



VEEDER-ROOT  
INSTALLATION, OPERATION AND  
PROGRAMMING MANUAL

Technical Manual  
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# SERIES 7910 ELECTRONIC PREDETERMINING COUNTER

Manual No. 576013-709

For use with Form No. 791006-210 and 791006-220 Counters  
(Models which incorporate RS-422 and RS-232 Data Interfaces)



**VEEDER-ROOT**   
Digital Products



**TABLE OF CONTENTS**

	Page		Page
<b>SECTION 1. INTRODUCTION</b>		D. Reset .....	19
A. General .....	1	E. Security .....	19
B. Description .....	1	F. Prescale Factor .....	19
C. Application .....	1	G. Write Feature .....	19
		H. Offset Mode .....	19
<b>SECTION 2. SPECIFICATIONS AND FEATURES</b>		I. Power-Up Display Selection .....	19
A. Standard Specifications .....	1	J. Counting By Eights .....	19
B. Standard Models .....	4		
C. Front Panel Features .....	4	<b>SECTION 7. DATA COMMUNICATIONS</b>	
D. Rear Panel Features .....	4	A. Introduction .....	19
		B. Getting Started .....	20
<b>SECTION 3. PREPARATION FOR INSTALLATION AND OPERATION ....</b>	<b>4</b>	C. System Wiring .....	20
		D. Baud Rate and Address Selection .....	21
<b>SECTION 4. INSTALLATION — MOUNTING AND WIRING .....</b>	<b>4</b>	E. Serial Format .....	21
A. General .....	5	F. Data Codes .....	22
B. Mounting .....	5	G. Error Codes .....	23
C. General Wiring Practice .....	5	H. ASCII Code System and Character Set .....	23
D. Rear Connections .....	5		
E. Wiring .....	6	<b>SECTION 8. RS-232 DATA COMMUNICATIONS</b>	
		A. Introduction .....	24
<b>SECTION 5. PROGRAMMING</b>		B. Data Format .....	24
A. Operating Modes .....	9	C. Data Code .....	24
B. Additional Programming .....	16	D. Transmitting Data .....	24
C. Decimal Point Selection .....	17	E. Modification of Values Through Serial Data .....	25
D. Prescaler Factor .....	18		
E. Security .....	18	<b>SECTION 9. MAINTENANCE</b>	
F. Reset Security (Front Panel Only) .....	18	A. Periodic Maintenance .....	26
		B. Relay Replacement .....	26
<b>SECTION 6. OPERATION</b>		C. Repair .....	26
A. Initial Start-Up .....	18	D. Diagnostics .....	26
B. Limit Entry .....	18	E. Spare Parts .....	27
C. Count Display .....	19	F. Shipment .....	27
		<b>SECTION 10. CLAIMS AND WARRANTY</b>	
		A. Damage Claims .....	27
		B. Warranty and Conditions .....	27

**PLEASE NOTE:** It is understood that Veeder-Root assumes no responsibility for the use of information contained in this manual or for the results obtained therefrom. Despite our efforts to avoid them, this manual may contain technical inaccuracies or typographical errors.

Information contained in this manual is subject to change from time to time. Any such changes will be reported in subsequent revisions. Requests for copies of Veeder-Root publications should be made to Veeder-Root Company, 125 Powder Forest Drive, P.O. Box 2003, Simsbury, Connecticut 06070-2003.

Sections 7 and 8 are intended for people who have prior knowledge of serial communications and are familiar with the functions of the 7910. Any person working with Veeder-Root equipment is expected to take every safety precaution possible. To prevent electrical shock and the possibility of serious injury disconnect all power prior to making any electrical connections to the 7910.

Software Revision Level At Time Of Printing

791006-210	7910-2
791006-220	7910-3

Refer to Section 9D to determine the software revision level of a counter. Consult Veeder-Root if any questions arise regarding software revisions.

## SECTION 1. INTRODUCTION

### A. GENERAL

This manual contains instructions for installation, operation, and programming procedures for the Series 7910 Electronic Predetermining Counter.

**Note:** Vertical bars adjacent to text indicate information added or changed during the issue date on the front cover.

Consult Veeder-Root on any unusual application, installation, or possible modifications of this basic design.

### B. DESCRIPTION

The Series 7910 is a full featured, highly versatile predetermining counter designed for use in machine and process control applications.

Counting inputs are accepted from a variety of bidirectional or unidirectional signal sources. Two individual counting registers are provided, which may be arranged in customized operating configurations through use of programming function codes. Dual scaling factor (prescaler) functions provide precise calibration of individual counting registers and easy accommodation of available count signals.

Two control output channels, each with a Form C relay and a transistor output, actuate based on a count register's value matching a user-entered preset-limit value. Additional programming flexibility allows several output methods, including timed, alternating and latching operation.

A nonvolatile, solid state memory retains all programming codes, preset limits, and counted values during power interruption.

Communication ports for transmission or receipt of preset, program, or count-correction data use ASCII coding at four selectable baud rates.

The front panel of the Series 7910 features a bright, highly visible, six digit LED display with a programmable decimal point. Panel controls are operated by finger touch and confirmed by illuminated indicators. A dust and water tight surface is obtained when the unit is panel mounted with the gasket provided.

Rear panel wiring is connected via screw terminal strips. Rear access is provided to the two plug-in replaceable relays.

Self-diagnostic tests can be initiated at any time without causing a loss of previously entered programs. Diagnostics confirm proper operation of internal memory circuits and indicate fault conditions on the unit's display. The LED display is tested by sequential illumination of all segments and numerals.

### C. APPLICATION

The Series 7910 Electronic Predetermining Counter is designed for use in applications where automated machine or process functions are controlled by the occurrence of a preset number of events.

The highly flexible, programmable nature of the Series 7910 requires the control designer to carefully analyze the requirements of an application, relate these requirements to the capabilities of the Series 7910, and "write" a program that best matches the counter to the application. This manual is a valuable aid in this process.

Typical applications include:

- batching control of liquids or solids
- packaging
- cutting to length
- punching, bending or forming
- winding of coils or roll material
- automatic assembly

or any other application for cycle control based on a predetermined count.

## SECTION 2. SPECIFICATIONS AND FEATURES

### A. STANDARD SPECIFICATIONS

#### Physical

**Display:** Red LED, 6 digits, 1.42 cm (0.56") high. Programmable decimal point location.

**Front Panel:** Laminated structure with membrane switch push buttons. Moisture and dust tight (NEMA 4) when unit is panel mounted with gasket provided.

**Enclosure Material:** Plastic (phenylene oxide), SE 1 rating.

**Enclosure Dimension:** Refer to Figure 2-1.

**Weight:** 1.1 kg (2.5 lbs).

#### Environmental

**Operating Temperature:** 0° to 50°C (32° to 122°F).

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

**Operating Humidity:** 85% noncondensing, maximum.

#### Power Requirement

**Supply Voltage:** 115/230 VAC ( $\pm 10\%$ ), 50/60 Hz.

**Power Consumption:** 20 watts, maximum.

**Memory Retention:** NOVRAM, all programmed and counted data is retained in nonvolatile memory during power absence.

#### Operating Configuration

Six operating modes are provided. Selection of modes is through use of function codes programmable via the front panel:

**Mode 80:** Bidirectional dual preset limit predetermining counter with batch totalizer. Limit-1 provides relay and transistor control output and automatic reset.

Limit-2 provides prewarn-function control output via separate relay and transistor. (Prewarn is the value entered in Limit-2 that operates at a constant differential before the value entered in Limit-1.) The batch totalizer increments at completion of Limit-1/Limit-2 control cycle.

**Mode 81:** Bidirectional single preset limit predetermining counter and batch totalizer with preset limit.

**Mode 82:** Provides the function of two completely separate unidirectional, single preset-limit predetermining counters.

**Mode 83:** Bidirectional dual limit counter with magnitude output operation. Limit-1 and Limit-2 energize separate control outputs when the magnitude of value is equal to or greater than the value entered in the limit. Output(s) will



de-energize when counted value is below the limit value.

**Mode 84:** Bidirectional two level preset counter with accumulative totalizer.

**Mode 85:** Two single level preset counters driven by the same bidirectional input with separate scaling.

**Mode Variations:** Modes 80 to 85 can be modified through use of function codes to provide customized operation.

**Reset Mode Selection:** Reset to zero or reset to preset.  
**Output Method:** Choice of timed (momentary), latching, alternating, or latch/release outputs.

**Automatic Reset:** Selectable high-speed automatic reset (Auto-Reset) on overrun operation.

**Decimal Point Placement:** Programmable in five locations (Counter-A and Counter-B programmable separately).

**Input Methods:** Programmable selection from eight bidirectional and unidirectional input logic functions (refer to "Counting Input").

**Input Filtration:** Programmable selection from nine steps of count-speed response.

**Counter Characteristics**

Two counters (Counter-A, Counter-B) are addressable via front panel push buttons. Counter function depends on mode selection (refer to "Operating Configuration"). The following specifications apply to both counters:

**Counting Range:** 0 to 999,999 with rollover, leading zeros are displayed.

**Preset-Limit Range:** 0 to 999,999.

**Decimal Point:** Individually programmable for Counter-A and Counter-B. Locations as follows: "X.X.X.X.X.X".

**Prescalers:** Separate prescale factor provided for each counting register. Calibration factor multipliers ranging from  $\times 0.0001$  to  $\times 100$  may be entered.

**Counting Speed:** Programmable digital filter adjusts count-speed response:

Speed	Minimum Pulse ON or OFF Time
7.5 KHz*	40 microseconds
1.0 KHz	500 microseconds
700 Hz	715 microseconds
350 Hz	1.4 milliseconds
180 Hz	2.8 milliseconds
100 Hz	5 milliseconds
50 Hz	10 milliseconds
25 Hz	20 milliseconds
15 Hz	33 milliseconds

\*Note: Count speed of individual input may be increased to 10 KHz if combined speed of INPUT-A and INPUT-B does not exceed 15 KHz.

**Counting Input**

**Input Channels:** Two counting input channels (Channel-A, Channel-B). Inputs accept "current sinking" device interface only (isolated contact or NPN open collector transistor). Inputs function based upon programming instructions. Refer to "Operating Configuration" and "Input Methods."

**Input Methods:** Selection of one of the following count input methods is programmable by function code:

**Add/Subtract:** Signals provided to Input-A will add. Signals provided to Input-B will subtract. An add or subtract signal arriving during the presence of an opposing direction signal will be counted. Add and subtract signals arriving simultaneously will be negated (no count).

**Count/Direction:** All count signals applied to Input-A. Input-B functions as the direction command, thus "steering" the signals at Input-A to count in either the up or down direction.

**Add (Or Subtract)/Inhibit:** Count signals applied to Input-A will add (subtract). Channel-B will inhibit counting when activated.

**Add (Or Subtract)/Simultaneous:** Count signals applied to Input-A and/or Input-B will add (subtract). Simultaneous count signals on both inputs will be counted correctly.

**Quadrature:** Requires two-phase count signal (90 degree quadrature) as provided by a bidirectional rotary pulse generator. The two quadrature phases are connected to Input-A and Input-B.

**Multiplier Logic:** Selectable via function codes. Single count per pulse ( $\times 1$ ) or double count per pulse ( $\times 2$ , counts leading and trailing edge). **Note:**  $\times 4$  count possible for quadrature counting method.

**Input Rating (A and B):** Inputs function at high to low state transition.

**High State:** Open circuit (contact open or NPN open collector transistor off).

**Low State:** Circuit completed to "Common" (contact closed or NPN open collector transistor ON).

**Input Impedance:** 4.7 K ohms to +15 VDC supply.

**Input Current:** Input device must "Sink" 3 milliamps.

**Sensor Power Supply:** +15 VDC ( $\pm 5\%$ ), 160 milliamps maximum, is provided for powering external sensors.

**Veeder-Root Compatible Sensors:** The 7910 will interface with most Veeder-Root proximity switches and sensors. Sensor information available separately.

**Command Inputs**

**Remote Reset-A and -B:** Functions at high to low state transition (momentary reset).

**Security-1, Security-2:** Functions at low state.

**Stop Count:** Functions at low state.

**Transmit Command:** Functions at high to low state transition.

**Command Response Time:** 25 milliseconds, maximum.

**High State:** Open circuit (contact open or NPN open collector transistor OFF).

**Low State:** Circuit completed to "Common" (contact closed or NPN open collector transistor ON).

**Control Outputs**

Dual channels, each with relay and transistor output.

**Relay Rating:**

Type: Form C (SPDT).

Load Voltage: 230 VAC, maximum.

Load Current: 5 amp, maximum, noninductive.

**Transistor Rating:**

Type: NPN, open collector.

Load Voltage: 30 VDC, maximum.

Load Current: 150 milliamps, maximum.



**Output Response Time:**

Transistor: 2 milliseconds, maximum.  
 Relay: 12 milliseconds, maximum

**Output Methods:** Choice of timed, latching, alternating, or latch/release.

Timing Range: 0.05 to 10 seconds in 0.05 second steps.  
 Timing Accuracy:  $\pm 1\%$ .

**Diagnostics**

**Automatic Diagnostics:** Entry of the special automatic diagnostic code provides the following tests:

Display Test: All display segments and characters are sequentially presented for visual examination.

Check Sum Test: Confirms proper contents of EPROM circuit.

Read/Write Test: Confirms proper operation of NOVRAM and RAM circuits.

Pass/Fail Message: LED display indicates results of check sum and read/write tests.

**Power Loss:** A power interruption of sufficient duration to cause possible non-registration of applied count signals will produce the display message "P-LOSS".

**Data Communications**

Separate ports are provided for transmitting and receiving data.

**Transmitted Data:** Count-A Value  
 Count-B Value  
 Limit-1 Preset  
 Limit-2 Preset  
 Configuration Codes

**Received Data:** Reset-A  
 Reset-B  
 Limit-1 Value  
 Limit-2 Value  
 Count-A Value  
 Count-B Value  
 Configuration Code Value

**Interface Type:** RS-422 Form No. 791006-210  
 RS-232 Form No. 791006-220  
 RS-485 Form No. 791006-230 (Optional).

**Data Rate:** Selectable baud rate: 110, 300, 1200, 2400.

**Data Code:** Standard ASCII.

**Data Format:** Start bit, 7 data bits, 1 parity (even), 1 stop bit (2 stop bits at 110 baud).

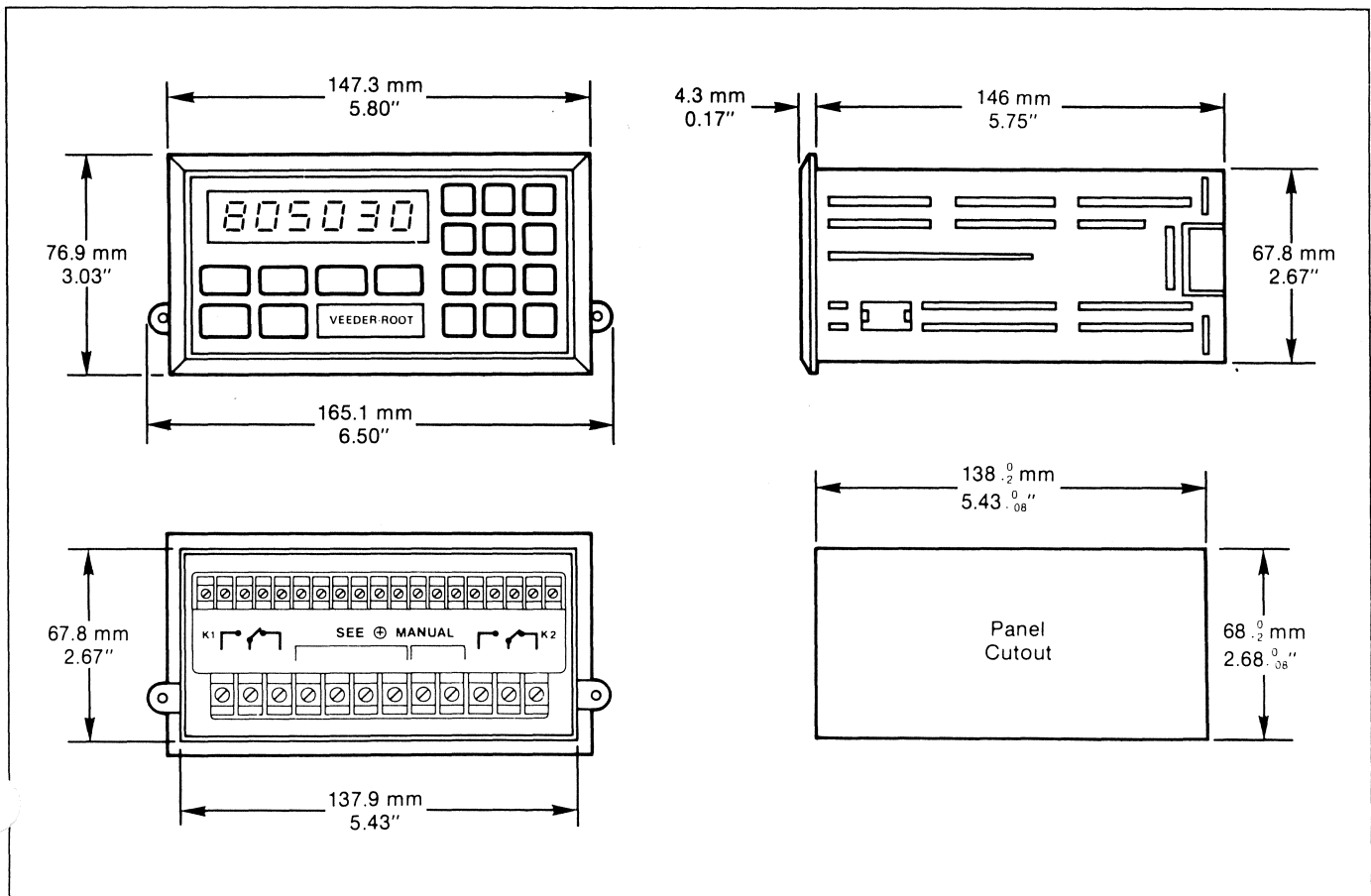


Figure 2-1. Dimensions.



