

THE ASTRO LINE SERIES



GEMINI 5200 INSTRUCTION MANUAL

INTRODUCTION

The Gemini 5200 is another unit in a 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 5200, 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.



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



CAUTION: Risk of electric shock.

TABLE OF CONTENTS

I.	GENERAL DESCRIPTION _____	2
	A) Safety Summary _____	2
	B) Programming The Gemini 5200 _____	2
	C) Programming The Personality _____	2
	D) Programming The Presets, Scale Factors, Timed Output Values _____	3-4
	E) Factory Settings _____	5-6
	F) Operator Accessible Functions With Programming Disabled _____	7
	G) Diagnostics, Self-Test, & "Watchdog" Timer _____	7
	H) Input Circuitry & Set-up _____	8
	I) Overflow Indication _____	8
II.	PROGRAMMING THE GEMINI 5200 IN DUAL RATE WITHOUT DISPLAY C MODE _____	9
	A) Codes 41, 42, 43, 44, 45, & 46 _____	9-10
	B) Codes 51, 52, 53, 54, 55, & 56 _____	10-12
	C) Codes 61, 62, 63, 64, 65, 66, Preset Values, & Scale Factors A & B _____	12-14
III.	PROGRAMMING THE A/B, (A-B)/B, & A-B DISPLAY C MODES _____	15
	A) Basic Operation _____	15
	B) Codes 41, 42, 43, 45, & 46 _____	15-16
	C) Codes 51, 52, 53, 54, & 55 _____	16-18
	D) Codes 61, 62, 63, 64, 65, 66, Preset Values, & Scale Factors A & B _____	18-20
	E) Gemini 5200 Programming Example - Speed Ratio Application _____	21-22
IV.	GEMINI 5200 20 MA CURRENT LOOP COMMUNICATIONS _____	23
	A) Communication Format _____	23
	B) Sending Commands & Data To The Gemini 5200 _____	24-25
	C) Receiving Data From The Gemini 5200 _____	26
	D) Print Options _____	26
	E) Current Loop Installation _____	27
	F) Communications Application _____	28
	G) Troubleshooting Gemini Serial Communications & Serial Loop-Back Self-Test _____	29
V.	APPENDIX "A" - INSTALLATION & INPUT CONFIGURATION SWITCH SET-UP _____	30-37
VI.	APPENDIX "B" - SPECIFICATIONS & DIMENSIONS _____	38-39
VII.	APPENDIX "C" - TROUBLESHOOTING GUIDE _____	40-41
VIII.	APPENDIX "D" - DUAL RATE W/O DISP C FUNCTION COMMAND CODE SUMMARY _____	42-45
IX.	APPENDIX "E" - GEMINI 5200 DUAL RATE W/DISP C FUNCTION COMMAND CODE SUMMARY _____	46-49
X.	APPENDIX "F" - SCALING FOR RATE & DISPLAY C _____	50-52
XI.	APPENDIX "G" - GEMINI 5200 PROGRAMMING CHARTS _____	53-56
XII.	APPENDIX "H" - ORDERING INFORMATION _____	57

GENERAL DESCRIPTION

The Gemini 5200 is a multi-function dual rate indicator which can fulfill almost any rate indication application. The unit can operate as two independent rate indicators, with scaling, decimal point placement, and update times, separately programmable for each channel. The Gemini 5200 also has three other unit personalities. These modes feature a third display channel, C, which can indicate the ratio, difference or draw between the A and B rate channels.

The programming of the rate channels and the calculated display is very straightforward. Setting up Channel C only requires programming the desired amount of resolution (for ratio and draw) and the appropriate decimal point location. The Gemini 5200 simply takes the two rate values and mathematically calculates display C accordingly.

The Gemini 5200 20 mA Current Loop Communications option provides the capability of two-way serial communications between the Gemini 5200 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 Rate Values, Presets, and Scale Factor can be interrogated or changed by sending the proper command codes and numerical data (if required) to the unit. Various "Print Options" can be selected to automatically interrogate the Rate Values, Presets, and Scale Factor by activating the "Print Request" terminal or by sending a "Transmit Per Print Option" (P) command.

The construction of the Gemini 5200 features a metal die-cast bezel, offering maximum durability with a high quality die-cast 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.

PROGRAMMING THE GEMINI 5200

When your Gemini 5200 arrives from the factory, it has already been programmed to function as a Dual Rate Indicator without the calculated C display. It is programmed with the factory settings listed in the "Factory Settings" section. If it is required to have the unit operate as a speed ratio, speed difference or draw indicator, the Unit Personality function code can be changed to do so.

The personality, functions, and modes are accessed by pressing the appropriate keys as indicated by the embossed numbers above them. 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.

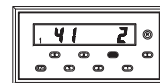
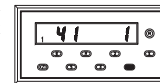
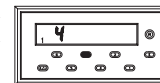
Data for the Presets, Scale Factors and Timed Output Values are entered differently. Each digit key controls the digit on the display directly above it. Changing the digits can be done by repeatedly pressing the key beneath the digit position you wish to change or by holding the key down. As you hold 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.

PROGRAMMING THE PERSONALITY

Entering function and mode is easily accomplished by pressing the appropriate digit key. For the personality function, you would enter 41 by pressing the front panel keys, 4 and 1.

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.

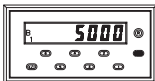


Pressing the “E” key finalizes the change. The display will now show the rate value immediately.

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.

Whenever the Unit Personality is changed, the factory settings will automatically be loaded into the unit. The factory settings can also be programmed into the unit by calling up the Unit Personality, putting a “-” in front of the mode by pushing the “+/-” key, and entering it.

Refer to the “Initial Factory Configuration” section for more details.



PROGRAMMING THE PRESETS, SCALE FACTORS & TIMED OUTPUT VALUES

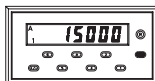
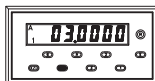
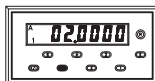
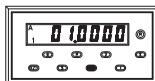
The Presets and Scale Factor Values are commonly reprogrammed on a daily basis. As such, single keystroke access has been provided on the front panel.

The Gemini 5200 has two Scale Factors, one for Rate Display A, and one for Rate Display B. Pressing the “3” key will call up the Scale Factor for the current rate value being displayed (Rate A or Rate B).

To call up the “other” Scale Factor, the “+/-” key is first pushed to change the display to the “other” value (Rate A or Rate B), then the “3” key is pushed to display the Scale Factor for that value.

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 cycle.

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



The internal unscaled rate value is multiplied by the Scale Factor Value, which changes the displayed value accordingly.

To display the Preset 1 Value, the “1” key is pushed.

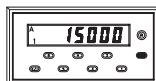
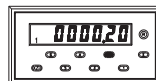
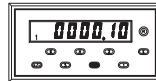
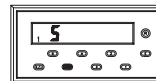
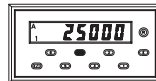
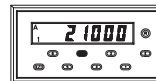
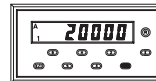
To change the value, the digits can be cycled through in the same manner as discussed for the Scale Factors. The Preset Values can range from -999999 to +999999.

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

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 or 2 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 rate value.



PROGRAMMING THE PRESETS, SCALE FACTORS & TIMED OUTPUT VALUES [Cont'd]

Note: A Timed Output Value of zero cannot be programmed into the Gemini 5200. 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.

FACTORY SETTINGS

INITIAL FACTORY CONFIGURATION (DUAL RATE)

Keys Struck	Display	Description
4,1	41 1	Personality selected as DUAL RATE W/O DISP C
4,2	42 3	Reset Rate A & B outputs
4,3	43 1	Rate B Conversion Factor is Rate Per Second (x1)
4,4	44 1	Rate B Minimum Update time of 0.5 Sec.
4,5	45 4	Rate B Scale Multiplier of 1.0
4,6	46 1	Rate B leading zero blanking and no decimal point
5,1	51 1	Output 1 assigned to Rate A, Output 2 to Rate B
5,2	52 3	Output 1 terminates at Reset, Normal Phase
5,3	0000.10	Timed Output 1 value of 0.1 Sec.
5,4	54 3	Output 2 terminates at Reset, Normal Phase
5,5	0000.10	Timed Output 2 value of 0.1 Sec.
5,6	56 4	No Rate B right hand dummy zeros
6,1	61 4	No Rate A right hand dummy zeros
6,2	62 1	Rate A Conversion Factor is Rate per Second (x1)
6,3	63 1	Rate A Minimum Update Time of 0.5 Sec.
6,4	64 4	Rate A Scale Multiplier of 1
6,5	65 1	Rate A leading zero blanking, no decimal point
6,6	66 1	No functions except Reset enabled
3	01.0000	Scale Factor A (Rate A) set to 1.0000
3	01.0000	Scale Factor B (Rate B) set to 1.0000
1	000500	Preset 1 set to 500
2	001000	Preset 2 set to 1000

DUAL RATE WITH SPEED RATIO FACTORY SETTINGS *

Keys Struck	Display	Description
4,1	41 2	Personality selected as DUAL RATE W/SPEED RATIO
4,2	42 3	Reset Rate A & B outputs
4,3	43 1	Rate B Conversion Factor is Rate Per Second (x1)
4,5	45 4	Rate B Scale Multiplier of 1.0
4,6	46 1	Display C leading zero blanking and no decimal point
5,1	51 1	Output 1 assigned to Rate A, Output 2 to Rate B
5,2	52 3	Output 1 terminates at Reset, Normal Phase
5,3	0000.10	Timed Output 1 value of 0.1 Sec.
5,4	54 3	Output 2 terminates at Reset, Normal Phase
5,5	0000.10	Timed Output 2 value of 0.1 Sec.
6,1	61 1	Display C Multiplier of 1
6,2	62 1	Rate A Conversion Factor is Rate per Second (x1)
6,3	63 1	Rate Minimum Update Time of 0.5 Sec.
6,4	64 4	Rate A Scale Multiplier of 1
6,5	65 1	Rate A & B leading zero blanking, no decimal point
6,6	66 1	No functions except Reset enabled
3	01.0000	Scale Factor A (Rate A) set to 1.0000
3	01.0000	Scale Factor B (Rate B) set to 1.0000
1	000500	Preset 1 set to 500
2	001000	Preset 2 set to 1000

* If function Code 41 is changed to [41 2], then the factory settings are as shown.

FACTORY SETTINGS [Cont'd]

DUAL RATE WITH SPEED DIFF. FACTORY SETTINGS *

Keys Struck	Display	Description
4,1	41 3	Personality selected as DUAL RATE W/SPEED DIFF.
4,2	42 3	Reset Rate A & B outputs
4,3	43 1	Rate B Conversion Factor is Rate Per Second (x1)
4,5	45 4	Rate B Scale Multiplier of 1.0
4,6	46 1	Display C leading zero blanking and no decimal point
5,1	51 1	Output 1 assigned to Rate A, Output 2 to Rate B
5,2	52 3	Output 1 terminates at Reset, Normal Phase
5,3	0000.10	Timed Output 1 value of 0.1 Sec.
5,4	54 3	Output 2 terminates at Reset, Normal Phase
5,5	0000.10	Timed Output 2 value of 0.1 Sec.
6,2	62 1	Rate A Conversion Factor is Rate per Second (x1)
6,3	63 1	Rate Minimum Update Time of 0.5 Sec.
6,4	64 4	Rate A Scale Multiplier of 1
6,5	65 1	Rate A & B leading zero blanking, no decimal point
6,6	66 1	No functions except Reset enabled
3	01.0000	Scale Factor A (Rate A) set to 1.0000
3	01.0000	Scale Factor B (Rate B) set to 1.0000
1	000500	Preset 1 set to 500
2	001000	Preset 2 set to 1000

* If [41 1] is changed to [41 2], then the factory settings are as shown.

DUAL RATE WITH SPEED DRAW FACTORY SETTINGS *

Keys Struck	Display	Description
4,1	41 4	Personality selected as DUAL RATE W/SPEED DRAW
4,2	42 3	Reset Rate A & B outputs
4,3	43 1	Rate B Conversion Factor is Rate Per Second (x1)
4,5	45 4	Rate B Scale Multiplier of 1.0
4,6	46 1	Display C leading zero blanking and no decimal point
5,1	51 1	Output 1 assigned to Rate A, Output 2 to Rate B
5,2	52 3	Output 1 terminates at Reset, Normal Phase
5,3	0000.10	Timed Output 1 value of 0.1 Sec.
5,4	54 3	Output 2 terminates at Reset, Normal Phase
5,5	0000.10	Timed Output 2 value of 0.1 Sec.
6,1	61 1	Display C Multiplier of 1
6,2	62 1	Rate A Conversion Factor is Rate per Second (x1)
6,3	63 1	Rate Minimum Update Time of 0.5 Sec.
6,4	64 4	Rate A Scale Multiplier of 1
6,5	65 1	Rate A & B leading zero blanking, no decimal point
6,6	66 1	No functions except Reset enabled
3	01.0000	Scale Factor A (Rate A) set to 1.0000
3	01.0000	Scale Factor B (Rate B) set to 1.0000
1	000500	Preset 1 set to 500
2	001000	Preset 2 set to 1000

* If [41 1] is changed to [41 2], then the factory settings are as shown.

OPERATOR ACCESSIBLE FUNCTIONS WITH PROGRAMMING DISABLED

One of the important features of the Gemini 5200 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 Scale Factor Values, to be changed in daily operation. The Gemini 5200, through the use of the "Operator Accessible Functions" modes, can enable these functions even when the "PGM. DIS." 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 four basic "Operator Accessible Functions" Modes available. These modes enable the following functions.

1. **NO FUNCTIONS EXCEPT RESET ENABLED** - In this mode, manual reset is enabled, but none of the programming functions can be changed. However, the functions can be interrogated.
2. **PRESET PROGRAMMING AND RESET ENABLED** - The entire front panel is disabled with the exceptions of Preset programmability and manual reset. All functions can be interrogated.
3. **SCALE FACTOR PROGRAMMING AND RESET ENABLED** - The entire front panel is disabled with the exceptions of Scale Factor programmability and manual reset. All functions can be interrogated.
4. **SCALE FACTOR AND PRESET PROGRAMMING, AND RESET ENABLED** - The entire front panel is disabled with the exceptions of Scale Factor and Preset programmability, and manual reset. All functions can be interrogated.

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 remote reset (RST., not RST.A) 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 terminal remote reset, and can be used in conjunction with any front panel disable mode. The combination of a manual and remote reset inputs provides a high level of security without sacrificing flexibility.

DIAGNOSTICS, SELF-TEST, & "WATCHDOG" TIMER

The security of the Gemini 5200 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 5200. Whenever the 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.

The Gemini 5200 also contains a "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 check, is the front panel initiated self-test. It can be performed at any time, even when the Gemini 5200 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" or "2" key. (The program disable pin must be disconnected in order to allow activation of the outputs.) 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 5200. Various types of sensor outputs can be accommodated by appropriate DIP switch set-up. These include: TTL or CMOS logic, current sinking, current sourcing, dry contact or magnetic pickup.

