S.J. Controls, Inc.

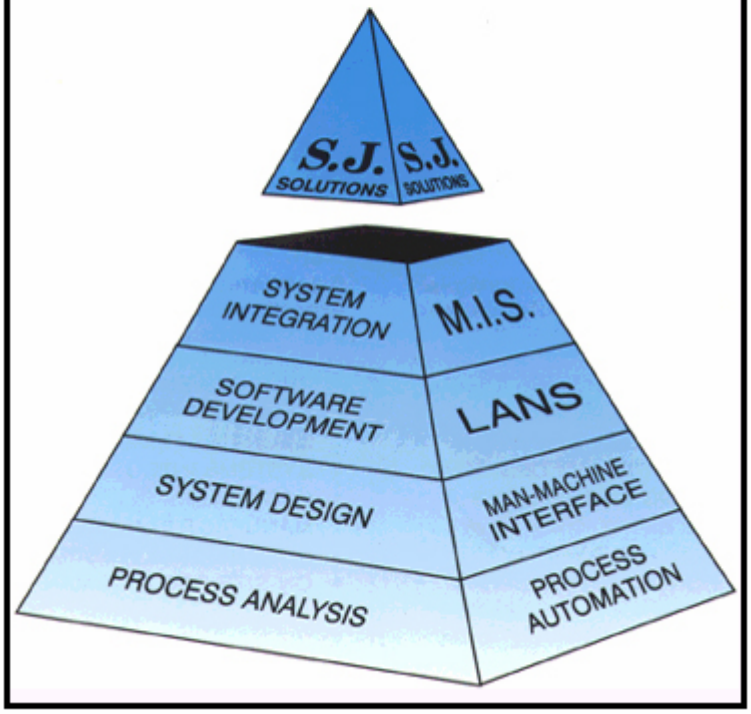
# EBU INSTRUCTION MANUAL

## EBU SERIES

## ELECTRONIC BATCHING UNIT

S.J. Controls, Inc.

PROCESS SYSTEMS SOLUTIONS




# Electronic Batching Unit
# Instruction Manual

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# 1. INTRODUCTION AND SPECIFICATIONS

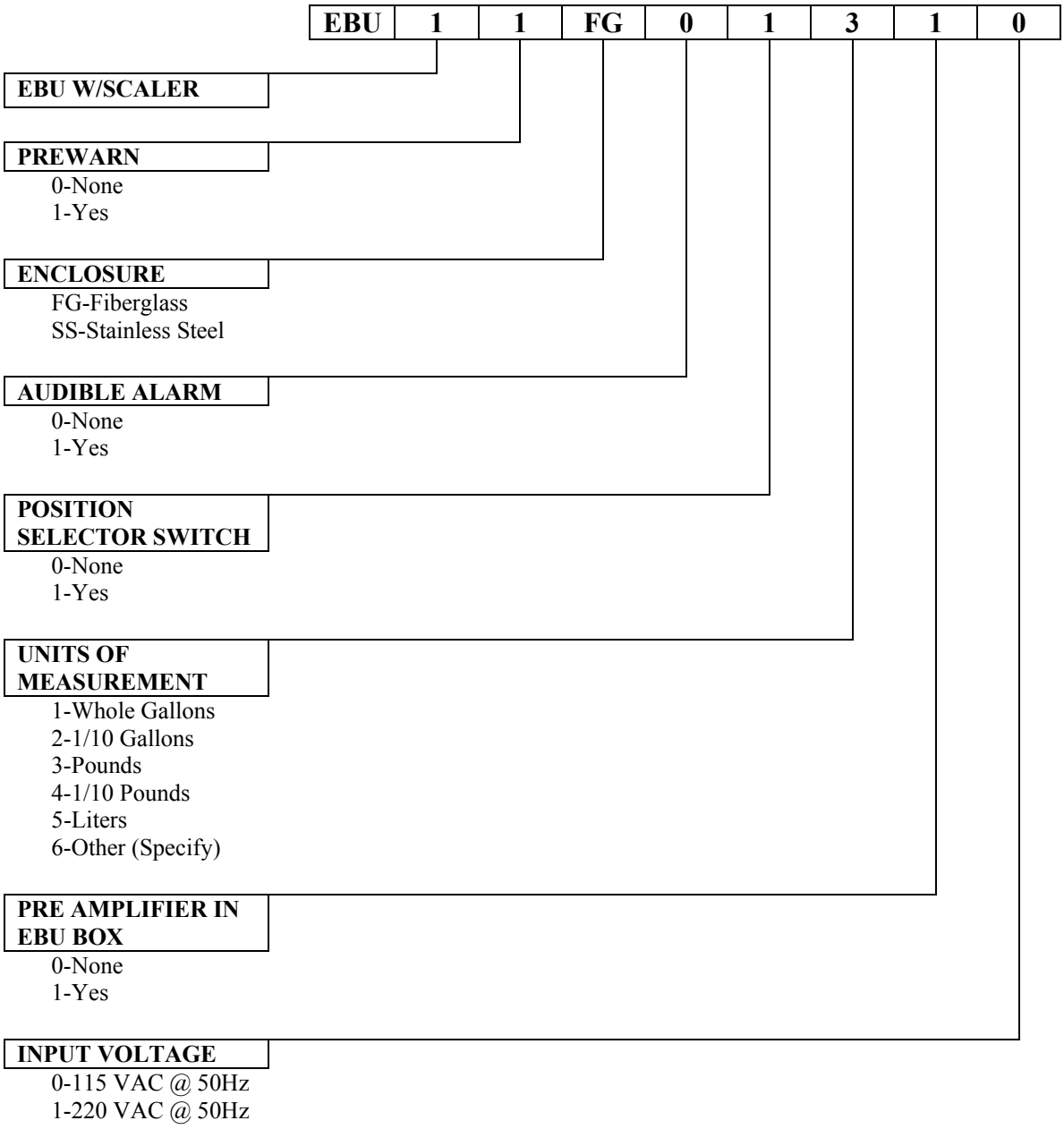
## 1.1 Introduction

The S.J. Controls EBU (Electronic Batching Unit) is a solid state predetermining batch control system. It is equipped with a 5-digit preset, a 5-digit LED display and a 6-digit totalizer (electromechanical non-reset). When the EBU is reset the preset amount is transferred to the LED display and the control relay is energized. In the field a flow element sends digital pulses to the EBU, where they are filtered, scaled if required, and then processed. The processed pulses are then used to decrement the LED display (counts down) and are also divided by 10 and used to increment the totalizer (counts up). When the EBU reaches the floating zero set point the control relay is released.

Standard features include component failure alarm, over-run indicator, battery back-up with indicator, floating zero and membrane switching all provided in one of two splash-proof enclosures.

The EBU is designed for batch control in areas where accidental splashing or hose-down may occur. We do not recommend hosing down any electrical equipment.

## 1.2 Model Number




Example: **EBU - 1 1 – FG – 0 1 – 3 1 0**

The above part number consists of the following features:
EBU with Scaler, Prewarn=Yes, Enclosure=Fiberglass, Audible Alarm=No, Position Selector Switch=Yes, Units of Measurement=Pounds, Pre Amplifier in EBU Box=Yes, Input Voltage=115 VAC @ 50Hz

## 1.3 Specifications

| | |
|---|---|
| **Power Source:** | 120 VAC standard (240 VAC optional) ± 10%<br>50/60 Hz 50W |
| **Flow Signal Input From:** | Reed pulsers, photoelectric pulsers, magnetic and proximity sensors (some electronic sensors may require pre-amplification). System requires a square wave input with pulse registered at Logic "O." |
| **Output Power to Sensor:** | +15 VDC |
| **Pulse Input Frequency:** | DC to 7000 Hz. Contact bounce filter adjustable for maximum inputs of: 5 Hz, 375 Hz, 3200 Hz and 7000 Hz. |
| **Control Outputs:** | Single stage ─ DPDT contacts, two stage ─ additional DPDT contacts. Contacts are rated at 5 amps no inductive. Contacts are fused at 5 amps. |
| **Operating Temperature:** | 0° F to 130° F |

# 2. EBU COMPONENT FUNCTIONS

## 2.1 In This Section


| | Section |
|---|---|
| • LED Display | **2.2** |
| • Preset Switches | **2.3** |
| • Floating Zero | **2.4** |
| • Prewarn | **2.5** |
| • Totalizer | **2.6** |
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| • Rotary Switch | **2.16** |
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## 2.2 LED Display

5-digit display which resets to the preset amount and counts down to zero. When the display reaches zero it will begin counting up to give the operator an indication of exactly how much product was batched. The decimal point can be changed via switch S8.

**a)** No switches on = 00000 (no decimal point)
**b)** Switch 8-1 on = 0000.0
**c)** Switch 8-2 on = 000.00
**d)** Switch 8-3 on = 00.000

**Note:** Only one switch should be on at a time.

## 2.3 Preset Switches

Five rotary type code switches used to select the batch amount. Switches have black knobs with switches to the right of the decimal point having red knobs. If a field change of the decimal point is required please call factory for replacement knobs. Changing the switch setting once the batch has been started will have no effect on batch size. The preset amount is loaded into the memory when the EBU is reset.

## 2.4 Floating Zero

Is used to compensate for the amount of product over-run due to the time it takes for a valve to close.

## 2.5 Prewarn

Is used to slow down the system's flow rate prior to final shut-off. Floating zero and prewarn cannot be supplied together.

## 2.6 Totalizer

Is a 6-digit electromechanical counter capable of operating at a maximum count speed of 600 counts per minute. The standard totalizer runs at 1/10 the count speed of the LED display. This can be adjusted from 1/10 to 1/10000 (see Switch S18 Instructions on next page). Care should be taken to ensure that the totalizer is not run at a speed higher than 600 counts per minute, or it will not function correctly.

## 2.7 Pre-Amp

Used to convert signals from a magnetic pick-up to a signal useable by the EBU.

## 2.8 Emergency Stop & Run Switches

These are used to stop and restart a batch cycle. When the EBU is restarted it will continue counting from where it was stopped. In the stop mode relays CR1 and CR2 will be released.

## 2.9 Reset Start Switch

Is used to start a batch. Once the EBU has been reset the reset start switch is electronically locked out until the batch is completed. To clear the EBU the power switch will have to be turned off and a new batch started. For the relay to energize upon reset the emergency stop switch must be in the "run" position.

## 2.10 Battery Power Indicator

Will be illuminated when the main power fails and the EBU power switch is on. It indicates that the system's memory is being retained on battery power. The battery will hold the memory for approximately one hour. Complete recharge time is 48 hours. The main power to the EBU should not be turned off unless the EBU power switch is off. This is done to prevent the battery from being discharged.

## 2.11 Over-Run Indicator

Is illuminated to show that the EBU has reached zero and has begun to count up.

## 2.12 Component Failure Alarm

Monitors the EBU and the flow element and alarms at these flow conditions: no flow, low flow rate, and over-flow. Can be set to release control relays CR1 and CR2 if an alarm condition exists (see Switch S18 Instructions, Section 2.19).

## 2.13 Scaler

Scales the incoming pulse signals from the flow element to any desired engineering unit (i.e., pounds, 1/10 gallons, liters, etc.). Pulses are first multiplied by either 1, 10, 100 or 1000 and then divided by any number from 1 to 9999. The field adjustable scaler enables most systems to be adjusted to within .1%.

## 2.14 CR1 Relay

This relay is energized during the batch cycle. DPDT contacts are provided for customer use. These contacts are fused at 5 amps, and the 5-amp rating should not be exceeded or damage to the printed circuit board may occur. The contacts are brought out at TS1. CR1 is released when the LED counter counts down to the floating zero set point.

## 2.15 CR2 Relay

This relay is supplied with the prewarn option. DPDT contacts are provided for customer use. These contacts are fused at 5 amps, and the 5-amp rating should not be exceeded or damage to the printed circuit board may occur. The contacts are brought out at TS1. It is energized when the LED counter counts down to the prewarn set point and released at zero.

## 2.16 Rotary Switch

This is used to select one of ten valves through which to batch. The outputs are 120 VAC – 5 amps at TS2.

## 2.17 Contact Bounce Filter

This filter is used to clean up or filter incoming pulses from the flow element. Filter should be set to the maximum clean-up for the application. The filter network limits the pulse input frequency that the EBU will accept. Adjust switch S11 for your specific application.