**B. STANDARD MODELS**

**Description:** Per preceding Standard Specifications.

Form No.
791006-210 RS-422 Data Interface
791006-220 RS-232 Data Interface

**C. FRONT PANEL FEATURES**

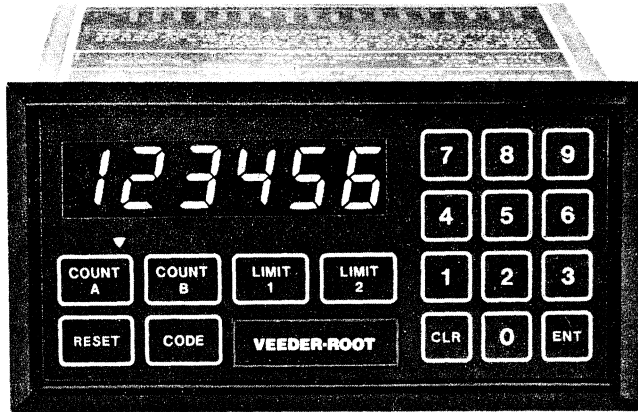


Figure 2-2. Front Panel View.

**Note:** The Series 7910 front panel controls respond to light finger pressure. Permanent damage may result if the panel is touched with a sharp object.

**Digital Display:** All count, preset and programming data is presented on the unit's six digit display.

**Count-A/Count-B:** Displays the actual count total of the 7910's two counting registers. Reset of a register via the panel reset button can be accomplished only when the register is displayed. Remote reset commands will reset the count registers regardless of the displayed function.

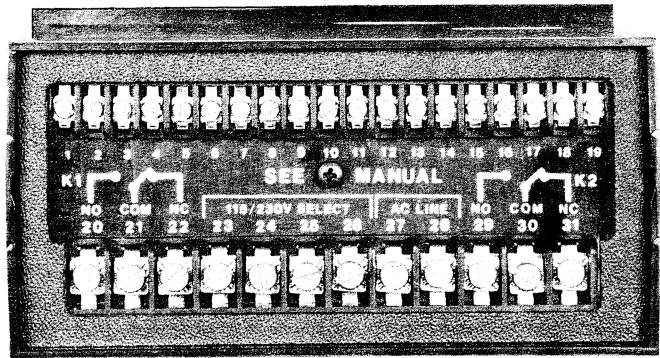
**Limit-1/Limit-2:** Displays preset limits associated with the Count-A and/or Count-B registers (actual configuration is dependent upon the operating mode selected). Preset limits can be changed through use of the numeric keyboard, clear and enter buttons.

**Code:** Displays the function codes used to program operating modes of the Series 7910. Codes may be changed through use of the numeric, clear and enter buttons.

**Reset:** Used to perform the reset function on the Count-A or Count-B registers. The register to be reset must be displayed by pressing the appropriate function button (Count-A or Count-B) before a reset can be performed. Panel reset security must also be disabled.

**Status Indicators:** Four triangular-shaped indicators are located above the function buttons for Count-A, Count-B, Limit-1 and Limit-2. Indicators illuminate to show the current status of data on the digital display. Additionally, the indicators associated with Limit-1 and Limit-2 illuminate to show the status of Output-1 and Output-2.

**D. REAR PANEL FEATURES**



**Note:** Terminals 1-19: Input and Command Connections  
Terminals 20-31: Power and Relay Output Connections

Figure 2-3. Rear Panel View.

**SECTION 3. PREPARATION FOR INSTALLATION AND OPERATION**

It is recommended that the following steps be taken:

1. Check Package Contents. The shipping container for this unit should include:
  - 1 - Series 7910 Electronic Predetermining Counter
  - 2 - Mounting Hardware Assemblies
    - 1 - Panel Mounting Gasket
    - 1 - Installation, Operation and Programming Manual
2. Tools Required. No special tools are required to panel mount and wire the Series 7910. However, standard Phillips and slot head screwdrivers are needed.

**WARNING: WHEN THE COUNTER IS USED TO CONTROL A MACHINE OR PROCESS WHERE PERSONAL INJURY OR EQUIPMENT DAMAGE MIGHT OCCUR AS A RESULT OF FAILURE OF ANY ELECTRONIC OR OTHER COUNTER FUNCTION, YOU ARE URGENTLY RECOMMENDED TO INSIST ON INSTALLATION OF SAFEGUARDS WHICH WOULD PROTECT THE OPERATOR AND/OR MACHINE IN THE EVENT OF ANY UNEXPECTED OPERATION OF THE MACHINE OR PROCESS.**

**SECTION 4. INSTALLATION — MOUNTING AND WIRING**

**WARNING: IN INSTALLATION AND USE OF THIS PRODUCT, COMPLY WITH THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES, AND ANY OTHER APPLICABLE SAFETY CODES. IN ADDITION, TURN OFF POWER AND TAKE OTHER NECESSARY PRECAUTIONS DURING INSTALLATION, SERVICE, AND REPAIR TO PREVENT PERSONAL INJURY, PROPERTY LOSS AND EQUIPMENT DAMAGE.**

### A. GENERAL

Do not attempt installation or operation of this equipment without first following these basic instructions:

1. The Series 7910 counter is designed to be panel mounted. For panel mounting and clearance data, see Figures 2-1 and 4-1. Access to the rear of the counter housing is required to allow performance of mounting procedure and wiring. Access to the front panel is required for operation of the panel mounted controls.

**WARNING: IF INSTALLATION IS TO BE IN A VOLATILE, COMBUSTIBLE OR EXPLOSIVE ATMOSPHERE, THIS PRODUCT MUST BE HOUSED IN AN APPROPRIATE ENCLOSURE AS REQUIRED FOR USE IN SUCH ATMOSPHERE BY NATIONAL ELECTRICAL CODE AND ANY LOCAL APPLICABLE STANDARDS.**

2. This product is designed for operation in an industrial environment free from severe vibration, extreme temperatures and excessive dirt, humidity or harmful contaminants. Installation and operation in a dirty, corrosive, contaminated or otherwise unclean environment will yield unsatisfactory performance or reduced life and reliability. Further, it would be considered "abuse" under terms of the Warranty, thereby voiding the Warranty. If the product must be used in a harmful environment, it is the user's responsibility to install the product in a suitable enclosure to protect it from such an environment.
3. It is generally advisable to complete the programming procedure as instructed in Section 5 prior to permanently wiring the counter to the equipment which it controls. This will prevent unexpected operation of the equipment during the programming procedure. In this case, all that is necessary to complete the programming procedure is the AC power wiring procedure outlined in Paragraph C in this section. After the programming is confirmed to be correct for the application, the remaining wiring can be completed.

**CAUTION: THE OPERATING MODE OF THIS PRODUCT PRIMARILY DEPENDS ON CUSTOM PROGRAMMING WHICH IS THE RESPONSIBILITY OF THE INSTALLER. BEFORE PLACING THE PRODUCT INTO SERVICE INITIALLY, OR AFTER REPAIR, IT IS NECESSARY TO PERFORM THE PROGRAMMING PROCEDURES AS DESCRIBED IN THIS MANUAL.**

### B. MOUNTING

1. Cut mounting hole in panel (refer to Figure 2-1 in Section 2).
2. Remove the adhesive mask from the mounting gasket provided with the counter.
3. Carefully slip the gasket (adhesive side towards the front) over the rear of the counter and slide forward until it engages the inner surface of the front bezel. Carefully press the gasket to the bezel to assure complete adhesion.
4. Place the counter in the panel cutout until the gasket surface engages the panel.
5. Install the Phillips head screws (provided) in the mounting assembly brackets and insert in holes located on both sides of the counter (see Figure 4-1).
6. Using a five inch Phillips head screwdriver, tighten the screws to firmly attach the counter bezel to the panel.

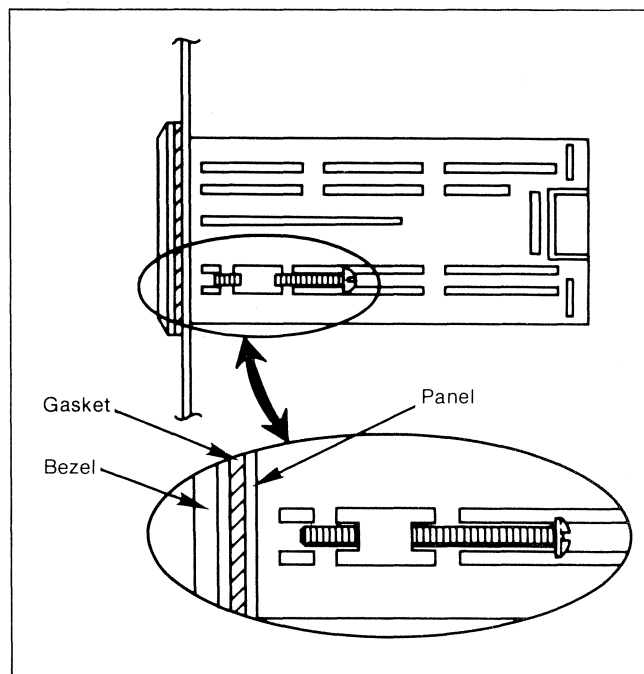


Figure 4-1. Mounting Assembly.

### C. GENERAL WIRING PRACTICE

The Series 7910 uses state-of-the-art MOS/LSI circuitry which characteristically has high immunity to the effects of electrical interference. Proper electrical wiring will further reduce the probability of electrical interference. The following precautions should be observed:

1. Do not run input count signal or command lines in the same conduit as power or control lines from relays, motor starters, etc.
2. Use two-conductor shielded wire for count signal and command inputs. The shield should be connected at the counter end to "Common" (Terminal 3 or 19) only.
3. **DO NOT** connect counter to "Earth Ground".
4. Mount the counter as far as possible away from motor starters, SCR circuits, large relays, etc.
5. When connecting to terminal strips, use solderless terminals or "solder-tin" the ends of all stranded wires.

**Note:** Do not allow the counter to support the weight of cables, harnesses, etc. All interconnection wiring must be supported elsewhere.

### D. REAR CONNECTIONS

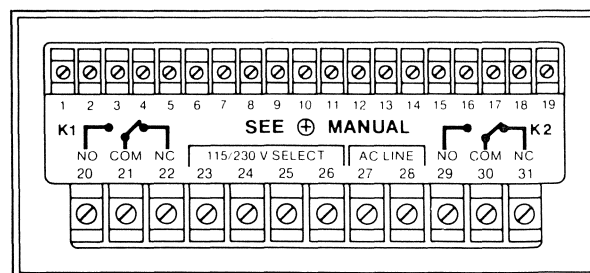


Figure 4-2. Rear Connections.

1. All count input, command signals and solid state outputs are wired to Terminals 1 - 19. Power line connections and relay output wiring are connected to Terminals 20 - 31.

**CAUTION: DO NOT APPLY ANY EXTERNAL VOLTAGE TO TERMINALS 1 - 19. PERMANENT DAMAGE MAY RESULT.**

2. All count signal and control command inputs must be connected via two-conductor shielded cable. Connect shield at counter end to "Common" (Terminal 3 or 19).

Terminal Number	7910 Rear Connections
1	+ Serial Out.
2	- Serial Out.
3	Common — for all signals, commands, shields.
4	+15 Volts for External Sensors(s) — 160 mA, max.
5	Output #4 — not used.
6	Output #3 — not used.
7	Output #2 — associated with Limit 2.
8	Output #1 — associated with Limit 1.
9	- Serial In.
10	+ Serial In.
11	Stop Count — inhibits count input(s).
12	*Transmit.
13	B Reset — remote reset for Count B.
14	A Reset — remote reset for Count A.
15	Security 2 — restricts operating codes.
16	Security 1 — restricts limits.
17	B-Count In — current sinking sensor or isolated contact closure only.
18	A-Count In — current sinking sensor or isolated contact closure only.
19	Common — for all signals, commands, shields.
20-22	Relay Output #1.
23-26	AC Voltage Select.
27-28	Power Line 115/230 VAC, 50/60 Hz.
29-31	Relay Output #2.

\*Transmit Input is inoperative for RS-422/RS-485 version counters.

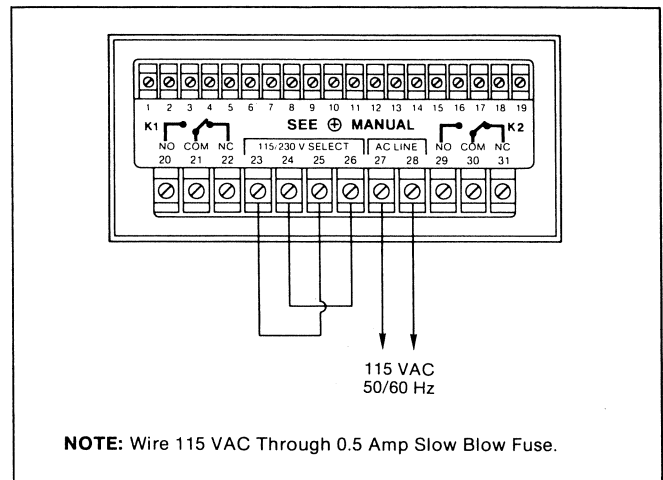


Figure 4-3. 115 VAC Power Line.

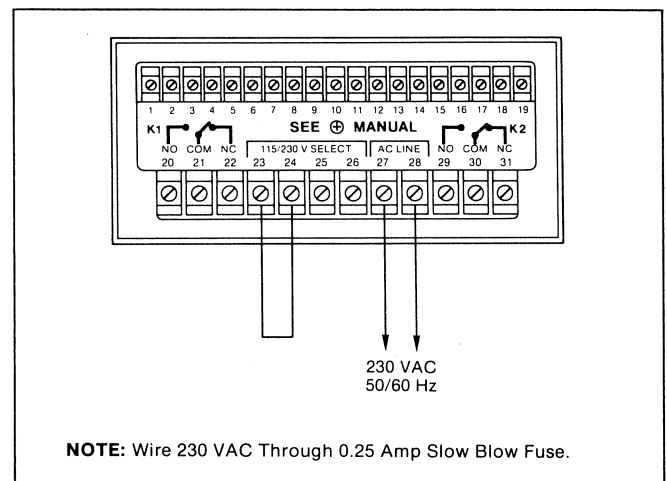


Figure 4-4. 230 VAC Power Line.

2. Wire control outputs 1 and 2:
  - a. Relay(s): Wire per Figure 4-5. Relay contacts have no internal connection to power and must be energized externally.

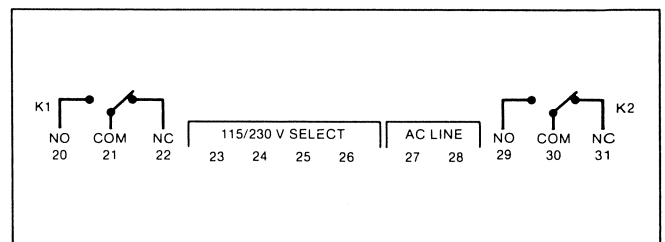


Figure 4-5. Relay Outputs.

### E. WIRING

**Note:** Disconnect AC line power from equipment before wiring the 7910.

1. Wire the AC power line per Figure 4-3 (115 VAC) or Figure 4-4 (230 VAC).

**WARNING: IN INSTALLATION AND USE OF THIS PRODUCT, COMPLY WITH THE NATIONAL ELECTRICAL CODE; FEDERAL, STATE AND LOCAL CODES, AND ANY OTHER APPLICABLE SAFETY CODES. IN ADDITION, TURN OFF POWER AND TAKE OTHER NECESSARY PRECAUTIONS DURING INSTALLATION, SERVICE, AND REPAIR TO PREVENT PERSONAL INJURY, PROPERTY LOSS AND EQUIPMENT DAMAGE.**

- b. Transistor(s): Wire transistor Output-1 to Terminal 8 and/or transistor Output-2 to Terminal 7. Transistors are NPN open collector types, refer to Section 2, Paragraph A, Standard Specifications.
- c. If transistors are used with an inductive load, wire per Figure 4-6.

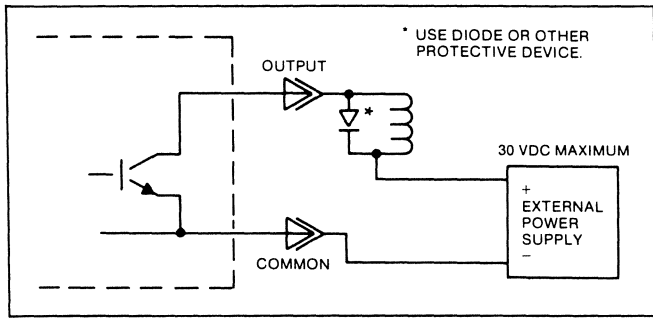


Figure 4-6. Transistor Output With Inductive Load.

- Wire count signal sources to Input-A and/or Input-B as the application requires (refer to Section 5 for input methods). Signal source must be isolated contact or NPN open collector transistor. Refer to Figure 4-7 for connection of count inputs and Figure 4-8 for recommended use of shielded cable. For easy reference of terminal assignments, refer to Figure 4-9.

