manual Reset to Zero	
	+/-2	Manual Reset to Preset	
	+/-3	Auto Reset to Zero after Timed Output 2	
	+/-4	Auto Reset to Preset after Timed Output 2	
	+/-5	Auto Reset to Zero at Preset 2	
	+/-6	Auto Reset to Preset at Zero	
63		BATCH COUNTER RESET ACTION MODES	
	1	Manual Reset to Zero	
	2	Manual Reset to Preset	
	3	Auto Reset to Zero after Timed Output B	
	4	Auto Reset to Preset after Timed Output B	
	5	Auto Reset to Zero at Preset B	
	6	Auto Reset to Preset at Zero	
64		BATCH OUTPUT TERMINATION MODES	
	-	(+) Normal Phase	Output normally "OFF", turns "ON" at preset.
	-	(-) Reverse Phase*	Output normally "ON", turns "OFF" at preset.
	+/-3	Terminate at Manual Reset	
	+/-4	Terminate at Manual Reset End	
	+/-5	Terminate after Timed Output B	
65		TIMED BATCH OUTPUT VALUE	Range 0.01 to 599.99 sec.
*Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.			

APPENDIX "D" - GEMINI 3300 BATCH COUNTER MODE FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
66		"OPERATOR ACCESSIBLE FUNCTIONS" MODES	"PGM.DIS" Terminal connected to "Comm"
	-	(+) Reset Button & "RST" Terminal Enabled	Front panel reset can be independently disabled by using DIP switch.
	-	(-) Reset Button & "RST" Terminal Disabled*	Both front panel and rear terminal are disabled.
	+/-1	No Functions Enabled	
	+/-2	Preset Programming Enabled	
	+/-3	Scale Factor Programming Enabled	
	+/-4	Preset & Scale Factor Programming Enabled	
	+/-5	Preset, 2-Button Reset & Counter Load Programming Enabled	
	+/-6	Preset, Scale Factor, 2-Button Reset & Counter Load Programming Enabled	
1	Display P	PROCESS PRESET 1	Up to +999999
1	Display B	BATCH PRESET	Up to +999999
2	Display P	PROCESS PRESET 2	Up to +999999
3		SCALE FACTOR	Up to +5.9999
E & +/-	Disp P, B, T	COUNTER LOAD VALUE	Up to +999999. Counter load value is saved in memory when power is removed.
E & 1		RESET PROCESS COUNTER	
E & 2		RESET BATCH COUNTER	
*Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.			

APPENDIX "E" - SCALING FOR COUNTING

The Gemini 3300 is factory set to provide 1 count on the display for each pulse that is input to the unit. In many applications, there will not be a one to one correspondence between input pulses and display units. In these applications it will be necessary for the Gemini 3300 to scale or multiply the input pulses by a scaling factor to achieve the proper display units *(feet, meters, gallons, widgets, etc.)*. There are three different function codes that are used in scaling the input pulses to the desired reading. They are: the *"Scale Factor"*, the *"Scale Multiplier"*, and the *"Number of Count Edges"*. All three are factored together to provide the Total Scaling that is necessary.

The *"Number of Count Edges"* can be 1, 2 or 4 (Quad x4). In the Quadrature x4, Inputs 1 & 2 Response mode, both the rising and falling edges of both Inputs, 1 & 2, are counted. In this mode the *"Number of Count Edges"* is 4.

The first step in scaling the counter requires that the *"Number of Pulses"* per *"Display Unit"* or *"Display Units"* be obtained. This may require a small amount of deductive reasoning. For example: A 48 tooth gear is mounted to a 2 ft circumference feed roll in a paper processing plant. It is desired to totalize the total footage of paper processed. In this example the units of display will be in feet. A sensor sensing the gear teeth will provide 48 pulses for each revolution of the feed roll. Each revolution will equate to a linear distance of 2 feet. The number of *"Display Units"* will be 2. The *"Number of Pulses"* per *"Display Units"* (2 feet) would naturally be 48.

Once the number of *"Display Units"* and the *"Number of Pulses"* have been obtained, the Total Scaling Factor can be calculated.