**Maximum Frequency Input Examples**

| Frequency | Switch 11 (S11) | Application |
|---|---|---|
| 7000 Hz | All Down | High Speed Encoder |
| 3200 Hz | 1 Up, 2,3 Down | Turbine Meters |
| 375 Hz | 2 Up, 1,3 Down | PD Meters & Reed Type Pulsers |
| 5 Hz | 3 Up, 1,2 Down | Air Actuated Diaphragm Pumps |

If S11 is set for too little clean-up, contact bounce from pulser may enter EBU as extra pulses, giving an inaccurate batch. If S11 is set for too much clean-up the bounce filter will lock up when the maximum frequency input is exceeded, giving no-flow registration and an inaccurate batch. For example, if the flow element is a 100 GPM maximum meter with a 100-pulse-per-gallon pulser, to compute maximum frequency input:

$$\frac{\mathbf{100}\text{GPM} \times \mathbf{100}\text{PPG}}{\mathbf{60}\text{Hz}} = \mathbf{166\ Hz}$$ S11 should be set with #2 up/on, (D,U,D)

**Note:** Only one switch should be on at a time.

## 2.18 Enclosure

The EBU comes standard in a fiberglass enclosure (NEMA 4, 4X). A stainless steel enclosure (NEMA 4, 4X) is also available as an alternate option.

**Fiberglass Enclosure**

**Stainless Steel Enclosure**

## 2.19 Switch S18

Is a 4-pole dip switch. Switch positions 1 and 2 are used to set the totalizer divider network.

| Switch No. 1 | Switch No. 2 | Divide by |
|---|---|---|
| OFF | OFF | 10 |
| ON | OFF | 100 |
| OFF | ON | 1000 |
| ON | ON | 10000 |

The component failure alarm over-flow counter uses the totalizer signals if switch S17 is in the “up” position.

Switch No. 3 will disable the component failure alarm system if in the “on” position.

Switch No. 4, if in the “on” position, will release the CR1 and CR2 control relays during an alarm condition, thus stopping the batch process. To restart, push the emergency “STOP” button and then the “RUN” button.

# 3. INSTALLATION, START-UP AND OPERATING INSTRUCTIONS

## 3.1 In This Section


| | Section |
|---|---|
| • Special Installation – Notes and Precautions | **3.2** |
| • Wiring and Installation – Instructions | **3.3** |
| • Start-Up and Operating Instructions | **3.4** |
| • Scaler Instructions | **3.5** |
| • Floating Zero | **3.6** |
| • Prewarn (Optional) | **3.7** |
| • Component Failure Alarm Instructions | **3.8** |
| • Field Test for EBU | **3.9** |
| • Troubleshooting Notes | **3.10** |


## 3.2 Special Installation – Notes and Precautions

1. Mount control box intelligently, away from steam or high humidity areas. Avoid areas where rapid temperature changes will occur. Condensation will occur in these areas. Avoid excessive vibration.
2. When installing conduit holes the circuit boards must be protected from damage. When drilling the enclosure, know what you are drilling into and keep metal chips off the P.C. boards
3. It is recommended that all conduit be brought in from the sides or bottom of the box. The right side and bottom are recommended, as the terminal strips are located to the right and bottom of the circuit board. Conduit brought into the top greatly increases the possibility of water being introduced into the control box. (Water damage due to carelessness will void warranty)
4. Do not use the control box for a pull box for any outside wiring
5. Observe all local electrical codes. If control box is non-metallic (fiberglass) observe grounding requirements for non-metallic enclosures
6. Know the maximum load that you are going to switch through the relay. An excessive load will damage the circuit board. External power relays may be required.
7. All wires from the pulser, remote reset start switch and the emergency stop switch must be run in their own conduit. These wires should not be run with high voltage power lines. Shielded cable is recommended

If questions should arise on any of these notes, please consult the factory for proper installation assistance.

## 3.3 Wiring and Installation – Instructions

1. Mount unit in acceptable area. See section 3.2 of Special Installation-Notes and Precautions.
2. Install necessary conduit knock-outs. See section 3.2 of Special Installation-Notes and Precautions

3. Bring power into control box and terminate to terminals 1, 2 and 3 of TS1.
4. Bring in pulse signal wires from flow meter or pulser located at pump. For standard contact closure type pulsers, see drawing EBU-3; for turbine meter preamps, see drawing EBU-4.
5. Bring control lines from valves as necessary (see drawings EBU-8 to EBU-13). Observe contact ratings.
6. Bring pump control lines in from pump starter (see drawing EBU-8). Observe contact ratings.
7. Install remote switch, if required. Be sure, if remote switch is used, to remove jumper between terminals 2 and 3 of TS3 (see drawing EBU-3).
8. Please feel free to contact the factory for wiring of special valves or pumps, or any other problems that may arise.

## 3.4 Start-Up and Operating Instructions

1. Before introducing power to the batch system, check to see that all connections are tight and made to the proper terminals. Turn main power on.
2. Push the power "On" switch and a red indicator will light, showing the power is on.
3. Select a test amount on the preset switches. Push the emergency stop "Stop" switch. Push the reset start switch. The amount selected on the preset will now be shown on the LED display. Push the emergency stop "Run" switch to run the batch. The red batching indicator will light, showing that the CR1 relay has been energized, thus opening the valve and starting the pump. As flow begins, the LED counter will count down from the set point to zero, at which time the batching indicator light will go off, the relay will be released, the pump will shut off, and the valve will close.
4. If the system is supplied with a scaler, all adjustments will be made in the control box (see scaler instructions); otherwise calibration will be made at the flow element. Set the EBU with a quantity to be run into a test tank that can be weighed or measured accurately. Run a batch and determine the error between the amount on the LED preset plus the amount of over-run, if any, and the amount in the test tank. Set new scaler setting. Run a second test. Amount on EBU preset plus the amount of over-run and amount in test tank should be the same. If not, set new scaler setting. If tests do not repeat, check plumbing, valving, and metering systems for design problems. If tests are correct and repeat, set the amount of over-run on the floating zero switches (S6, S7; see floating zero instructions, Section 3.6).
5. If two-stage shut-down is utilized, see prewarn instructions for proper switches to set. Setting should give the system time to slow flow rate down before final shut-off. This is done to prevent line shock. If line shock is still present, adjust valve to throttle further. If two-stage option is utilized, floating zero compensation will not be available.
6. The emergency stop switches are used to pause during a batching cycle. Pushing the emergency stop "Stop" switch will release the relays, thus shutting valve and turning off the pump as necessary. After the emergency condition is over, pushing the "Run" switch will start the batch from where it was stopped. If the

operator determines that he has set an incorrect amount to be batched and has already pushed the reset start switch, he must push the emergency stop "Stop" switch. When the system stops, it will be necessary to note how much has already been batched and how much more is required, then push the power "Off" switch to erase the memory in the EBU. Push the power "On" switch and set the necessary amount on the preset to finish the batch. Push the reset start switch and the emergency stop "Run" switch to complete the batch. If an emergency stop is utilized while in prewarn (two-stage closure) the emergency stop switch must be left off for approximately 20 seconds, or the valve might not re-open.

7. The reset start switch is used to start a pre-selected batch. Once the batch has been started, the reset button and the preset switches are electronically locked out. This prevents erroneous or double batching.

## 3.5 Scaler Instructions

The S.J. Controls optional scaler consists of multiplication and division circuitry. Switch S12 controls multiplication. Switch S12 consists of four individual switches. Only one of the four should be on at a time. Should two or more be on, the scaler will give an incorrect output. When the first switch is on there is no multiplication of the incoming pulse. When the second is on, each incoming pulse is multiplied by 10. When the third is on, each incoming pulse is multiplied by 100, and when the fourth is on, each incoming pulse is multiplied by 1000.

Switches S13, S14, S15 and S16 do the division. Each switch can be set at any number between 0 and 9. Switch S13 divides by thousands, S14 by hundreds, S15 by tens and S16 by units. If switches S13 through S16 are set at 1110 and switch S12 is set at position 4, each incoming pulse will be multiplied by 1000 and divided by 1110. Consequently each time one pulse is put in the scaler, 0.9009 pulses will be put out by the scaler.

Basically the scaler is nothing but an electronic gear train. Increasing or decreasing the setting on a scaler is similar to increasing or decreasing the number of teeth on gears.

In this particular setup each time a pulse goes into the board it is multiplied by 1000 and divided by 1110. In a gear train this would be the same as a 1000-tooth gear driving an 1110-tooth gear. If the meter is 1% in error and is under-registering (i.e., giving product away), it is necessary to increase the speed of the counter by 1%. Therefore the divisor is decreased 1% or from 1110 to 1099. The multiplier remains constant at 1000.

The following formula is useful to determine a new scaler setting once meter error has been established (scaler setting is another name for divisor setting):

$$\frac{\text{EXISTING SCALER SETTING} \times \text{(PRESET AMOUNT + OVER-RUN)}}{\text{AMOUNT THAT ACTUALLY FLOWED}}$$

For example: Exactly 99.5 gallons were deposited in a vat or prover, but the batch system indicates 100.0 gallons was delivered. The scaler setting was 4236. The scaler setting should be changed to (4236 x 100.0) / 99.5 or 4257 to correct for meter error.

## 3.6 Floating Zero

All standard control boxes have two digits of floating zero (switches S6 and S7). In liquid metering applications floating zero is necessary since it takes time for a valve to close, and during that time a quantity of liquid will be batched, greater than set on the EBU. For any liquid at any one flow rate that quantity is constant and the amount can be dialed into the floating zero circuitry of the controls. From then on the valve will close sooner to accommodate that amount of over-run.

The floating zero switches S6 and S7 correspond with the first two digits of the LED counter, with S7 being the least significant digit. The CR1 relay is energized at the beginning of the batch and is released when the LED counts down to the floating zero set point. If the EBU is operating in 1/10 gallons the maximum floating zero setting will be 9.9 gallons.

Suppose that it is desired to batch exactly 100 pounds of water into a kettle. 100 is set on the EBU and the start switch is pushed. The controls receive one electrical pulse from the flow meter for each pound of water that goes into the kettle, and once it counts 100 pulses it releases the solenoid that holds the valve open, allowing the valve to close. During the time that it takes the valve to close, three additional pounds of water go into the kettle, giving a batch of 103 pounds when only 100 pounds was set into the controls. The over-run will be shown on the EBU's LED display when the over-run indicator is on. To prevent this from happening in the future, it is necessary to dial 3 on switch S7 and 0 on S6. From then on the valve will start closing 3 pounds short of the quantity set in the preset.

This feature can also be used instead of two-stage closure (or prewarn) to prevent water hammer (or shock) in the piping, caused by the valve closing too rapidly. A needle valve or orifice can be placed on the controls of the valve to slow the closure of the valve, eliminating most of the shock. This slow closure will increase, considerably, the amount of liquid going into the kettle. The floating zero feature will compensate for this overage so that the amount batched into the kettle will always be that set on the control box.

The batch size must be larger than the floating zero set point or the EBU will release the CR1 relay at zero.

## 3.7 Prewarn (Optional)

Usually with flow rates over 50 GPM (20 GPM in the case of water and some other thin liquids) line shock or water hammer due to valve closure can be eliminated using a slow-closure valve and the floating zero feature. For higher capacities a two-stage closure valve is necessary. This valve opens on a start signal from the EBU. A prewarn signal from the control unit partially closes the valve to throttle the flow sufficiently to prevent line shock on final closure of the valve.

Prewarn is available as an optional feature and can easily be field adjusted or set. When the prewarn option is utilized the floating zero function is eliminated. Switches S6 and S7 will now be used to adjust the prewarn set point. Switches S6 and S7 correspond with the first and second digits of the LED display. This means that an EBU operating in 1/10 gallons will have a maximum prewarn setting of 9.9 gallons. S7 is the least significant digit. When the prewarn option is utilized the CR2 control relay is installed. CR2 is energized when the LED display reaches the prewarn set point. For example, assume a 100.0 count batch is set on the EBU and 53 is set on switches S6 and S7 respectively. When the EBU is reset the CR1 relay will energize. When the LED counter counts down to 0005.3 the CR2 relay will be energized. Both relays will be released when the LED shows zero. **The batch size must be higher than the prewarn setting or the CR2 relay will not operate**.

Some prewarn valve operators require a delay time be built into the EBU to prevent CR1 and CR2 from energizing at the same time when the system is restarted from an emergency stop condition. If the EBU is stopped while in prewarn it will be necessary to wait 20 seconds prior to restarting to ensure correct operation of the valve.

## 3.8 Component Failure Alarm Instructions

The component failure alarm is a safety feature that alarms under three of conditions.