Both Input Channels A and B consist of a logic input and a separate low level magnetic pickup input. For a complete detailed description of input set-up, see Appendix "A".

OVERFLOW INDICATION

The Gemini 5200 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 following conditions occur.

Upon power-up, the display will go to zero, and the overflow LED will turn on. The overflow LED is turned on to indicate that the zero on the display is not a measured value. The overflow LED will turn off after the Gemini 5200 completes its rate measurement. It will take 16 seconds if the rate is zero.

The overflow LED can also turn on when the rate input frequency exceeds the maximum 3250 cps allowed for a rate update period of 16 sec. See Code 63 - "Rate Minimum Update Time".

PROGRAMMING THE GEMINI 5200 IN DUAL RATE WITHOUT DISPLAY C MODE

The rate indicators use a time interval method (1/tau) to calculate the rate value. This method enables high resolution at all input rates. The unit counts input pulses and after a programmable minimum update time has occurred, it waits until the next count edge occurs, takes the elapsed time and number of edges, and calculates the rate value. At slower rates, averaging can be accomplished by programming the "Minimum Update Time" (0.5 sec. to 16 sec.) for the desired response. Extensive scaling capabilities allow practically any desired reading at very slow count rates.

In the Dual Rate, without Display C mode, the two rate indicators operate in an independent non-synchronized fashion. Input A serves as the input to the Rate A indicator and Input B serves as the input to the Rate B indicator. All modes are independently selected for each rate channel.

CODE 41 - UNIT PERSONALITY

The unit personality mode is the first function code that is programmed. This mode will determine the basic operational characteristics of the unit. This programming section deals with the unit programmed as a Dual Rate Indicator without Display C, mode 1. The "Programming The A/B, (A-B)/B, And A-B Display C Modes" section covers programming of the Gemini 5200 when in Unit Personality modes 2, 3, and 4.

Once the Unit Personality mode is changed, the factory settings will automatically be loaded into the unit's memory. This provides a known starting place. If at any point, it is desired to return to the factory settings for the current mode, the unit personality is called up, a minus is put in front of the mode by pressing the "+/-" key, and the "E" key is pushed to load the factory settings. The factory settings are listed on page 5 and 6.

- [41 1] DUAL RATE INDICATION - In this mode, the Gemini 5200 operates as two independent rate indicators.
- [41 2] DUAL RATE WITH A/B DISPLAY C - In this unit personality, the Gemini 5200 operates as a dual rate indicator with an A/B display C function. See "Programming The A/B, (A-B)/B, And A-B Display C Modes" section for programming details.

[41 3] DUAL RATE WITH A-B DISPLAY C - In this unit personality, the Gemini 5200 operates as a dual rate indicator with an (A-B) Display C function. See "Programming The A/B, (A-B)/B, And A-B Display C Modes" section for programming details.

[41 4] DUAL RATE WITH (A-B)/B DISPLAY C - In this unit personality, the Gemini 5200 operates as a dual rate indicator with an (A-B)/B Display C function. See "Programming The A/B, (A-B)/B, And A-B Display C Modes" section for programming details.

[41 -1]
[41 -2] } A minus indicator preceding the mode will cause
[41 -3] } the factory settings to be loaded when entered.
[41 -4]

CODE 42 - RESET KEY & TERMINAL ACTUATION MODES

The Reset Button & Terminal Actuation Modes controls the effect that the reset button and terminal have on the two display channels. Resetting will not affect the rate displays or update period in any manner. Reset only affects the output(s) associated with the rate channels.

There is a separate "Rst A" terminal provided which makes it possible to independently reset both the Rate A and B Outputs.

- [42 1] RESET RATE A OUTPUT(S)
- [42 2] RESET RATE B OUTPUT(S)
- [42 3] RESET RATE A & B OUTPUTS

CODE 43 - RATE B CONVERSION FACTOR

The Rate B Conversion Factor is used to convert Display B to indicate rate in the desired time unit. See Appendix "F" - Scaling For Rate And Display C.

- [43 1] Rate Per Second (x1)
- [43 2] Rate Per Minute (x60)
- [43 3] Rate Per Hour (x3600)

CODE 44 - RATE B MINIMUM/MAXIMUM UPDATE TIME

The determination of the rate value uses a method in which the elapsed time is measured between the first and last pulse of the update period. The minimum update time is the shortest the time period can be. Once the minimum update time has expired, the unit will end the measurement period when the next negative going count edge occurs. If the unit does not receive the next negative count edge within the maximum update time at the start of the measurement period, the unit will end the time period and the rate display will go to zero. At very slow count rates the update time period will be the actual period of one count cycle.

- [44 1] 0.5 Sec. minimum/1 Sec. maximum
- [44 2] 1 Sec. minimum/2 Secs. maximum
- [44 3] 2 Secs. minimum/4 Secs. maximum
- [44 4] 4 Secs. minimum/8 Secs. maximum
- [44 5] 8 Secs. minimum/16 Secs. maximum (max. rate = 7500 cps)
- [44 6] 16 Secs. minimum/32 Secs. maximum (max. rate = 3250 cps)

CODE 45 - RATE B SCALE MULTIPLIER

The Rate B Scale Multiplier is used in conjunction with the Rate Scale Factor B and Rate B Conversion Factor to scale the actual signal input to obtain the desired reading.

- [45 1] x 1000
- [45 2] x 100
- [45 3] x 10
- [45 4] x 1
- [45 5] x 0.1
- [45 6] x 0.01

CODE 46 - RATE B DECIMAL POINT & LEADING ZERO BLANKING

There are six basic modes of decimal point placement for the Rate B indicator of the Gemini 5200. 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	}	LEADING ZERO BLANKING
[46 2]	0.0		
[46 3]	0.0 0		
[46 4]	0.0 0 0		
[46 5]	0.0 0 0 0		
[46 6]	0.0 0 0 0 0		
[46 -1]	0 0 0 0 0 0	}	LEADING ZERO BLANKING INHIBITED
[46 -2]	0 0 0 0 0.0		
[46 -3]	0 0 0 0.0 0		
[46 -4]	0 0 0.0 0 0		
[46 -5]	0 0.0 0 0 0		
[46 -6]	0.0 0 0 0 0		

CODE 51 - OUTPUT ASSIGNMENT

The outputs of the Gemini 5200 can be assigned to either the Rate A or Rate B channel or one to each.

The Gemini 5200 has a Preset tracking feature which allows Preset 1 to track Preset 2. If Preset tracking is programmed, whenever the Preset 2 value is changed, the Preset 1 value will also change to maintain the same offset. For example, if Preset 1 is 100 and Preset 2 is 200, changing Preset 2 to 300 will automatically change Preset 1 to 200, maintaining the same 100 unit offset. In order to change the amount of offset, the Preset 1 value is changed. The Preset tracking feature is programmed by adding a “-” modifier in front of the desired mode.

Note: When Preset tracking is enabled, before changing Preset 2 via serial communications, the Preset 2 value must be interrogated in order to establish the Preset 1 value.

- [51 1] Output 1 assigned to Rate A, Output 2 assigned to Rate B
- [51 2] Outputs 1 & 2 assigned to Rate B
- [51 3] Outputs 1 & 2 assigned to Rate A

- [51 -1]
 - [51 -2]
 - [51 -3]
- } These modes are the same as above with the exception that Preset Tracking is enabled.

CODE 52 - OUTPUT 1 TERMINATION MODES

The Gemini 5200 has four “Output 1 termination Modes” which control the way Output 1 will terminate or reset. In all modes, Output 1 will terminate immediately when the channel to which it is assigned is manually reset.

A reverse phase mode is available on the Gemini 5200. This refers to the complementing of the logic state of Output 1. With normal phase operation, when the display 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 3] TERMINATE AT MANUAL RESET - Output 1 activates when the rate is greater than or equal to 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 deactivates when reset ends. Output 1 is set for normal phase operation.

[52 5] TERMINATE AFTER TIMED OUTPUT 1 - If both outputs are assigned to the same rate channel [51 2,3], Output 1 will activate when the rate is below or equal to the Preset 1 value. If each output is assigned to a different channel [51 1], Output 1 will activate when the rate is greater than or equal to the Preset 1 Value. Output 1 will terminate after the “Timed Output 1 Value” if the timed output value is less than the update time of the rate channel. If the timed output value is greater than the update time, the output will appear to be latched on, deactivating when the rate drops below the Preset [51 1], or above the Preset [51 2,3] and the output time expires. Output 1 is set for normal phase operation.

[52 6] BOUNDARY MODE - When in boundary mode, the Preset 1 Value serves as the boundary point. When the rate value is less than Preset 1, Output 1 is not activated (normal phase). When the rate value is greater than or equal to the Preset, Output 1 is activated. If the display value were to drop below Preset 1, Output 1 would then deactivate. Output 1 is set for normal phase operation.

[52 -3]
[52 -4]
[52 -5]
[52 -6]

These modes are the same as above with the exception that Output 1 is set for reverse phase operation.

CODE 53 - TIMED OUTPUT 1 VALUE

The Gemini 5200 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 the “Programming The Presets, Scale Factors, And Timed Output Values” section for more details about entering. The timed output will be terminated if the unit is manually reset.

The Timed Output 1 Value is used only when in timed output termination mode, [52 5].

Note: A Timed Output Value of zero cannot be programmed into the Gemini 5200. 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 5200 has four “Output 2 termination Modes” which control the way Output 2 will terminate or reset. In all modes Output 2 will terminate immediately when the channel to which it is assigned is manually reset.

A reverse phase mode is available on the Gemini 5200. This refers to the complementing of the logic state of Output 2. With normal phase operation, when the display 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.

CODE 54 - OUTPUT 2 TERMINATION MODES (Cont'd)

[54 3] TERMINATE AT MANUAL RESET - Output 2 activates when the rate is greater than or equal to the Preset 2 value. 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 deactivates when reset ends. Output 2 is set for normal phase operation.

[54 5] TERMINATE AFTER TIMED OUTPUT 2 - Output 2 will activate when the rate is greater than or equal to the Preset 2 Value and will terminate after the "Timed Output 2 Value" expires. This will occur every update time period for which the above condition is true. If the output duration time is greater than the update time, Output 2 will appear to be latched on, deactivating when the rate drops below the Preset and the output time expires. Output 2 is set for normal phase operation.

[54 6] BOUNDARY MODE - When in boundary mode, the Preset 2 Value serves as the boundary point. When the rate value is less than Preset 2, Output 2 is not activated (normal phase). When the rate value is greater than or equal to Preset 2, Output 2 is activated. If the display value were to drop below Preset 2, Output 2 would then deactivate. Output 2 is set for normal phase operation.

[54 -3]
[54 -4]
[54 -5]
[54 -6] } These modes are the same as above with the exception that Output 2 is set for reverse phase operation.

CODE 55 - TIMED OUTPUT 2 VALUE

The Gemini 5200 has the capability of varying the timed output 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 Factors, And Timed Output Values" section for more details about entering. Timed Output 2 will be terminated if the unit is manually reset.

The Timed Output 2 Value is used only when in timed output termination mode, [54 5].

Note: A Timed Output Value of zero cannot be programmed into the Gemini 5200. 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 56 - RATE B RIGHT HAND DUMMY ZEROS

Dummy zeros can be used to alleviate display fluctuations due to an unstable input signal. These zeros effectively move significant digits to the left. Therefore, a normal rate display of 1 could be shown as a 10, 100, or 1000. Using the dummy zeros will make it necessary to adjust the scaling if they were not considered before.

[56 1] 1 RIGHT HAND DUMMY ZERO
[56 2] 2 RIGHT HAND DUMMY ZEROS
[56 3] 3 RIGHT HAND DUMMY ZEROS
[56 4] NO RIGHT HAND DUMMY ZEROS

CODE 61 - RATE A RIGHT HAND DUMMY ZEROS

Dummy zeros can be used to alleviate display fluctuations due to an unstable input signal. These zeros effectively move significant digits to the left. Therefore, a normal rate display of 1 could be shown as a 10, 100, or 1000. Using the dummy zeros will make it necessary to adjust the scaling if they were not considered before.

[61 1] 1 RIGHT HAND DUMMY ZERO
[61 2] 2 RIGHT HAND DUMMY ZEROS
[61 3] 3 RIGHT HAND DUMMY ZEROS
[61 4] NO RIGHT HAND DUMMY ZEROS

CODE 62 - RATE A CONVERSION FACTOR

The Rate A Conversion Factor is used to convert Display A to indicate rate in the desired time unit. See Appendix "F" - Scaling For Rate And Display C.

[62 1] Rate Per Second (x1)
[62 2] Rate Per Minute (x60)
[62 3] Rate Per Hour (x3600)

CODE 63 - RATE A MINIMUM/MAXIMUM UPDATE TIME

The determination of the rate value uses a method in which the elapsed time is measured between the first and last pulse of the update period. The minimum update time is the shortest the time period can be. Once the minimum update time has expired, the unit will end the measurement period when the next negative going count edge occurs. If the unit does not receive the next negative count edge within the maximum update time at the start of the measurement period, the unit will end the time period and the rate display will go to zero. At very slow count rates, the update time period will be the actual period of one count cycle.

- [63 1] 0.5 Sec. minimum/1 Sec. maximum
- [63 2] 1 Sec. minimum/2 Secs. maximum
- [63 3] 2 Secs. minimum/4 Secs. maximum
- [63 4] 4 Secs. minimum/8 Secs. maximum
- [63 5] 8 Secs. minimum/16 Secs. maximum (max. rate = 7500 cps)
- [63 6] 16 Secs. minimum/32 Secs. maximum (max. rate = 3250 cps)

CODE 64 - RATE A SCALE MULTIPLIER

The Rate A Scale Multiplier is used in conjunction with the Rate Scale Factor A and Rate A Conversion Factor to scale the actual signal input to obtain the desired reading.

- [64 1] x 1000
- [64 2] x 100
- [64 3] x 10
- [64 4] x 1
- [64 5] x 0.1
- [64 6] x 0.01

CODE 65 - RATE A DECIMAL POINT & LEADING ZERO BLANKING

There are six basic modes of decimal point placement for the Rate A indicator of the Gemini 5200. 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.

[65 1]	0	} LEADING ZERO BLANKING
[65 2]	0.0	
[65 3]	0.0 0	
[65 4]	0.0 0 0	
[65 5]	0.0 0 0 0	
[65 6]	0.0 0 0 0 0	
[65 -1]	0 0 0 0 0 0	} LEADING ZERO BLANKING INHIBITED
[65 -2]	0 0 0 0 0 0	
[65 -3]	0 0 0 0 0 0	
[65 -4]	0 0 0 0 0 0	
[65 -5]	0 0 0 0 0 0	
[65 -6]	0 0 0 0 0 0	

CODE 66 - “OPERATOR ACCESSIBLE FUNCTIONS” MODES

The Gemini 5200 has four 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 Factors are enabled.
- [66 4] SCALE FACTOR, PRESET PROGRAMMING & RESET ENABLED - In this mode, manual reset and the programming of the Scale Factor and Preset Values are enabled.