The *"Total Scaling Factor"*, denoted as "K_T", is simply the total amount of scaling required. It is obtained by dividing the *"Display Units"* by the *"Number of Pulses"* as shown in Formula #1 below.

FORMULA #1: K_T = Display Units/Number of Pulses

WHERE:
DISPLAY UNITS - The number of units *(revolutions, feet, 10ths of feet, meters, etc.)* that would be acquired after the *"Number of Pulses"* has occurred.
NUMBER OF PULSES - The Number of pulses required to achieve the number of *"Display Units"*.

For the preceding example, the Total Scaling Factor, "K_T", is calculated by inserting 2 and 48 in the formula. K_T = Display Units/Number of Pulses = 2/48 = 0.041667.

As previously stated, the Total Scaling Factor, "K_T", is the combination of the Scale Factor, Scale Multiplier, and Number of Count edges. In many applications the Total Scale Factor, "K_T", can be programmed directly into the Scale Factor, *"SF"*, and the Scale Multiplier and Number of Count Edges factory settings, of x1, would be used.

In some applications, more display resolution may be required. Whenever the Total Scaling Factor is greater than 1.0000 and when utilizing only one edge per count pulse, there may not be enough display resolution. For example; with a Total Scaling Factor of 2.000, when an input pulse is generated, the display will increment by 2. If the display units are in feet, when 3 feet has gone by, the display will still only read 2. It will not increment again until 4 feet has been accumulated. With this amount of display resolution it would be impossible to set the Preset and have the output respond at odd feet intervals *(1, 3, 5, etc.)*. To increase resolution, the Number of Count edges will have to be increased. This can be achieved by programming Function Code 44 to mode 2, 2 edges, or Function Code 43 to mode 6, Quad x4, if quadrature counting is being used.

If enough resolution still has not been attained, more input pulses will need to be generated per display unit.

The amount of resolution required will vary depending on the particular application. In cut-to-length applications, a high amount of resolution is often necessary. However, in totalizing applications, display resolution may not be important. It should be noted that whenever the number of count edges is increased to 2 or 4 *(Quad x4)*, the maximum count frequency will decrease. *(See Appendix "B" for maximum count frequency specification.)*
Note: When using 2 or 4 edge counting for length sensor, on/off duty cycle must be 50% to maintain max. accuracy (mag. pickup will not work).

Once the Number of Count Edges *(NCE)* to be used has been determined, the Remaining Scaling factor required, "K_R", can be calculated. This is simply the Total Scaling Factor, "K_T", divided by the Number of Count edges.

FORMULA #2: K_R = K_T/NCE
WHERE: K_R - Remaining Scaling required

In our original example, the Total Scaling Factor, "K_T" was determined to be 0.041667. Since this value is less than one, sufficient pulse information is being generated, i.e., there is enough resolution for the units selected. The Number of Count edges can be left at the factory set value of 1. The Total

Scaling Factor, "K_T", effectively becomes the Total Scaling Remaining, "K_R". (K_R = 0.041667/1 = 0.041667)

If the scaling remaining is between 0.6000 and 5.9999, it can be programmed directly into the Scale Factor value and the x1 factory setting for the Scale Multiplier, *"SCM"*, can be used.

The general rule for choosing a SCM value is, when the Remaining Scaling Required, "K_R", is less than 0.6000, an SCM value of 0.1 or 0.01 can be used to get a Scale Factor value between 0.6 and 5.9999 or to the point where the maximum number of significant digits is obtained.

FORMULA #3: SF = K_R/SCM

Following our continuing example, it is easy to see that the Scaling Remaining, "K_R" *(0.041667)*, cannot fit into the Scale Factor Value without losing significant digits. Using the Formula above and a Scale Multiplier value of 0.01, will allow us to get the maximum number of significant digits possible (SF = K_R/SCM = 0.041667/0.01 = 4.1667).

COUNTER SCALING EXAMPLE:
EXAMPLE #1:
A flow sensor provides 62 pulses per gallon. Calculate the scaling required to provide a display reading in gallons.

In this example the number of *"Display Units"* is the same as the desired reading, since there are no decimal points involved.

The number of *"Display Units"* displayed after 62 pulses have been counted should be 1.