1. **Flow Indication Alarm**
   The system alarms if there is flow going through the meter after the batching operation when there should be no flow. A good example of this would be if the valve controlling the size of the batch leaked or failed, the meter would continue turning and would send electrical pulses to the batch system. The system then activates the alarm light and buzzer. Since an extra pulse or two might not be critical and could be caused by variations of the system, an alarm set point is incorporated in the system which inhibits the alarm until a predetermined number (up to 9) of extra pulses are received by the system. This number is variable and can be dialed into the controls by the operator by changing the number on switch number S-9. If a scaler is utilized the component failure alarm system receives pulses after they are scaled. This alarm can be silenced by pushing the alarm reset switch. This will clear only an over-flow type alarm condition. If switch S17 is changed to the up position the alarm over-flow counter will receive pulses from the totalizer divider circuit.

The totalizer divider circuit is normally set to divide by 10; however, it can be changed to divide by 100, 1000, or 10000 via switch S18.

2. **No Pulses Detected by Flow Element Alarm**
   The second alarm operates if the meter is not sending pulses to the system when it should be. A good example of this would be if a turbine or positive displacement meter becomes jammed and will not turn over, but flow continues through the meter without being metered. The system activates the alarm light and buzzer while it is not receiving pulses from the meter and the controls are in batching mode.

3. **Low Flow Alarm**
   The last alarm is at low flow. This alarm pulsates each time a pulse is received from the meter when the flow rate through the meter is below a field adjustable predetermined rate of flow. Unless otherwise directed the EBU is factory set to alarm if the time between pulses going to the LED display is longer than 2.5 seconds. The flow rate at which the alarm is actuated can be changed by turning the potentiometer screw P1 either clockwise for alarm at a higher flow rate or counter-clockwise to have the system alarm at a lower flow rate. The minimum alarm time setting is about ½ second between counts. The maximum alarm time setting is 13 seconds between counts before the alarm sounds.

## 3.9 Field Test for EBU

The S.J. Controls EBU batch controller can be quickly tested to ensure proper operation. Follow these steps to test system.

1. Turn power on to the system.
2. Push "Stop" switch of emergency stop (this is to keep the relay (CR1) from energizing during test).
3. Set 100 on the preset.
4. Push reset start switch (the LED display will show 00100).
5. Open enclosure and put run/test switch (S10) in test position to generate a flow signal.
6. Watch LED display. It should count down from 100 to zero. At zero the LED display will begin counting up and you will see the over-run indicator is now lit. When you reach the component failure alarm set point you will get an alarm condition indicated by light and buzzer. This can be cleared by pushing the alarm reset switch.
7. This test shows that the batch system is loading the preset amount, counting down to zero, setting the over-run indicator, and energizing the over-flow alarm system correctly.

8. Switch S10 is connected to a pulse generator operating at 3600 pulses per minute. You can test the optional scaler by:
   1. Pushing power "off" then power "on" to clear the display.
   2. Push the test switch S10 for 1 minute.

3. Read the amount on the LED display. You can stop the over-flow alarm by pushing the alarm reset switch.
4. The amount on the LED equals:

$$\frac{\textbf{3600} \times \textbf{MULTIPLIER SETTING}}{\textbf{DIVIDER SETTING}}$$

**Example**
Multiplier Setting = 1000
Divider Setting = 3714

$$\frac{\textbf{3600} \times \textbf{1000}}{\textbf{3714}} = \textbf{1053}$$ on the LED Display

**Note:** The test amount may be off by a little due to the speed at which S10 is pushed and released. Set switch S10 back to the run position.

## 3.10 Troubleshooting Notes

The S.J. Controls EBU that you have is a solid state device utilizing CMOS & PMOS logic. This device has been bench tested at least 72 hours to hold the number of in-field failures to a minimum. 98% of the failures of this type logic occur in the first 72 hours of use.

**1)** Check switches for audible signal when pushed.
**2)** Power light won't light:
   a) Check power to control box.
   b) Check wiring harness between P.C. boards.
**3)** Unit won't reset/start:
   a) Check preset for all zeros
   b) Check remote cable and emergency stop switch. Remote emergency stop switch should be on.
   c) Check emergency stop switch on panel; it should be on to run the batch, but the display should reset to preset amount.
   d) If remote switch is not used, check to see that a jumper is installed between terminals 2 and 3 of TS3
**4)** Unit won't shut off at preset amount:
   a) Push power "On" switch. Push emergency stop "Stop" switch. Set a test amount on preset. Push reset start switch. The LED display should show amount on preset switches.
   b) Check to see if batch light goes off at end of batch. If it does, then check relay contacts for overload damage.
   c) Check to see if valve is closing.

**5)** Unit won't count:
   a) Check pulser terminations
   b) Check multiplier.
   c) Check for flow through the meter.
   d) Check for closed valves.

e) Push test switch S10. When the switch is pushed electrically generated input pulses are sent to the board. The LED will show these pulses and sound the alarm, indicating an over-flow alarm condition.

**6)** System is not accurate at start-up:
   a) Check test procedure (is weight per gallon correct, is scale accurate).
   b) Check valve, pump, plumbing, and metering system.
   c) Check to see if error is within the limits set by pump or meter manufacturer.

**7)** System becomes inaccurate after use:
   a) Check for pump or meter wear.
   b) Check for product change.
   c) Check plumbing system for changes.
   d) Check to see if error is consistent and not too excessive; if yes, recalibrate system.

**8)** After running these tests you may require factory assistance to solve your problems. Please contact S.J. Controls service department.

# 4. BILL OF MATERIALS

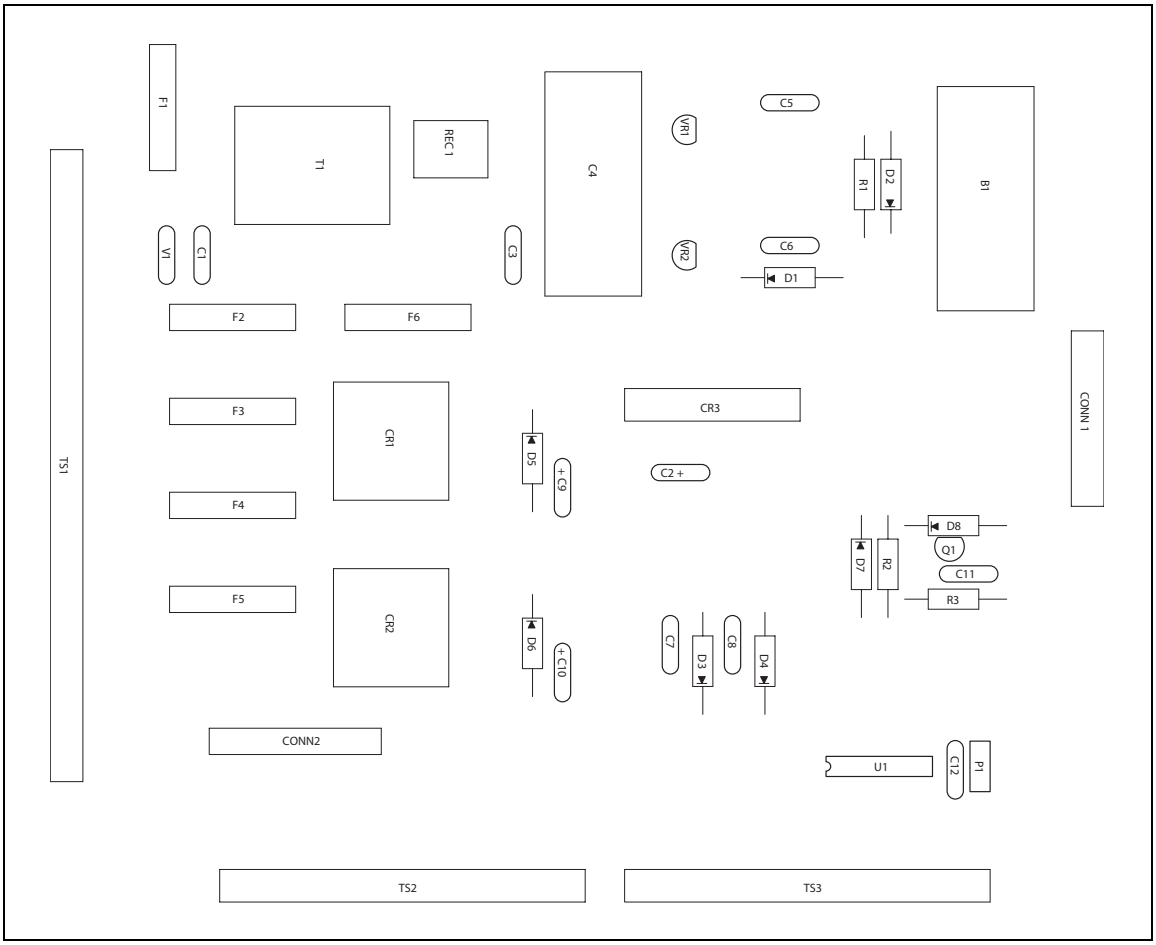
## 4.1 In This Section


| | Section |
|---|---|
| • Bill of Materials - EBU Power Supply/Relay PC Board | **4.2** |
| • EBU Power Supply/Relay PC Board Component Layout | **4.3** |
| • EBU Power Supply/Relay PC Board Electrical Diagram | **4.4** |
| • EBU Power Supply/Relay PC Board Front View | **4.5** |
| • Bill of Materials - EBU Control Logic PC Board | **4.6** |
| • EBU Control Logic PC Board Component Layout | **4.7** |
| • EBU Control Logic PC Board Electrical Diagram | **4.8** |
| • EBU Control Logic PC Board Front View | **4.9** |
| • EBU Control Logic PC Board Rear View | **4.10** |

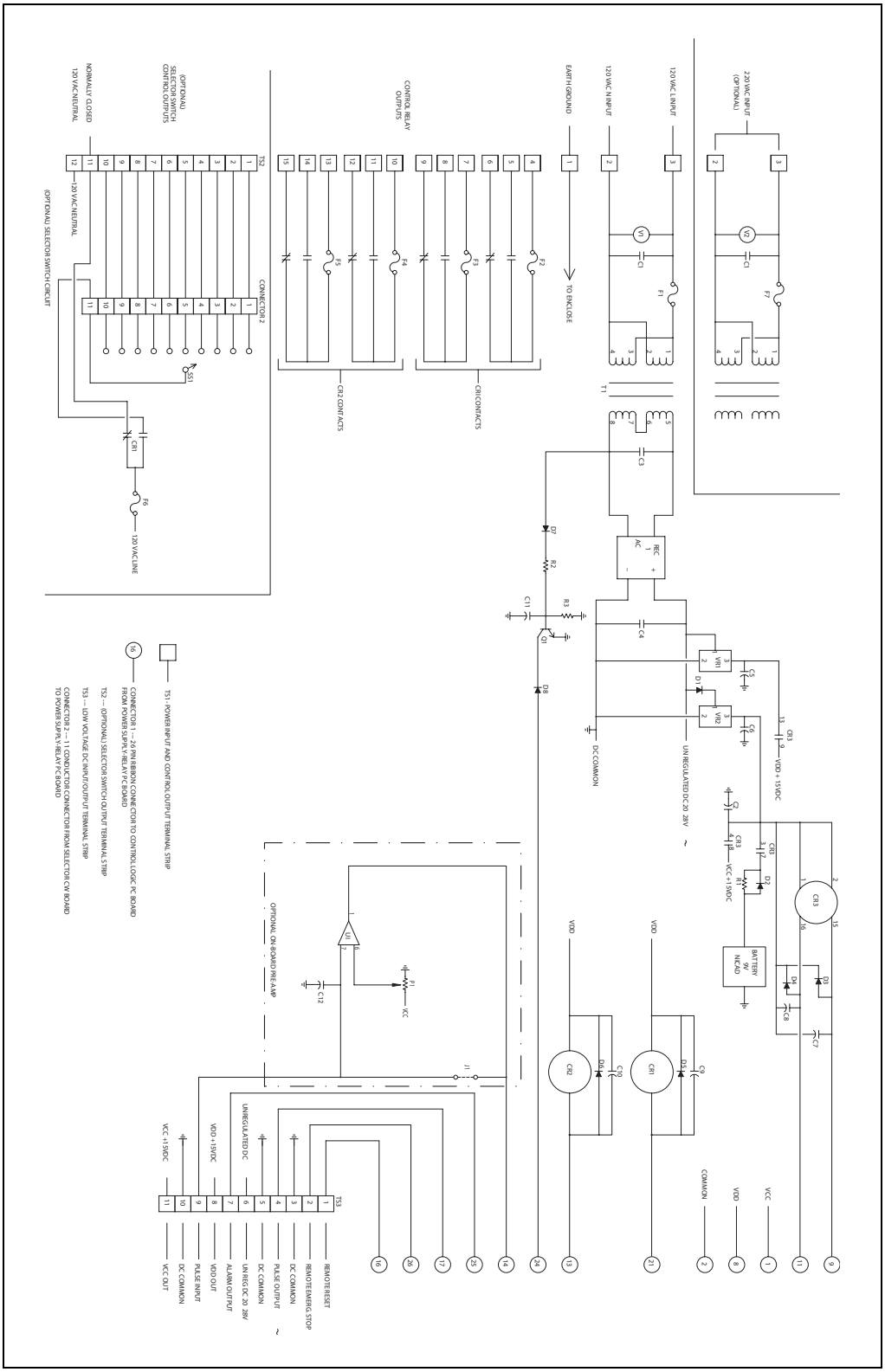
## 4.2 Bill of Materials - EBU Power Supply/Relay PC Board