CODE 66 - "OPERATOR ACCESSIBLE FUNCTIONS" MODES (Cont'd)

[66 -1]
[66 -2]
[66 -3]
[66 -4]

These Modes are the same as above with the exception that manual reset is disabled.

PRESET VALUES

Whenever the display value equals the Preset 1 or 2 Value, an output action will occur. This action depends on the previously programmed modes. The Preset Values may vary from -999,999 to 999,999. Refer to "Programming The Presets, Scale Factors, And Timed Output Values" section for instructions on entering the Preset Values.

"1" - PRESET 1 VALUE
"2" - PRESET 2 VALUE

SCALE FACTORS A & B

"3" SCALE FACTOR - The Scale Factor, for whichever Value (Rate A or B) is currently being displayed, is accessed by pressing the "3" key. To access the Scale Factor of the "other" rate display value, the "+/-" key would be pushed (to change the display to the other value), then the "3" key would be pushed. The actual rate (in pps) is multiplied by the Scale Factor, Scale Multiplier, and Rate Conversion factor to obtain the desired display reading. 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 Values may range from 0.0001 to 5.9999. Refer to "Programming The Presets, Scale Factors, And Timed Output Values" section for instructions on entering the Scale Factor Values.

PROGRAMMING THE A/B, (A-B)/B, AND A-B DISPLAY C MODES

This section will deal with the programming and operation of the Gemini 5200 in the modes which include Display C, [41 2,3,4]. Since all three display C modes are very similar in operation, they will all be covered in one section.

BASIC OPERATION

In all of the display C modes, the Gemini 5200 performs a mathematical calculation using Rate channels A & B to obtain the Display C value.

The two rate indicators, use a time interval method (1/tau) to calculate the rate value. This method enables high resolution at all input rates. The unit counts input pulses and after a programmable minimum update time has occurred, it waits until the next count edge occurs, takes the elapsed time and number of edges, and calculates the rate value. At slower rates, averaging can be accomplished by programming the "Minimum Update Time" (0.5 sec. to 16 sec.) for the desired response.

When operating in any of the three modes which utilize display C, the two rate indicators will synchronize themselves in order to obtain an accurate display C reading. The Gemini 5200 will determine which channel is running at the slower rate, and it will use that channel to synchronize the other channel. This is done so that both time measurement windows are as close as possible. Because it is necessary to keep the measurement windows the same, there is only one Rate Minimum Update Time setting. The slower channel will determine the update time for the other rate channel and Display C.

If one rate input signal drops out before the update period has completed, that channel will go to zero after the maximum update time has expired. The channel will then continually time-out according to the maximum update time that was selected in Code 63, until a rate signal again appears on its input. After the first time-out, the other channel, which still has a rate signal on its input, will then begin to operate in a non-synchronous manner, updating according to the "Minimum Update Time" and its input frequency. It will not synchronize with the channel that timed-out, and has an update period of 16 seconds.

The Display C channel, however, will only update according to the maximum update time because it is calculated based on both of the rate channels. The rate channels will again synchronize when both channels have a rate signal on their inputs.

CODE 41 - UNIT PERSONALITY

The unit personality mode is the first function code that is programmed. This mode will determine the basic operational characteristics of the unit. This programming section deals with the unit personality programmed as a Dual Rate Indicator with Display C, modes 2, 3, or 4. A separate section, "Programming The Gemini 5200 In Dual Rate Without Display C Mode" goes over the programming of the Gemini 5200 when programmed in mode 1.

Whenever the Unit Personality mode is changed, the factory settings will automatically be loaded into the unit's memory. This provides a known starting place. If at any point, it is desired to return to the factory settings for the current personality, the unit personality is called up, a minus is put in front of the mode by pressing the "+/-" key, and the "E" key is pushed to load the factory settings.

[41 1] DUAL RATE INDICATION - In this Unit Personality, the Gemini 5200 operates as two independent rate indicators. See "Programming The Gemini 5200 In Dual Rate Without Display C Mode" section for programming details.

[41 2] DUAL RATE WITH A/B DISPLAY C - In this unit personality, the Gemini 5200 operates as a dual rate indicator with an A/B (Speed Ratio) Display C function.

[41 3] DUAL RATE WITH A-B DISPLAY C - In this unit personality, the Gemini 5200 operates as a dual rate indicator with an A-B (Speed Difference) Display C function.

[41 4] DUAL RATE WITH (A-B)/B DISPLAY C - In this unit personality, the Gemini 5200 operates as a dual rate indicator with an (A-B)/B (Speed Draw) Display C function.

[41 -1]
[41 -2]
[41 -3]
[41 -4]

A minus indicator preceding the mode will cause the factory settings to be loaded when entered.

CODE 42 - RESET BUTTON & TERMINAL ACTUATION MODES

The Reset Button & Terminal Actuation modes control the effect that the reset button and terminal have on the two display channels. Resetting will not affect the rate displays in any manner. Reset only affects the output(s) associated with the rate channels.

There is a separate "Rst A" terminal provided which makes it possible to independently reset both Rate A and B channels.

- [42 1] RESET RATE A OUTPUT(S)
- [42 2] RESET RATE B OUTPUT(S)
- [42 3] RESET RATE A & B OUTPUT(S)
- [42 4] RESET DISPLAY C OUTPUT(S)
- [42 5] RESET DISPLAY C AND RATE A OUTPUT(S)
- [42 6] RESET DISPLAY C AND RATE B OUTPUT(S)

CODE 43 - RATE B CONVERSION FACTOR

The Rate B Conversion Factor is used to convert Display B to indicate rate in the desired time unit. See Appendix "F" - Scaling For Rate And Display C.

- [43 1] Rate Per Second (x1)
- [43 2] Rate Per Minute (x60)
- [43 3] Rate Per Hour (x3600)

CODE 45 - RATE B SCALE MULTIPLIER

The Rate B Scale Multiplier is used in conjunction with the Rate Scale Factor B and Rate B Conversion Factor to scale the actual signal input to obtain the desired reading.

- [45 1] x 1000
- [45 2] x 100
- [45 3] x 10
- [45 4] x 1
- [45 5] x 0.1
- [45 6] x 0.01

CODE 46 - DISPLAY C DECIMAL POINT & LEADING ZERO BLANKING

There are six basic modes of decimal point placement for the Display C indicator of the Gemini 5200. 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	} LEADING ZERO BLANKING
[46 2]	0.0	
[46 3]	0.0 0	
[46 4]	0.0 0 0	
[46 5]	0.0 0 0 0	
[46 6]	0.0 0 0 0 0	

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

CODE 51 - OUTPUT ASSIGNMENT

The outputs of the Gemini 5200 can be assigned to the Rate A, Rate B, or the Display C channel.

The Gemini 5200 has a Preset tracking feature which allows Preset 1 to track Preset 2. If Preset tracking is programmed, whenever the Preset 2 value is changed, the Preset 1 value will also change to maintain the same offset. For example, if Preset 1 is 100 and Preset 2 is 200, changing Preset 2 to 300 will automatically change Preset 1 to 200, maintaining the same 100 unit offset. In order to change the amount of offset, the Preset 1 value is changed. The Preset tracking feature is programmed by adding a "-" modifier in front of the desired mode.

Note: When Preset tracking is enabled, before changing Preset 2 via serial communications, the Preset 2 value must be interrogated in order to establish the Preset 1 value.

- [51 1] Output 1 assigned to Rate A, Output 2 assigned to Rate B
- [51 2] Outputs 1 & 2 assigned to Rate B
- [51 3] Outputs 1 & 2 assigned to Rate A
- [51 4] Output 1 assigned to Rate B, Output 2 assigned to Display C
- [51 5] Output 1 assigned to Rate A, Output 2 assigned to Display C
- [51 6] Output 1 & 2 assigned to Display C

- [51 -1]
 - [51 -2]
 - [51 -3]
 - [51 -4]
 - [51 -5]
 - [51 -6]
- These modes are the same as above with the exception that Preset Tracking is enabled.

CODE 52 - OUTPUT 1 TERMINATION MODES

The Gemini 5200 has four “Output 1 termination Modes” which control the way Output 1 will terminate or reset. In all modes, Output 1 will terminate immediately when the channel to which it is assigned is manually reset.

A reverse phase mode is available on the Gemini 5200. This refers to the complementing of the logic state of Output 1. With normal phase operation, when the display 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 3] TERMINATE AT MANUAL RESET - Output 1 activates when the rate or display value is greater than or equal to the Preset 1 value. In this mode, once Output 1 is activated, it does not deactivate until the moment a 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 deactivates when reset ends. Output 1 is set for normal phase operation.

[52 5] TERMINATE AFTER TIMED OUTPUT 1 - If both outputs are assigned to the same channel [51 2,3,6], Output 1 will activate when the rate or display value is below or equal to the Preset 1 value. If each output is assigned to a different channel [51 1,4,5], Output 1 will activate when the rate or display value is greater than or equal to the Preset 1 Value. Output 1 will terminate after the “Timed Output 1 Value” if the Timed Output Value is less than the update time of the rate or display channel. If the Timed Output 1 Value is greater than the programmed update time, Output 1 will appear to be latched on, deactivating when the rate or display value drops below the Preset [51 1,4,5], or above the Preset [51 2,3,6] and the output time expires. Output 1 is set for normal phase operation.

[52 6] BOUNDARY MODE - When in boundary mode, the Preset 1 Value serves as the boundary point. When the rate or display value is less than Preset 1, Output 1 is not activated (normal phase). When the rate or display value is greater than or equal to Preset 1, Output 1 is activated. If the display value were to drop below Preset 1, Output 1 would then deactivate. Output 1 is set for normal phase operation.

- [52 -3]
 - [52 -4]
 - [52 -5]
 - [52 -6]
- These modes are the same as above with the exception that Output 1 is set for reverse phase operation.

CODE 53 - TIMED OUTPUT 1 VALUE

The Gemini 5200 has the capability of varying Timed Output 1 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 Presets, Scale Factors, and Timed Output Values” section for more details about entering. The timed output will be terminated if the unit is manually reset.

The Timed Output 1 Value is used only when in timed output termination mode, [52 5].

Note: A Timed Output Value of zero cannot be programmed into the Gemini 5200. 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 5200 has four “Output 2 termination Modes” which control the way Output 2 will terminate or reset. In all modes, Output 2 will terminate immediately when the channel to which it is assigned to is manually reset.

A reverse phase mode is available on the Gemini 5200. This refers to the complementing of the logic state of Output 2. With normal phase operation, when the display 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 3] TERMINATE AT MANUAL RESET - Output 2 activates when the rate or display value is greater than or equal to the Preset 2 value. In this mode, once Output 2 is activated, it does not deactivate until the moment a 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 deactivates when reset ends. Output 2 is set for normal phase operation.

[54 5] TERMINATE AFTER TIMED OUTPUT 2 - Output 2 will activate when the rate or display value is greater than or equal to the Preset 2 Value and will terminate after the “Timed Output 2 Value” expires. This will occur every update time period for which the above condition is true. If the Output 2 duration time is greater than the display update time, the output will appear to be latched on, deactivating when the rate or display value drops below Preset 2 and the output time expires. Output 2 is set for normal phase operation.

[54 6] BOUNDARY MODE - When in boundary mode, the Preset 2 Value serves as the boundary point. When the rate or display value is less than Preset 2, Output 2 is not activated (normal phase). When the rate or display value is greater than or equal to Preset 2, Output 2 is activated. If the display value were to drop below Preset 2, Output 2 would then deactivate. Output 2 is set for normal phase operation.

[54 -3]
[54 -4]
[54 -5]
[54 -6]

These modes are the same as above with the exception that Output 2 is set for reverse phase operation.

CODE 55 - TIMED OUTPUT 2 VALUE

The Gemini 5200 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 Presets, Scale Factors, and Timed Output Values” section for more details about entering. Timed Output 2 will be terminated if the unit is manually reset.

The Timed Output 2 Value is used only when in timed output termination mode, [54 5].

Note: A Timed Output Value of zero cannot be programmed into the Gemini 5200. 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 - DISPLAY C MULTIPLIER

The Display C Multiplier is used in the Speed Ratio [41 2] and Draw [41 4] modes to obtain the desired amount of resolution for Display C. For example; if Display C is indicating speed ratio, and both rates are the same, the ratio would be 1. By using a Display C Multiplier of 10, 100, 1,000 or 10,000, in conjunction with the proper decimal point, the ratio could be read in tenths, hundredths, thousandths or ten thousandths respectively.

The Display C Multiplier is not available in the Speed Difference Unit Personality [41 3].

[61 1] x1
[61 2] x10
[61 3] x100
[61 4] x1,000
[61 5] x10,000

CODE 62 - RATE A CONVERSION FACTOR

The Rate A Conversion Factor is used to convert Display A to indicate rate in the desired time unit. See Appendix "F" - Scaling For Rate And Display C.

- [62 1] Rate Per Second (x1)
- [62 2] Rate Per Minute (x60)
- [62 3] Rate Per Hour (x3600)

CODE 63 - RATE MINIMUM/MAXIMUM UPDATE TIME

The determination of the rate value uses a method in which the elapsed time is measured between the first and last pulse of the update period. In the Display C modes [41 2,3,4], the rate channels are synchronized. The slower of the two channels will determine the minimum update time. The minimum update time is the shortest the time period can be. Once the minimum update time has expired, the unit will end the measurement period, for the synchronizing channel, when the next negative going count edge occurs. If the unit does not receive the next negative count edge within the maximum update time at the start of the measurement period, the unit will end the time period and calculate the rate based upon the amount of pulses received during the time period. After the synchronizing channel ends its measurement period, the other channel will end its measurement period when it receives the next negative going edge.

- [63 1] 0.5 Sec. minimum/1 Sec. maximum
- [63 2] 1 Sec. minimum/2 Secs. maximum
- [63 3] 2 Secs. minimum/4 Secs. maximum
- [63 4] 4 Secs. minimum/8 Secs. maximum
- [63 5] 8 Secs. minimum/16 Secs. maximum (max. rate = 7500 cps)
- [63 6] 16 Secs. minimum/32 Secs. maximum (max. rate = 3250 cps)

CODE 64 - RATE A SCALE MULTIPLIER

The Rate A Scale Multiplier is used in conjunction with the Rate Scale Factor A and Rate A Conversion Factor to scale the actual signal input to obtain the desired reading.

- [64 1] x 1000
- [64 2] x 100
- [64 3] x 10
- [64 4] x 1
- [64 5] x 0.1
- [64 6] x 0.01

CODE 65 - RATE A & B DECIMAL POINT & LEADING ZERO BLANKING

There are six basic modes of decimal point placement for the Rate A & B indicators of the Gemini 5200. 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.