STEP 1 - Calculate the Total Scaling Factor, "K_T", using Formula #1.
K_T = Display Units/Number of Pulses *(Formula #1)*
K_T = 1/62 = 0.016129

STEP 2 - In this application 62 pulses per gallon provides more than enough resolution, so the *"Number of Count Edges"* is left set to the factory configured value of 1. With a *"NCE"* value of 1, the remaining amount of scaling necessary is still 0.016129
K_R = K_T/NCE *(Formula #2)*
K_R = 0.016129/1 = 0.016129

STEP 3 - In order to provide maximum scaling accuracy, a *"Scale Multiplier"* value is chosen that will give the maximum amount of significant digits in the Scale Factor. A value of 0.01 will result in a Scale Factor Value of 1.6129.
SF = K_R/SCM *(Formula #3)*
SF = 0.016129/0.01 = 1.6129

EXAMPLE #2:
A quadrature Rotary Pulse Generator that provides 100 pulses per revolution is coupled to a feed roll that is 2.5 feet in circumference. It is desired to read in feet with display resolution to the nearest hundredths of a foot.

In this application, the requirement is for the display to read in hundredths of a foot. A 2.5 ft. distance will equate to 250 *"Display Units" (hundredths)*. The *"Number of Pulses"* for 2.5 ft. *(250 hundredths)* is 100, as stated.

From the information obtained, the Total Scaling Factor, "K_T", can be calculated, using Formula #1.
K_T = Display Units/Number of Pulses
K_T = 250/100 = 2.5

With a Total Scaling Factor, "K_T", of 2.5, it can easily be seen that for every pulse that is input, the display will increment by 2.5 display units *(hundredths)*. The application requires resolution to the nearest hundredth of a foot. In order to get higher resolution, Quadrature x4 Input Response Mode is selected. This will provide four times more resolution. Using Formula #2, and 4 for the *"Number of Count Edges"*, the Remaining Scaling, "K_R", is calculated.
K_R = K_T/Number of Count Edges
K_R = 2.5/4 = 0.625

At this point, it can be seen that the Remaining Scaling value of 0.625 will fit into the Scale Factor value range without losing any significant digits or scaling it any further. Because of this, the Scale Multiplier *(SCM)* factory set value of x1 is used, and 0.6250 is programmed directly into the Scale Factor, *"SF"*.
SF = K_R/SCM
SF = 0.6250/1 = 0.6250

DETAILED MODE MENUS

41 ( ) — LOAD FACTORY SETTINGS
(-1) Loads unit with factory settings

43 ( ) — INPUTS A & B RESPONSE MODES
(1) A = CNT., B = INH.
(2) A = CNT., B = UP/DN
(3) A = CNT. UP, B = CNT. DN.
(4) A = CNT. UP, B = CNT. UP
(5) QUADRATURE X1
(6) QUADRATURE X4

44 ( ) — INPUT PULSE EDGES REGISTERING COUNTS*
(1) NEG. GOING EDGES ONLY (1 count/pulse)
(2) BOTH + & – EDGES (2 counts/pulse)

* Not accessible with Quadrature X4 Counter Input Response Mode.

45 ( ) — SCALE MULTIPLIER
(1) x1   (2) x0.1   (3) x0.01   (4) x0.001

46 ( ) — DECIMAL POINT & LEADING ZERO BLANKING

	With L.Z.B.			No L.Z.B.
(1)	0		(-1)	0 0 0 0 0 0 (NO L.Z.B.)
(2)	0.0		(-2)	0 0 0 0 0.0
(3)	0.0.0		(-3)	0 0 0 0.0.0
(4)	0.0.0.0		(-4)	0 0 0.0.0.0
(5)	0.0.0.0.0		(-5)	0 0.0.0.0.0
(6)	0.0.0.0.0.0		(-6)	0.0.0.0.0.0