**CAUTION: ALL COUNT SIGNAL OR CONTROL COMMAND INPUTS MUST BE CONNECTED VIA TWO-CONDUCTOR SHIELDED CABLE. REFER TO FIGURE 4-8 FOR RECOMMENDED WIRING METHOD.**

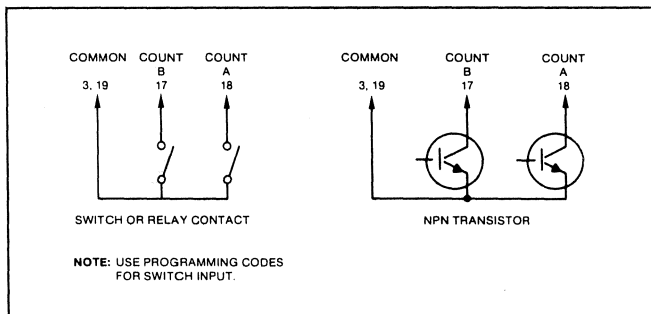


Figure 4-7. Connection of Count Inputs.

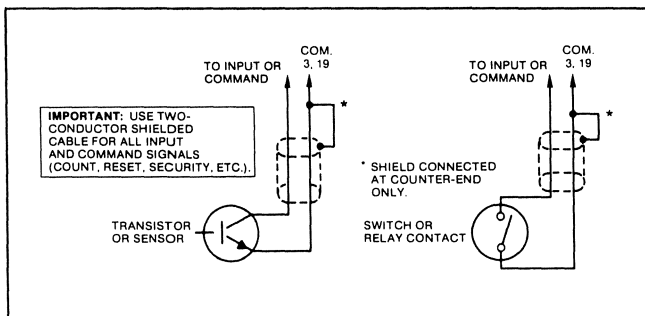


Figure 4-8. Use of Shielded Cable.

+ SERIAL OUT	- SERIAL OUT	COMMON	+ 15 VOLTS	OUTPUT 4	OUTPUT 3	OUTPUT 2	OUTPUT 1	- SERIAL IN	+ SERIAL IN	STOP COUNT	TRANSMIT	B RESET IN	A RESET IN	SECURITY 2	SECURITY 1	B COUNT IN	A COUNT IN	COMMON
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Figure 4-9. Terminal Assignments.

- For connection of proximity switch or photoelectric sensors, refer to Figures 4-10 and 4-11. The sensor must be capable of operating from a 15 VDC power supply and have an NPN open collector transistor output.

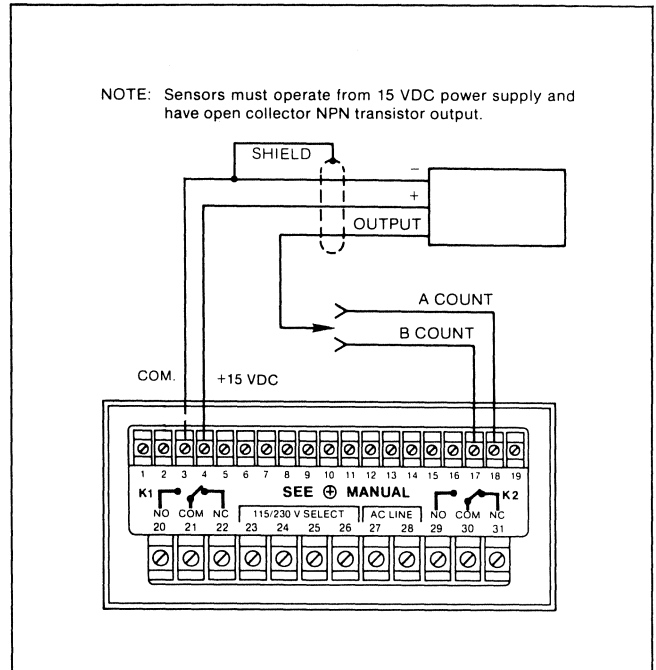


Figure 4-10. Proximity Switch or One-Piece Photoelectric Sensor Wiring.

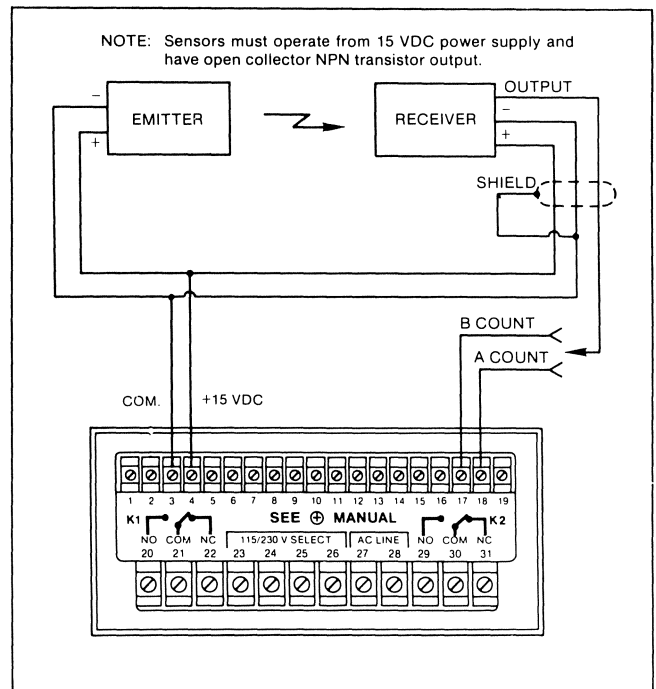


Figure 4-11. Two-Piece Photoelectric Sensor Wiring.

- b. For connection of a Veeder-Root Series 7132 Unidirectional Rotary Pulse Generator, refer to Figure 4-12.

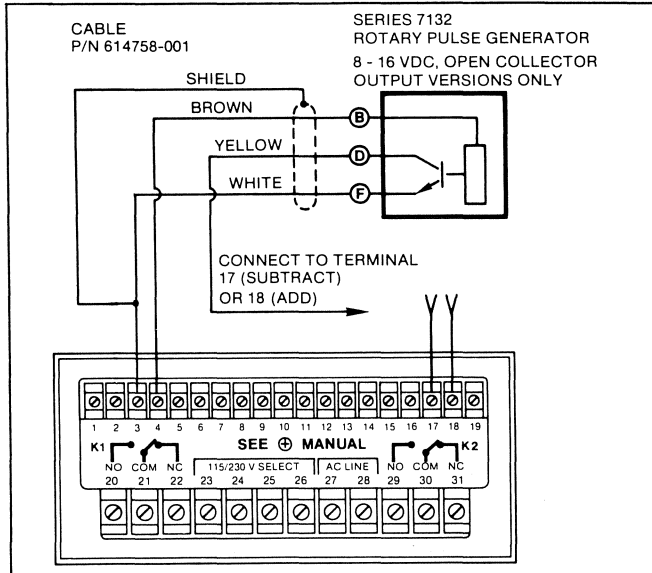


Figure 4-12. Connection of a Veeder-Root Series 7132 Unidirectional Rotary Pulse Generator.

- c. For connection of a Veeder-Root Series 7133, 7138 Bidirectional Rotary Pulse Generator, refer to Figure 4-13. Quadrature input method must be programmed per Section 5.

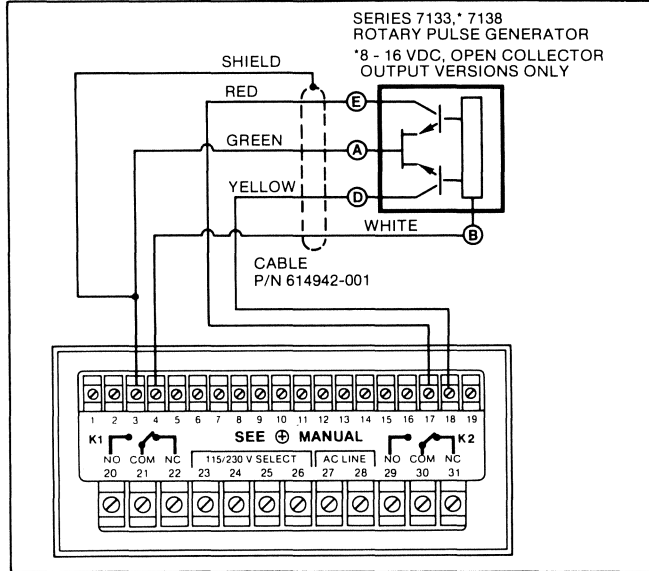


Figure 4-13. Connection of a Veeder-Root Series 7133, 7138 Bidirectional Rotary Pulse Generator.

4. Wire command signal inputs per application requirements (refer to Figure 4-9):

Command	Terminal
A-Reset	14
B-Reset	13
Stop Count	11
Security-1	16
Security-2	15
Transmit	12

All control command inputs must be connected via two-conductor shielded cable (refer to Figure 4-8 for recommended use of shielded cable).

**Note:** All command inputs require signal source from isolated contact or NPN open collector transistor. The command is performed when the contact status is CLOSED, or transistor is ON, in reference to "Common" (Terminal 3 or 19).

- a. Remote Reset Wiring

Remote reset connection for Counter-A is made to Terminal 14; Counter-B is made to Terminal 13. A normally open switch contact or NPN open collector transistor **may** be used to control remote reset. The reset is momentary at the leading edge of a command. Counting will resume after a reset even during the presence of a continuous reset command. For wiring, refer to Figure 4-14.

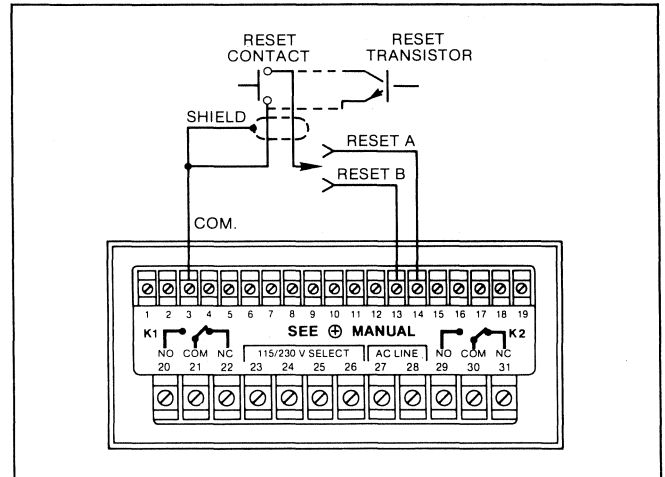


Figure 4-14. Remote Reset Wiring.

- b. Stop Count Wiring

Wire per Figure 4-15 using a switch contact or NPN open collector transistor. Operation of Counter-A and Counter-B will be inhibited during the presence of the Stop Count command.

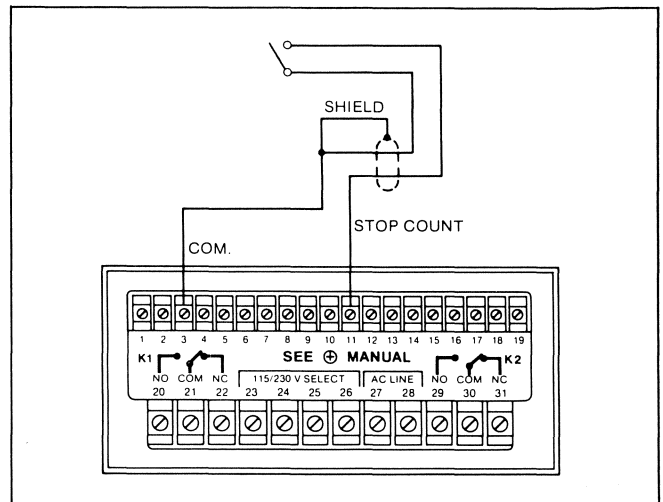


Figure 4-15. Stop Count Wiring.



c. Security-1 and Security-2 Wiring

Wire per Figure 4-16. Security-1 (S-1) restricts the change of preset limits, and the front panel reset button if required. Security-2 (S-2) restricts the change of function codes.

For permanent program security, S-1 and/or S-2 connections can be made with a short length of insulated wire connected directly between security input(s) and "Common" (Terminal 3 or 19).

When it is necessary to have easy access to secured programs, a switch contact may be connected between security inputs(s) and "Common". If restricted access is desired, the switch may be of the key-lock type.

**Note:** It is recommended that two-conductor shielded cable be used between the counter and switch. Refer to Figure 4-8.

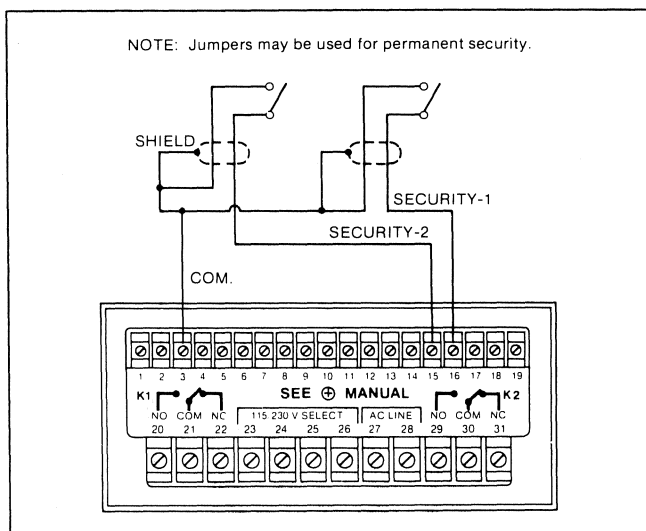


Figure 4-16. Security-1 and Security-2 Wiring.

d. Transmit Command Wiring

Wire per Figure 4-17. Data will be transmitted via serial communication outputs at the leading edge of the transmit command. Note that this input is inoperative in RS-422/RS-485 version counters.

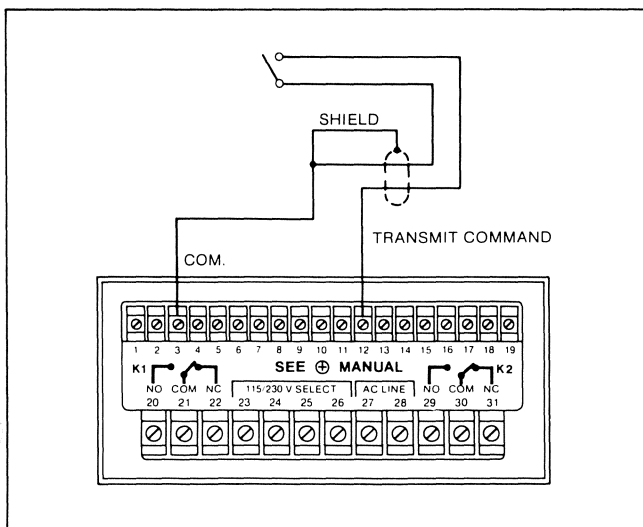


Figure 4-17. Transmit Command Wiring.

e. Serial Data Communication Wiring

Refer to Section 7 and 8 for wiring theory and operation of data communications.

**CAUTION:** CONFIRM PROPER WIRING PER ABOVE STEPS BEFORE APPLYING AC LINE POWER TO EQUIPMENT.

5. Preparation for Programming: To avoid unexpected operation of 7910's control outputs during the programming procedure, take steps to restrict operation of equipment that may be initiated by the 7910.

## SECTION 5. PROGRAMMING

### A. OPERATING MODES

The 7910 is a highly versatile electronic predetermining counter. It can be programmed, through use of operating codes, to function in four basic modes of operation. The selected mode of operation can be further modified, by additional codes, to customize the product's function to a specific application. The following steps outline the mode selection procedure:

1. Review the six block diagrams and description of operation for Modes 80 through 85 in Tables 5-1 to 5-6. Determine which configuration best suits the methods needed for the application.

**Note:** Security connections must not be in place during this procedure.

2. Access the operating mode selected in step 1 as follows:  
a. Press the CODE button.  
b. Press the two-digit 80 series access code as stated in the desired mode description.

**EXAMPLE:** Assume selection of Mode 82. Press "82".  
(The display will show "C82-C1".)

c. Press CLEAR. The display will show "C8X-C0" ("C82-C0" per above example).  
d. Press ENTER. The display will show "C8X-PL" ("C82-PL" per above example).

The mode is now fully programmed to operate per the block diagram and description.

3. Review the table contained within the mode description selected in step 1 in respect to "Factory Set Operation" and "Modified Operation" characteristics. If a modified function better suits the application's requirements, enter the code as stated in the "Modifying Code" column.

a. Press the CODE button.  
b. Press the two digits that follow the "C" in the modifying code.

**EXAMPLE:** For Code "C42-15", press "42".

c. At this time, note the display presentation in case return to the "Factory Set Operation" is later desired.  
d. Press the CLEAR button.

e. Press the digit(s) following the "-" in the modifying code.