- | | | |
|---------|-------------|--------------------------------------|
| [65 1] | 0 | } LEADING ZERO
BLANKING |
| [65 2] | 0.0 | |
| [65 3] | 0.0 0 | |
| [65 4] | 0.0 0 0 | |
| [65 5] | 0.0 0 0 0 | |
| [65 6] | 0.0 0 0 0 0 | |
| | | |
| [65 -1] | 0 0 0 0 0 0 | } LEADING ZERO
BLANKING INHIBITED |
| [65 -2] | 0 0 0 0 0.0 | |
| [65 -3] | 0 0 0 0.0 0 | |
| [65 -4] | 0 0 0.0 0 0 | |
| [65 -5] | 0 0.0 0 0 0 | |
| [65 -6] | 0.0 0 0 0 0 | |

CODE 66 - "OPERATOR ACCESSIBLE FUNCTIONS" MODES

The Gemini 5200 has four 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 Values are enabled.

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

[66 -1]
[66 -2]
[66 -3]
[66 -4] } These modes are the same as above with the exception that manual reset is disabled.

PRESET VALUES

Whenever the rate or display value equals the Preset Value, an output action will occur. This action depends on the previously programmed modes. The Preset Value may vary from -999,999 to 999,999. Refer to "Programming the Presets, Scale Factors, And Timed Output Values" section for entering instructions.

"1" - PRESET 1 VALUE

"2" - PRESET 2 VALUE

SCALE FACTORS A & B

The Scale Factor, for whichever Value (Rate A or B) is currently being displayed, is accessed by pressing the "3" key. To access the Scale Factor of the "other" display value, the "+/-" key would be pushed (to change the display to the other value), then the "3" key would be pushed. If the "3" key is pushed while the Display C value is on the display, a scale factor will not be displayed, since the Display C value does not have a scale factor associated with it.

The actual rate (in pps) is multiplied by the appropriate Scale Factor, Scale Multiplier, and Rate Conversion factor to obtain the desired display reading. 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 0.0001 to 5.9999. Refer to "Programming the Presets, Scale Factors, And Timed Output Values" section for entering instructions.

"3" - SCALE FACTOR

GEMINI 5200 PROGRAMMING EXAMPLE - SPEED RATIO

A paper towel manufacturer needs to maintain a tight control on the speed relationship of two rollers. Two outputs are needed to signal when the speed relationship of the rolls are out of the operating "safe zone". A 72 tooth gear is mounted on each of the rolls. Two LMPC's are used to sense the gear teeth. Each of the rolls have a circumference of 2 feet.

The Gemini 5200 can fulfill all the requirements of the system. The Gemini 5200 can provide an indication of the speed relationship, and can also provide a Feet per Minute indication of the speed at which each of the rolls are running.

The system can be set-up so that the speed relationship is given as a speed ratio or draw. After programming, only the Presets will have to be changed. In this programming example, Display C will be set-up to indicate speed ratio, A/B.

SCALING THE RATE CHANNELS

Since both of the rolls have the same circumference and have gears with the same number of teeth, the scaling parameters obtained will apply to both Rate channels A & B.

The unit of display for the rate channels will be in feet. From the information given, 72 pulses will be provided for 2 "Display Units" (feet) of linear web travel. Utilizing the formulas and procedure in Appendix "F", we obtain the Total Scaling Factor required, "K_T".

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

$$K_T = 2/72 = 0.0277777$$

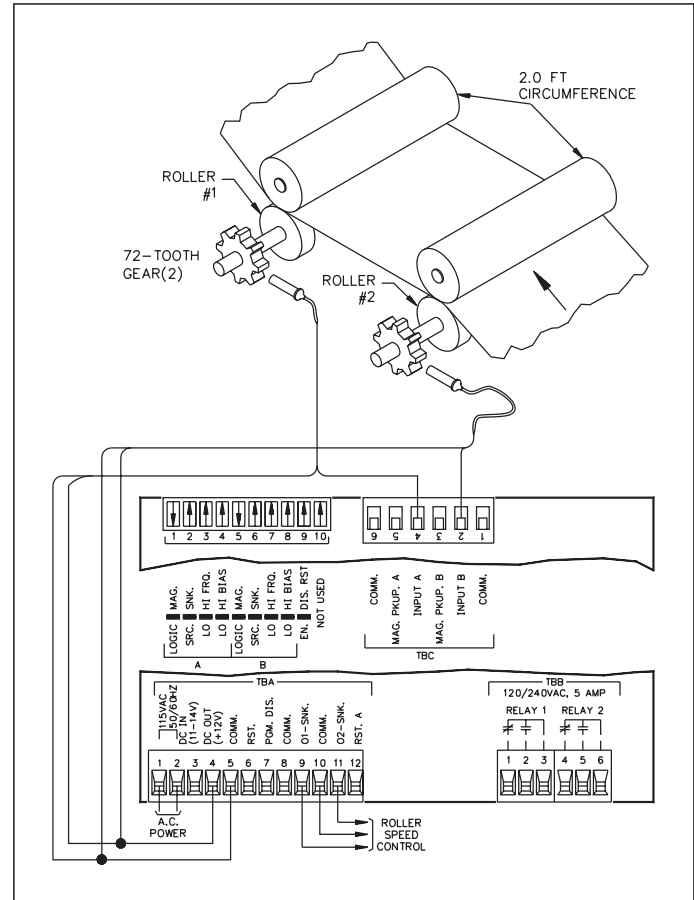
To provide maximum conversion accuracy, a Scale Multiplier value of 0.01 is chosen to give the largest number of significant digits possible for the Scale Factor.

$$SF = K_T/SCM$$

$$SF = 0.027777/0.01 = 2.7778$$

The Rate A & Rate B Scale Factors will be programmed for 2.7778 and the corresponding Scale Multipliers will be programmed for 0.01.

The final scaling parameter that needs to be selected is the "Rate Conversion Factors" for both of the Rate channels. To achieve rate in Feet Per Minute, the "Rate Conversion Factor", Rate Per Minute is selected.



SCALING DISPLAY C

Scaling Display C is simply a matter of choosing the amount of decimal point resolution that is desired for the application. This is accomplished by selecting a Display C Multiplier and by programming the desired “Display C Decimal Point” location. To obtain Display C resolution in thousandths, a “Display C Multiplier” of 1000 is used. For example; If both rolls are operating at the same speed, the ratio would be 1. Selecting a “Display C Multiplier” of 1000 and a decimal point to the right of digit 4, will result in a Display C readout of 1.000.

HARDWARE SET-UP

The application drawing shows how the hardware for the system is configured. The Input to both rate channels will be LMPC open collector Logic Magnetic Pickups. The A & B Input channels will therefore, be set-up identically. The dip switch settings for various types of sensors are shown in Appendix “A”. The “EN/DIS RST.” DIP switch position, is set to the “DIS.” position to disable the use of the front panel reset button. The solid state open collector outputs of the Gemini, “O1-SNK” and “O2-SNK”, are connected to the speed control circuitry of the system.

STEP BY STEP PROGRAMMING PROCEDURE

STEP 1 - Select function code 41 (Unit Personality). Select and enter mode 2 for a Dual rate with speed ratio unit personality.

Note: Function code 42, “Reset Button & Terminal Actuation Modes” is not programmed, since the application does not require the resetting of the outputs.

STEP 2 - Enter function code 43 (Rate B Conversion Factor). Select and enter mode 2 for Rate Per Minute.

STEP 3 - Enter function code 45 (Rate B Scale Multiplier). Select and enter mode 6 for a Scale Multiplier of 0.01, as determined when scaling the rate.

STEP 4 - Enter function code 46 (Display C Decimal Point & Leading Zero Blanking). Select and enter mode 4 for decimal to the right of digit 4.

STEP 5 - Enter function code 51 (Output Assignment). Select and enter mode 6 to assign both outputs to Display C.

STEP 6 - Enter function code 52 (Output 1 Termination Mode). Select and enter mode 6 for boundary operation.

Note: Since Output 1 is not being used in timed output operation, function code 53, the “Timed Output 1 Value”, is not programmed.

STEP 7 - Enter function code 54 (Output 2 Termination Modes). Select and enter mode 6 for boundary operation.

Note: Since Output 2 is not being used in timed output operation, function code 55, the “Timed Output 2 Value”, is not programmed.

STEP 8 - Enter function code 61 (Display C Multiplier). Select and enter mode 4 for a multiplier of 1000.

STEP 9 - Enter function code 62 (Rate A Conversion Factor). Select and enter mode 2 for Rate Per Minute.

STEP 10 - Enter function code 63 (Rate Minimum Sample Time). Select and enter mode 1 for 0.5 second minimum sample time.

STEP 11 - Enter function code 64 (Rate A Scale Multiplier). Select and enter mode 6 for a Scale Multiplier of 0.01, as determined when scaling the rate.

STEP 12 - Enter function code 65 (Display A & B Decimal Point & Leading Zero Blanking). Select and enter mode 1 for no decimal point.

STEP 13 - Enter code 66 (Operator Accessible Functions Modes). Select and enter mode (-)1 for no functions enabled. When the “PGM.DIS.” terminal is connected to “COMM.”, all programming changes will be inhibited.

STEP 14 - The “+/-” key is pushed, if necessary, so that Rate A is being indicated on the Gemini 5200. The “3” key is then pushed to call up the Rate A Scale Factor. The value is changed to 2.7778.

STEP 15 - The “+/-” key is pushed so that Rate B is being indicated on the Gemini 5200. The “3” key is then pushed to call up the Rate B Scale Factor. The value is changed to 2.7778.

STEP 16 - Both presets are programmed to the desired ratio limits for within which the machine is to operate.

After the Gemini 5200 has been programmed, the “PGM. DIS.” terminal is connected to “COMM.” to prevent any unauthorized or accidental mode changes. The function codes can, however, be recalled to view or verify that the proper modes are entered.

GEMINI 5200 20 MA CURRENT LOOP COMMUNICATIONS

The Gemini 5200's 20 mA Current Loop Communications Option allows a "two-way" serial communications link to be established in order to monitor the display values, Presets and Scale Factors from a remote location. Some typical devices that can be connected with the Gemini 5200 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 5200 and one for receiving the data values from the Gemini 5200. Up to sixteen Geminis or other RLC units with 20 mA serial communication capability, can be connected together in the "loop". These units are assigned unit 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 of a number of Geminis.

With the Communications Option, the following functions can be performed:

1. Interrogation of the rate or display values, Presets, and Scale Factors.
2. Changing of the Presets and Scale Factors.
3. Resetting of the Outputs.
4. Automatic print-out when using a printer and the "Print Request" Terminal.
5. Change viewed display channel

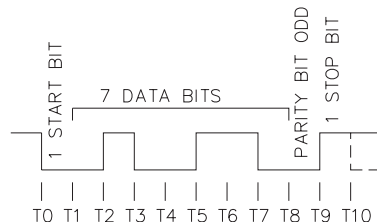
COMMUNICATION FORMAT

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 5200 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 5200

When sending commands to the Gemini 5200, a command string must be constructed. The command string may consist of command codes, value identifiers, and numerical data. Below is a list of commands and value identifiers that are used when communicating with the Gemini 5200

COMMAND	DESCRIPTION
N (4EH)	Address command; followed by a unit address number 1-15 and one of the following commands.
P (50H)	Transmit per Print Options command.
R (52H)	Reset command; operates on Output(s) assigned to the channel being reset.
T (54H)	Transmit Value command; operates on display values, Presets and Scale Factors.
V (56H)	Change Value command; operates on Scale Factors, and Presets.
D (44H)	Change Display command; operates on display values (E-G).

VALUE IDENTIFIER	DESCRIPTION	MNEMONIC
A (41H)	Preset 1	(PS1)
B (42H)	Preset 2	(PS2)
C (43H)	Scale Factor A	(SFA)
D (44H)	Scale Factor B	(SFB)
E (45H)	Rate A	(CTA)
F (46H)	Rate B	(CTB)
G (47H)	Display C	(CTC)

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 5200. The Gemini 5200 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 5200 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 5200, to which the command is to be sent, is assigned an address other than zero, the first two 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 5200 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 5200 with address of 2 to 00123.4.

COMMAND STRING: N2VA1234*

(EX. 2) Have the Gemini 5200, with address of 3, transmit the Rate B value.

COMMAND STRING: N3TF*

(EX. 3) Reset the Rate B outputs of the Gemini 5200 with address of 0.

COMMAND STRING: RF*

SENDING COMMANDS & DATA TO THE GEM52 [Cont'd]

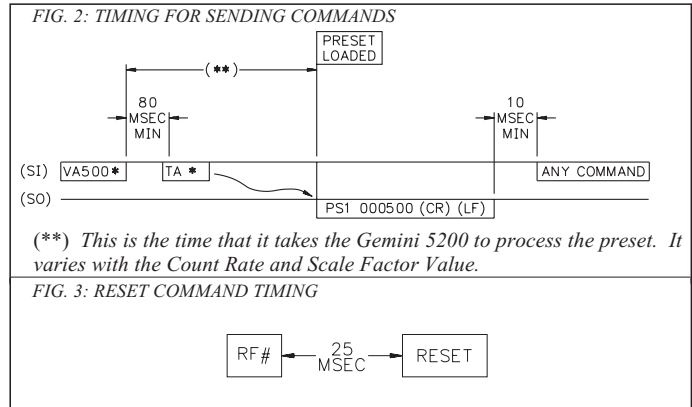
As shown, all commands must be terminated with a "Command Terminator" (* or 2AH). The Gemini 5200 will not process the command until the terminator is sent. If illegal commands or characters are sent to the Gemini 5200, they still would need to be terminated by an (*). If they are not terminated, the 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 5200 will not accept a carriage return or line feed as valid characters. See "Terminal Emulation Program" section for a listing of a terminal emulation program written in Basic.

When a "Change Value" command is sent to the Gemini 5200, 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 5200. 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.

Note: When Preset tracking is enabled, before changing Preset 2 via serial communications, the Preset 2 value must be interrogated in order to establish the Preset 1 value.

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

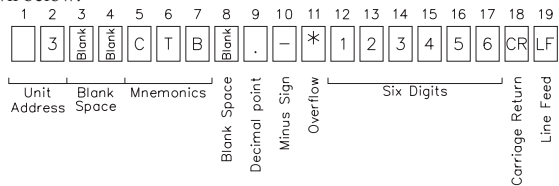


RECEIVING DATA FROM THE GEMINI 5200

Data is transmitted from the Gemini 5200 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 5200 can transmit 7 values: display channel A, B and C, Presets 1 and 2, and Scale Factors A and B. A list of the abbreviations used when the Gemini 5200 transmits the values are shown below.

CTA - Rate Display A Value
 CTB - Rate Display B Value
 CTC - Display C Value
 PS1 - Preset 1
 PS2 - Preset 2
 SFA - Scale Factor A
 SFB - Scale Factor B

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 display 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 CTB 1234.56 <CR> <LF>

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 <CR> <LF>

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 5200 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 5200. The various Print Options available are:

- A. Print Rate Display A
- B. Print Rate Display B
- C. Print Display C
- D. Print Display A, B, & C
- E. Print Display C, Presets 1 & 2, and Scale Factors A & B
- F. Print Display B, Presets 1 & 2, and Scale Factors A & B
- G. Print Display A, Presets 1 & 2, and Scale Factors A & B
- H. Print Display A, B, & C, Presets 1 & 2, and Scale Factors A & B

A typical print-out is shown below. The Print Options are selected by setting S3, S4 and S5 on the Serial DIP Switch. See “Current Loop Installation” section for the various switch settings.