| Ref No. | Description | S.J. Part Number |
|---|---|---|
| T1 | TRANSFORMER | 5100-T4-0005 |
| V1 | VARISTOR, 120V | 6900-P9-0005 |
| C1 | CAPACITOR .01µF @ 1KV | 6900-C2-0075 |
| C2 | CAPACITOR 10µF @ 25V | 6900-C2-0050 |
| C3 | CAPACITOR .1µF @ 50V | 6900-C2-0040 |
| C4 | CAPACITOR 2000µF @ 50V | 6900-C2-0070 |
| C5, C6, C7, C8 | CAPACITOR .1µF @ 25V | 6900-C2-0040 |
| C9, C10 | CAPACITOR 100µF @ 25V | 6900-C2-0060 |
| Q1 | TRANSISTOR | 6900-T3-0005 |
| F1 (120 only) | FUSE 6/10 AMP | 6900-F1-0030 |
| F2, F3, F4, F5, F6 | FUSE 5 AMP | 6900-F1-0035 |
| FUSE HOLDERS (6) | | 6900-F1-0060 |
| D1-D8 | DIODE | 6900-D1-0005 |
| VR1, VR2 | VOLTAGE REGULATOR, +15VDC | 6900-V5-0010 |
| REC1 | DIODE | 6900-D1-0010 |
| R1 | RESISTOR, 3K, ¼ WATT | 6900-R1-0060 |
| R2 | RESISTOR, 10K, ¼ WATT | 6900-R1-0085 |
| R3 | RESISTOR, 100K, ¼ WATT | 6900-R1-0105 |
| CR1, CR2 | RELAY, TPDT | 6900-R2-0055 |
| CR3 | RELAY, DPDT | 6900-R2-0080 |
| RELAY SOCKETS | FOR CR1 & CR2 | 6900-R2-0010 |
| DIP SOCKETS | FOR CR3 | 6900-M2-0010 |
| CONN1 | 26 PIN RIBBON CABLE CONNECTOR | 6900-C3-0120 |
| B1 | 9V NICAD BATTERY | 5100-B3-0010 |
| BATTERY HOLDER | | 5100-B3-0005 |
| HOLD DOWN SPRINGS | FOR CR1 & CR2 | 6900-R2-0005 |
| TS1 | TERMINAL STRIP | 6900-T1-0080 |
| TS3 | TERMINAL STRIP | 6900-T1-0085 |
| EBU-PS/R-5 | PC BOARD | 5100-P8-0010 |

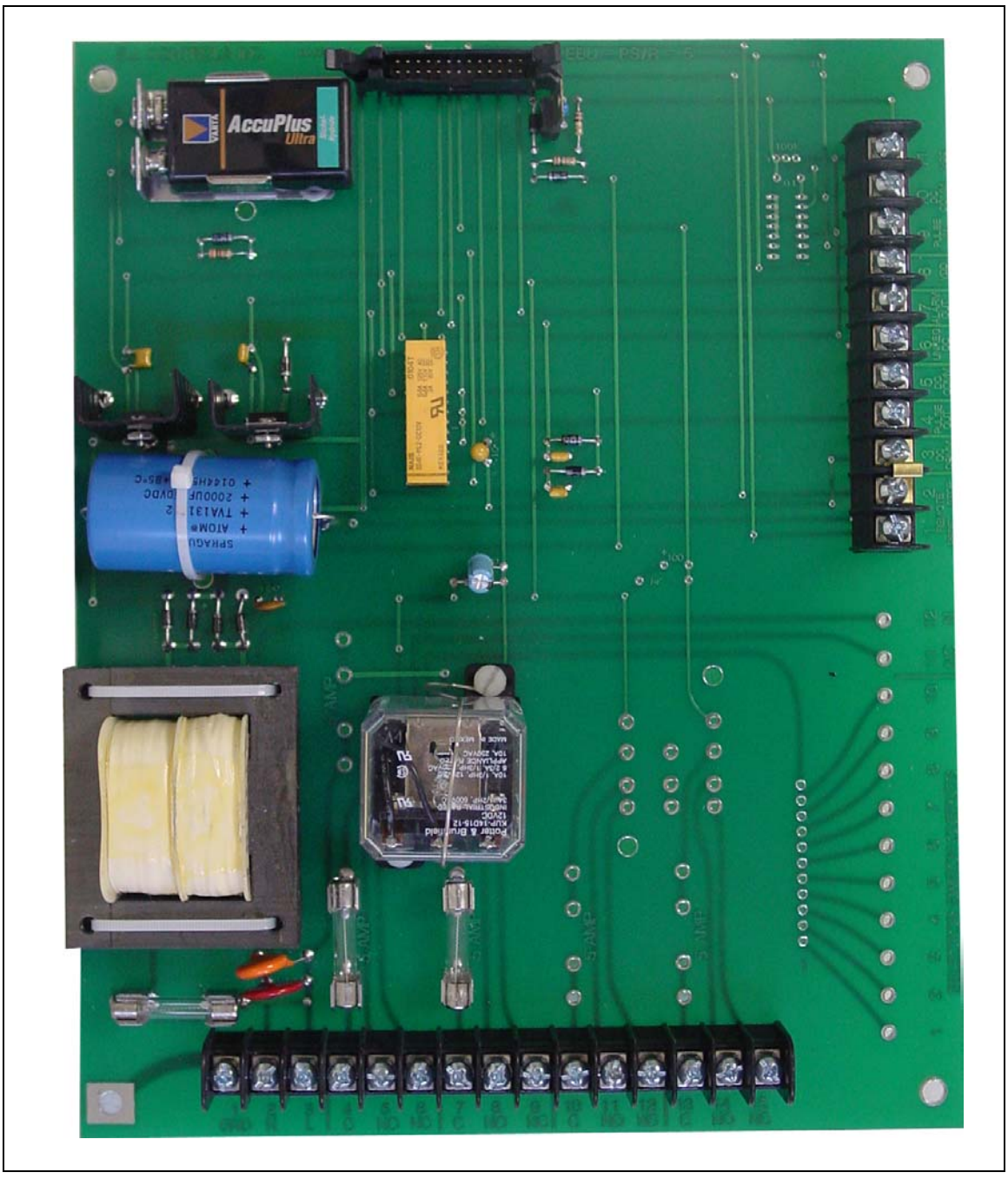
## 4.3 EBU Power Supply/Relay PC Board Component Layout