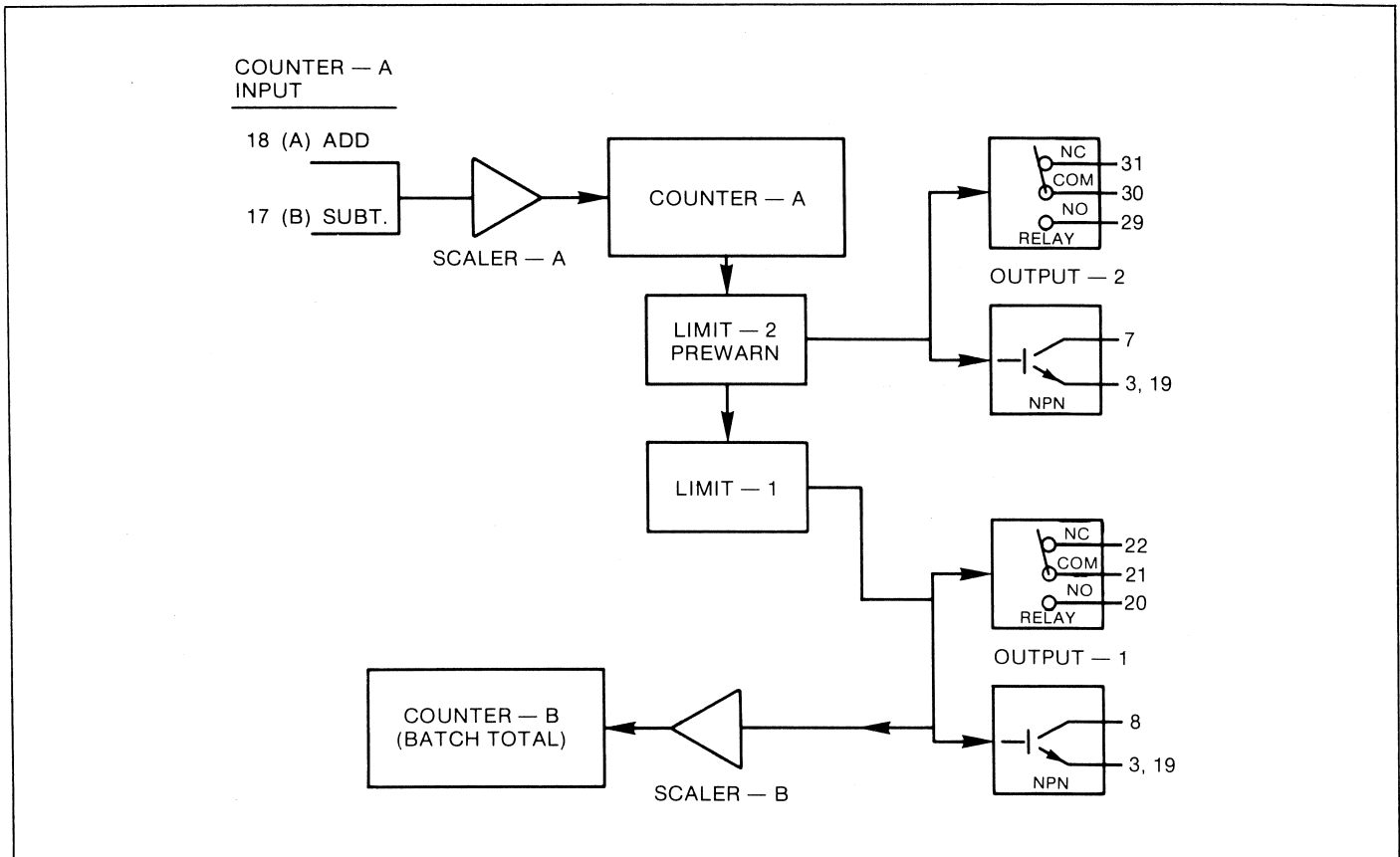
**EXAMPLE:** For Code "C42-15", press "15".

f. Press the ENTER button.  
g. If two modifying codes are specified, repeat the above steps for the second code.

4. If the modifying codes presented in the mode description tables do not provide a suitable operating function for the application, refer to the next section, Additional Programming.

5. When programming is completed, record the operating program on the sheet provided on the last page of this manual.

Table 5-1. Mode 80



Counter-A acts as a preset control counter.  
Counter-B acts as a batch totalizer.

Counter-A resets to zero and may count bidirectionally, although control functions must occur in the additive direction.

Limit-1 is considered the final control function and is associated with Output-1 and an automatic reset.

Limit-2 is considered a prewarn function and is associated with Output-2.

When the Count-A value adds to equal Limit-1 minus Limit-2 (prewarn), Output-2 will lock in.

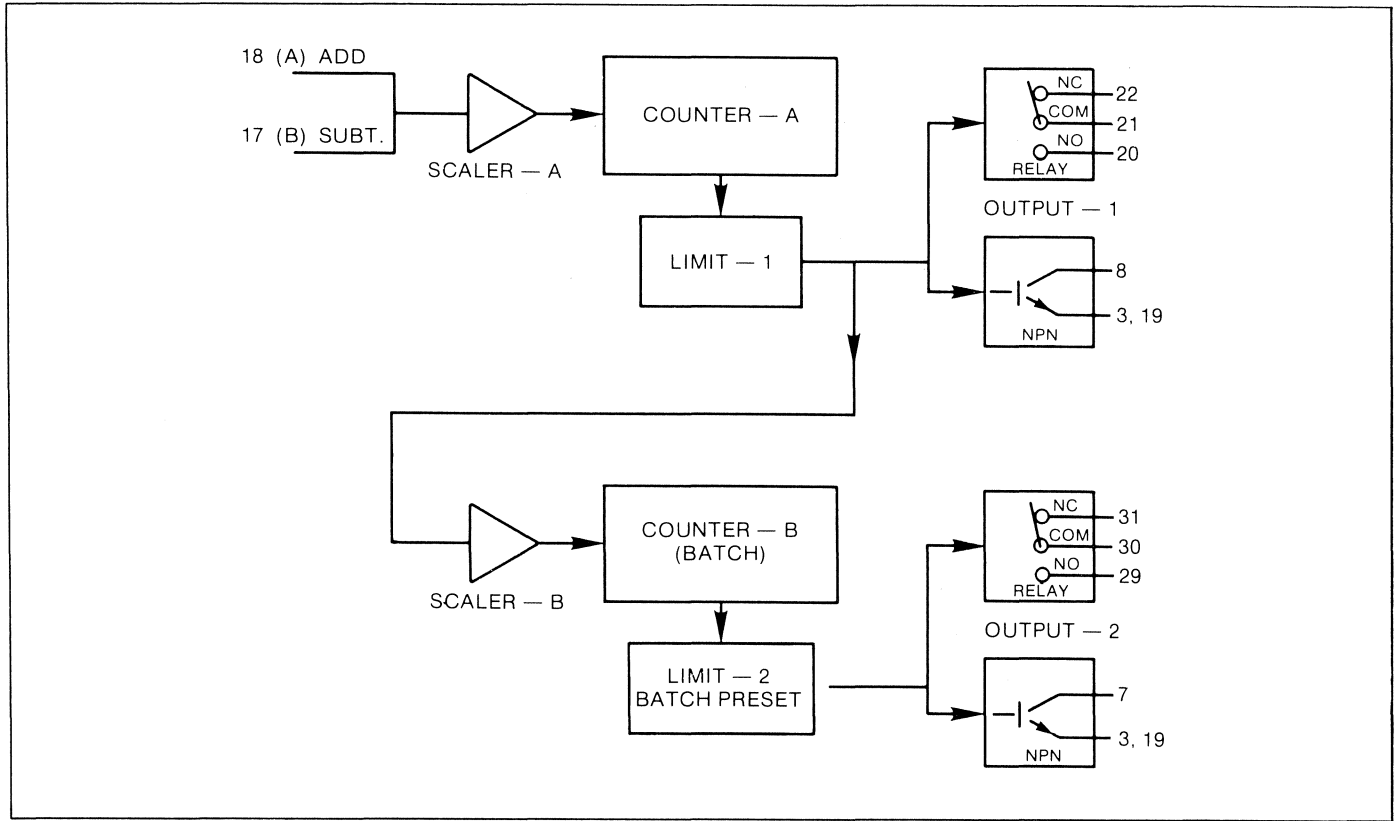
When Count-A equals the Limit-1 value, Output-1 actuates for 100 milliseconds, Output-2 is released, and automatic reset of Count-A occurs.

Count-B, the batch totalizer, increments for each full cycle of Counter-A.

- Note:**
1. Prescaler-A will factor the Count-A signal by the multiplier entered in Code-0.
  2. Prescaler-B will factor the Count-B (batch) total by the multiplier entered in Code-1.
  3. To access Mode 80, enter Code 80:
  4. The following table can be used to determine code entries that will modify the operating characteristics of Mode 80.

Factory Set Operation	Modified Operation	Modifying Codes
Count Speed: High (7.5 KHz)	Switch Input/Low Speed (15 Hz)	C41—15, C42—15
Add/Subtract Counting	1. Quadrature Counting 2. Count/Direction Counting	C40—00 C40—04, C61—02
Output-2 Mode: Latch-In	Output-2 Momentary	C63—03, C3—X.XX seconds
Output-1 Mode: Momentary	Output-1 Latch-In	C62—00, C2—0.00
Output-1 Hold Time: 100 ms	Hold Time Selection (seconds)	C2—X.XX seconds
Auto-Reset	No Auto-Reset	C64—00

Table 5-2. Mode 81



Counter-A acts as a preset control counter.  
Counter-B acts as a batch counter.

Counter-B is a batch counter that increments at each full cycle of Counter-A.

Counter-A resets to zero and may count bidirectionally, although preset will occur in the additive direction only.

Limit-2 is the preset for Counter-B (batch preset) and is associated with Output-2.

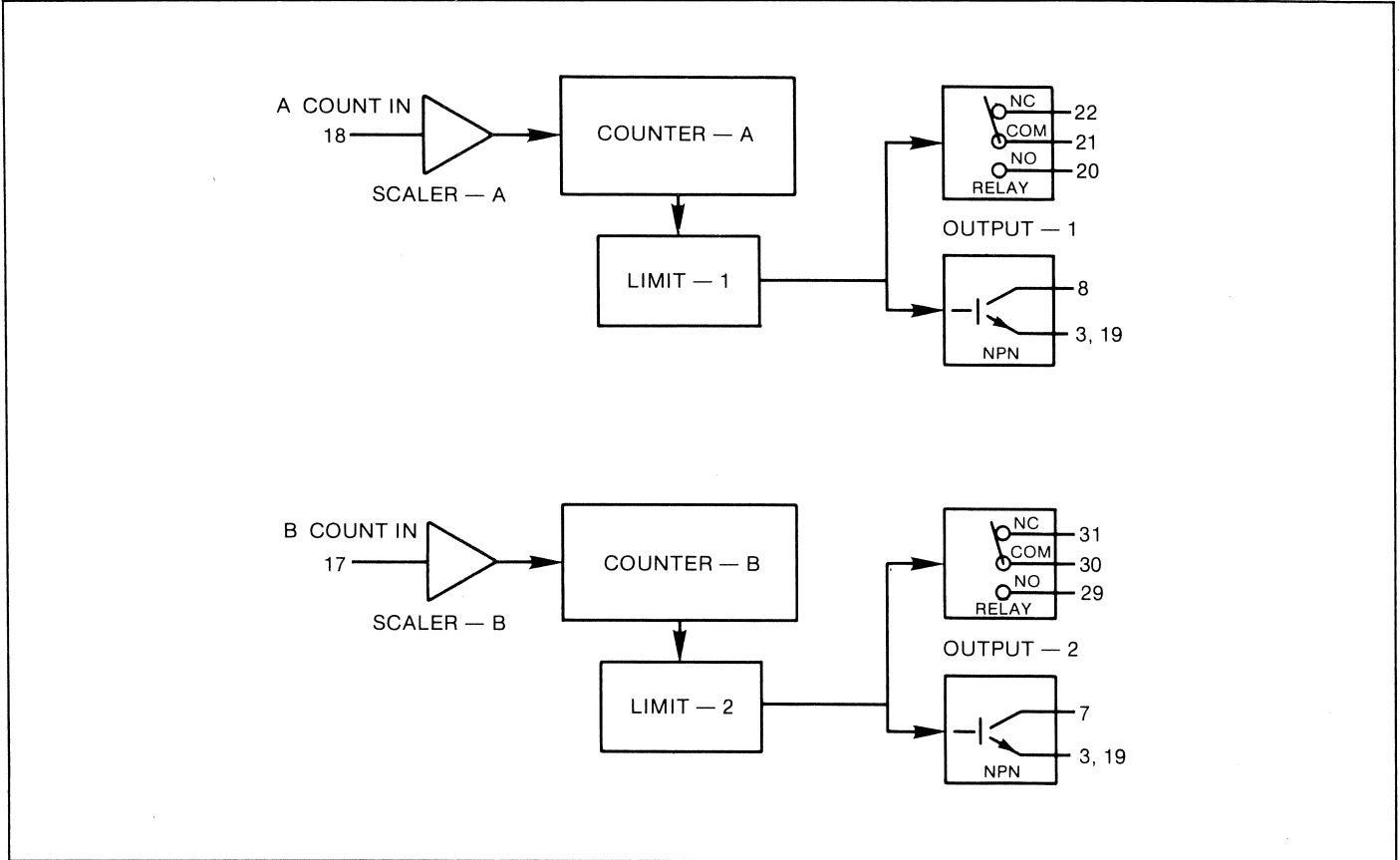
Limit-1 is the preset for Counter-A and is associated with Output-1 and an automatic reset.

- Note:**
1. Prescaler-A will factor the Count-A signal by the multiplier entered in Code-0.
  2. Prescaler-B will factor the Count-B (batch) total by the multiplier entered in Code-1.
  3. To access Mode 81, enter Code 81.
  4. The following table can be used to determine code entries that will modify the operating characteristics of Mode 81:

Factory Set Operation	Modified Operation	Modifying Codes
Count Speed: High (7.5 KHz)	Switch Input/Low Speed (15 Hz)	C41—15. C42—15
Add/Subtract Counting	1. Quadrature Counting 2. Count/Direction Counting	C40—00 C40—04. C61—-2
Output-1 Hold Time: 100 ms Output-2 Hold Time: 100 ms	Hold Time Selection (seconds) Hold Time Selection (seconds)	C2—X.XX seconds C3—X.XX seconds
Output-1: Momentary Actuation Output-2: Momentary Actuation	Latch-In Operation Latch-In Operation	C2—0.00. C62—-0 C3—0.00. C63—-0
Counter-A and Counter-B: Reset to Zero	1. Counter-A Reset to Limit-1* 2. Counter-B Reset to Limit-2* 3. Both 1 and 2	C50—-6 C50—-5 C50—-4
Counter-A: Auto Reset Counter-B: Overrun	No Auto-Reset (Overrun) Auto-Reset	C64—-0 C65—-3

\*Output occurs at zero

Table 5-3. Mode 82



Counter-A and Counter-B act as completely independent single preset predetermining counters.

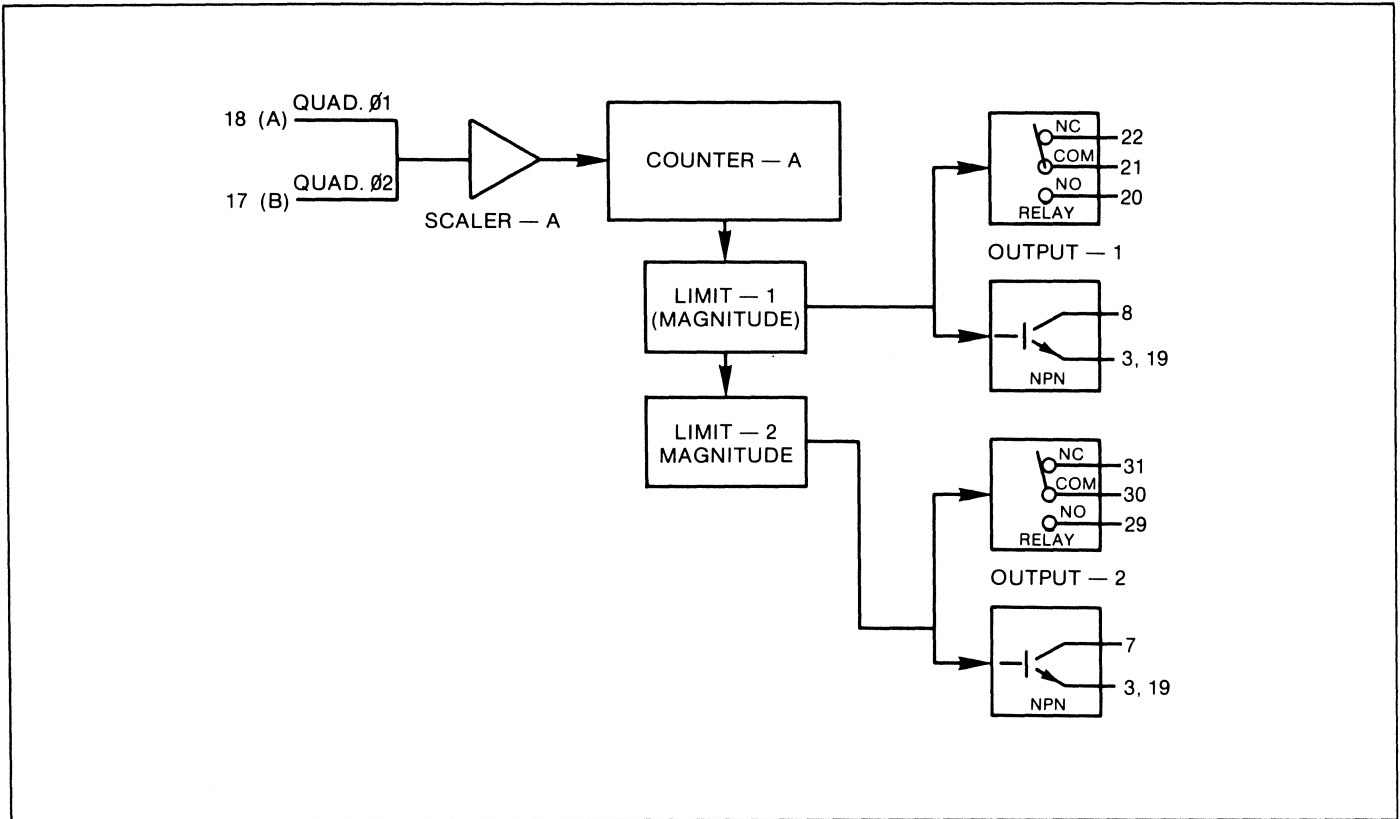
Counting mode is unidirectional, additive, with preset output occurring when the count reaches coincidence with limit values. Counter-A is associated with Limit-1 and Output-1; Counter-B is associated with Limit-2 and Output-2. Output actuation is momentary (100 milliseconds) with automatic reset.