52 ( ) — PROCESS OUTPUT 1 TERMINATION MODES

MODE	AT OUTPUT 1 START	AT OUTPUT 2 START	AT OUTPUT 1 END	AT OUTPUT 2 END	AT RESET START	AT RESET END	AFTER TIMED OUTPUT 1	OUTPUT 1 NORMALLY "OFF"	OUTPUT 1 NORMALLY "ON"
(1)	•							•	
(-1)	•								•
(2)		•						•	
(-2)		•							•
(3)			•					•	
(-3)			•						•
(4)					•			•	
(5)						•		•	
(-5)						•			•

53 ( ) — PROCESS OUTPUT 2 TERMINATION MODES

MODE	AT OUTPUT 1 START	AT OUTPUT 2 START	AT OUTPUT 1 END	AT OUTPUT 2 END	AT RESET START	AT RESET END	AFTER TIMED OUTPUT 2	OUTPUT 2 NORMALLY "OFF"	OUTPUT 2 NORMALLY "ON"
(1)	•							•	
(-1)	•								•
(2)		•						•	
(-2)		•							•
(3)			•					•	
(-3)				•				•	
(4)					•			•	
(-4)					•				•
(5)						•		•	
(-5)						•			•

54 ( ) — TIMED PROCESS OUTPUT 1 VALUE
Timed Output Value range: 0.01 to 599.99 sec

55 ( ) — TIMED PROCESS OUTPUT 2 VALUE
Timed Output Value range: 0.01 to 599.99 sec

61 ( ) — RESET BUTTON & TERMINAL ACTUATION MODES

MODE	RESET PROCESS	RESET BATCH	RESET TOTAL	MAINTAINED RESET	MOMENTARY RESET
(1)	•			•	
(-1)	•				•
(2)	•	•		•	
(-2)	•	•			•
(3)	•	•	•	•	
(-3)	•	•	•		•
(4)		•		•	
(-4)		•			•

PROCESS COUNTER RESET MODES

MODE	RESET TO ZERO	RESET TO P.PRST 2	AUTO RST AFTER TIMED OUT.2	AUTO RST AT TIMED OUT.2	PRESET TRACKING DISABLED	PRESET TRACKING ENABLED
(1)	•					•
(-1)	•				•	
(2)		•				•
(-2)		•			•	
(3)	•		•			•
(-3)	•		•		•	
(4)		•	•			•
(-4)		•	•		•	
(5)	•			•		•
(-5)	•			•	•	
(6)		•		•		•
(-6)		•		•	•	

62 ( )

BATCH COUNTER RESET MODES

MODE	RESET TO ZERO	RESET TO PRESET B.	AUTO RESET AFTER TIMED OUT. B.
(1)	•		
(2)		•	
(3)	•		•
(4)		•	•
(5)	•		•
(6)		•	•

63 ( )

BATCH OUTPUT TERMINATION MODES

MODE	AT RESET START	AT RESET END	AFTER TIMED OUTPUT B	OB-SNK NORMALLY "OFF"	OB-SNK NORMALLY "ON"
(3)	•			•	
(-3)	•				•
(4)		•		•	
(-4)		•			•
(5)			•	•	
(-5)			•		•

64 ( )

TIMED BATCH OUTPUT VALUE
Timed Output Value range: 0.01 to 599.99 sec

65 ( )

"OPERATOR ACCESSIBLE FUNCTIONS" MODES
(With "PGM. DIS." terminal to "COMM")

MODE	PRESET VALUES	SCALE FACTOR	COUNTER LOAD VALUES	2-BUTTON RESET	RESET BUTTON & TERMINAL
(1)					•
(-1)					•
(2)	•				•
(-2)	•				•
(3)	•	•			•
(-3)	•	•			•
(4)	•	•	•	•	
(-4)	•	•	•	•	
(5)	•	•	•	•	
(-5)	•	•	•	•	
(6)	•	•	•	•	
(-6)	•	•	•	•	

66 ( )

GEMINI 3300 PROGRAMMING

SOME NOTES & HINTS ON PROGRAMMING THE GEMINI 3300

1. Be systematic about programming! Plan out the exact features & functions you need for your application. Write out the code entries you need from start to finish, and then enter the codes completely. Don't start in the middle of the program codes & make arbitrary entries to "see what it will do." This is a sure way to create confusing results. Finally, after you are done, record your program & file it where you can find it later if you want to make changes. You can use this card to write in your codes in the program ladder on the reverse side, together with any fixed data entries, for convenient future reference.