## 4.4 EBU Power Supply/Relay PC Board Electrical Diagram



## 4.5 EBU Power Supply/Relay PC Board Front View

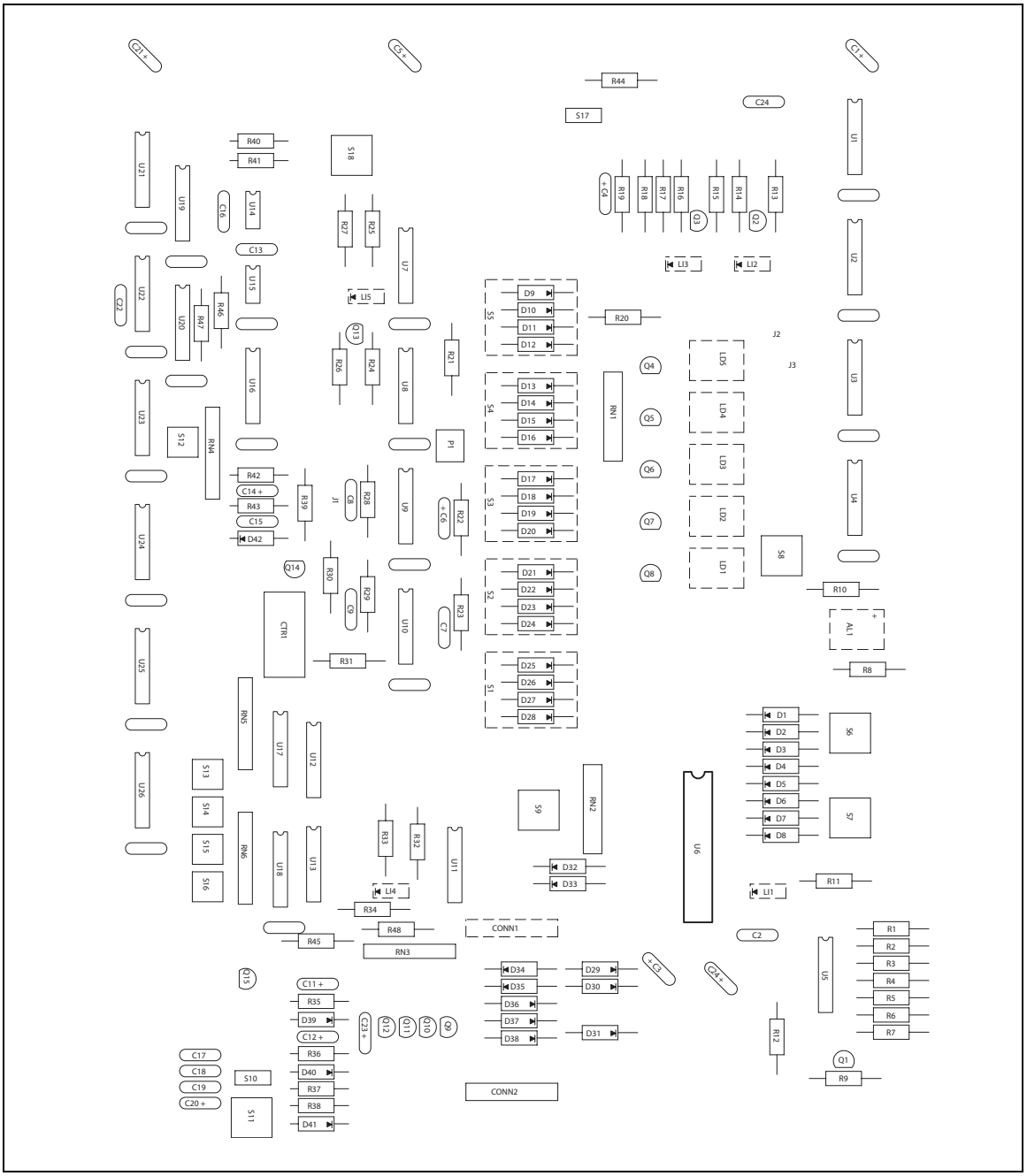


## 4.6 Bill of Materials - EBU Control Logic PC Board

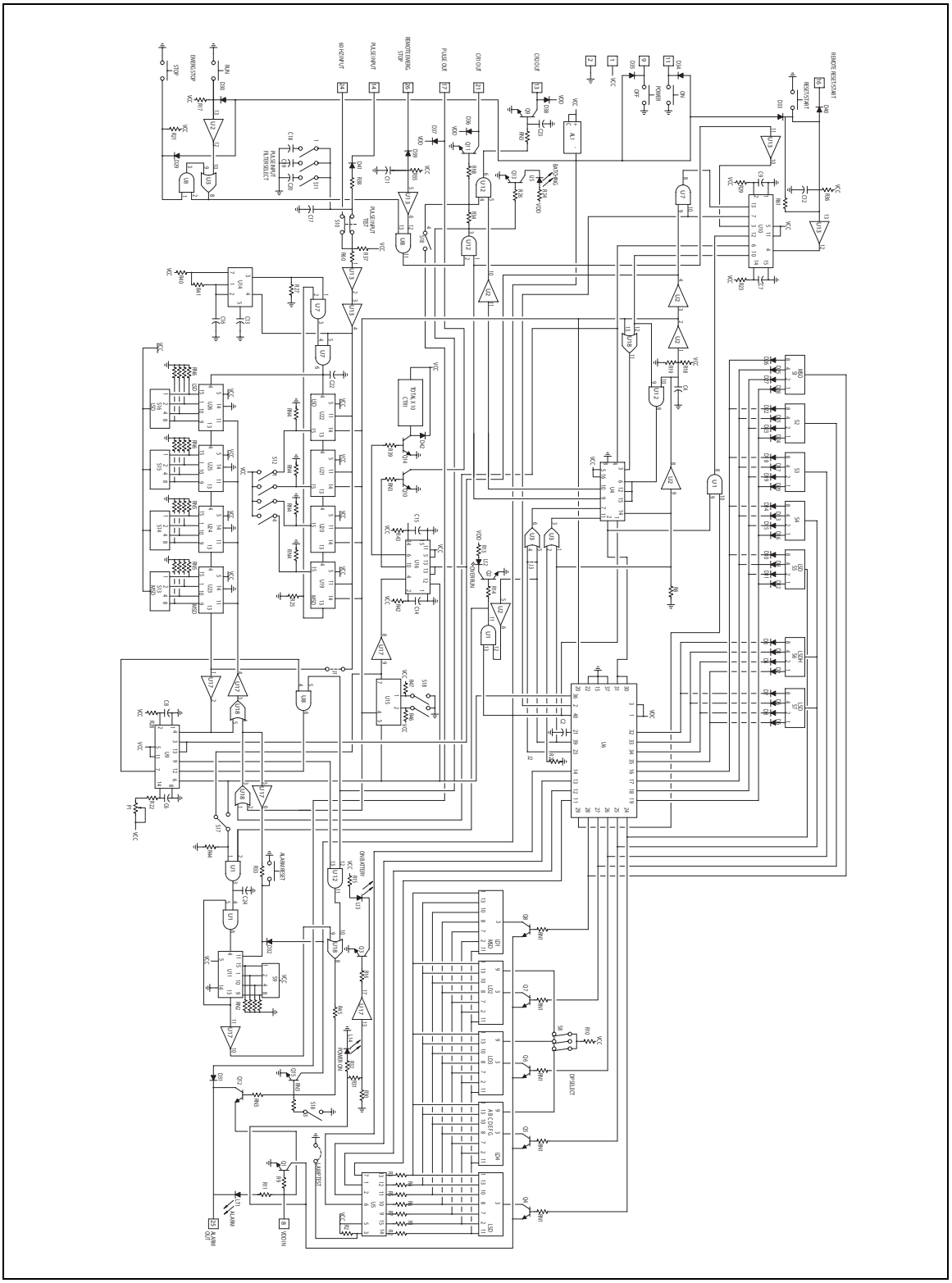
| Ref. No. | Description | S.J. Part Number |
|---|---|---|
| U1, U7, U8, U12 | IC (14 PIN DIP) | 6900-M1-0020 |
| U2, U13, U17 | IC (14 PIN DIP) | 6900-M1-0015 |
| U3, U18 | IC (14 PIN DIP) | 6900-M1-0025 |
| U4 | IC (16 PIN DIP) | 6900-M1-0040 |
| U5 | IC (14 PIN DIP) | 6900-M1-0035 |
| U6 | IC (40 PIN DIP) | 6900-M1-0055 |
| U9, U10, U16 | IC (16 PIN DIP) | 6900-M1-0030 |
| U11, U19, U26 | IC (16 PIN DIP) | 6900-M1-0005 |
| U14 | IC (8 PIN DIP) | 6900-M1-0050 |
| S1-S5 | PRESET SWITCH | 5100-S4-0005 |
| S6, S7, S9, S13-S16 | BCD CODE SWITCH | 6900-S4-0130 |
| S8, S11 | SLIDE DIPSWITCH –3 POSITION | 6900-S4-0135 |
| S10 | SPDT TOGGLE SWITCH | 6900-S4-0065 |
| S12, S18 | SLIDE DIPSWITCH –4 POSITION | 6900-S4-0140 |
| S17 | SPDT SLIDE SWITCH | 6900-S4-0055 |
| Q1, Q4-Q12, Q14, Q15 | TRANSISTOR | 6900-T3-0005 |
| Q2, Q3, Q13 | TRANSISTOR | 6900-T3-0010 |
| R1-R7, R10, R11, R13, R15, R24, R32 | 620 OHM, ¼W RESISTOR | 6900-R1-0040 |
| R8, R9, R14, R16, R19, R20, R25-27, R30, R39, R44, R48 | 100K OHM, ¼W RESISITOR | 6900-R1-0105 |
| R12, R22, R23, R28, R29, R35-37, R40, R41 | 10K OHM, ¼W RESISTOR | 6900-R1-0085 |
| R17, R21, R33, R34, R45-47, R18, R42, R43 | 27K OHM, ¼W RESISTOR | 6900-R1-0090 |
| R31 | 3K OHM, ¼W RESISTOR | 6900-R1-0060 |
| R38 | 100 OHM ¼W RESISTOR | 6900-R1-0020 |
| D1-D42 | DIODE | 6900-D1-0005 |
| RN1, RN3 | 10K RESISTOR NETWORK | 6900-R1-0145 |
| RN2, RN4 | 10K RESISTOR NETWORK | 6900-R1-0125 |
| RN5, RN6 | 10K RESISTOR NETWORK | 6900-R1-0140 |
| P1 | 100K POTENTIOMETER | 6900-R1-0170 |
| C1, C3, C5, C6, C21, C23 | 100µF @ 25V CAPACITOR | 6900-R1-0090 |
| C2 | .01µF @ 25V CAPACITOR | 6900-C2-0035 |
| C4 | 3.3µF @ 25V CAPACITOR | 6900-C2-0010 |
| C11, C12, C14, C15 | 1µF @ 35V CAPACITOR | 6900-C2-0045 |
| C7, C8, C13, C18 | .01µF @ 25V CAPACITOR | 6900-C2-0035 |
| C9, C24 | 680pF @ 1KV CAPACITOR | 6900-C2-0025 |
| C17 | 6800pF @ 100V CAPACITOR | 6900-C2-0030 |
| C19 | .1µF @ 25V CAPACITOR | 6900-C2-0040 |
| C16, C22 | 20pF @ 1KV CAPACITOR | 6900-C2-0005 |
| C20 | 10µF @ 25V CAPACITOR | 6900-C2-0050 |

| | | |
|---|---|---|
| AL 1 | ALARM BUZZER | 5100-A3-0005 |
| LI1 – LI5 | LED INDICATOR – RED | 6900-L1-0060 |
| LD1 – LD5 | 7 SEGMENT DISPLAY | 6900-L3-0030 |
| CONN 1 | RIGHT ANGLE HEADER | 6900-H1-0045 |
| CONN 2 | 26 PIN RIBBON CABLE CONNECTOR | 6900-C3-0120 |
| CTR 1 | 6 DIGIT E.M. TOTALIZER | 5100-C1-0005 |
| C-DECOUPLING (19) | .01µF @ 25V CAPACITOR | 6900-C2-0035 |
| 14 PIN IC SOCKETS (14) | DIP SOCKETS | 6900-M2-0010 |
| 16 PIN IC SOCKETS (13) | DIP SOCKETS | 6900-M2-0015 |
| 40 PIN IC SOCKETS (1) | DIP SOCKETS | 6900-M2-0035 |
| 8 PIN IC SOCKETS (1) | DIP SOCKETS | 6900-M2-0005 |
| EBU CL-4 | P.C. BOARD | 5100-P8-0005 |

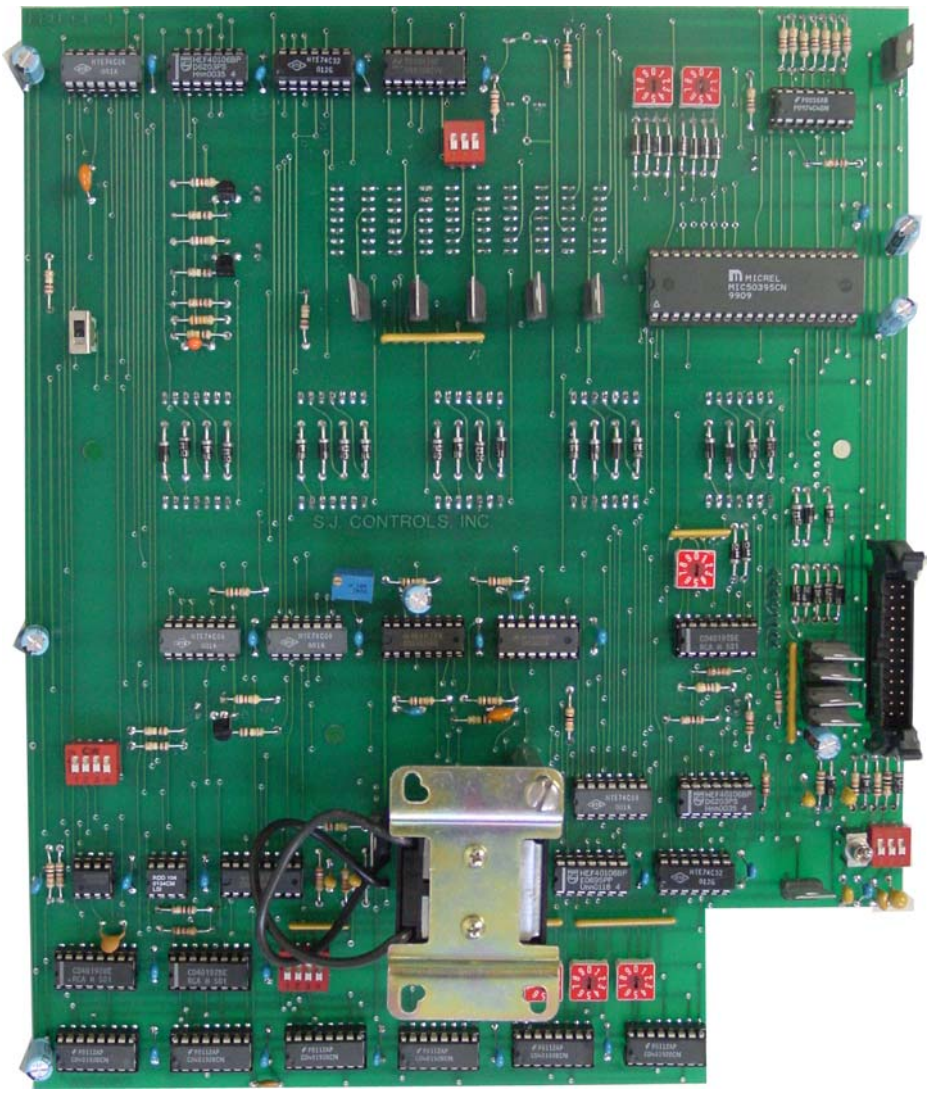
## 4.7 EBU Control Logic PC Board Component Layout



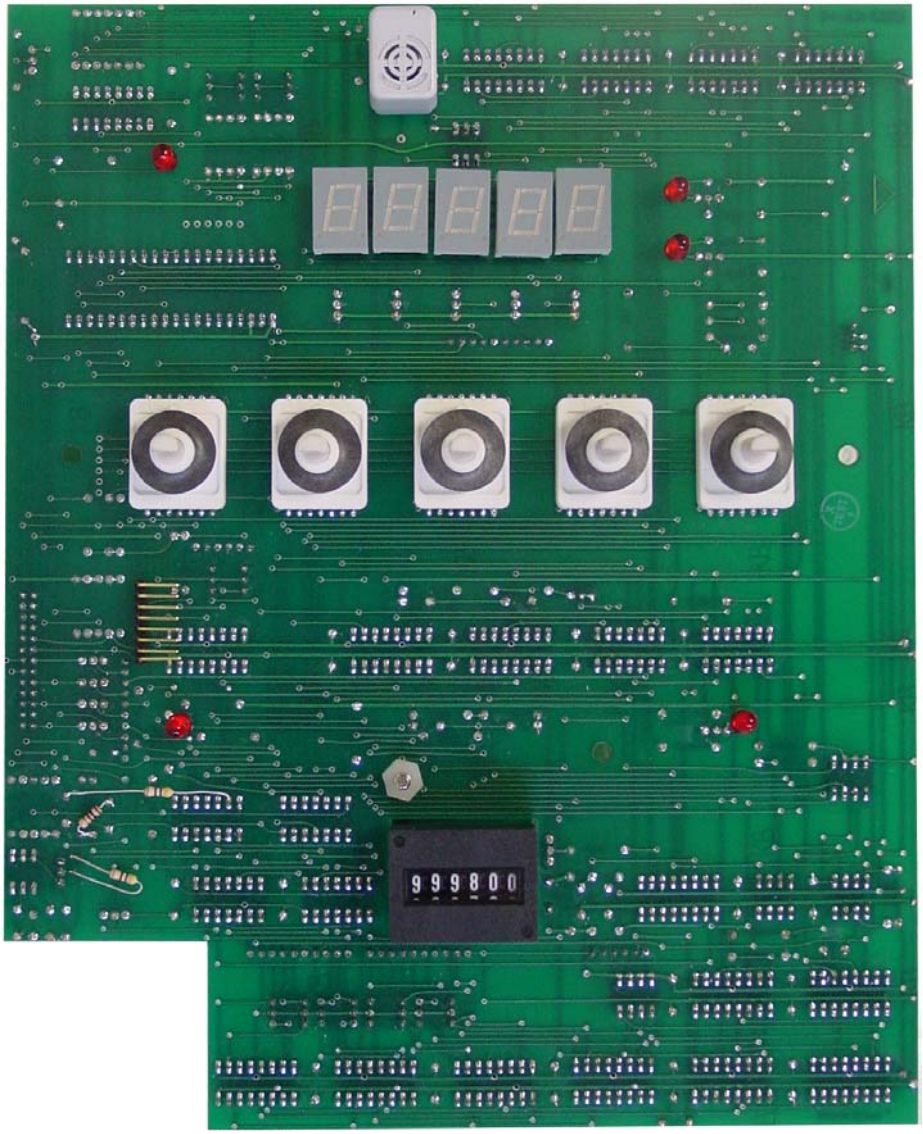
## 4.8 EBU Control Logic PC Board Electrical Diagram