- Note:**
1. Prescaler-A and Prescaler-B will factor count inputs to Counter-A and Counter-B, respectively. Enter the multiplier Factor-A in Code 0 and Factor-B in Code 1.
  2. To access Mode 82, enter Code 82.
  3. The following table can be used to determine code entry(s) that will modify the operating characteristics of Mode 82:

Factory Set Operation	Modified Operation	Modifying Codes
Counter-A Speed: High (7.5 KHz) Counter-B Speed: High (7.5 KHz)	Switch Input/Low Speed (15 Hz) Switch Input/Low Speed (15 Hz)	C41—15 C42—15
Output-1 Hold Time: 100 ms Output-2 Hold Time: 100 ms	Hold Time Selection (seconds) Hold Time Selection (seconds)	C2—X.XX seconds C3—X.XX seconds
Output-1: Momentary Actuation Output-2: Momentary Actuation	Latch-In Operation Latch-In Operation	C2—0.00, C62—0 C3—0.00, C63—0
Output-1: Momentary Actuation Output-2: Momentary Actuation	Alternating Operation Alternating Operation	C2—0.00, C62—2 C3—0.00, C63—2
Reset to Zero (Additive Count)	To Preset (Subtractive Count) *	C50—4, C40—00
Auto Reset: Counter-A Auto-Reset: Counter-B	Overrun Overrun	C64—0 C65—0

\*Output occurs at zero

Table 5-4. Mode 83



Counter-A acts as a two-level counter with the preset output's operation solely based on the magnitude of the count in respect to the limit values. Counter-B has no function in this mode.

Output-1 will actuate when the Count-A magnitude is equal to, or greater than, the Limit-1 value. The output will remain active until the count is diminished to less than the Limit-1 value, either by subtractive counting or reset.

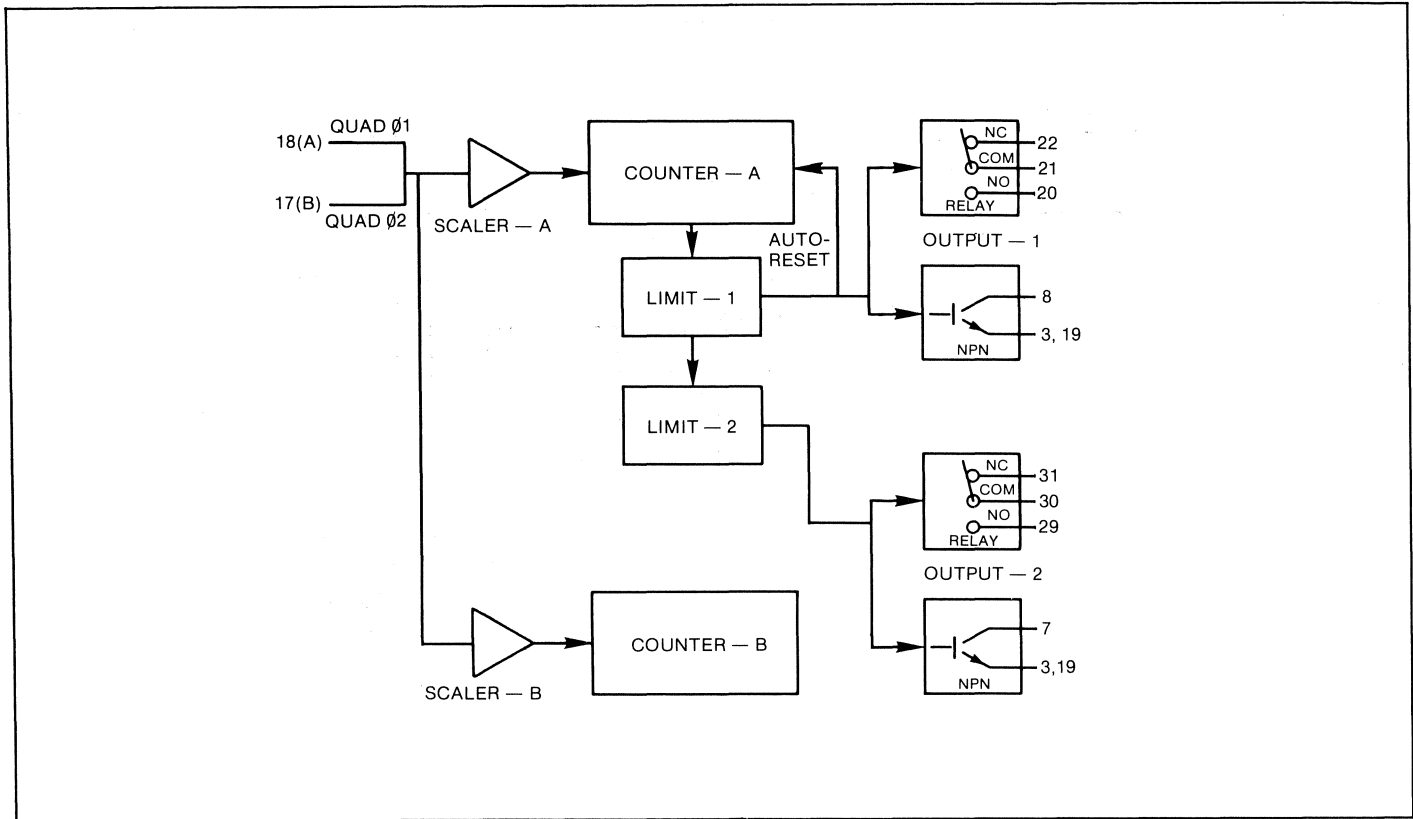
- Note:**
1. To access Mode 83, enter Code 83.
  2. Prescaler-A will factor the Count-A signal by the multiplier entered in Code 0.
  3. Prescaler-B and Counter-B are inoperative.
  4. The following table can be used to determine code entry(s) that will modify the operating characteristics of Mode 83:

Output-2 operates in an identical manner associated with Limit-2.

The standard Mode 83 count input is via quadrature signals as supplied by bidirectional rotary pulse generators (encoders) or similar devices.

Factory Set Operation	Modified Operation	Modifying Codes
Count Speed: High (7.5 KHz)	Switch Input/Low Speed (15 Hz)	C41—15, C42—15
Quadrature Mode Counting	<ol style="list-style-type: none"> <li>1. Quadrature Doubled (× 2)</li> <li>2. Add/Subtract Counting</li> <li>3. Count/Direction Counting</li> </ol>	C40—01 C40—06 C40—04, C61—2

Table 5-5. Mode 84



Counters "A" and "B" accept counts from the same bidirectional input.

Counter "A" acts as a 2-level predetermining counter. Outputs-1 and -2 actuate upon coincidence of Counter "A" with Limit-1 and Limit-2 respectively. Counter "A" will reset to zero upon coincidence with Limit-1.

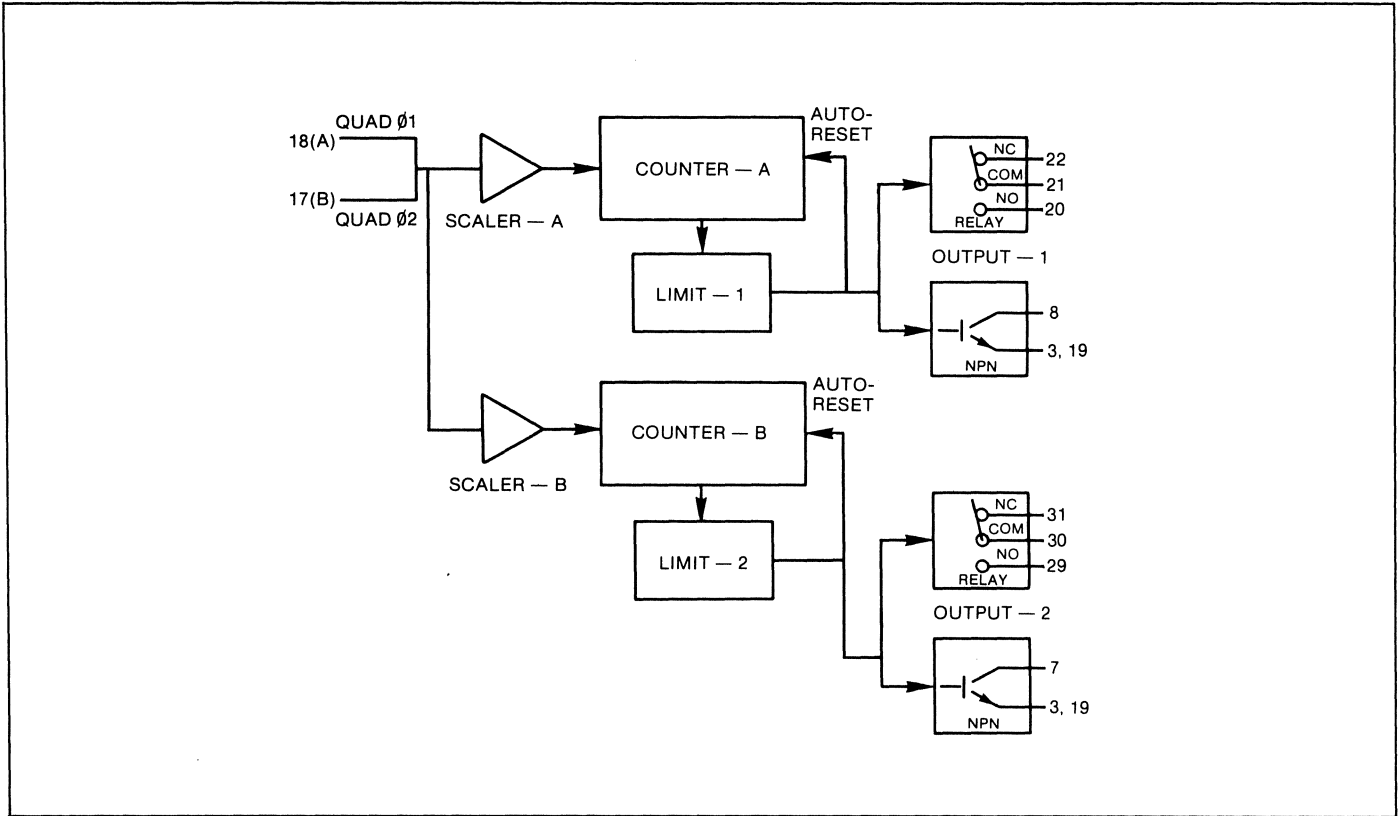
Counter "B" acts as a totalizer of counts received by Counter "A" except that both counters may be independently reset.

- Note:**
- To access Mode 84, enter Code 84.
  - Scaler-A and Scaler-B will factor count inputs to Counter "A" and Counter "B" respectively. Enter the multiplier Factor-A in Code-0 and Factor-B in Code-1.
  - The following table can be used to determine code entries that will modify the operating characteristics of Mode 84:

Factory Set Operation	Modified Operation	Modifying Codes
Count Speed: High (7.5 KHz)	Switch Input/Low Speed (15 Hz)	C41—15, C42-15
Quadrature Mode Counting	1. Quadrature Doubled (×2) 2. Add/Subtract Counting 3. Count/Direction Counting	C40-01 C40-06 C40-04, C61—2
Output-1: Momentary Actuation Output-2: Momentary Actuation	Latch-In Operation Latch-In Operation	C2—0.00, C62—0 C2—0.00, C63—0
Output-1: Hold Time: 100 ms Output-2: Hold Time: 100 ms	Hold Time Selection (Seconds) Hold Time Selection (Seconds)	C2—X.XX Seconds C3—X.XX Seconds
2-Level Predetermining Counter with Independent Limits and Outputs	Limit-2 Functions as a Pre-warn. Limit-1 is Final Level	C71—1
Auto Reset of Counter A	No Auto Reset	C64—0



Table 5-6. Mode 85



Counters "A" and "B" accept counts from the same bidirectional input and act as two independent predetermining counters. Output-1 actuates upon coincidence of Counter "A" with Limit-1 and Output-2 actuates upon coincidence of Counter "B" with Limit-2.

- Note:**
- To access Mode 85, enter Code 85.
  - Scaler-A and Scaler-B will factor count inputs to Counter "A" and Counter "B" respectively. Enter the multiplier Factor-A in Code-0 and Factor-B in Code-1.
  - The following table can be used to determine code entries that will modify the operating characteristics of Mode 85:

Factory Set Operation	Modified Operation	Modifying Codes
Count Speed: High (7.5 KHz)	Switch Input/Low Speed	C41—15, C42-15
Quadrature Mode Counting	1. Quadrature Doubled ( $\times 2$ ) 2. Add/Subtract Counting 3. Count/Direction Counting	C40-01 C40-06 C40-04, C61—2
Output-1: Hold Time: 100 ms Output-2: Hold Time: 100 ms	Hold Time Selection (Seconds) Hold Time Selection (Seconds)	C2—X.XX Seconds C3—X.XX Seconds
Output-1: Momentary Actuation Output-2: Momentary Actuation	Latch-In Operation Latch-In Operation	C2—0.00, C62—0 C3—0.00, C63—0
Auto Reset: Counter "A" Auto Reset: Counter "B"	Overrun Overrun	C64—0 C65—0

**B. ADDITIONAL PROGRAMMING**

The operating modes and associated modifying codes presented in Paragraph A will provide all the necessary flexibility to satisfy most applications. However, if a desired function cannot be programmed based on the information provided in Paragraph A, the following additional programming codes will be helpful.

**1. Input Filtration**

Operating modes (see Paragraph A) provide factory set input filtration which allows counting speeds to 7.5 KHz and minimum signal pulse width of 40 microseconds. This filtration allows input Channels A and B to operate in high-speed applications with signal sources derived from sensors or circuits with open collector transistor (NPN) output.

These operating modes also provide for entry of alternate program codes which increase filtration of input channels A and B to accommodate count signals from mechanical switch or relay contacts. This filtration reduces maximum count speed capability to 15 Hz, and minimum signal pulse width to 33 milliseconds, which is sufficient to prevent extra counts caused by "contact-bounce".

The standard filtration (7.5 KHz) and switch contact filtration (15 Hz) options should accommodate the majority of applications. However, if it is desired to adjust the maximum input count speed characteristic to provide maximum immunity to electrical interference, Table 5-7 can be used.

For this purpose, the filtration should be adjusted as close as possible to the **maximum** count speed and/or **minimum** pulse width that will be encountered in the application. If it is apparent that some count signals are not being registered, change filtration to the next step of higher count speed; i.e., from 350 Hz to 700 Hz. Note that Channel-A and Channel-B filtration are adjusted separately.

Table 5-7. Input Filtration Codes

Maximum Count Speed	Minimum Pulse Width	Channel-A Code	Channel-B Code
7.5 KHz	40 microseconds	C41—00	C42—00
1.0 KHz	500 microseconds	C41—01	C42—01
700 Hz	715 microseconds	C41—02	C42—02
350 Hz	1.4 milliseconds	C41—03	C42—03
180 Hz	2.8 milliseconds	C41—04	C42—04
100 Hz	5 milliseconds	C41—05	C42—05
50 Hz	10 milliseconds	C41—09	C42—09
25 Hz*	20 milliseconds	C41—13	C42—13
15 Hz*	33 milliseconds	C41—15	C42—15

\*25 Hz recommended for switches with moderate contact-bounce.

\*15 Hz recommended for switches with severe contact-bounce.

Table 5-8. Input Method Codes for Modes 80, 81, 83, 84 and 85 (Not for Mode 82)

Input Method	Code S	Channel A INPUT	Channel B INPUT	Operation
Add/Subtract Add/Subtract ×2	C40—06 C40—07	Additive Additive ×2	Subtractive Subtractive ×2	<b>Add/Subtract Counting Method:</b> Signals provided to Input-A (Terminal 18) will add. Signals provided to Input-3 (Terminal 17) will subtract. An add or subtract signal arriving during the presence of an opposing direction signal will be counted. Add and subtract signals arriving simultaneously will be negated (no count). ×2 operation produces count at leading and trailing edges of signal.
Count/Direction Count/Direction ×2	C40—04, C61—2 C40—05, C61—2	Count Count ×2	Direction Command Direction Command	<b>Count/Direction Counting Method:</b> All count signals applied to Input-A (Terminal 18). Input-3 (Terminal 17) functions as the direction command, thus "steering" the signals at Input-A to count in either the up or down direction. ×2 operation produces count at leading and trailing edges of signal.
Add/Inhibit Add/Inhibit ×2	C40—14 C40—15	Count (Add) Count ×2 (Add)	Inhibit Inhibit	<b>Add/Inhibit (Subt./Inhibit) Counting Method:</b> Count signals applied to Input-A (Terminal 18) will add (subtract). Channel-B (Terminal 17) will inhibit counting when activated. ×2 operation produces count at leading and trailing edges of signal.
Subt./Inhibit Subt./Inhibit ×2	C40—12 C40—13	Count (Subt.) Count ×2 (Subt.)	Inhibit Inhibit	
Add Simultaneous Add Simultaneous ×2	C40—10 C40—11	Add Add ×2	Add Add ×2	<b>Add Simultaneous (Subtract Simultaneous) Counting Method:</b> Count signals applied to Input-A (Terminal 18) and/or Input-B (Terminal 17) will add (subtract). Simultaneous count signals on both inputs will be counted correctly. ×2 operation produces count at leading and trailing edges of both signals.
Subt. Simultaneous Subt. Simultaneous ×2	C40—08 C40—09	Subtract Subtract ×2	Subtract Subtract ×2	
Quadrature Quadrature ×2 Quadrature ×4	C40—00 C40—01 C40—03	Phase A Phase A Phase A	Phase B Phase B Phase B	<b>Quadrature Counting Method:</b> Requires two-phase counting signal (90 degree quadrature) as provided by specialized sensors such as bidirectional rotary pulse generators (shaft encoder), linear glass scales, etc. The two quadrature phases are connected to Input-A (Terminal 18) and Input-B (Terminal 17). <b>NOTE:</b> To reverse counting direction relative to direction of sensor motion, exchange connections on Terminals 17 and 18. ×2 quadrature doubles the resolution of the input signal. ×4 quadruples resolution.