2. Watch out for conflicting modes! The programs in the GEMINI 3300 have been written to prevent illegal code entry.

However, to provide optimum flexibility, some reliance must be placed on the programmer to avoid conflicting codes.

3. The GEMINI 3300 can be interrogated at any time to see what modes & data entries have been made. Such interrogation can be made during a counting cycle or a sample time run without interrupting the normal counting process. In the lockout mode, all functions can also be interrogated, but those functions locked out cannot be changed. Making changes in program modes or data during a run is not recommended since mid-cycle changes can result in unanticipated outputs for that particular cycle.

PROGRAMMING PROCEDURE FOR FUNCTION & MODE SELECTION ☆
(Applies To Programming Chart)

To enter a programmable function or mode, enter the function selector code desired and then select the particular mode identifier required.

For example, to set up a decimal point to display a reading in 1/100ths with leading zero blanking, function selector code #46 must be entered. (See codes on reverse side.)

Press button #4, then button #6. The display will temporarily interrupt its normal readout (without interfering with the normal operation of the unit).

It will then display the entered code on the L.H. side.

[46   ] (DISPLAY READOUT)

Next, enter the mode identifier (button #3) that defines the decimal point location & LZB condition. This code is displayed on the right.

[46   3] (DISPLAY READOUT)

Now, enter this new selection by pressing the "E" button.

PROGRAMMING PROCEDURE FOR DATA ENTRY

In data entry, the front panel pushbuttons are identified by two different sets of references and will cause two different reactions in the course of making a data entry.

In the first phase of a data entry cycle, the particular data entry mode is called up by pushing the buttons identified by their panel markings. (i.e. Buttons "5", "3", or "1"). Once the data entry mode has been entered, the existing data appears on the display and the buttons below the display reference themselves to the digits directly above each button. The data can then be changed a digit at a time by depressing the button directly below the digits to be changed.

After the new data value is obtained, the "E" button is depressed to enter the new value.

[53, 55, 65   ] TIMED OUTPUT VALUES ☆
Entering Code "53, 55, or 65" will call up the Timed Output 1, 2, or B Value in seconds & hundredths. The value can be set to the new value by incrementing each digit with the button underneath that digit.

Press the "E" button to enter the new Timed Output value. (Max. Timed Output value = 599.99 sec.)

[3   ] SCALE FACTOR
One stroke of the "3" button calls up the current Scale Factor. (The Scale Factor is the multiplier used to convert the actual count to the direct readout display). The value can be changed by incrementing each digit with the button below it. Pressing the "E" key enters the new S.F. The S.F. can be set at any value from 0.0001 to 5.9999.

[1, 2   ] PRESETS
With the Process Count on the display, pressing the "1" or "2" button calls up the preset 1 or 2 value. With the Batch count on the display, pressing the "1" value calls up the Batch Preset value. They can then be changed by incrementing each digit with the button below it. Press the "E" button to enter the new Preset.

☆Program before connecting "PGM. DIS." to "COMMON".

SELF TEST ROUTINE 6, +/-

Depressing "6" & then "+/-" starts the self test routine by lighting all decimal points, then all 9's, all 8's, all 7's etc., until alternate 8's & 9's are displayed. At this time, the output can be manually activated for testing by pressing the "1" or "2" button (Process only). (The

Output test is disabled when "PGM. DIS." terminal is pulled to "COMMON".) An automatic exit will occur six (6) seconds after the Test Mode is completed. Test Mode can be run at any time and will not interfere with the normal operation of the Gemini 3300.

APPENDIX "G" - ORDERING INFORMATION

MODEL NO.	DESCRIPTION	w/20 mA Current Loop	PART NUMBERS FOR AVAILABLE SUPPLY VOLTAGES
			115/230 VAC
GEM33	Gemini 3300	No	GEM33060
		Yes	GEM33160
—	Gemini 3300 Relay Board		RLYBD002
For Information on Pricing, Enclosures, & Panel Mount Kits, refer to the RLC Catalog or contact your local RLC distributor.			

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