1	CTA	000054
1	PS1	000100
1	PS2	000200
1	SFA	01.0000
1	SFB	02.5000

CURRENT LOOP INSTALLATION

WIRING CONNECTIONS

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.

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.

TERMINAL DESCRIPTIONS FOR TERMINAL BLOCK TBD

1. **-20 mA SRC (COMM.)** - Common for 20 mA SRC and Print Request terminal.
2. **PRINT REQUEST** - The Print Request Terminal is pulled low to request the Gemini 5200 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 5200 transmits the requested data on these terminals. 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 5200 receives commands on these terminals. They are connected in series with the transmit or output terminals of the device to be connected.

Note: The serial input terminals must be held in the mark condition (current on) in order for the Gemini 5200 to respond to a Print Request terminal activation.

SERIAL DIP SWITCH SET-UP

The Serial DIP switches are accessible through the side of the Gemini 5200. 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. 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.*)

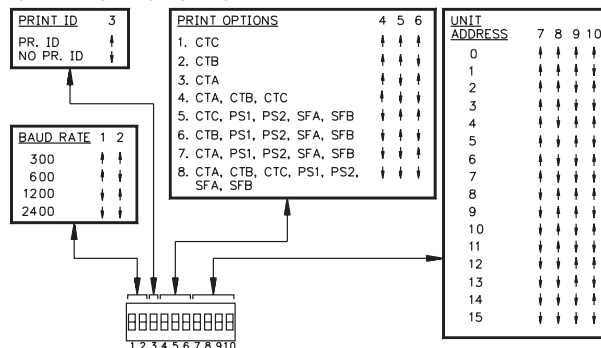
PR.ID - PRINT ID. - When this switch is in the up position, the Gemini 5200 will print the unit address, data value ID and the data value when a transmission is requested. The unit will also insert a 400 msec delay between transmissions when the "P" command or Print Request terminal is used. This switch position is generally used when the unit is connected with a printer.

When the switch is in the down position, the Gemini 5200 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 printed out when the Print Request terminal is activated or when the Transmit per Print Options command "P" is sent to the Gemini 5200.

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



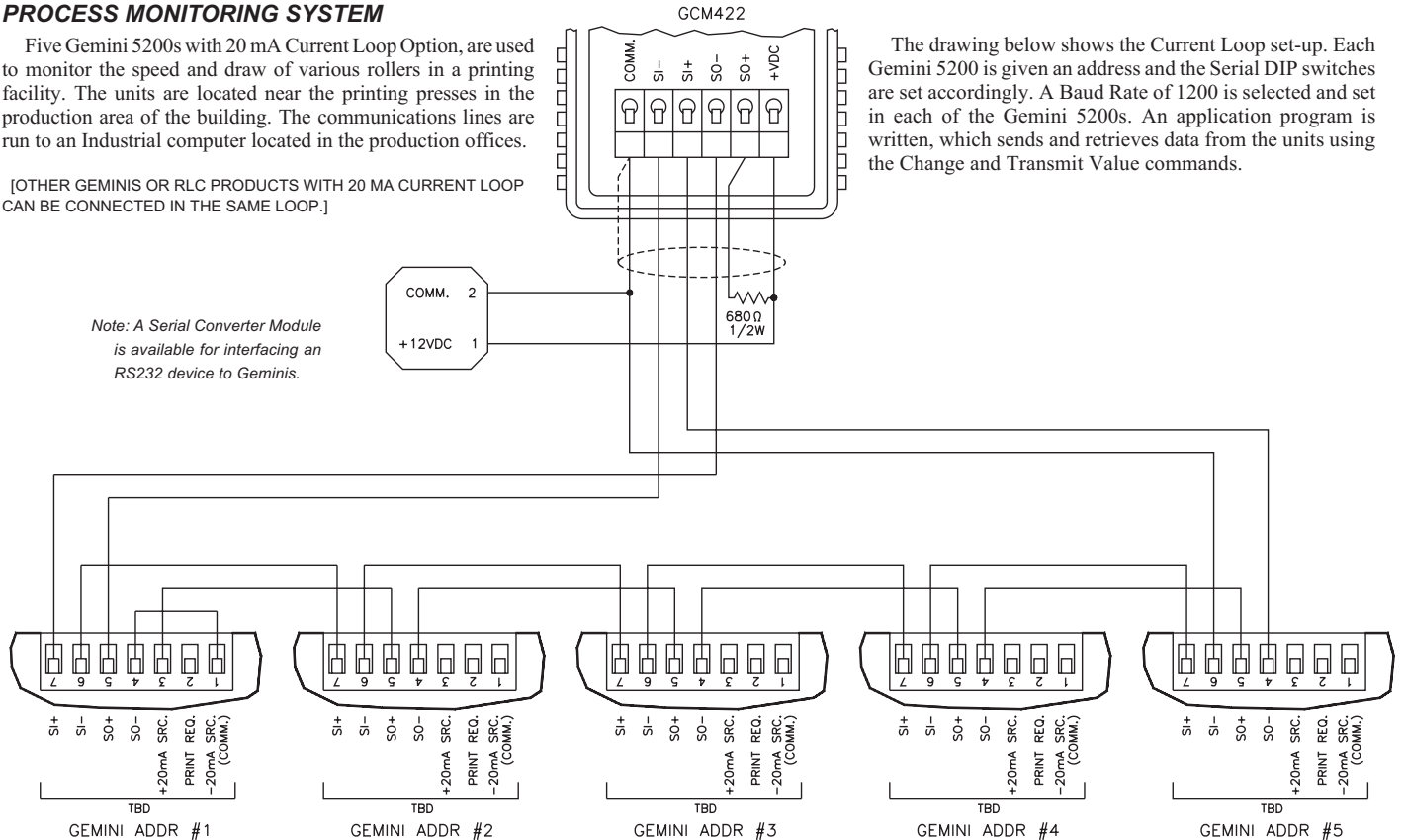
COMMUNICATIONS APPLICATION

PROCESS MONITORING SYSTEM

Five Gemini 5200s with 20 mA Current Loop Option, are used to monitor the speed and draw of various rollers in a printing facility. The units are located near the printing presses 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.]

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



The drawing below shows the Current Loop set-up. Each Gemini 5200 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 5200s. An application program is written, which sends and retrieves data from the units using the Change and Transmit Value commands.

TROUBLESHOOTING GEMINI SERIAL COMMUNICATIONS

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

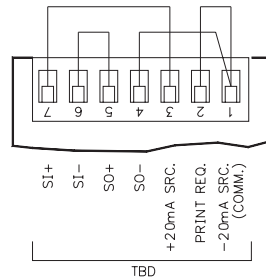
1. Check all wiring. Refer to the previous application examples and use them as a guide to check your serial communication wiring. Proper polarity of all Geminis and other peripherals must be observed. If a multimeter or ammeter is available, insert it in series in each Serial loop and check for current 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 are 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 5200 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 5200 will change its Scale Factor B 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 below.
2. Set the Gemini's unit address to 15 (set switches 7-10 of the Serial DIP Switch to 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 B value by pressing the "3" key while the Rate B value is being displayed. If the Serial loop is functioning properly the Scale Factor B 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 5200 into the panel, the user should first become familiar with the unit. It may also be desirable to program the unit 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.

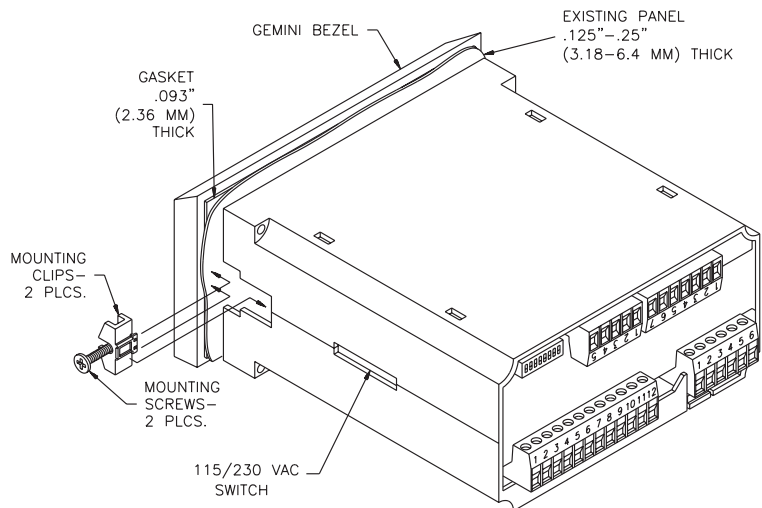
Installation Environment

The GEM5200 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}

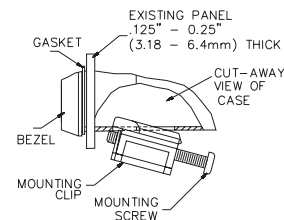


The Gemini 5200 is intended to be mounted into an enclosed panel with a gasket to provide a water-tight seal. The unit meets NEMA 4/IP65 requirements for indoor use when properly installed. Two mounting clips and screws are provided for easy installation. Consideration should be given to the thickness 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 the Installation Figure on the previous page, or the label on the 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

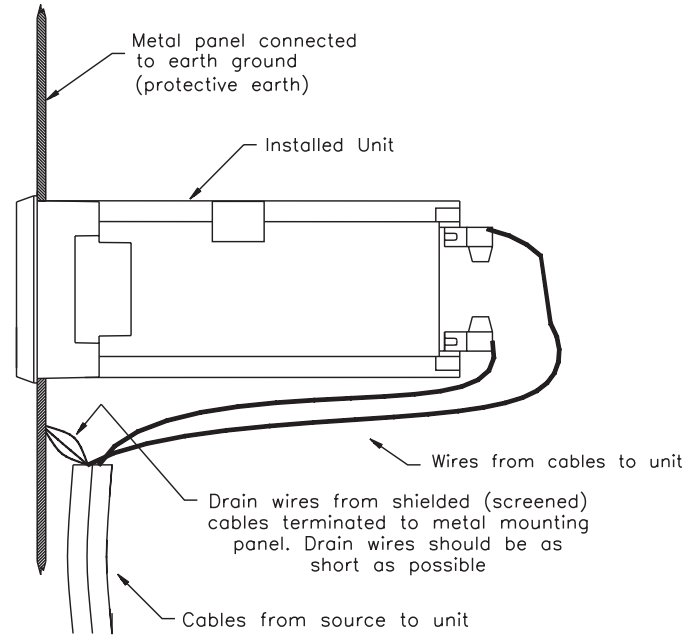
Alpha #2404 4 conductor, #22 AWG with foil shield and drain wire

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 when using optional DC power supply. Test: EFT Immunity per EN61000-4-4.

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.



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), rate 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.

PRIMARY A.C. WIRING

For best results, the A.C. primary 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 as AC Power, 50/60 Hz. The voltage selector switch, located on 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 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 5200 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 programming information. The Gemini 5200 has an internal non-volatile memory in which the programming information is stored upon 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 5200 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.

INPUTS A & B AND MAGNETIC PICKUP INPUTS A & B

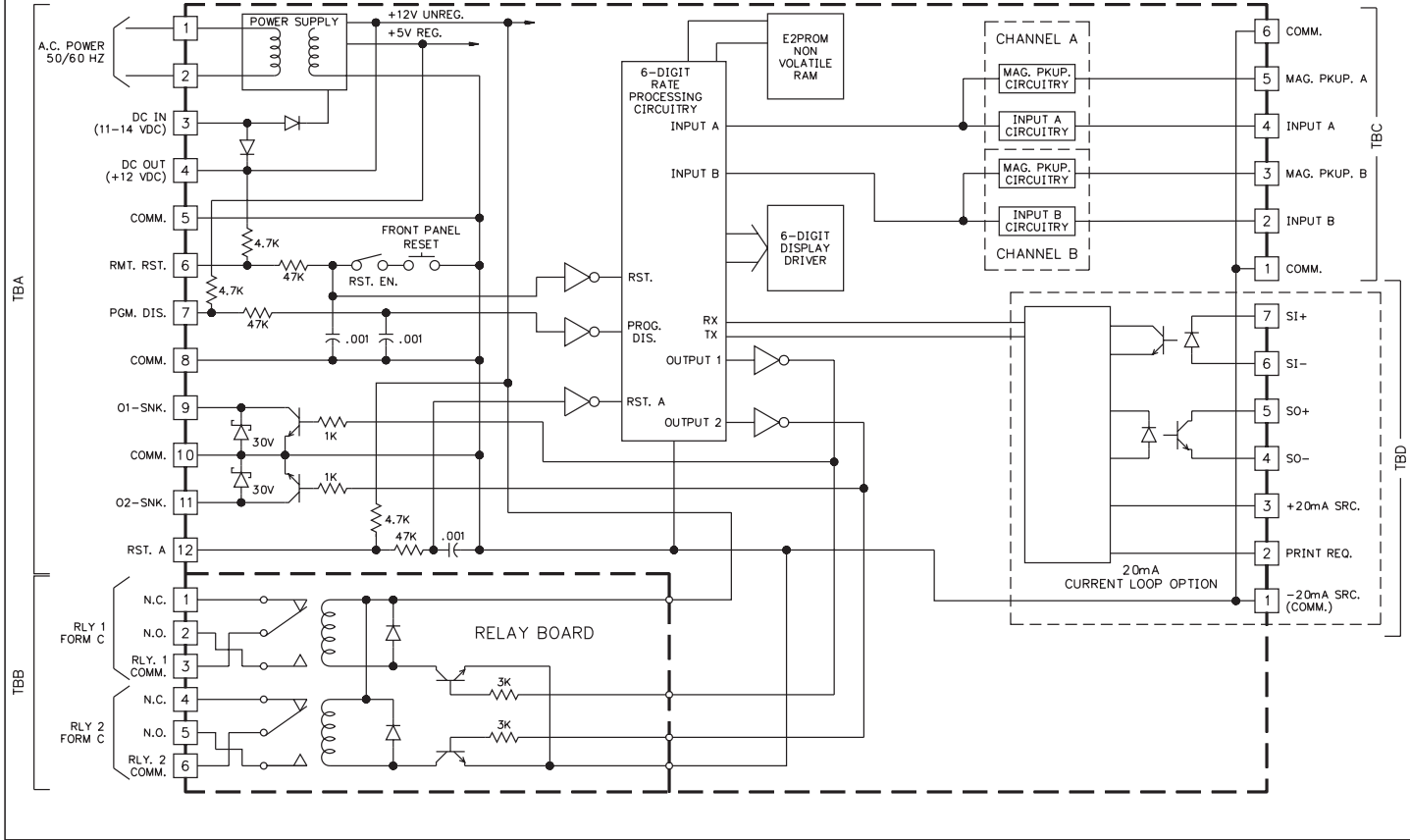
The Gemini 5200 has two input channels. Input Channel A is associated with Rate Display A and Channel B is associated with the Rate Display B. The Magnetic Pickup Input and the Logic Input of each channel utilize some common circuitry. For this reason the Input switches are used to set up both the Magnetic and Logic Input.