## 4.9 EBU Control Logic PC Board Front View



## 4.10 EBU Control Logic PC Board Rear View



# 5. WIRING DIAGRAMS

## 5.1 In This Section


| | Section |
|---|---|
| • EBU-1 Customer Terminal Strip Locations | **5.2** |
| • EBU-2 Terminal Designations | **5.3** |
| • EBU-3 Remote Reset/Start, Remote Emergency Stop, Pulse Input | **5.4** |
| • EBU-4 S.J. Pre-Amp Diagram | **5.5** |
| • EBU-5 Magnetic Pick-Up w/Pre-Amp Option On-Board | **5.6** |
| • EBU-6 S.J. Hall Effect Pulser Wiring | **5.7** |
| • EBU-7 RFT9712 Micromotion Meter Pulse Output Diagram | **5.8** |
| • EBU-8 Solenoid Valve & Pump Starter Diagram | **5.9** |
| • EBU-9 Two Valve Two Stage Closure Diagram | **5.10** |
| • EBU-10 Single Stage Ball Valve & Pump Control | **5.11** |
| • EBU-11 Two Stage Ball Valve & Pump Control | **5.12** |
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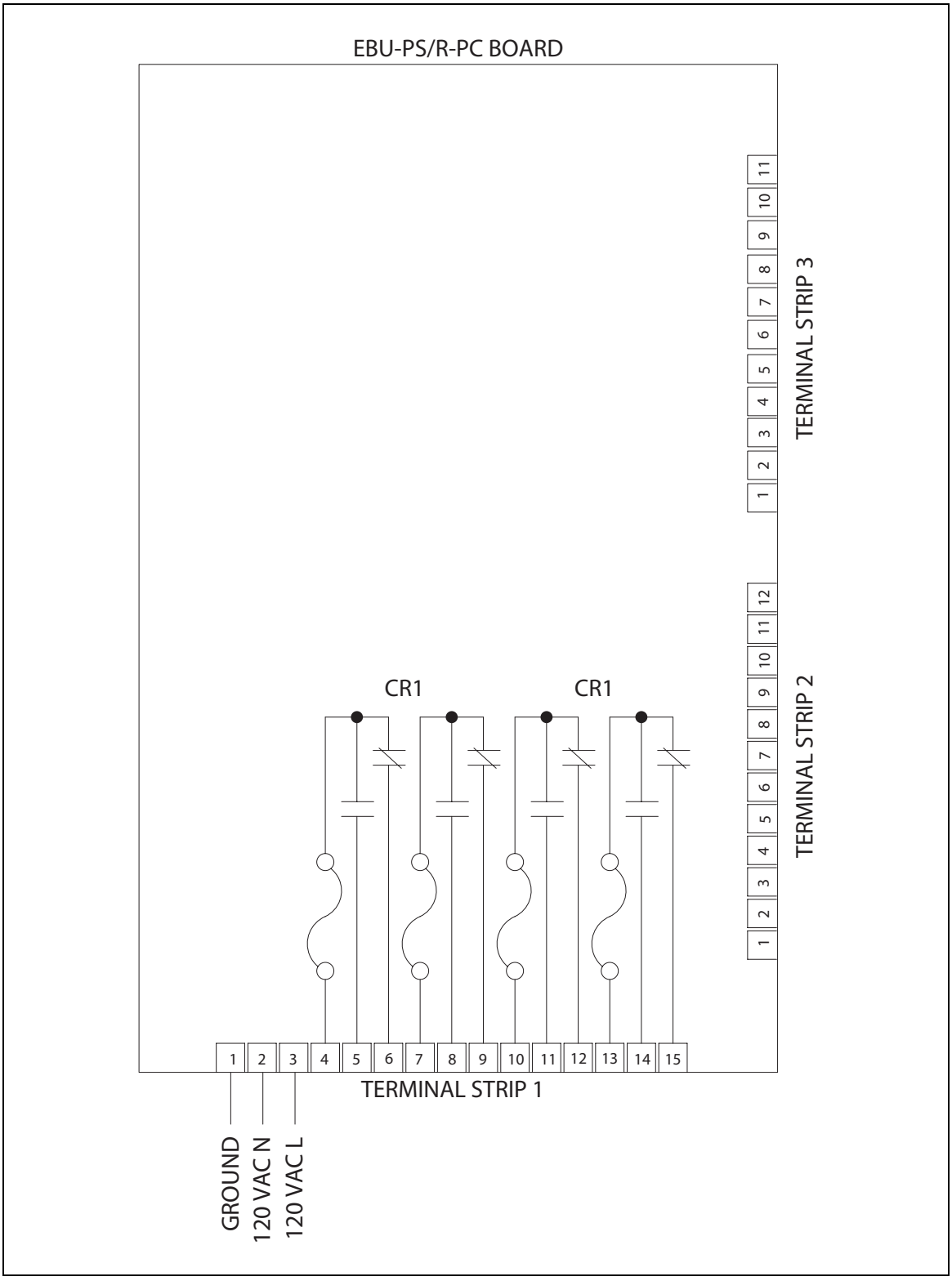
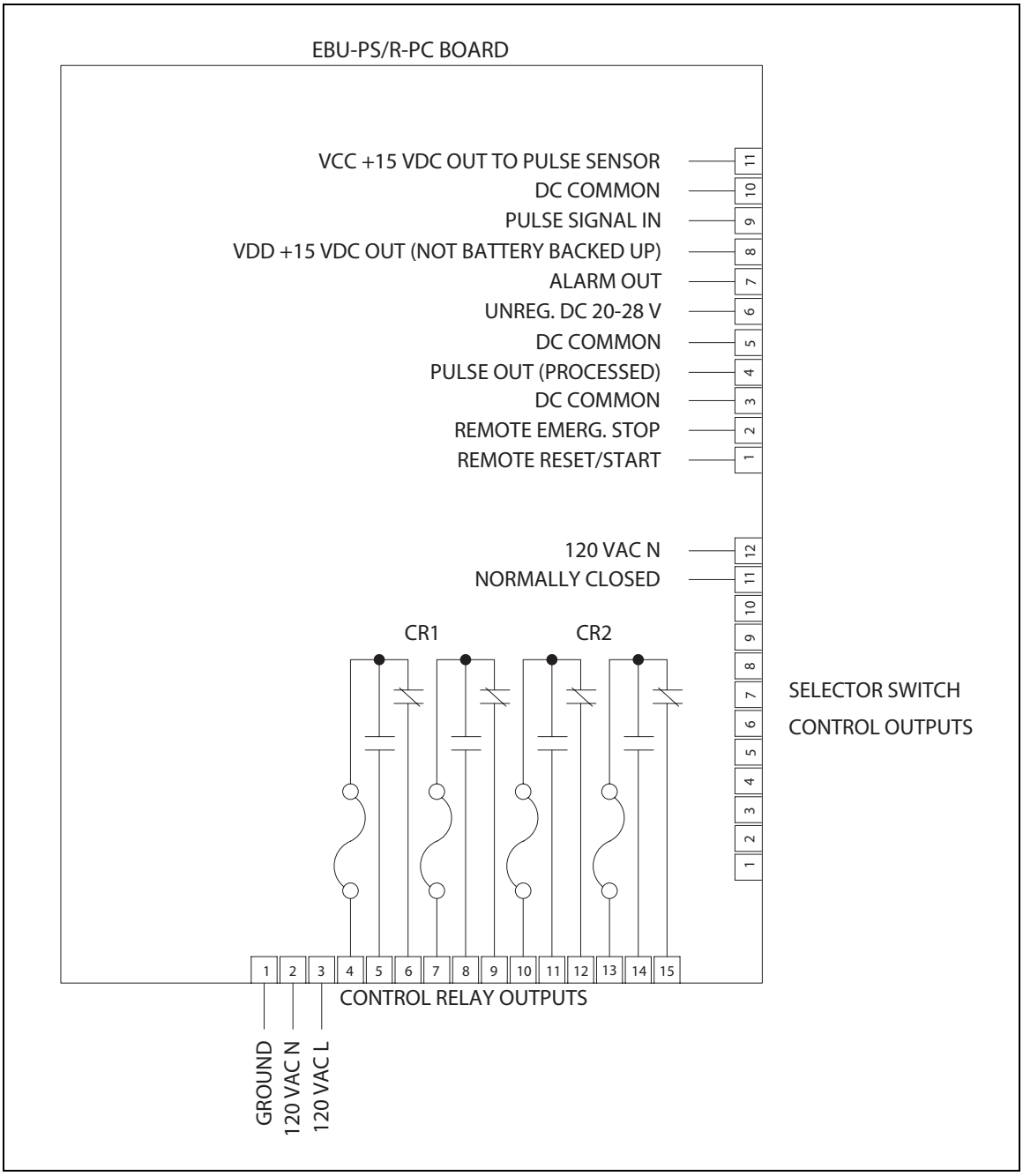
| • EBU-13 Ten Position Selector Switch – 4 Motor Driven Valves (Opt.) | **5.14** |
| • EBU-14 Remote Totalizer & Alarm | **5.15** |
| • EBU-19 RFT9739 Micromotion Meter Pulse Output Diagram | **5.16** |
| • EBU-20 1700/2700 Series Micromotion Pulse Output Diagram | **5.17** |

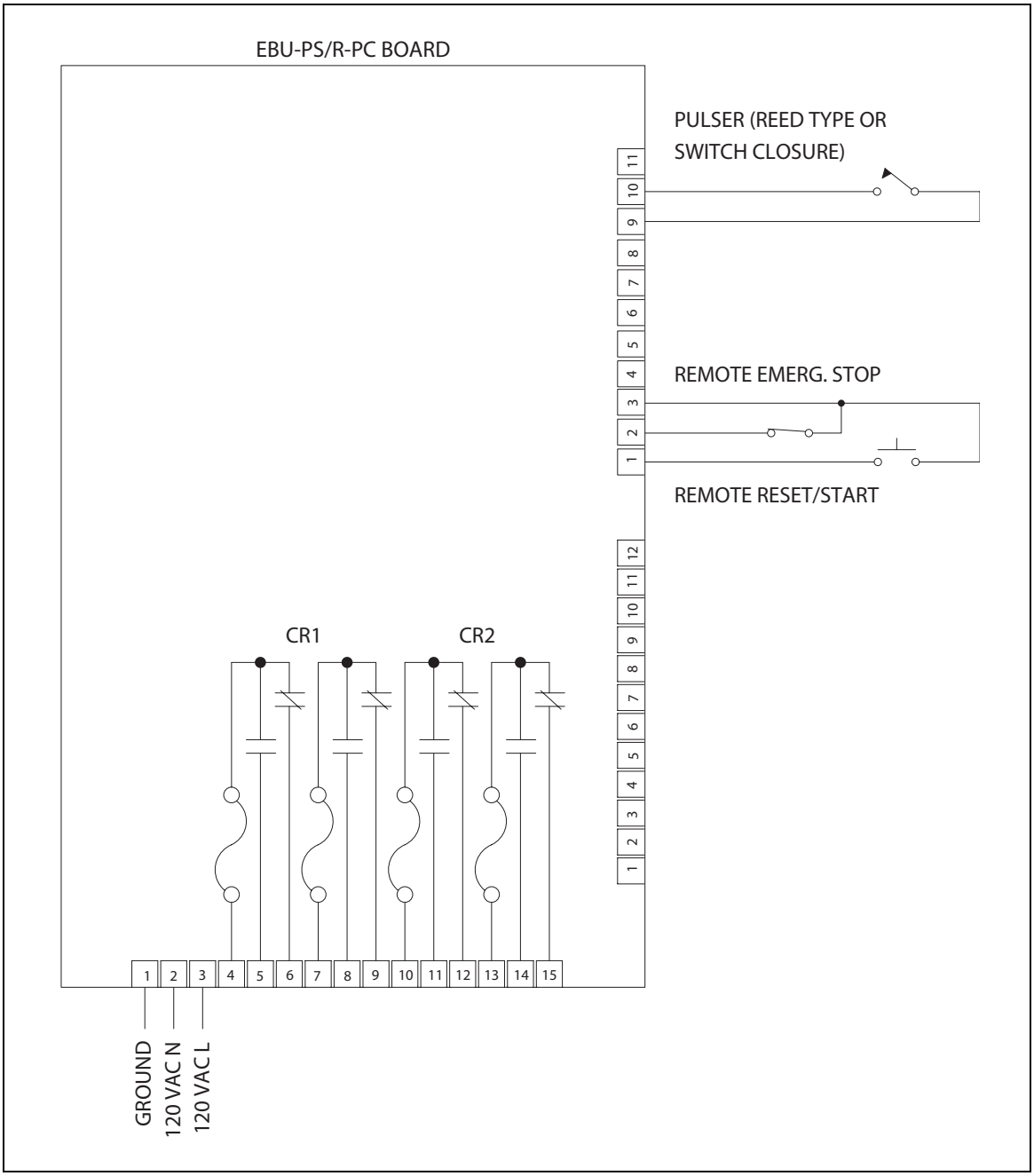
## 5.2 EBU-1 Customer Terminal Strip Locations