### 2. Input Method Selection

Each operating mode described in Paragraph A includes a factory preselected input method. The description provides programming codes for modification to alternate input methods which are considered to be likely choices.

Table 5-8 and 5-9 provide a complete listing of all possible input methods and the program code required to select each method. The tables may be used if the operating modes in Paragraph A do not contain input methods appropriate for a specific application.

When selecting an input method, careful consideration of the overall operating program should be exercised. This exercise will help to avoid incompatible instructions such as combining a subtractive input method with a program that resets the counter to zero. In this example, counted pulses will drive the display below zero (999999, 999998, etc.) which is not a valid application, since preset values must be zero or above. The correct use of a subtractive-only input method would be in combination with a program that provides "Reset to Limit-1" operation.

Table 5-9. Input Method Code for Mode 82 Only  
(Not Modes 80, 81, 83, 84 and 85)

Input Method Counter A	Input Method Counter B	Code	Operation
Additive	Additive	C40—10	Counter A and Counter B are fully independent and unidirectional. Counter must be programmed for "Reset to Zero" mode when additive operation is desired, "Reset to Preset" mode for subtractive operation.
Additive ×2	Additive	C40—11	
Additive ×2	Additive ×2	C40—15	
Subtractive	Additive	C40—08	
Subtractive ×2	Additive	C40—09	
Subtractive	Additive ×2	C40—12	
Subtractive ×2	Additive ×2	C40—13	
Subtractive	Subtractive	C40—00	

### 3. Automatic Reset

The 7910's automatic reset (Auto-Reset) feature is ideal for applications requiring instantaneous reset of Counter-A and/or Counter-B upon reaching a preset limit.

The operating modes explained in Paragraph A include Auto-Reset functions per the mode descriptions. Instruction codes are provided that will remove the Auto-Reset function and allow counting to overrun the value of the final preset limit. (The Auto-Reset instruction does not apply to Mode 83.)

For easy programming of the Auto-Reset function, refer to the mode descriptions in Paragraph A. The following table further defines codes relating to this function:

Table 5-10. Auto Reset

CODE	Counter-A		Counter-B	
	Auto-Reset	Overrun	Auto-Reset	Overrun
	C64—2	C64—0	C65—3	C65—0

### 4. Output Methods (Not Applicable to Operating Mode 83)

The operating modes described in Paragraph A contain factory-set output methods. Modifying codes are also provided so that alternate output operations can be selected. The following output method instructions provide additional programming flexibility.

- a. Momentary Output Function: Output-1 and Output-2 may be programmed to operate for a momentary period of time, referred to as "hold time." A momentary output will be initiated when its associated limit function is achieved.

Output-1 hold time is entered in Code C2; Output-2 hold time is entered in Code C3. Refer to Table 5-11. Hold time may be programmed for durations of 0.05 to 10.00 seconds in increments of 0.05 seconds.

Time will automatically be rounded off to the nearest 0.05 second increment. Entry of 9.99 will provide 10 second duration.

EXAMPLE: Time entered in C2 or C3 of 1.27 will be rounded to 1.25; 1.28 will be rounded 1.30. Do not enter a hold time of less than 0.03 seconds.

- b. Latching Output: An output may be programmed to "latch" upon reaching its associated limit's function. The output will remain energized until released by a manual or remote reset command (or will release at power line interruption). Refer to Table 5-11.
- c. Alternating Output Function: The alternating output instruction is a specialized command which provides "flip-flop" operation of Output-1 and/or Output-2. When the counter limit associated with an "alternating" output is initially reached, the output will lock in and the counter will automatically reset (Auto-Reset instruction must be used). The next actuation of the limit will release the output to its original state. This operation will continue, providing alternate lock-in and release action of the output. Manual or remote reset will release the output. Refer to Table 5-11.
- d. Latch/Release Output Function: Output "latches" at the function of its associated preset limit. Output is released at the function of the **other** preset limit.

EXAMPLE: Preset Limit-1 function latches Output-1. Preset Limit-2 provides a momentary hold time of Output-2 and releases Output-1. Refer to Table 5-11.

- e. Momentary/Crop Output Function: Provides momentary hold time for Output-1 and/or Output-2, similar to "Momentary Output Function." Output **also actuates** for the same hold time upon a **manual or remote reset** command.

Table 5-11. Output Method Codes  
(Not Applicable to Operating Mode 83)

Output Function	Output-1		Output-2	
	Code C62	Code C2	Code C63	Code C3
Momentary	C62—3	C2—X.XX seconds	C63—3	C3—X.XX seconds
Latch	C62—0	C2—0.00	C63—0	C3—0.00
Alternating*	C62—2	C2—0.00	C63—2	C2—0.00
Latch/Release	C62—1	C2—0.00	C63—1	C2—0.00
Momentary/Crop	C62—2	C2—X.XX seconds	C63—2	C2—X.XX seconds

\*Automatic Reset Function Must Be Used.

### C. DECIMAL POINT SELECTION

Counter-A and Counter-B may be provided with individual placement of illuminated decimal points.

The decimal point placement does not affect actual counter scale factor which must be determined by input signal resolution and/or prescale factor.



**1. Setting Decimal Points**

- a. For the Counter-A decimal, access Code 51 and refer to the following table for the corresponding entry to program a decimal point in a desired location.

Table 5-12. Decimal Points

Decimal Position	Code Counter-A	Code Counter-B
XXXXXX (none)	C51—0	C52—0
XXXXX.X	C51—2	C52—2
XXXX.XX	C51—3	C52—3
XXX.XXX	C51—4	C52—4
XX.XXXX	C51—5	C52—5
X.XXXXX	C51—6	C52—6

- b. Press the CLEAR button. The display will show "C51--0".
- c. Use the numeric keyboard to enter the numeral selected from the above table. The display will show "C51--X" (X = the selected numeral).
- d. Press the ENTER button. The display will blink.
- e. For the Counter-B decimal, access Code 52 and repeat steps b - d.

**Note:** The decimal point will also show for limit(s) associated with the count register.

**D. PRESCALER FACTOR**

The Series 7910 contains separate prescaling factors for internal calibration of its two counting registers (Count-A, Count-B). The factors may be programmed to multiply values through the range of X0.0001 to X10.0 or 00.001 to 100.00.

Reference should be made to the block diagrams and description contained in Paragraph A, "Operating Modes," for the effect of the prescaler's operation for various program modes.

**Note:** Scaling factors are always in effect regardless of operating mode. Factors must be set to a value of X1.0000 for a direct 1:1 counting ratio.

Code 75 Selects the Prescale Factor Range:

- Code 75 = 0, Factor Range is 0.0001 to 9.9999 (0.0000 = 10)
- Code 75 = 1, Factor Range is 00.00 to 99.999 (00.00 = 100)

The ability to change both prescalers is restricted via security connection S-2. Factors may be accessed for viewing on the display without removing security by following step a and/or e, below.

**1. Entry of Prescale Factors**

- a. To access Scaler-A (associated with Count-A), press the CODE button, then enter " 0 ". The panel indicator located above "COUNT-A" will illuminate and a display of FX.XXXX (the existing factor in memory) will be provided.
- b. Press the CLEAR button. The display will show F0.0000.
- c. Use the numeric keyboard to enter the desired factor. EXAMPLE: For a factor of 1, press 1-0-0-0-0.
- d. Press the ENTER button. The display will blink.
- e. For access and entry of Scaler-B (associated with Count-B), press the CODE button, then " 1 ". The panel indicator above "COUNT-B" will illuminate and a display of FX.XXXX will be provided.
- f. Repeat Steps b - d.

**E. SECURITY**

Two rear connector inputs are provided as the means of protecting operating codes and preset entries from unauthorized or accidental change:

Connector Terminal 16: Security-1 (S-1) restricts change of Limit-1 and Limit-2 program and the front panel reset button if required.

Connector Terminal 15: Security-2 (S-2) restricts change of operating code program. Also restricts access to the 7910's "WRITE" feature.

At the completion of programming (Paragraphs A - D), it may be desirable to restrict access for changing programming codes by installing security connection S-2.

1. Connect the jumper wire or close the external switch contact as described in Section 4, Paragraph E.
2. Press any function button. Security is now activated.

**F. RESET SECURITY (Front Panel Only)**

The resetting of values in Count-A and -B registers via the front panel RESET button may be disabled. This is accomplished by entering the appropriate values in Codes 73 and 74 and connecting the Security-1 input to Common. A key switch may be used to make this connection providing access for authorized personnel.

Code 73 - Count-A Reset Enable

Code 74 - Count-B Reset Enable

Code Value:

0 - Disable front panel Reset button

1 - Enable front panel Reset button

**SECTION 6. OPERATION**

All operation of the Series 7910 is performed through one of front panel controls and remote commands.

**CAUTION: THE SERIES 7910 FRONT PANEL CONTROLS RESPOND TO LIGHT FINGER PRESSURE. PERMANENT DAMAGE MAY RESULT IF THE PANEL IS TOUCHED WITH A SHARP OBJECT.**

**Note:** The operating controls and remote commands described in this section function in accordance with the operating mode and other programming defined in Section 5. Refer to the program configuration to help define the operation of this product's controls and commands.

**A. INITIAL START-UP**

Precautions should be taken during initial start-up to confirm proper operation of the counter and its user-entered program to avoid personal injury or equipment damage.

**B. LIMIT ENTRY**

Preset values are entered in Limit-1 and Limit-2 using the following procedure:

1. Remove security connection S-1, if used.
2. Press the LIMIT-1 or LIMIT-2 button depending upon which limit value is to be entered. The existing preset limit will be displayed.
3. Press the CLEAR button. The display will show " 000000 ".
4. Using the numeric keyboard, enter the desired value.
5. Press the ENTER button. The display will blink.
6. Replace security connection S-1, if used. Press any function button to complete the security procedure.

**Note:** If the counter has been programmed to function in Mode 80, Limit-2 will function as a prewarn. In this case, the Limit-2 value will be displayed as "PXXXXX". Limit-2 will actuate Output-2 when the count reaches Limit-1 value minus Limit-2 value.

EXAMPLE: Limit-1 = 500  
Limit-2 = 20

When the count reaches 480, Output-2 will actuate.

**C. COUNT DISPLAY**

Front panel buttons are provided to display the counted value of the Count-A and Count-B registers. A decimal point will be displayed if programmed per the instructions in Section 5, Programming.

**D. RESET**

- Counter-A or Counter-B may be reset individually by first pressing the appropriate count button (COUNT-A or COUNT-B) and then pressing the RESET button. Note that reset security must be disabled. Outputs will respond to the reset command by releasing to their de-energized condition.

**Note:** Output will momentarily actuate at reset if the crop function is programmed (refer to Section 5, Programming).

- Remote reset commands are provided individually for Count-A and Count-B and function in a similar manner to the panel reset.

**E. SECURITY**

- Two rear connector inputs are provided as the means of protecting operating codes and preset entries from unauthorized or accidental change:

Connector Terminal 16: Security-1 (S-1) restricts change of Limit-1 and Limit-2 program. S-1 also disables the front panel reset if this feature is enabled.

Connector Terminal 15: Security-2 (S-2) restricts change of operating code program. Also restricts access to the 7910's "WRITE" feature.

- Security is activated when a connection (or switch contact) is made between security input(s) and common, followed by the pressing of any function button.

Security is deactivated when a connection is removed (or opened), switch followed by the pressing of any function button.

**F. PRESCALE FACTOR**

Refer to Section 5, Paragraph D, for entry of prescaling factor. Security connection S-2 must be removed for a prescale value entry.

**G. WRITE FEATURE**

The Series 7910's "WRITE" feature allows Count-A or Count-B registers to be directly set to any six-figure value.

This feature may be used to initialize the counter to a known "starting value" or to correct count data to compensate for production variables such as deletion of waste material (after inspection) from the total.

Access to the "WRITE" feature is normally restricted via security connection S-2. The following procedure describes the count correction operation:

- Remove security connection S-2, if used.
- Depending upon the register requiring correction, press the COUNT-A or COUNT-B button.
- Press the CLEAR button. The display will show "000000".
- Using the numeric keyboard, enter the corrected value.

- Press the ENTER button. The display will blink.
- Replace security connection S-2, if used. Press any function button to complete the security procedure.

**H. OFFSET MODE**

The Series 7910 can be programmed so that the Count-A register will reset to an offset count value other than a Limit or zero. When the Offset Mode has been enabled, the offset value is entered as described above for the "WRITE" feature. Upon actuation of a remote or the front panel reset, the Count-A register will reset to the offset value.

Code 55 - Offset Mode Select

Code 55 value:

- 0 - Offset Mode disabled. Counter resets to zero or a limit value.
- 1 - Counter resets to a positive offset.
- 3 - Counter resets to a value equal to 1,000,000 minus the offset value.

**WARNING: CHANGING FUNCTION CODE VALUES WHILE THE PROCESS IS OPERATING MAY BE HAZARDOUS TO THE OPERATOR AND/OR THE CONTROLLED EQUIPMENT. USE EXTREME CAUTION AND STOP THE PROCESS BEFORE ATTEMPTING TO MODIFY FUNCTION CODE VALUES.**

**CAUTION SHOULD BE OBSERVED IF IT IS NECESSARY TO CHANGE LIMIT VALUES WHILE THE PROCESS IS OPERATING. DO NOT SET LIMITS TO WHICH ARE ALREADY EXCEEDED BY THE COUNT VALUE WITHOUT RESETTING THE COUNT REGISTER.**

**I. POWER-UP DISPLAY SELECTION**

Code 56 will select which message or register will be displayed upon applying the AC power.

Table 5-13. Code 56 Value

Code 56 Value	Power-Up Display
C56—0 or 2	P-LOSS
C56—1	Count A
C56—3	Count B

**J. COUNTING BY EIGHTS**

Counter A can be configured so that the least significant digit will increment from 0 through 7 before advancing the next digit. This allows counting 1/8 units. Limits and prescaling would be programmed in eights also. Code 51 should be set to 2 so that a decimal point appears in the display to differentiate the eights digit from the whole number digits.

C76—0	Normal Counting
C76—1	Eights Counting

**SECTION 7. RS-422 DATA COMMUNICATIONS  
(Form Number 791006-210 Counters only)**

**A. INTRODUCTION**

The 7910's RS-422 data interface provides computer access to as many as 32 7910's on one bus. Each unit on the bus can be accessed individually and interrogated or programmed by the host computer. The host selects the unit to be interrogated or programmed by transmitting a two-digit address code within its "request" message. The 7910 that has been assigned that same address code will transmit a "response". All request and response messages are transmitted in ASCII code and follow a specific format. The host may request production information from a 7910's data registers or check the status

of and/or alter its programming. The host may also perform other miscellaneous functions such as resetting count registers.

### B. GETTING STARTED

The following procedure is a general approach to establish communications between a terminal or computer and a 7910.

1. Connect one 7910 to a computer or a terminal via the RS-422 interface Use the diagram in Figure 7-2 as a reference for wiring.
2. Set up the baud rate, parity and address as described in Section 7D. Select address 03 for this example.
3. Using a terminal or terminal emulation program, transmit the request message in Section 7E, Figure 7-3 to the 7910. Refer to the Error Codes in Section 7G to help establish communication. Note that if the 7910 detects a parity error, a response message will not be sent.
4. The correct response message from the 7910 will be similar to the message shown in Figure 7-4. At this point, all of the data codes should be evaluated for their response format. Note that this data is in computer format and does not include spaces, line feeds or carriage returns. It is the responsibility of the host system programmer to sort or rearrange the received data to suit the application.
5. Once communication is established, custom application software can be developed.

**CAUTION: IT IS NOT ADVISABLE TO CHANGE APPLICATION PARAMETERS OR SET UP FUNCTIONS VIA THE TOUCH PANEL OR THE RS-422 INTERFACE WHILE THE 7910 IS CONTROLLING A PROCESS. DOING SO COULD RESULT IN DAMAGE TO EQUIPMENT OR INJURY TO PERSONNEL.**

**COMMERCIALLY AVAILABLE COMPUTER PROGRAMS.** Consult Veeder-Root for information regarding suppliers of ready-made software for data logging systems using the Series 7910. This may be an alternative to writing your own program.

### C. SYSTEM WIRING

Use multiple twisted-pair cable with separate shields for each pair. Connect all shields to Com at one end of the cable or cable segment only. Do not connect Com to Earth or Machine Ground.