S1 selects between Magnetic Pickup Input A and Logic Input A. S5 selects between Magnetic Pickup Input B and Logic Input B. WHEN MAGNETIC PICKUP A IS BEING USED, S2 MUST BE IN THE “SNK” POSITION or the unit will not display the rate properly. Likewise, WHEN MAGNETIC PICKUP B IS BEING USED, S6 MUST ALSO BE IN THE “SNK” POSITION.

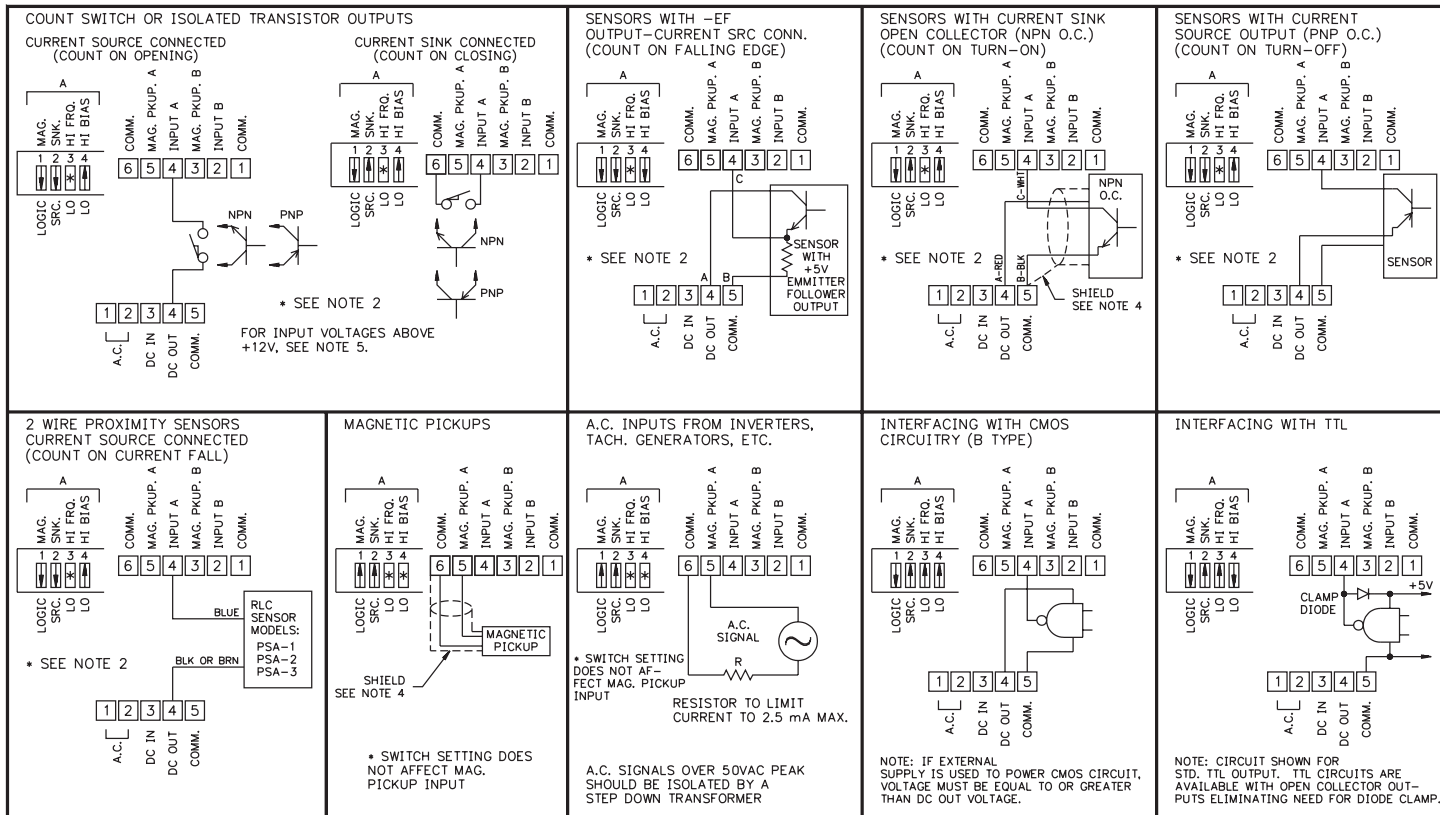
S3 (HI/LO FRQ) and S4 (HI/LO BIAS) or S7 (HI/LO FRQ) and S8 (HI/LO BIAS) do not effect the Magnetic Pickup Inputs A & B and their settings are inconsequential. When S1 or S5 is in the Logic position, the Magnetic Pickup Input A or B is disabled and Inputs A or B can be used as logic inputs.

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

BLOCK DIAGRAM



CONNECTIONS & CONFIGURATION SWITCH SET-UPS FOR VARIOUS SENSOR OUTPUTS (See Note 5)



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 rate 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 pulse widths never decrease below 5 msec, and the rate does not exceed 100 cps.

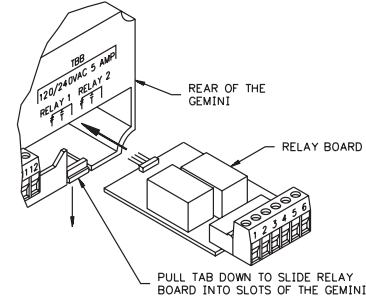
3. V_{IL} and V_{IH} levels given are nominal values +/-10% when the voltage on "DC OUT" terminal is +12 VDC. These nominal values will vary in proportion to the variations in the "DC OUT" terminal voltage, which are caused by line voltage and load changes.

4. When shielded cable is used, the shield should be connected to "COMM." at the counter and left unconnected at the sensor end.

5. 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.

INSTALLATION & REMOVAL OF THE RELAY BOARD

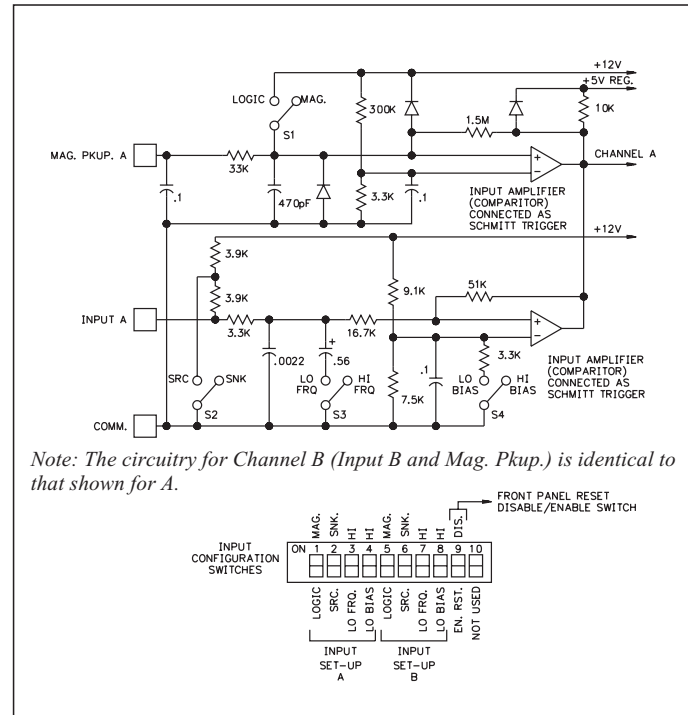
To install the relay board, locate the relay opening at the lower right-hand corner, on the back of the Gemini 5200. Pull the tab down while sliding the board into the two slots in the housing. The relay board will seat into the unit, allowing the tab to return to its original position. To remove the relay board, pull down on the tab just enough to allow the relay board to slide out. Grasp the six terminal connector and pull to remove the board.



SENSOR INPUT CONNECTIONS & INPUT CONFIGURATION SWITCH SET-UP

The accompanying diagram shows the details of the logic and magnetic pickup circuitry. The four switches used to set up Logic Input A and Magnetic Pickup A are designated S1, S2, S3, and S4. The four switches used to set up Logic Input B and Magnetic Pickup B are designated S5, S6, S7, and S8. The functions of these switches are as follows:

- CHANNEL A**
- 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.
 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.)
 - 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. ($V_{IL} = 5.5 \text{ V}$, $V_{IH} = 7.5 \text{ V}$, See Note 3.)
 LO BIAS: Sets input trigger levels to the low range to accept logic pulses with 0 to 5 V swings. ($V_{IL} = 1.5 \text{ V}$, $V_{IH} = 3.75 \text{ V}$, See Note 3.)
- CHAN. B**
- S5 -** Same as S1, for Magnetic pickup B and Logic Input B.
 - S6 -** Same as S2, for Magnetic pickup B and Logic Input B.
 - S7 -** Same as S3, for Logic Input B.
 - S8 -** Same as S4, for Logic Input B.
 - S9 - 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.
 - S10 -** Not used.

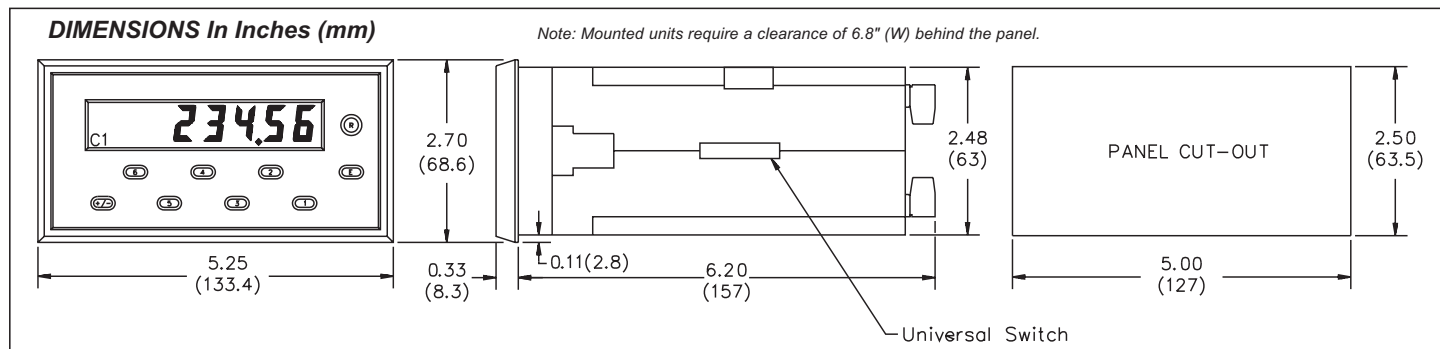


APPENDIX "B" - SPECIFICATIONS & DIMENSIONS

- DISPLAY:** 6-digit 0.56" (14.2 mm) High LED display.
- POWER REQUIREMENTS:**
AC Power: Switch selectable 115/230 VAC ($\pm 10\%$), 50/60 Hz, 20 VA
DC Power: 11 to 14 VDC @ 0.7 amp max.
- SENSOR POWER:** +12 VDC ($\pm 25\%$) @ 100 mA.
- MEMORY:** Non-volatile E²PROM memory retains all programming information when power is removed or interrupted.
Power Cycles (ON/OFF): 100,000 min.
Data Retention: 10 yrs. min.
- INPUTS A AND B:** Switch selectable to accept pulses from a variety of sources including switch contacts, outputs from CMOS or TTL circuits, and all standard RLC sensors.
Current Sourcing - Unit provides 3.9 K pull-down resistor for sensor with current sourcing outputs. (Max. input voltage = 28 VDC @ 7 mA.)
Current Sinking - Unit provides 7.8 K pull-up resistor for sensors with current sinking outputs. (Max. sensor current = 1.6 mA.)
Debounce - Damping capacitor provided for switch contact debounce. Limits rate to 100 Hz max. and input pulse widths to 5 msec. min.
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 $\pm 10\%$ @ 12 VDC. They vary proportionally with sensor supply voltage at "DC OUT" terminal.

- MAGNETIC PICKUP INPUTS A & B:**
Sensitivity: 150 mV peak (typical @ 12 VDC)
Hysteresis: 100 mV
Input impedance: 26.5 K Ω @ 60 Hz
Maximum Input Voltage: ± 50 Vp
- RATE ACCURACY AND REPEATABILITY:** +0.025%
- RATE MINIMUM INPUT FREQUENCY:** 0.03 Hz
Note: At frequencies below 0.03 Hz (1 pulse every 32 sec.) the rate indicator will display a zero.
- RATE MAXIMUM INPUT FREQUENCY:** 10 KHz
- CONTROL INPUTS:**
Reset - Active low ($V_{IL} = 1.5$ V max.), internally pulled up to +12 VDC ($I_{SNK} = 3$ mA), Activation & De-activation 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 - (GEM521xx only) Active low, ($V_{IL} = 1.5$ V max.), internally pulled up to +5 VDC ($I_{SNK} = 1$ mA).



11. SERIAL COMMUNICATIONS:

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. *(Actual number in a single loop is limited by serial hardware specifications.)*

Data Format - 10 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: $V_{\max} = 30 \text{ VDC}$, $V_{\text{SAT}} = 1 V_{\max}$ at 20 mA

SI - Input Diode Rating: $V_F = 1.25 V_{\text{TP}}$; $1.5 V_{\max}$

Note: The compliance voltage rating of the source must be greater than the sum of the voltage drops around the loop.

12. OUTPUTS:

Solid-State - Current sinking NPN open collector transistors. $I_{\text{SNK}} = 100 \text{ mA}$ maximum @ $V_{\text{CE}} = 1 \text{ V}$. $V_{\text{OH}} = 30 \text{ VDC}$ max. (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). The operate time is 5 msec. nominal and the release time is 3 msec. nominal.

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, +/- (0.01% + 10 msec.).

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. 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), IEC529

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
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Notes:

1. Metal bezel of unit connected with ground lead 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.

15. CONSTRUCTION:

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

16. WEIGHT: 2.1 lbs (0.9 kg)

APPENDIX "C" - TROUBLESHOOTING GUIDE

The majority of difficulties arising with the Gemini 5200 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 on the back cover of this instruction manual.

<i>PROBLEM</i>	<i>POSSIBLE CAUSE</i>	<i>REMEDIES</i>
NO DISPLAY	1. Power off, improperly connected, or power brown-out.	1. Check all wiring, verify power.
P ON DISPLAY	1. Data error on power-up.	1a. Press "E" key. b. Check all function codes.
E ON THE DISPLAY	1. Data error detected by processor.	1a. Press "E" key. 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.
NO RATE INDICATION	1. No input. 2. Input selected incorrectly. 3. Scale factor/multiplier too small. 4. Input frequency below 0.03 cps.	1. Check sensors/connections. 2. Check rear panel DIP switches. 3. Check scale factor value and scale multiplier values. 4. At frequency under 0.03 cps (1 pulse every 32 sec) the display will read zero.