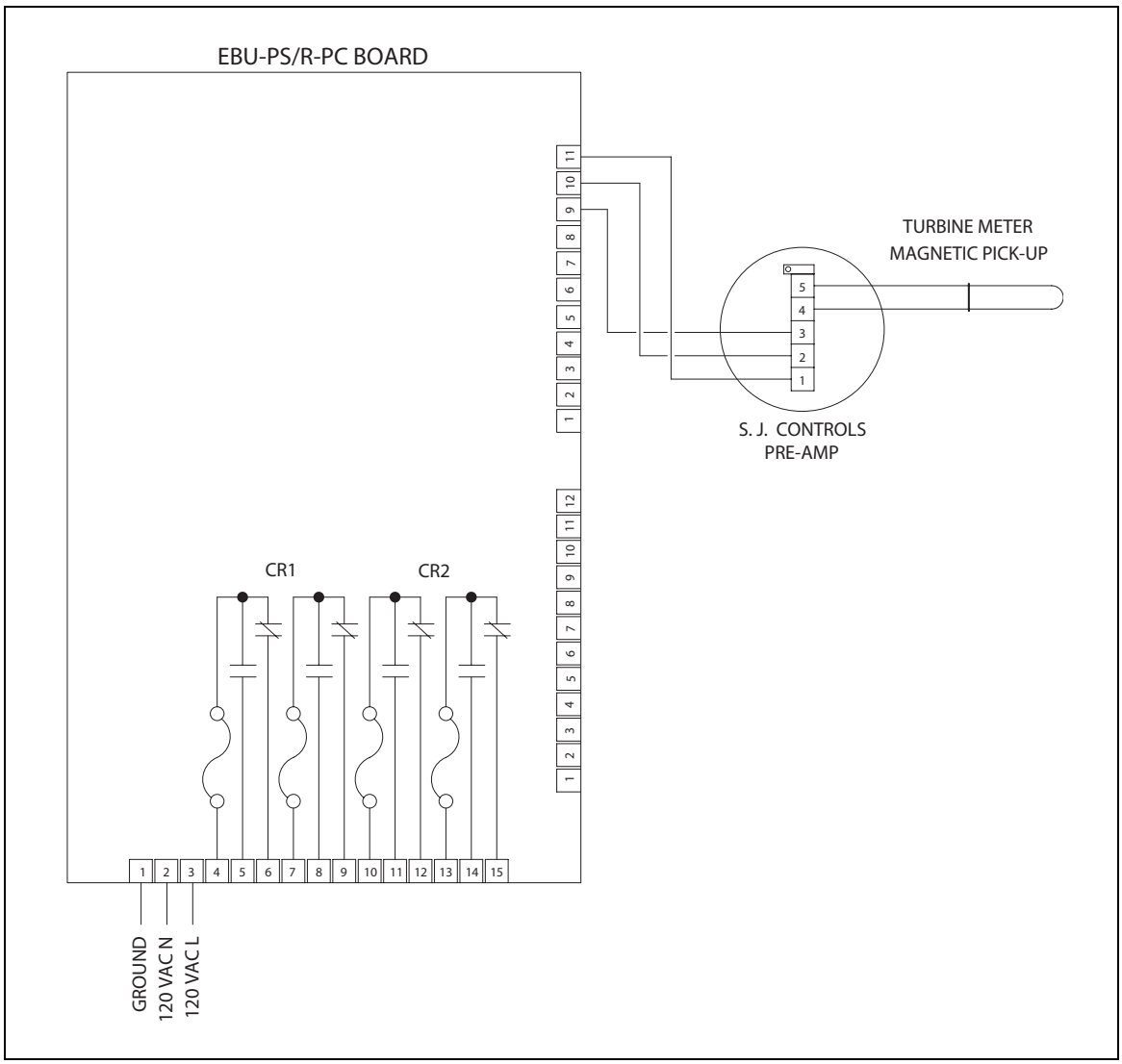
## 5.3 EBU-2 Terminal Designations



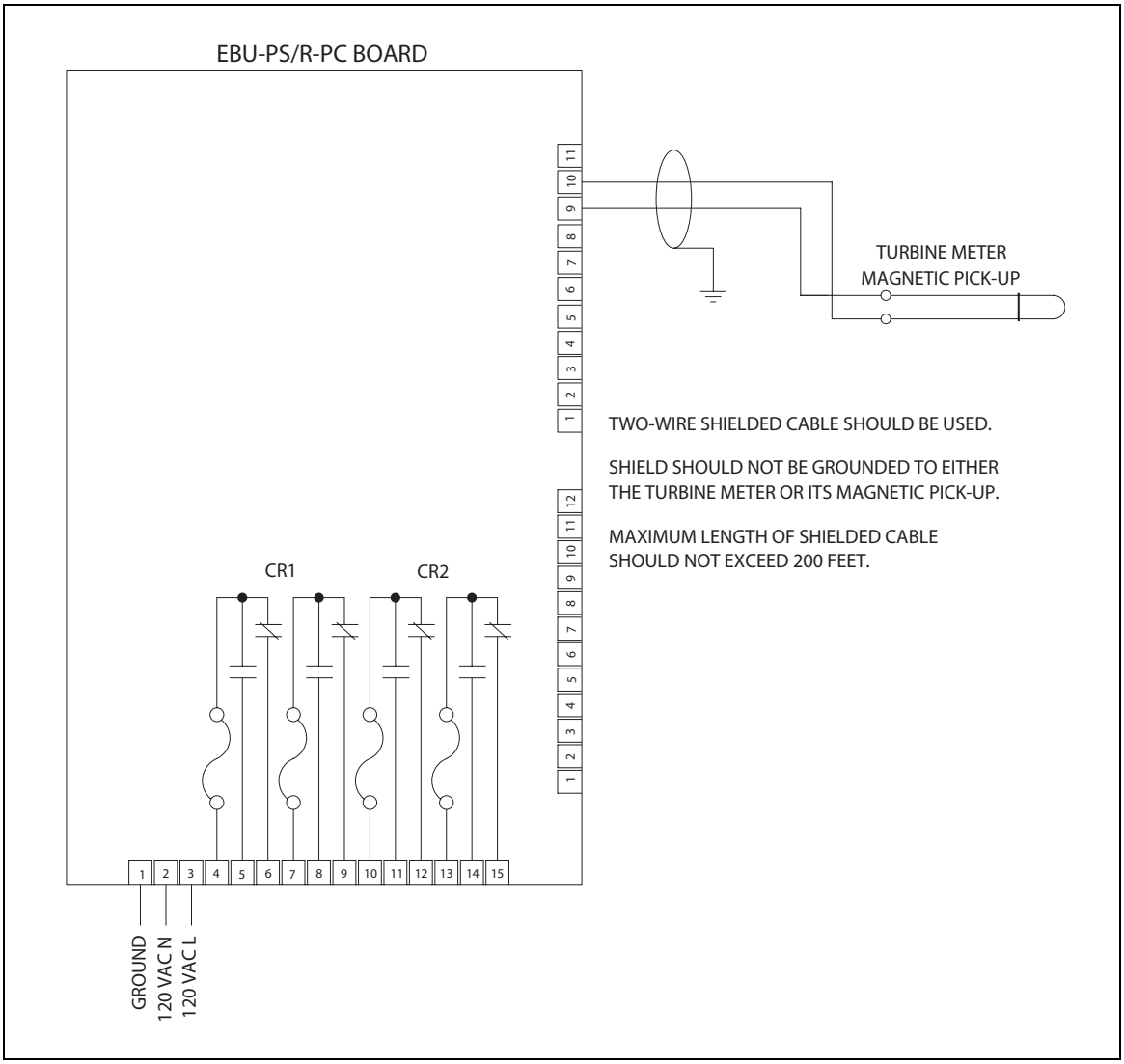
## 5.4 EBU-3 Remote Reset/Start, Remote Emergency Stop, Pulse Input