**Important: Do not run the data cable with cables carrying high or line-level voltages.**

+ SERIAL OUT	- SERIAL OUT	COMMON	+ 15 VOLTS	OUTPUT 4	OUTPUT 3	OUTPUT 2	OUTPUT 1	- SERIAL IN	+ SERIAL IN	STOP COUNT	TRANSMIT	B RESET IN	A RESET IN	SECURITY 2	SECURITY 1	B COUNT IN	A COUNT IN	COMMON
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

Figure 7-1. Terminal Assignments.

RS-422 Serial Interface connections are made to terminals 1, 2, 9 and 10. Common connections are made to terminals 3 or 19.

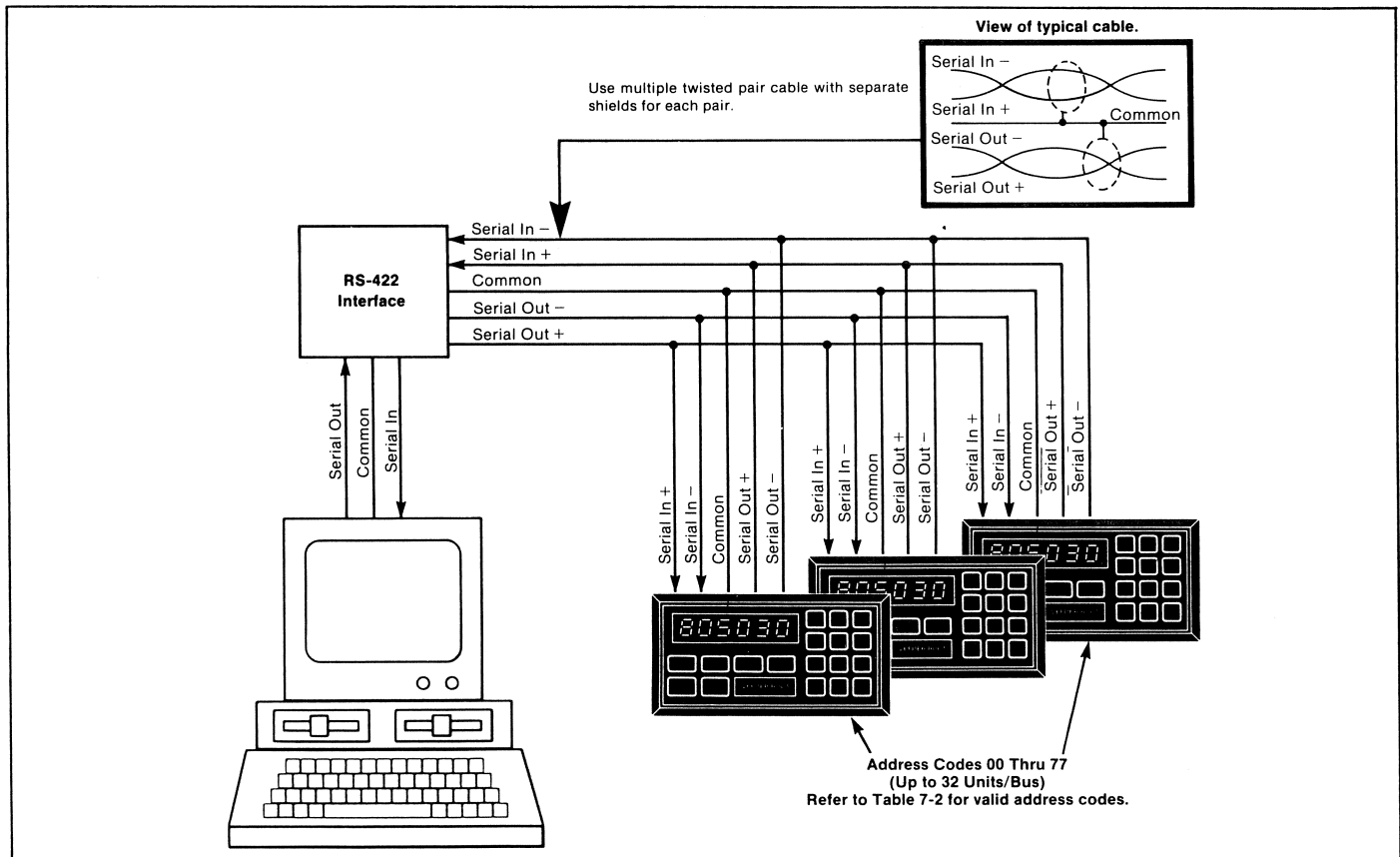


Figure 7-2. System Diagram

**D. BAUD RATE AND ADDRESS SELECTION**

**DESCRIPTION**

To establish communications between a 7910 and a computer or terminal, both devices must be set up with the same baud rate and parity configuration. Also note that each 7910 that is connected to the RS-422 data bus must be assigned a different two-digit address code. This is so the host can differentiate which 7910 will respond to a specific request message. Refer to the computer or terminal technical manual for information concerning configuration and interfacing. Additional software may also be required.

Table 7-1. Baud Rate Selection

Baud Rate	Character Rate	Code
110 Bits/Sec.	10 Char./Sec.	67—0
300 Bits/Sec.	30 Char./Sec.	67—1
*1200 Bits/Sec.	120 Char./Sec.	67—2
2400 Bits/Sec.	240 Char./Sec.	67—3

\*Factory set Baud Rate

**ADDRESS CODE**

Enter a 2-digit address into codes 53 and 54 from Table 7-2. The MSD of the address is entered into Code 53 and the LSD of the address is entered into Code 54. Do not assign the same address to more than one unit on the same bus.

Table 7-2. Valid Addresses

00	10	20	30	40	50	60	70
01	11	21	31	41	51	61	71
02	12	22	32	42	52	62	72
03	13	23	33	43	53	63	73
04	14	24	34	44	54	64	74
05	15	25	35	45	55	65	75
06	16	26	36	46	56	66	76
07	17	27	37	47	57	67	77

**PARITY**

The 7910 recognizes even parity only.

**E. SERIAL FORMAT**

**DESCRIPTION**

All data is standard eight-bit ASCII consisting of seven bits plus an eighth bit for parity. The baud rate is selectable from the front panel keyboard.

To accommodate multiple devices sharing a common line, the counter has a programmable address code. This code can be accessed via the keyboard or the serial interface.

All message transfers are initiated by a request from the host computer and completed by a response from the 7910. Multiple requests cannot be processed simultaneously. It is the responsibility of the host to wait at least 500 milliseconds after completing a request before assuming that the message was not received correctly.

**REQUEST MESSAGE PROTOCOL**

1. SOH (01H) — Unconditional start of message character. Valid anytime except while a response is in progress.
2. Two-digit address code. (See Table 7-2)
3. Two-digit data code.
4. Data field if required.
5. Two character hex checksum (00 - FF) which represents the negative of the sum of all data including the start character up to the character preceding the first checksum character. Parity bits are excluded from the checksum calculation.
6. ETX (03H) — Terminator character.

Checksum calculation for Figure 7-3 example:

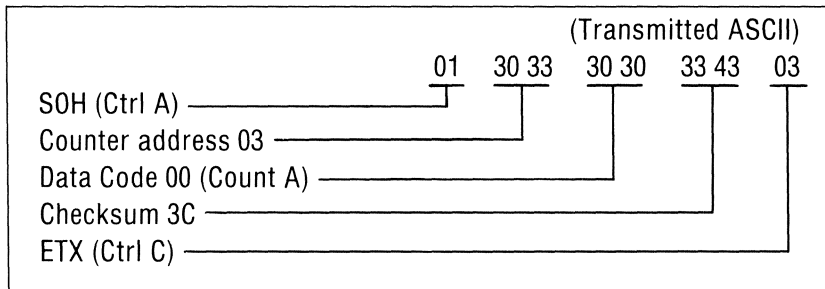


Figure 7-3. Example Request Message

```

01
30
33
30
+ 30
-----
C4      Hex Addition
11000100  Converted to Binary
00111011  Inversion
-----
+1
00111100  Twos compliment checksum result
3 C      Converted to Hex
    
```

**RESPONSE MESSAGE PROTOCOL**

1. STX (02H) Start character.
2. Two-digit data code.
3. Data field if required.
4. Two-digit hex checksum.
5. ETX Terminator.

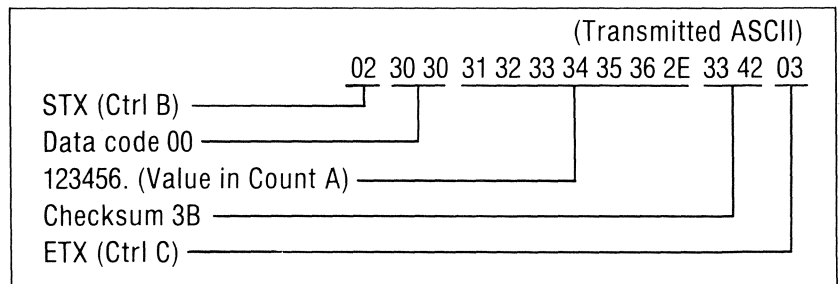


Figure 7-4. Example Response Message



**F. DATA CODES**

**GENERAL**

The two-digit data codes that are transmitted within the request and response messages are used to identify the information which is being transferred. They are shown as being the fourth and fifth characters transmitted in Figure 7-3. They are also shown in Figure 7-4 as being the second and third character transmitted.

The data codes are listed in the three categories shown below.

The data fields are shown as < xxx . . . > and are transmitted after the data codes when required.

Code/Data Field < xxx . . . >	Description	
00	Counter-A	Read the value of each display.
01	Counter-B	The response message will include a decimal point.
00 <xxxxxx>	Counter-A	Load the value of each display.
01 <xxxxxx>	Counter-B	The six digit value of the count register is transmitted without a decimal point.

Figure 7-5. Process Values

Code/Data Field < xxx . . . >	Description	
20	Limit-1	Read the value of each Limit. The response message will include a decimal point.
21	Limit-2	
20 <xxxxxx>	Limit-1	Load the value of each limit. The six digit value of the Limit is transmitted without a decimal point. This function should not be implemented while the process is in operation.
21 <xxxxxx>	Limit-2	
08	Inputs -A & -B	Enable count inputs.
09	Inputs -A & -B	Disable count inputs. Note that codes 08 and 09 operate in conjunction with each other.
90	Reset Counter-A	Equivalent to a front panel or remote reset function.
91	Reset Counter-B	
99	Initialization	Equivalent to a power up restart of the unit. This should be performed after changing of operating mode or configuration codes.

Figure 7-6. Application/Reset Functions

**CONFIGURATION CODES:**

**Important.** Please note that after changing the configuration of the unit via the serial interface, initialization code 99 should be transmitted in order to make the changes effective. Also note that it is not recommended to make any configuration or limit changes while the process being controlled is in operation.

Code/Data Field < xxx . . . >	Description	
10	Scaler-A	Read the value of each prescaler. The response message will include a decimal point.
11	Scaler-B	
10 <xxxxx>	Scaler-A	Load the value of each prescaler. The 5-digit value of the prescaler is transmitted without a decimal point. This function should not be implemented while the process is in operation.
11 <xxxxx>	Scaler-B	
30	Output-1 Hold Time	Read the increment factor of each output hold time. The value received in the response message is multiplied by 50 milliseconds to obtain the time value that an output will be active. Note that a factor of 000 indicates a latched output.
31	Output-2 Hold Time	
30 <xxx>	Output-1 Hold Time	Load the increment factor of each output hold time. A 3-digit value is transmitted to the 7910 which when multiplied by 50 milliseconds will equal the time value that an output will remain active.
31 <xxx>	Output-2 Hold Time	
8 <x>	Modes 80 thru 85	Load one of the standard operating programs.

Figure 7-7.



**CONFIGURATION CODES (Continued):**

The following configuration codes in Figure 7-8 are identical to the codes that are enterable via the 7910's front panel keyboard. The options for each of these codes are listed throughout the manual.

Code/Data Field < xx >		Description	Reference
Read	Load		
40	40 <XX>	Count Input Method	Table 5-8 and 5-9
41 42	41 <XX> 42 <XX>	Input Filtration Channel-A Input Filtration Channel-B	Table 5-7 Table 5-7
50	50 <X>	Preset Control	Table 5-2 and 5-3
51 52	51 <X> 52 <X>	Counter "A" Decimal Point Counter "B" Decimal Point	Table 5-12 Table 5-12
61	61 <X>	Count Input Active Edge	Table 5-8
62 63	62 <X> 63 <X>	Output 1 Method Output 2 Method	Table 5-11 Table 5-11
64 65	64 <X> 65 <X>	Counter "A" Auto Reset Counter "B" Auto Reset	Table 5-10 Table 5-10
73 74	73 <X> 74 <X>	Counter "A" Reset Security Counter "B" Reset Security	Section 5-F Section 5-F
53 54	53 <X> 54 <X>	Address Code MSD Address Code LSD	Table 7-2 Table 7-2
67	67 <X>	Baud Rate	Table 7-1
55	55 <X>	Offset Mode Enable	Section 6-H
56	56 <X>	Power-Up Display Selection	Section 6-I
75	75 <X>	Prescaler Decimal Places	Section 6-D
76	76 <X>	Counter "A" In Eighths	Section 6-J

Figure 7-8. < x . > — Data Field

**G. ERROR CODES**

All received data is thoroughly checked for errors. If a parity error is detected all data received since and including the last SOH start character is purged and no response will be sent. To avoid serial bus conflicts, no response is sent unless a valid start character and the proper address code is received.

To aid in the development of application software certain syntax errors will result in responses containing special Error Data Codes.

Error Code	Description
Z0	Message too short to be valid.
Z1	Checksum error.
Z2	Invalid function code.
Z4	Excess data in the data field.
Z5	Insufficient data in the data field.
Z6	Invalid data in the data field.

Figure 7-9.

All valid requests will result in a response. Functions which write data receive the same response as the corresponding read function.

**H. ASCII CODE SYSTEM AND CHARACTER SET**

b <sub>4</sub> b <sub>3</sub> b <sub>2</sub> b <sub>1</sub>	b <sub>7</sub> b <sub>6</sub> b <sub>5</sub>	0 0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
0 0 0 0		NUL	DLE	SP	0	@	P		p
0 0 0 1		SOH	DC1	!	1	A	Q	a	q
0 0 1 0		STX	DC2	"	2	B	R	b	r
0 0 1 1		ETX	DC3	#	3	C	S	c	s
0 1 0 0		EOT	DC4	\$	4	D	T	d	t
0 1 0 1		ENQ	NAK	%	5	E	U	e	u
0 1 1 0		ACK	SYN	&	6	F	V	f	v
0 1 1 1		BEL	ETB	'	7	G	W	g	w
1 0 0 0		BS	CAN	(	8	H	X	h	x
1 0 0 1		HT	EM	)	9	I	Y	i	y
1 0 1 0		LF	SUB	*	:	J	Z	j	z
1 0 1 1		VT	ESC	+	;	K	[	k	{
1 1 0 0		FF	FS	,	<	L	\	l	
1 1 0 1		CR	GS	-	=	M	]	m	}
1 1 1 0		SO	RS	.	>	N	^	n	~
1 1 1 1		SI	US	/	?	O	—	o	DEL

Figure 7-10.



**SECTION 8. RS-232 DATA COMMUNICATIONS**  
(Form Number 791006-220 Counters Only)

**A. INTRODUCTION**

All information that can be viewed or entered from the Series 7910's front panel may be transmitted or received via the RS-232 serial data interface.

This capability allows count values, preset values and even function codes to be accessed by a remote printer, terminal, or computer. In the case of a terminal or computer, the data may be modified and transmitted to the counter such as in changing preset limits, resetting count registers, or mass-loading the function code program.

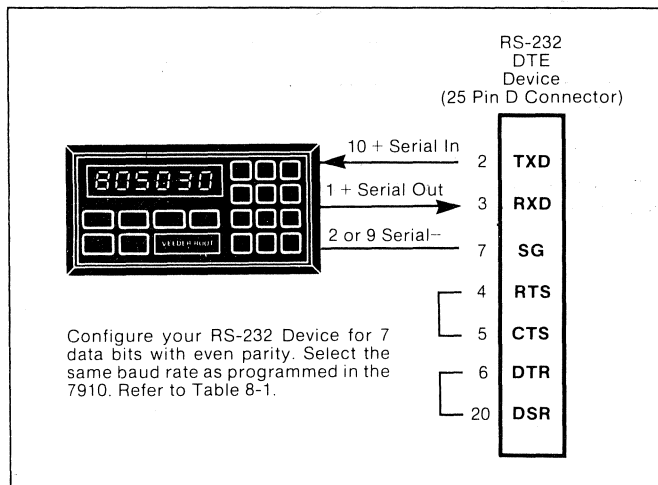


Figure 8-1. System Wiring.

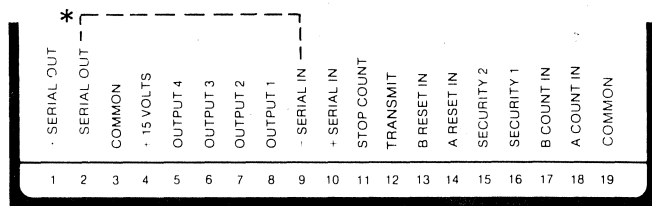


Figure 8-2. Terminal Assignments.

**B. DATA FORMAT**

With serial communications, data is transmitted (and received) as a sequence of pulses called "bits". Eight bits are required for each character, of which seven bits specify the character identity, and the eighth bit is used for error detection by "even parity" check. The Least Significant Bit (LSB) is transmitted first.

The bits must be transmitted at a rate that matches with the receiving device. This transmission rate is defined as bits-per-second, commonly known as "baud". The 7910 has programmable baud rates of 110, 300, 1200, and 2400, which are compatible with many terminals, printers, and computers. See Table 8-1 for programming codes.