APPENDIX “C” - TROUBLESHOOTING GUIDE

<i>PROBLEM</i>	<i>POSSIBLE CAUSE</i>	<i>REMEDIES</i>
INCORRECT RATE READING	<ol style="list-style-type: none">1. Input type incorrectly selected.2. Inputs incorrectly connected or loose connections.3. Electrical interference.4. Incorrect scaling.	<ol style="list-style-type: none">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. Review scaling parameters (Appendix “F”).
OUTPUT WILL NOT RESET	<ol style="list-style-type: none">1. Front panel reset disabled.2. Reset disabled.	<ol style="list-style-type: none">1. Check rear panel DIP switch.2. Check function code 42 or 66.
DATA VALUES AND FUNCTIONS WILL NOT CHANGE OR NOT RECORDED	<ol style="list-style-type: none">1. Front panel locked out.2. Incorrect programming procedure (“E” not pressed).	<ol style="list-style-type: none">1. Consult manual on “Operator Accessible Functions” mode (66)2. Consult section on programming functions in sequential order.

APPENDIX “D” - GEMINI 5200 DUAL RATE W/O DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
41		UNIT PERSONALITY	(-)Loads factory set code values*
	+/-1	Dual Rate W/O Display C	Rate A→Display A. Rate B→Display B
	+/-2	Dual Rate W/ Ratio (A/B)	See Appendix “E” for a Function Command Code Summary when in these modes
	+/-3	Dual Rate W/ Difference (A-B)	
	+/-4	Dual Rate W/ Draw [(A-B)/B]	
42		RESET BUTTON & TERMINAL ACTUATION MODES	Reset only affects the output(s) and does not change the rate display.
	1	Reset Rate A Output(s)	
	2	Reset Rate B Output(s)	
	3	Reset Rate A & B Outputs	
43		RATE B CONVERSION FACTOR	
	1	Rate Per Second (x1)	
	2	Rate Per Minute (x60)	
	3	Rate Per Hour (x3600)	
44		RATE B MINIMUM UPDATE TIME	
	1	0.5 sec minimum/1 sec maximum	
	2	1 sec minimum/2 sec maximum	
	3	2 sec minimum/4 sec maximum	
	4	4 sec minimum/8 sec maximum	
	5	8 sec minimum/16 sec maximum	
	6	16 sec minimum/32 sec maximum	
45		RATE B SCALE MULTIPLIER	
	1	x1000	
	2	x100	
	3	x10	
	4	x1	
	5	x0.1	
	6	x0.01	
46		RATE B DECIMAL POINT & LEAD ZERO BLANKING	
	-	(+) Leading Zero Blanking Enabled	
	-	(-) Leading Zero Blanking Disabled*	

* Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.

APPENDIX “D” - GEMINI 5200 DUAL RATE W/O DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
46		RATE B DECIMAL POINT & LEAD ZERO BLANKING (Cont'd)	
	+/-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	
51		OUTPUT ASSIGNMENT	
	-	(+) Preset Tracking disabled	
	-	(-) Preset Tracking enabled*	Preset 1 tracks Preset 2
	+/-1	Output 1 to Rate A, Output 2 to Rate B	
	+/-2	Outputs 1 & 2 to Rate B	
	+/-3	Outputs 1 & 2 to Rate A	
52		OUTPUT 1 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 1	
	+/-6	Boundary	
53		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.
	+/-3	Terminate at Manual Reset	
	+/-4	Terminate at Manual Reset End	
	+/-5	Terminate after Timed Output 2	
	+/-6	Boundary	
55		TIMED OUTPUT 2 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 5200 DUAL RATE W/O DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS	
56		RATE B RIGHT-HAND DUMMY ZEROS		
	1	1 Dummy Zero		
	2	2 Dummy Zeros		
	3	3 Dummy Zeros		
	4	No Dummy Zeros		
61		RATE A RIGHT-HAND DUMMY ZEROS		
	1	1 Dummy Zero		
	2	2 Dummy Zeros		
	3	3 Dummy Zeros		
	4	No Dummy Zeros		
62		RATE A CONVERSION FACTOR		
	1	Rate Per Second (x1)		
	2	Rate Per Minute (x60)		
	3	Rate Per Hour (x3600)		
63		RATE A MINIMUM UPDATE TIME		
	1	0.5 sec minimum/1 sec maximum		
	2	1 sec minimum/2 sec maximum		
	3	2 sec minimum/4 sec maximum		
	4	4 sec minimum/8 sec maximum		
	5	8 sec minimum/16 sec maximum		Maximum rate = 7500 cps.
	6	16 sec minimum/32 sec maximum		Maximum rate = 3250 cps.
64		RATE A SCALE MULTIPLIER		
	1	x1000		
	2	x100		
	3	x10		
	4	x1		
	5	x0.1		
	6	x0.01		
* Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.				

APPENDIX “D” - GEMINI 5200 DUAL RATE W/O DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
65		RATE A DECIMAL POINT & LEAD ZERO BLANKING	
	-	(+) Leading Zero Blanking 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	
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 the Input Configuration DIP switch.
	-	(-) Reset Button & “RST” Terminal Disabled*	This mode has no affect on the “RST A” terminal which is always enabled.
	+/-1	No Functions Enabled	
	+/-2	Preset Programming Enabled	
	+/-3	Scale Factor Programming Enabled	
	+/-4	Preset & Scale Factor Programming Enabled	
1	-	PRESET 1	Up to +/-999999
2	-	PRESET 2	
3	Display A	RATE A SCALE FACTOR	Up to 5.9999
3	Display B	RATE B SCALE FACTOR	

* Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.

APPENDIX "E" - GEMINI 5200 DUAL RATE W/ DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
41		UNIT PERSONALITY	(-)Loads factory set code values*
	+/-1	Dual Rate W/O Display C	See Appendix "D" for function command code summary.
	+/-2	Dual Rate W/ Ratio (A/B)	Rate A & B→Display value A & B, Ratio (A/B)→Display Value C
	+/-3	Dual Rate W/ Difference (A-B)	Rate A & B→Display value A & B, Difference (A-B)→Display Value C
	+/-4	Dual Rate W/ Draw [(A-B)/B]	Rate A & B→Display value A & B, Draw [(A-B)/B]→Display Value C
42		RESET BUTTON & TERMINAL ACTUATION MODES	
	1	Reset Rate A Output(s)	Reset only affects the output(s) and does not change the rate display.
	2	Reset Rate B Output(s)	
	3	Reset Rate A & B Outputs	
	4	Reset Display C Output(s)	
	5	Reset Display C & Rate A Outputs	
	6	Reset Display C & Rate B Outputs	
43		RATE B CONVERSION FACTOR	
	1	Rate Per Second (x1)	
	2	Rate Per Minute (x60)	
	3	Rate Per Hour (x3600)	
45		RATE B SCALE MULTIPLIER	
	1	x1000	
	2	x100	
	3	x10	
	4	x1	
	5	x0.1	
	6	x0.01	
46		DISPLAY C DECIMAL POINT & LEAD ZERO BLNKNG	
	-	(+) Leading Zero Blanking Enabled	
	-	(-) Leading Zero Blanking Disabled*	
	+/-1	No Decimal Point	

* Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.

APPENDIX “E” - GEMINI 5200 DUAL RATE W/ DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
46		DISPLAY C DECIMAL POINT & LEAD ZERO BLNKNG (Cont'd)	
	+/-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	
51		OUTPUT ASSIGNMENT	
	-	(+) Preset Tracking disabled	
	-	(-) Preset Tracking enabled*	Preset 1 tracks Preset 2
	+/-1	Output 1 to Rate A, Output 2 to Rate B	
	+/-2	Outputs 1 & 2 to Rate B	
	+/-3	Outputs 1 & 2 to Rate A	
	+/-4	Output 1 to Rate B, Output 2 to Display C	
	+/-5	Output 1 to Rate A, Output 2 to Display C	
+/-6	Outputs 1 & 2 to Display C		
52		OUTPUT 1 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 1 Boundary	
53		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.
	+/-3	Terminate at Manual Reset	
	+/-4	Terminate at Manual Reset End	
	+/-5	Terminate after Timed Output 2 Boundary	
* Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.			

APPENDIX "E" - GEMINI 5200 DUAL RATE W/ DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
55		TIMED OUTPUT 2 VALUE	Range 0.01 to 599.99 sec.
61		DISPLAY C MULTIPLIER	Not available in mode [41 3], Speed Difference
	1	x1	
	2	x10	
	3	x100	
	4	x1000	
	5	x10000	
62		RATE A CONVERSION FACTOR	
	1	Rate Per Second (x1)	
	2	Rate Per Minute (x60)	
	3	Rate Per Hour (x3600)	
63		RATE MINIMUM UPDATE TIME	
	1	0.5 sec minimum/1 sec maximum	
	2	1 sec minimum/2 sec maximum	
	3	2 sec minimum/4 sec maximum	
	4	4 sec minimum/8 sec maximum	
	5	8 sec minimum/16 sec maximum	Maximum rate = 7500 cps.
	6	16 sec minimum/32 sec maximum	Maximum rate = 3250 cps.
64		RATE A SCALE MULTIPLIER	
	1	x1000	
	2	x100	
	3	x10	
	4	x1	
	5	x0.1	
	6	x0.01	

**Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.*

APPENDIX “E” - GEMINI 5200 DUAL RATE W/ DISP C FUNCTION COMMAND CODE SUMMARY

CODE	MODE	DESCRIPTION	COMMENTS
65		RATE A & B DECIMAL POINT & LEAD ZERO BLNKNG	
	-	(+) Leading Zero Blanking 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		
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*	This mode has no affect on the “RST A” terminal which is always enabled.
	+/-1	No Functions Enabled	
	+/-2	Preset Programming Enabled	
	+/-3	Scale Factor Programming Enabled	
	+/-4	Preset & Scale Factor Programming Enabled	
1	-	PRESET 1	Up to +/-999999
2	-	PRESET 2	
3	Display A	RATE A SCALE FACTOR	Up to 5.9999
3	Display B	RATE B SCALE FACTOR	
*Polarity sign is displayed in front of the identifier, a (-) sign is displayed, a (+) sign is not.			

APPENDIX “F” - SCALING FOR RATE & DISPLAY C

The Gemini 5200 offers a simplified method of scaling the rate indicator. The method does not require time unit conversions. The desired time format (Rate Per Second, Rate Per Minute, Rate Per Hour) is simply selected as part of the programming procedure.

Due to the way the rate is calculated, high resolution and accuracy can be realized at all input rates, slow or fast. It is not necessary to increase the number of pulses per display unit to obtain higher resolution.

The Rate Minimum Update Time, function code 63, can be increased (from 0.5 Sec. up to 16 Sec.) to provide averaging in applications where the input pulse spacing is not stable. The Update time selected, however, will not affect the scaling in any manner.

Scaling the Rate channel simply involves programming the Gemini 5200 so that pulse units inputted to the unit will be scaled to the desired display units (revolutions, feet, meters, etc.), in the desired time format (Rate Per Second, Rate per Minute, Rate Per Hour).

In order to scale the rate, it is only necessary to know the number of pulses per “Display Unit” or units (feet, revolutions, etc.). For example; if a 48 tooth gear, which is coupled to a shaft, is being sensed and it is desired to indicate the shaft speed in revolutions, the “Display Units” would be revolutions. It is obvious that 48 pulses will occur in one revolution.

In order to convert the pulse units to revolutions, it is necessary for the Gemini 5200 to multiply the number of pulses by a scaling factor to convert the pulse units to revolution units. The Gemini 5200 has two programming codes that serve to scale pulse units to desired display units. They are: the Scale Factor and the Scale Multiplier. Both are used to attain the Total Scaling Factor, “K_T”.

To calculate the Total Scaling Factor, “K_T”, for the application, the following formula is used.

$$\text{FORMULA \#1: } K_T = \text{Display Units/Number of Pulses}$$

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”.

Using the example previously discussed, the display unit would be 1 revolution and the number of pulses per display unit would be 48. Therefore, the Total Scale Factor would be 0.020833 ($K_T = \text{Display Units/Number of Pulses} = 1 \text{ rev}/48 \text{ pulses per rev} = 0.020833$). In many applications the Total Scale Factor, “K_T”, can be programmed as the Scale Factor, “SF”, and the Scale Multiplier factory setting, x1, would be used. However, in some applications, such as the one above, it may be desired to obtain more significant digits in the Scale Factor, “SF”. These situations occur when the “K_T” factor does not calculate to a number that can be entered into the four decimal places available to the Scale Factor. The following formula can be used to calculate the Scale Factor when a SCM value other than x1 is needed.

$$\text{FORMULA \#2: } SF = K_T/SCM$$

In this formula, the Total Scaling Factor, previously calculated, is divided by the Scale Multiplier Value, “SCM”, to obtain the Scale Factor, “SF”.

The general rule for choosing a SCM value is, when the Total Scale Factor, “K_T”, is less than 0.6000, a 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. If the Total Scaling Factor, “K_T”, is greater than 5.9999, then a SCM value of 10, 100, or 1000 can be used to obtain a Scale Factor Value between 0.6 and 5.9999.

In our initial example, the Total Scaling Factor, “K_T”, was determined to be 0.020833. It is easy to see that this number cannot be programmed into the Scale Factor, “SF”, without losing significant digits. Using formula #2 and the general rules stated above, a Scale Multiplier Value of 0.01 is chosen and the Scale Factor is calculated as shown below. This will provide the maximum amount of conversion accuracy possible.

$$SF = K_T/SCM$$

$$SF = 0.020833/SCM$$

$$SF = 0.020833/0.01 = 2.0833$$

In situations where the Total Scale Factor is already in range of the Scale Factor (0.0001 to 5.9999) and when there are no significant digits lost, the Total Scaling Factor, “K_T”, can be programmed directly into the Scale Factor Value and a Scale Multiplier value of 1 (the factory set value) can be used. For example; if the display units are in feet and there are 100 pulses per foot, the Total Scaling Factor, “K_T”, would be 0.01 (K_T = Display Units/Number of Pulses = 1/100 = 0.01). Since the Total Scaling Factor, “K_T”, is exactly 0.01, it can be programmed into the Scale Factor Value, “SF”. The Scale Multiplier Value, “SCM”, can be left at or programmed to its factory setting of x1.

After the Scale Factor and Scale Multiplier values are selected, all that is necessary to complete the scaling is to choose the Rate Conversion Factor. The Rate Conversion Factor can be selected to provide indication in Rate per Second, Rate Per Minute, or Rate per Hour.

Note: There may be situations where there are many more pulses per display unit than needed. In these situations the minimum SCM value (0.01) may not provide enough significant digits in the Scale Factor. To achieve more significant digits, the Rate Conversion Factor should be set to mode 1, Rate per Second, and the following formula should be used.

$$SF = \frac{K_T \times CF}{SCM}$$

Where: CF = 60 for display reading in Rate Per Minute, or
CF = 3600 for display reading in Rate Per Hour

SCALING DISPLAY C

In the Speed Ratio and Speed Draw modes, [41 2,4], Display C can be scaled in order to obtain the desired amount of decimal point resolution. This is accomplished by selecting a “Display C Multiplier” and the proper “Display C Decimal Point & Leading Zero Blanking” mode.

In the Speed Ratio and Speed Draw modes the Gemini 5200 performs the appropriate Display C calculation based upon the measured internal rate value, utilizing the total number of significant digits available to it. It does not use the amount of resolution that is used in the Rate A & B displays. For example; if the Gemini 5200 was set-up in mode [41 2], Dual Rate with Speed Ratio, and the rate indicators were programmed to indicate rate with no decimal point. With actual rates of 1.5 PPS for Rate A, and 1 PPS for Rate B the rate displays would both read 1, however, Display C, when using a Display C Multiplier of 10 and a decimal point, would read 1.5 (C = A/B = 1.5/1 = 1.5).

RATE SCALING EXAMPLES

EXAMPLE #1:

A 60 tooth gear is mounted to a roller that has a circumference of 2 feet. It is desired to have a rate readout in 10ths of feet per minute. Calculate the Scale Factor and Scale Multiplier values necessary to provide the desired readout.

In this example one revolution of the roller will provide 60 pulses for 2 feet of linear travel. Since the desired display units are to be in tenths of feet, it is necessary to convert 2 feet to tenths, giving us 20 tenths (display units). The Total Scaling Factor, “K_T”, is calculated by simply plugging in the two numbers into formula #1.

$$K_T = \text{Display Units/Number of Pulses} \\ K_T = 20/60 = 0.333333$$

In order to get the maximum number of significant digits in the Scale Factor we use formula #2 and a Scale Multiplier value of 0.1 as shown below.

$$SF = K_T/SCM \\ SF = 0.333333/0.1 = 3.3333$$

To obtain rate indication in Feet Per Minute, the Rate Conversion Factor is programmed for Rate per Minute mode. A decimal point is also added to provide for a display of feet in 10ths.

EXAMPLE #2:

The shaft of a positive displacement pump has a 14 tooth sprocket that is being sensed by a magnetic pickup. It is known that when the unit is pumping 810 liters of water per minute, the shaft is turning 400 RPM. It is desired to have a display readout in liters per minute.

With the Gemini 5200, it is not necessary to deal with time unit conversions. From the information given, we know that when the shaft has turned 400 revolutions, 810 liters of water will have been pumped. The first step we need to take, is to calculate the number of pulses that occur when 810 liters have been pumped.

$$\text{NUMBER OF PULSES} = \# \text{ of Revolutions} \times \text{Pulses per Rev.} \\ \text{NUMBER OF PULSES} = 400 \text{ Rev} \times 14 \text{ Pulses per Rev} = 5600 \text{ pulses.}$$

RATE SCALING EXAMPLES (Cont'd)

We now have all the information necessary to scale the rate. The Total Scaling Factor “ K_T ”, is calculated using Formula #1 as shown below.

$$K_T = \text{Display Units/Number of Pulses}$$
$$K_T = 810/5600 = 0.144643$$

It is noticed that there are more significant digits in the Total Scale Factor, “ K_T ”, than there are available for Scale Factor, “SF”. In order to acquire the maximum amount of significant digits for the Scale Factor, Formula #2 is used and a Scale Multiplier value of 0.1 is selected.

$$SF = K_T/SCM$$
$$SF = 0.144643/0.1 = 1.4464$$

The Scale Factor, “SF”, then becomes 1.4464 (1.44643 rounded to 4 decimal places). This provides the maximum amount of conversion accuracy possible.

The final step is to select a Rate Conversion Factor. The Rate Conversion Factor is chosen to be Rate Per Minute as was required.

APPENDIX "G" - GEMINI 5200 PROGRAMMING CHARTS
CHART #1-DUAL RATE [NO DISPLAY C]
FEATURE & MODE SELECTION (See Programming Procedure)
DETAILED MODE MENUS

41 (1)	UNIT PERSONALITY * (±1) DUAL RATE (±2) DUAL RATE W/SPD. DIFF. (±3) DUAL RATE W/SPD. DRAW * Changing Unit Personality will load factory settings into the unit. A (-) sign modifier in front of the mode identifier will also load factory settings.
42 ()	RESET BUTTON & TERMINAL ACTUATION MODES (1) RST RATE A OUTPUT(S) (2) RST RATE B OUTPUT(S) (3) RST RATE A & B OUTPUTS
43 ()	RATE B CONVERSION FACTOR (1) RATE/SEC (X1) (2) RATE/MINUTE (X60) (3) RATE/HR. (X3600)
44 ()	RATE B MINIMUM UPDATE TIME* (1) 0.5 Sec (2) 1 Sec (3) 2 Sec (4) 4 Sec (5) 8 Sec (6) 16 Sec * Maximum update time varies with each minimum update time.
45 ()	RATE B SCALE MULTIPLIER (1) x1000 (2) x100 (3) x10 (4) x1 (5) x0.1 (6) x0.01 RATE B DECIMAL POINT & LEADING ZERO BLANKING (1) 0 (2) 0-0 (3) 0-0-0 (4) 0-0-0-0 (5) 0-0-0-0-0 (6) 0-0-0-0-0-0
46 ()	OUTPUT ASSIGNMENT * (±1) OUT 1 - RATE A, OUT 2 - RATE B (3) OUT 1&2 -RATE A & B * A (-) preceding the mode identifier enables Preset 1 to track Preset 2.
47 ()	OUTPUT 1 TERMINATION MODES
48 ()	OUTPUT 2 TERMINATION MODES
49 ()	OUTPUT 1 TERMINATION MODES
50 ()	OUTPUT 2 TERMINATION MODES
51 ()	OUTPUT ASSIGNMENT * (±1) OUT 1 - RATE A, OUT 2 - RATE B (3) OUT 1&2 -RATE A & B * A (-) preceding the mode identifier enables Preset 1 to track Preset 2.
52 ()	OUTPUT 1 TERMINATION MODES
53 ()	OUTPUT 2 TERMINATION MODES
54 ()	OUTPUT 1 TERMINATION MODES
55 ()	OUTPUT 2 TERMINATION MODES
56 ()	OUTPUT 1 TERMINATION MODES
57 ()	OUTPUT 2 TERMINATION MODES
58 ()	OUTPUT 1 TERMINATION MODES
59 ()	OUTPUT 2 TERMINATION MODES
60 ()	OUTPUT 1 TERMINATION MODES
61 ()	OUTPUT 2 TERMINATION MODES
62 ()	OUTPUT 1 TERMINATION MODES
63 ()	OUTPUT 2 TERMINATION MODES
64 ()	OUTPUT 1 TERMINATION MODES
65 ()	OUTPUT 2 TERMINATION MODES
66 ()	OUTPUT 1 TERMINATION MODES

CHART #2 - DUAL RATE W/SPEED RATIO OR DRAW (DISPLAY C) FEATURE & MODE SELECTION (See Programming Procedure)

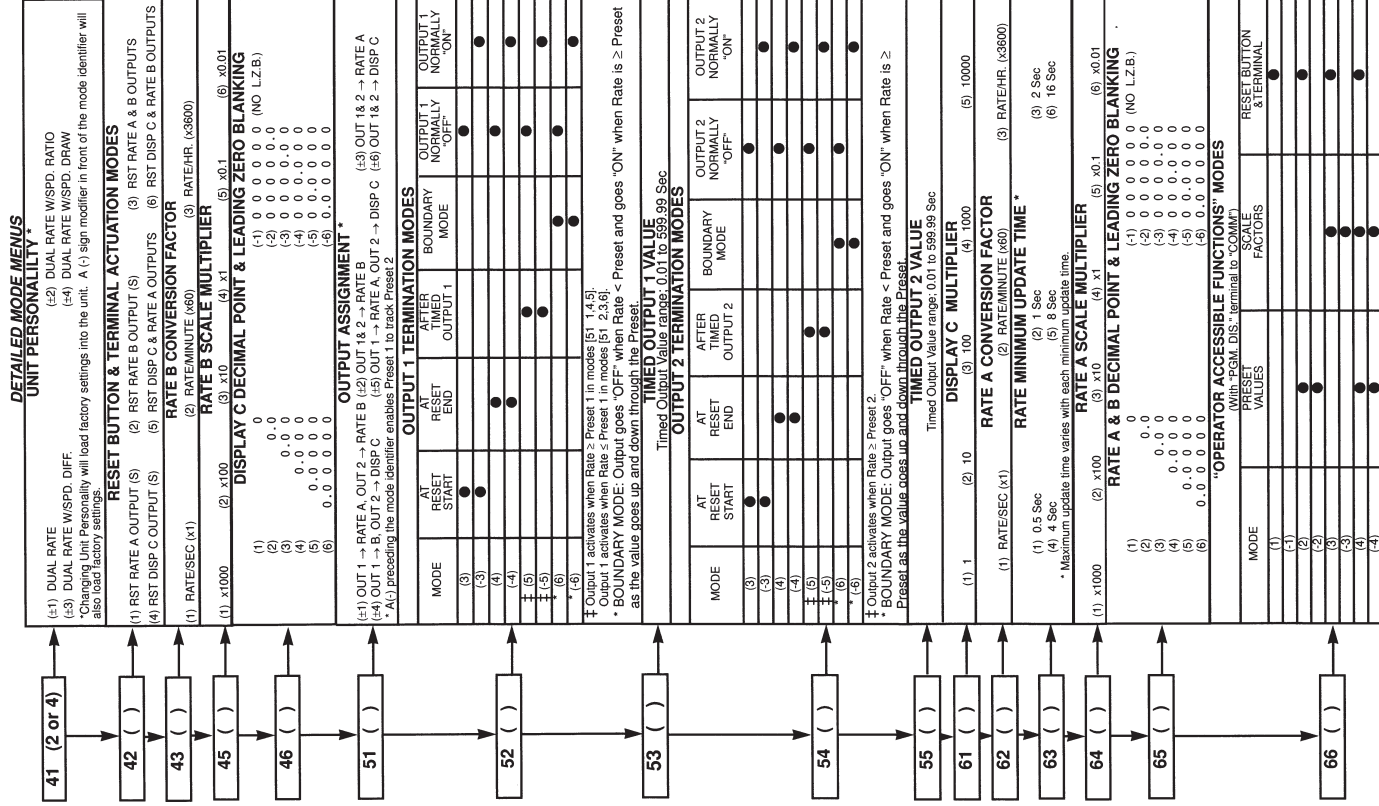


CHART #3 - DUAL RATE W/DIFFERENCE (DISPLAY C) FEATURE & MODE SELECTION (See Programming Procedure)

	DETAILED MODE MENUS UNIT PERSONALITY *	
41 (3)	(±1) DUAL RATE (±3) DUAL RATE W/SPD. DIFF. * Changing Unit Personality will load factory settings into the unit. A (-) sign modifier in front of the mode identifier will also load factory settings.	
42 ()	RESET BUTTON & TERMINAL ACTUATION MODES	
43 ()	(1) RST RATE A OUTPUT(S) (2) RST RATE B OUTPUT(S) (3) RST RATE A & B OUTPUTS (4) RST DISP C OUTPUT(S) (5) RST DISP C & RATE A OUTPUTS (6) RST DISP C & RATE B OUTPUTS	
44 ()	RATE B CONVERSION FACTOR	
45 ()	(1) RATE/SEC (x1) (2) RATE/MINUTE (x60) (3) RATE/HR. (x3600)	
45 ()	RATE B SCALE MULTIPLIER	
46 ()	(1) x1000 (2) x100 (3) x10 (4) x1 (5) x0.1 (6) x0.01 DISPLAY C DECIMAL POINT & LEADING ZERO BLANKING 0 0 (1) 0 0 0 0 0 0 (NO L.Z.B.) (2) 0 0 0 0 0 0 (3) 0 0 0 0 0 0 (4) 0 0 0 0 0 0 (5) 0 0 0 0 0 0 (6) 0 0 0 0 0 0	
51 ()	OUTPUT ASSIGNMENT *	
52 ()	(±1) OUT 1 → RATE A, OUT 2 → RATE B (±2) OUT 1 & 2 → RATE B (±3) OUT 1 & 2 → RATE A (±4) OUT 1 → B, OUT 2 → DISP C (±5) OUT 1 → RATE A, OUT 2 → DISP C (±6) OUT 1 & 2 → DISP C * A(-) preceding the mode identifier enables Preset 1 to track Preset 2	
53 ()	OUTPUT 1 TERMINATION MODES	
54 ()	OUTPUT 2 TERMINATION MODES	
55 ()	TIMED OUTPUT 1 VALUE Timed Output Value range: 0.01 to 599.99 Sec	
56 ()	TIMED OUTPUT 2 VALUE Timed Output Value range: 0.01 to 599.99 Sec	
57 ()	RATE A CONVERSION FACTOR	
58 ()	RATE B CONVERSION FACTOR	
59 ()	RATE MINIMUM UPDATE TIME *	
60 ()	RATE A SCALE MULTIPLIER	
61 ()	RATE B SCALE MULTIPLIER	
62 ()	RATE A & B DECIMAL POINT & LEADING ZERO BLANKING	
63 ()	* OPERATOR ACCESSIBLE FUNCTIONS* MODES (MODE: PREM. DIS. terminal to "COMM")	
64 ()	MODE	RESET BUTTON & TERMINAL
65 ()	OPERATOR ACCESSIBLE FUNCTIONS* MODES (MODE: PREM. DIS. terminal to "COMM")	RESET BUTTON & TERMINAL
66 ()	OPERATOR ACCESSIBLE FUNCTIONS* MODES (MODE: PREM. DIS. terminal to "COMM")	RESET BUTTON & TERMINAL

GEMINI 5200 PROGRAMMING

SOME NOTES & HINTS ON PROGRAMMING THE GEMINI 5200

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 5200 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 5200 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", "2", 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 J TIMED OUTPUT VALUES ☆
Entering Code "53" or "55" will call up the Timed Output 1 to 2 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.)

13 J SCALE FACTORS

One stroke of the "3" button calls up the Scale Factor for the currently displayed rate value. (The Scale Factor is the multiplier used to convert the actual rate 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.

11.2 J PRESETS

One stroke of the "1" or "2" button calls up the Preset 1 or 2 Value, which 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. (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 5200 during a run.

APPENDIX “H” - ORDERING INFORMATION

MODEL NO.	DESCRIPTION	W/20 mA Current Loop	PART NUMBERS
			115/230 VAC
GEM52	Gemini 5200	No	GEM52060
		Yes	GEM52160
—	Gemini 5200 Relay Board		RLYBD002
For Information on Pricing, NEMA Enclosures, Base Mount Kits, & Panel Adapter Kits, refer to the Red Lion Controls Catalog or contact your local RLC distributor.			

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LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to one year from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

No warranties expressed or implied are created with respect to The Company's products except those expressly contained herein. The Customer acknowledges the disclaimers and limitations contained and relies on no other warranties or affirmations.

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