Along with the eight data bits, the transmission also includes additional bits to help synchronize the receiving device. These are a start bit which denotes the beginning of the eight bit character, and a stop bit that marks the completion of the character transmission (two stop bits are sent when operating at 110 baud). See Figure 8-3.

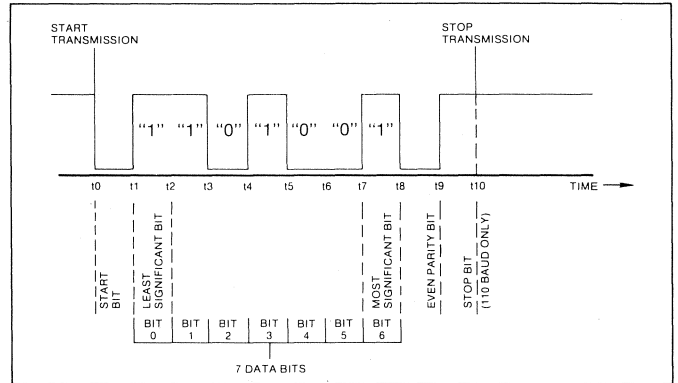


Figure 8-3. Transmission of Typical Character

The net effect of the data, parity, start and stop bits is to produce actual character transmission rates as follows:

Table 8-1. Baud Rate Programming

Baud Rate	Character Rate	Code
110 Bits/Sec.	10 Char./Sec.	67--0
300 Bits/Sec.	30 Char./Sec.	67--1
*1200 Bits/Sec.	120 Char./Sec.	67--2
2400 Bits/Sec.	240 Char./Sec.	67--3

\*Factory set Baud Rate.

**C. DATA CODE**

The character set used by the Series 7910 for communication of data is the **American Standard Code for Information Interchange** or ASCII. An ASCII reference chart is shown in Section 7-H of this manual.

ASCII code contains full alphanumeric characters plus symbols. The Series 7910 uses all numerical characters for data and some alphabetical and symbol characters for command functions. Table 8-2 defines the function of these characters.

**D. TRANSMITTING DATA**

Data transmission on the "Data-Out" communications port can be initiated by one of three methods:

- 1. Transmit Command:** A "transmit" input is provided on Terminal 12. The transmit command is generated when the input is connected to "Common". The data that is transmitted upon receipt of the transmit command is programmable using code C68. Refer to Table 8-3 for possible selections.
- 2. Print Upon Reset:** Data may be transmitted upon Reset-A, Reset-B, or both. Choice is made per Table 8-4. Also refer to Table 8-3 for selection of transmitted data.
- 3. Request by Serial Data:** Data will be transmitted upon receipt of a specific "command character" on the data-in communications port. Table 8-2 lists the alphabetical and symbol characters that can initiate transmission of specific data.



Table 8-2. Command Characters

Command	ASCII Character
Count-A	A
Count-B	B
Limit-1	L
Limit-2	M
Code	C
Reset	R
Clear	*
Enter	Carriage Return
Count Disable	D
Count Enable	E

Table 8-3. Print Format

Combination Printouts C53—0	Code C68
Do Not Print	C68—0
Print Counter A & B Only	C68—1
Print Limits 1 & 2 Only	C68—2
Print Counters & Limits	C68—3
Single Line Printouts C53—1	Code C68
Print Count-A Only Via Transmit Input	C68—0
Print Count-B Only Via Transmit Input	C68—1
Print Count-A Upon Reset-A and Count-B Upon Reset-B when the Transmit Command Input is connected to Common. Print will not occur if the Transmit Command Input is disconnected from Common. <b>Note:</b> Refer to Table 8-4 for Print on Reset Options.	C68—3

Table 8-4. Print On Reset Format

Format	Code C69
Do Not Print On Reset	C69—0
Print On Reset-A Only	C69—1
Print On Reset-B Only	C69—2
Print On Reset-A Or Reset-B	C69—3

A transmission will consist of the following character sequence:

- a. If initiated by a "print command" or "reset", the sequence is:
  1. "Carriage Return"
  2. 3 "Null" characters
  3. "Line Feed"
  4. 3 "Null" characters
  5. 10 label characters (including spaces) such as LIMIT 1 =, COUNT B =, OP. CODE =, etc.
  6. 8 value characters including one leading space and one decimal point (two spaces if no decimal point)
  7. "Carriage Return"
  8. 3 "Null" characters
  9. "Line Feed"
  10. 3 "Null" characters

- b. If initiated by "Request by Serial Data":  
Transmission is identical to previous description except the first "carriage return" is preceded by an "echo" of the character received on data-in communications port.

Two data-groups are provided for transmission of multiple data items upon receipt of a single command character (refer to Table 8-5):

Table 8-5. Data Group Commands

Data Group	ASCII Character
Counter-A and Counter-B, Limit-1 and Limit-2	?
Function Code Listing	X or Y

1. Counter-A and Counter-B, Limit-1 and Limit-2
2. Complete Function Code Listing

### E. MODIFICATION OF VALUES THROUGH SERIAL DATA

The data-in communication port may be used to change values of limits, count totals, prescalers, or function codes.

**WARNING: CHANGING FUNCTION CODE VALUES WHILE THE PROCESS IS OPERATING MAY BE HAZARDOUS TO THE OPERATOR AND/OR THE CONTROLLED EQUIPMENT. USE EXTREME CAUTION AND STOP THE PROCESS BEFORE ATTEMPTING TO MODIFY FUNCTION CODE VALUES.**

**CAUTION SHOULD BE OBSERVED IF IT IS NECESSARY TO CHANGE LIMIT VALUES WHILE THE PROCESS IS OPERATING. DO NOT SET LIMITS TO VALUES WHICH ARE ALREADY EXCEEDED BY THE COUNT VALUE WITHOUT RESETTING THE COUNT REGISTER.**

To accomplish entry or modification of values, the following sequence must be transmitted to the serial data-in communications port.

1. Request desired data register by transmitting alpha or symbol character per Table 8-2.
2. Await completion of return transmission of requested data.
3. Transmit "clear" character; i.e., ASCII "\*" symbol. Await return echo of character.
4. Transmit value to be entered or modified. Await echo to be returned after each character.
5. Transmit "enter" character; i.e., ASCII "carriage return".
  - a. Example: To change value of Limit-1:
    1. Transmit "L" (Limit-1).
    2. Transmit "\*" (Clear).
    3. Transmit up to six digit value (MSD first); therefore, 2580 = 2-5-8-0.
    4. Transmit "carriage return".

To reset Count-A or Count-B register:

1. Transmit "A" (Count-A) or "B" (Count-B) to access desired register.
2. Transmit "R" (Reset).

## SECTION 9. MAINTENANCE

### A. PERIODIC MAINTENANCE

Establish regular intervals for inspection. Periods should be based on operating time and environmental conditions.

Inspect:

1. Security of counter on mounting surface.
2. All leads and connectors. No looseness, chafing or wear is acceptable.
3. Proper operation of all control functions.

**WARNING: DISCONNECT MAIN POWER BEFORE ATTEMPTING ANY SERVICING OF THE COUNTER.**

### B. RELAY REPLACEMENT

If necessary, the relays in the 7910 may be easily replaced in the field. Veeder-Root P/N 576004-054 replacement relay should be used for this purpose. The procedure for relay replacement is as follows:

1. Access the rear of the counter. Remove the screw located in the center of the rear panel.
2. Slide the relay cover (see Figure 9-1) through the slot to expose the relay to be replaced (Relay K-1 for Output-1, left side; Relay K-2 for Output-2, right side).
3. Grasp the relay to be removed and rock gently while pulling from the socket (see Figure 9-2).
4. Plug the replacement relay into the socket. Note the alignment of the threaded locating screw.
5. Replace the relay cover and secure with the screw.

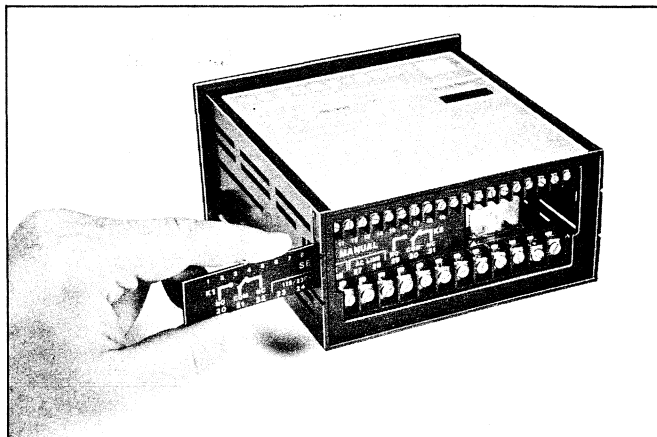


Figure 9-1. Removing the Relay Cover.

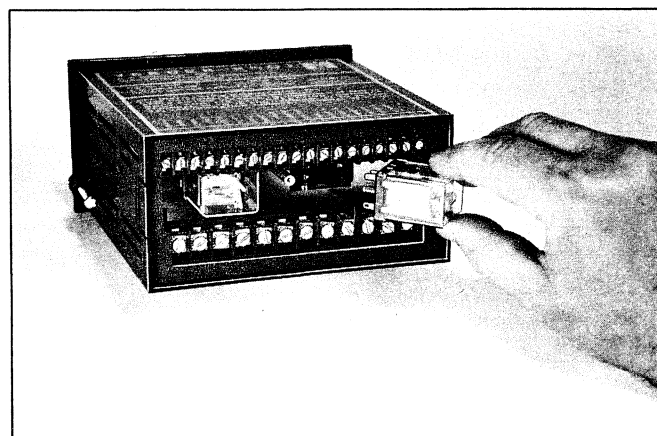


Figure 9-2. Removing the Relay.

### C. REPAIR

Other than relay replacement NO attempt to repair the counter should be made by the user. The compact design of the counter, made possible by the use of integrated circuits and other solid state devices, makes special knowledge and unique test equipment essential if serious damage to the electronic circuits is to be avoided. We, therefore, recommend that the counter be returned to the factory for repair or adjustment.

### D. DIAGNOSTICS

#### 1. Troubleshooting

Before returning the counter for repair, it may be helpful to refer to the following table for analysis of common user correctable problems:

Problem	Possible Solution
Display Does Not Illuminate	<ol style="list-style-type: none"> <li>1. Power supply not connected.</li> <li>2. External in-line fuse failure.</li> </ol>
Unit Does Not Count	<ol style="list-style-type: none"> <li>1. External sensor failed or incorrectly wired.</li> <li>2. Check external sensor adjustment or alignment.</li> <li>3. Confirm operating mode and program (Section 5) are correct for application.</li> </ol>
Unit Counts, But Incorrectly	<ol style="list-style-type: none"> <li>1. Check external sensor adjustment or alignment.</li> <li>2. Confirm operating mode and program (Section 5) are correct for application.</li> <li>3. Electrical transient interference. Check shielding and grounding practice per Section 4, Paragraphs C and E.</li> </ol>
Outputs Do Not Operate	<ol style="list-style-type: none"> <li>1. Check preset limits for proper value (see Section 6, Paragraph B).</li> <li>2. Check wiring related to outputs (see Section 4, Paragraph E).</li> <li>3. Confirm operating mode and program are correct for application (see Section 5, Paragraph B).</li> <li>4. Internal relay (K-1, K-2) failure. Replace if necessary (see Paragraph B, this section).</li> </ol>



**2. Automatic Diagnostics**

**CAUTION:** Count input and control output functions are inoperative during the test period. Stop process during diagnostic routine.

The 7910 incorporates an automatic program that will confirm proper operation in the following manner:

- a. Provide a visual test of all display segments and numerals.
- b. Check sum of internal EPROM.
- c. NOVRAM write/read test.
- d. RAM write/read test.

**Note:** Performance of the automatic diagnostic test does not affect the user-entered program.

The procedure for initiating the automatic diagnostic routine is:

- a. Press the CODE button, then "99". The display should read "C99-C1".
- b. Press the CLEAR button. The display should read "C99-C0".
- c. Press the ENTER button. The display should blink and the test should begin.
- d. Observe the LED display and confirm operation of all segments and numerals as the sequence progresses.
- e. Continue to observe the display until the message "7910-X" appears (the digit represented by X is the current factory software revision level). This indicates a pass condition for all tests.
- f. The message "FAIL-X" indicates automatic diagnostics test failure. The digit represented by the X provides information regarding the failure:

- 1 = check sum failure
- 2 = NOVRAM failure
- 4 = RAM failure

A counter that fails the automatic diagnostics test should be returned to the factory for service.

**3. Power Loss Message**

Display of the message "P-LOSS" indicates the occurrence of a power-line interruption of significant duration to possibly affect counting performance. The message may be removed from the display by pressing any function button such as "COUNT-A". Normal counting and control operation is maintained during presence of the message.

Repeated occurrence of the "P-LOSS" message suggests a serious problem with the power-line supplied to the Series 7910. Appropriate corrective action should be taken.

**E. SPARE PARTS**

The following replaceable parts may be ordered from Veeder-Root, if necessary.

Description	Part Number
Relay	576004-054
Relay Cover	328289-001
Mounting Hardware and Gasket	616451-001
Installation, Operating and Programming Manual	576013-709

**F. SHIPMENT**

If the counter must be returned to a Veeder-Root authorized electronic service center or factory for repair, perform the following steps:

1. Explain, in writing, the nature of the problem as accurately as possible. List the person(s) to be contacted in the event communication is required.
2. Place the letter along with the counter in its original packing material and container, or suitable substitutes.
3. Place in an overwrap box. Address to the nearest authorized Electronic Service Center or:

Service Department  
VEEDER-ROOT LTD.  
Kilspindie Road  
Dundee DD2 3QJ  
SCOTLAND  
Tel: 44-382 833033  
Telex: 76146  
FAX: 44-382 832382

Service Department  
VEEDER-ROOT  
COMPANY  
125 Power Forest Drive  
P.O. Box 2003  
Simsbury, CT 06070-2003  
Tel: (203) 651-2700  
Telex: 277844 VROOT UR  
FAX: (203) 651-2750

Service Department  
VEEDER-ROOT  
(Australia) PTY LTD.  
82 Herald Street  
Cheltenham, Victoria 3192  
AUSTRALIA  
Tel: 61 (3) 584-3800  
FAX: 61 (3) 583-8450

Service Department  
VEEDER-ROOT  
OF CANADA LTD.  
26 Fieldway Road  
Etobicoke, Ontario M8Z 3L2  
CANADA  
Tel: (416) 239-3094  
FAX: (416) 239-2653

4. All shipments must be prepaid.

**SECTION 10. CLAIMS AND WARRANTY**

**A. DAMAGE CLAIMS**

1. Thoroughly examine all components and units as soon as received. If damaged, write on the face of the freight bill a complete and detailed description of the damage. Have the carrier's agent sign the description.

**Note:** Insist that the carrier's agent verify the inspection and sign the description.

2. Immediately notify the delivering carrier of damage or loss. This notification may be given either in person or by telephone. Written confirmation must be mailed within 48 hours. Railroads and motor carriers are understandably reluctant to make adjustments for damaged merchandise unless inspected and reported promptly.
3. Risk of loss of, or damage to merchandise remains with the Buyer. It is the Buyer's responsibility to file a claim with the carrier involved.
4. Immediately advise your Veeder-Root representative, distributor, or the factory so that we may assist you.

**B. WARRANTY AND CONDITIONS**

1. **WARRANTY.** We warrant that our products shall be free from defects in material and workmanship for a period of one year from the date of shipment thereof or the product's total rated life, whichever first occurs. Within the warranty period we shall repair or replace such products which are returned to us with shipping charges prepaid and which are determined by us to be defective. This warranty will not apply to any product which has been subjected to misuse, negligence, or accident; or misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.



## Installation, Operation and Programming Manual Series 7910 Electronic Predetermining Counter

2. **INSPECTION.** You shall inspect the product promptly after receipt and shall notify us at our Simsbury office, in writing, of any claims, including claims of breach of warranty, within thirty days after you discover or should have discovered the facts upon which the claim is based. Your failure to give written notice of a claim within the time period shall be deemed to be a waiver of such claim.
3. **LIMITATION OF REMEDY AND WARRANTY.** The provisions of Paragraph 1 are our sole obligation and exclude all other remedies or warranties, express or implied, including warranties of **MERCHANTABILITY** and **FITNESS FOR A PARTICULAR PURPOSE**, whether or not purposes or specifications are described herein. We further disclaim any responsibility whatsoever to you or to any other person for injury to person or damage to or loss of property or value caused by any product which has been subjected to misuse, negligence, or accident; misapplied; or used in violation of product manuals, instructions or warnings; or modified or repaired by unauthorized persons; or improperly installed.
4. **LIMITATION OF DAMAGES.** Under no circumstances shall we be liable for any incidental, consequential or special damages, losses or expenses arising from this contract or its performance or in connection with the use of, or inability to use, this product for any purpose whatsoever.
5. **LIMITATION OF ACTIONS.** No action regardless of form arising out of this contract may be commenced more than one year after the cause of action has accrued, except an action for nonpayment.
6. **COLLATERAL PROMISES.** There are no representations, warranties, or conditions express or implied, statutory or otherwise except those herein contained, and no agreements or waivers collateral hereto shall be binding on either party unless in writing and signed by you and accepted by us at our Simsbury office.
7. **INTERPRETATION.** Rights and liabilities arising out of any contract with us shall be determined under the Uniform Commercial Code as enacted in Connecticut.

Warranty revised November 1, 1990



**VEEDER-ROOT**  
Digital Products



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