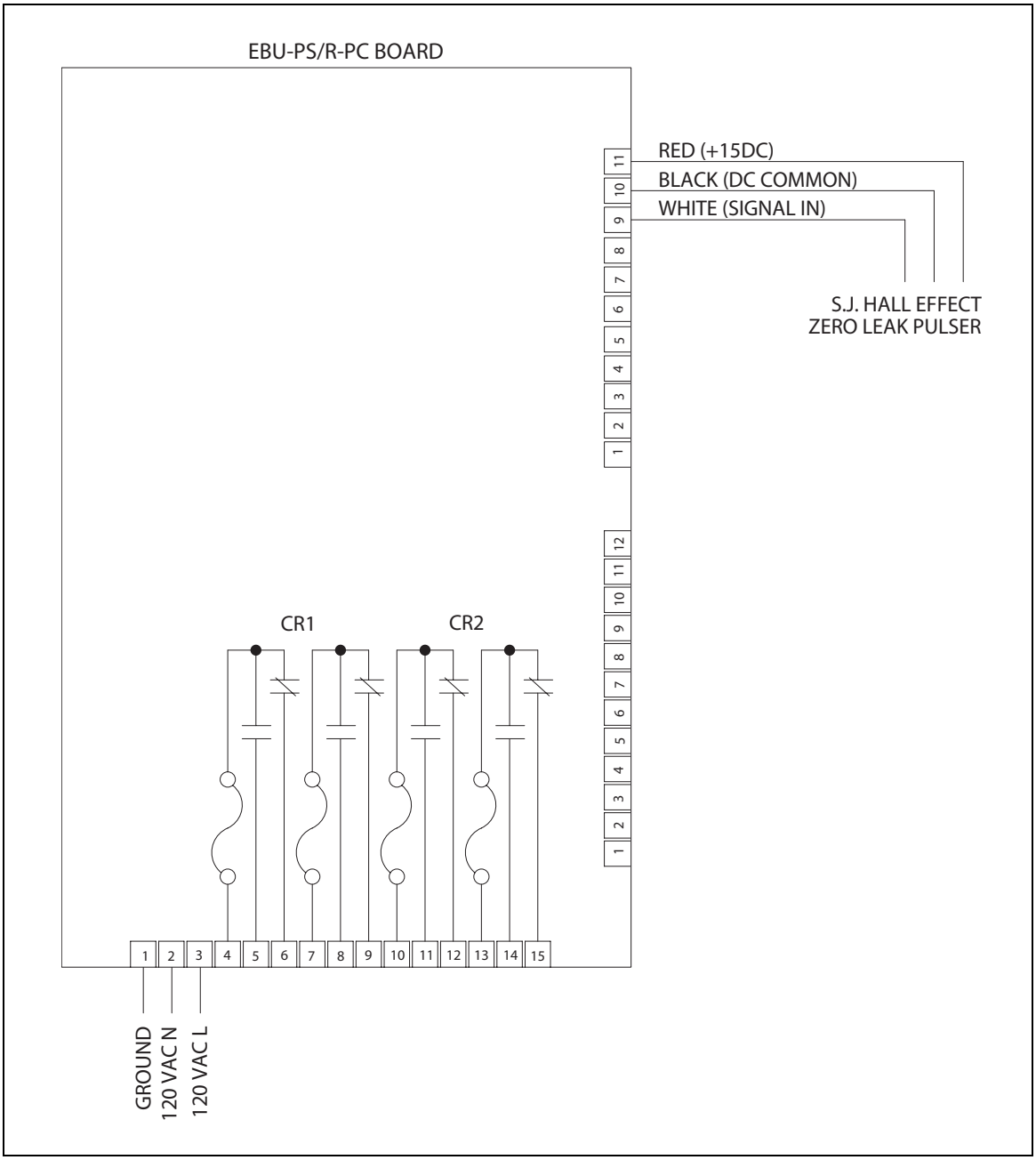
## 5.5 EBU-4 S.J. Pre-Amp Diagram



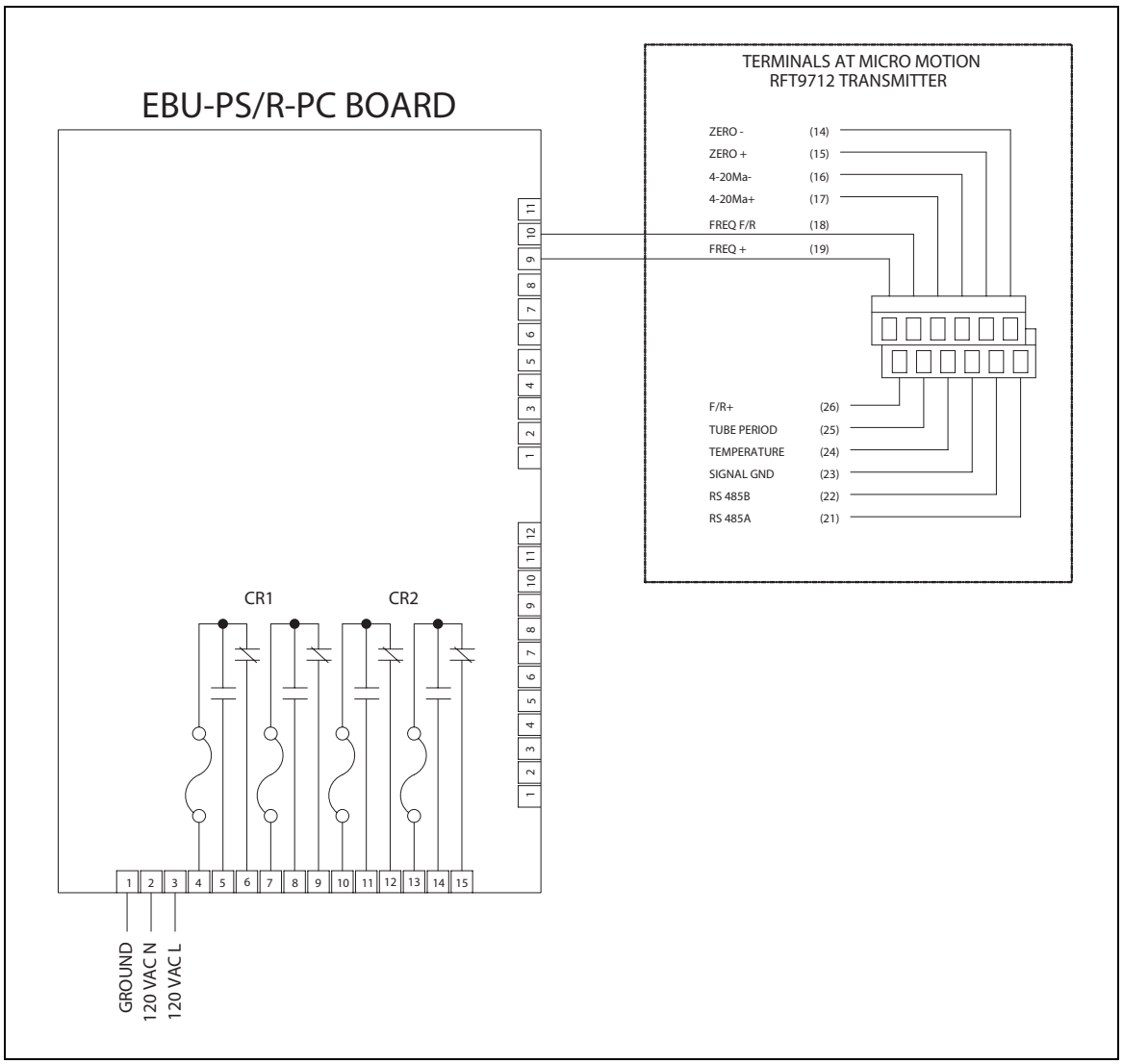
## 5.6 EBU-5 Magnetic Pick-Up w/Pre-Amp Option On-Board



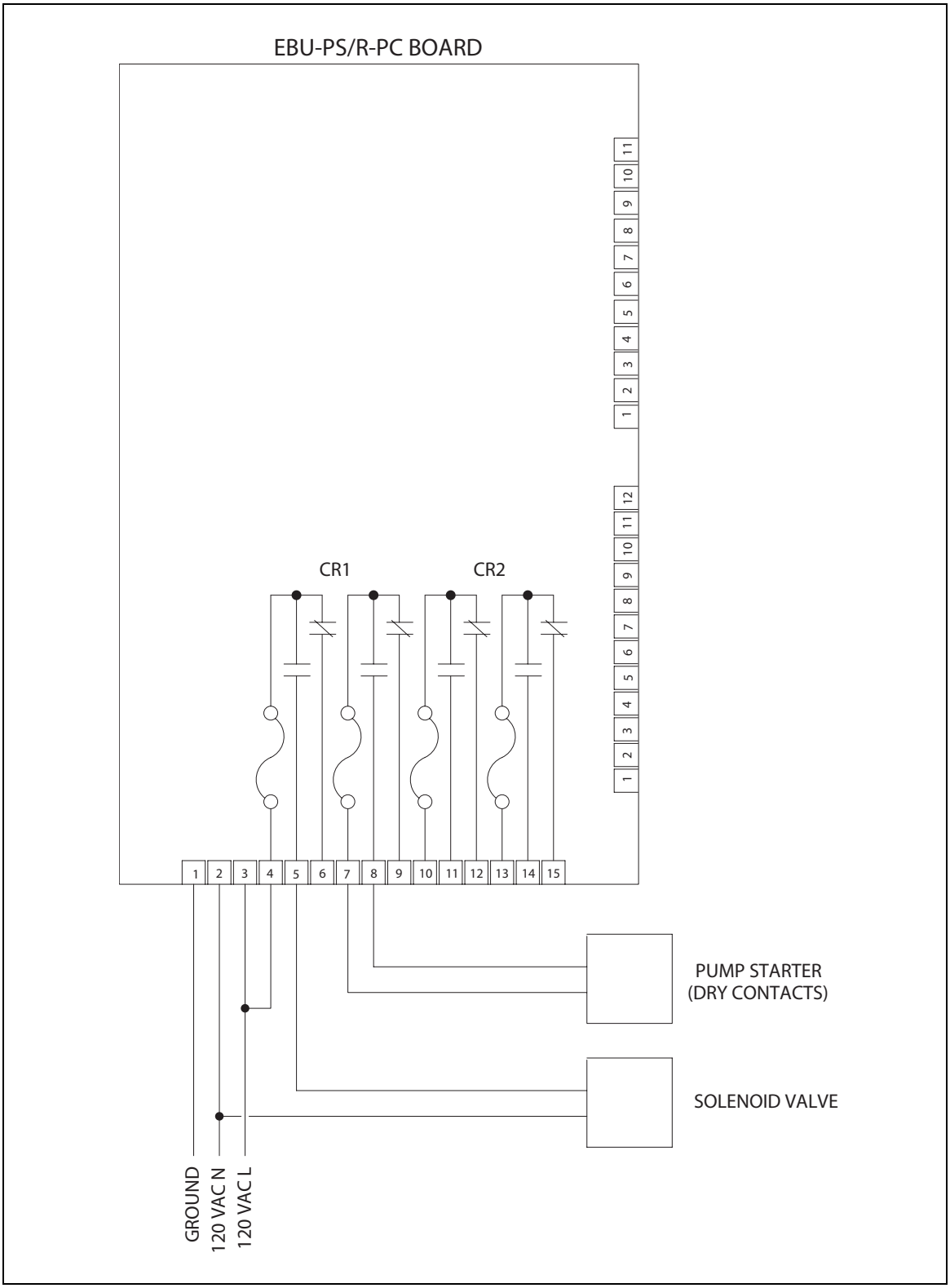
## 5.7 EBU-6 S.J. Hall Effect Pulser Wiring



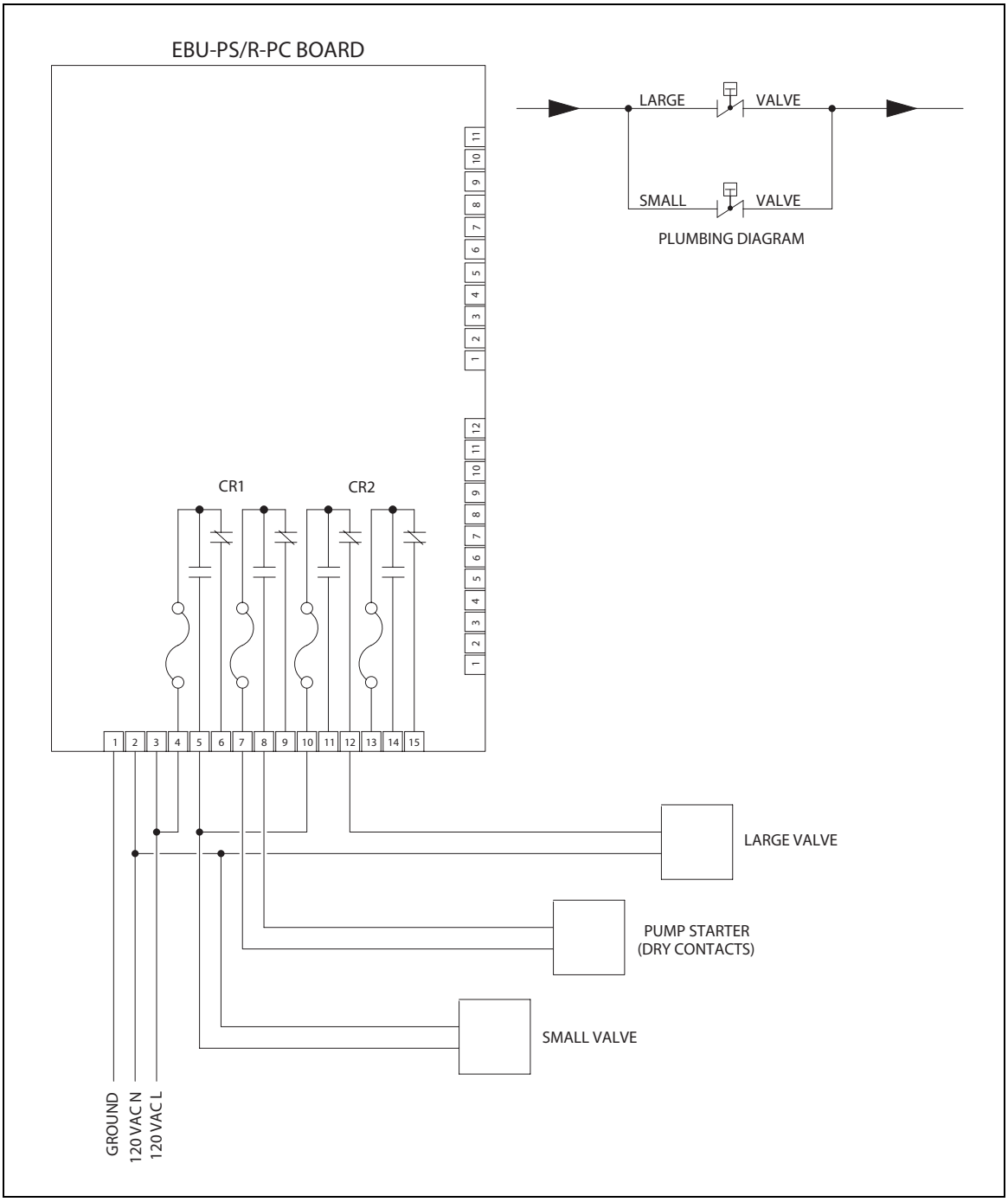
## 5.8 EBU-7 RFT9712 Micromotion Meter Pulse Output Diagram



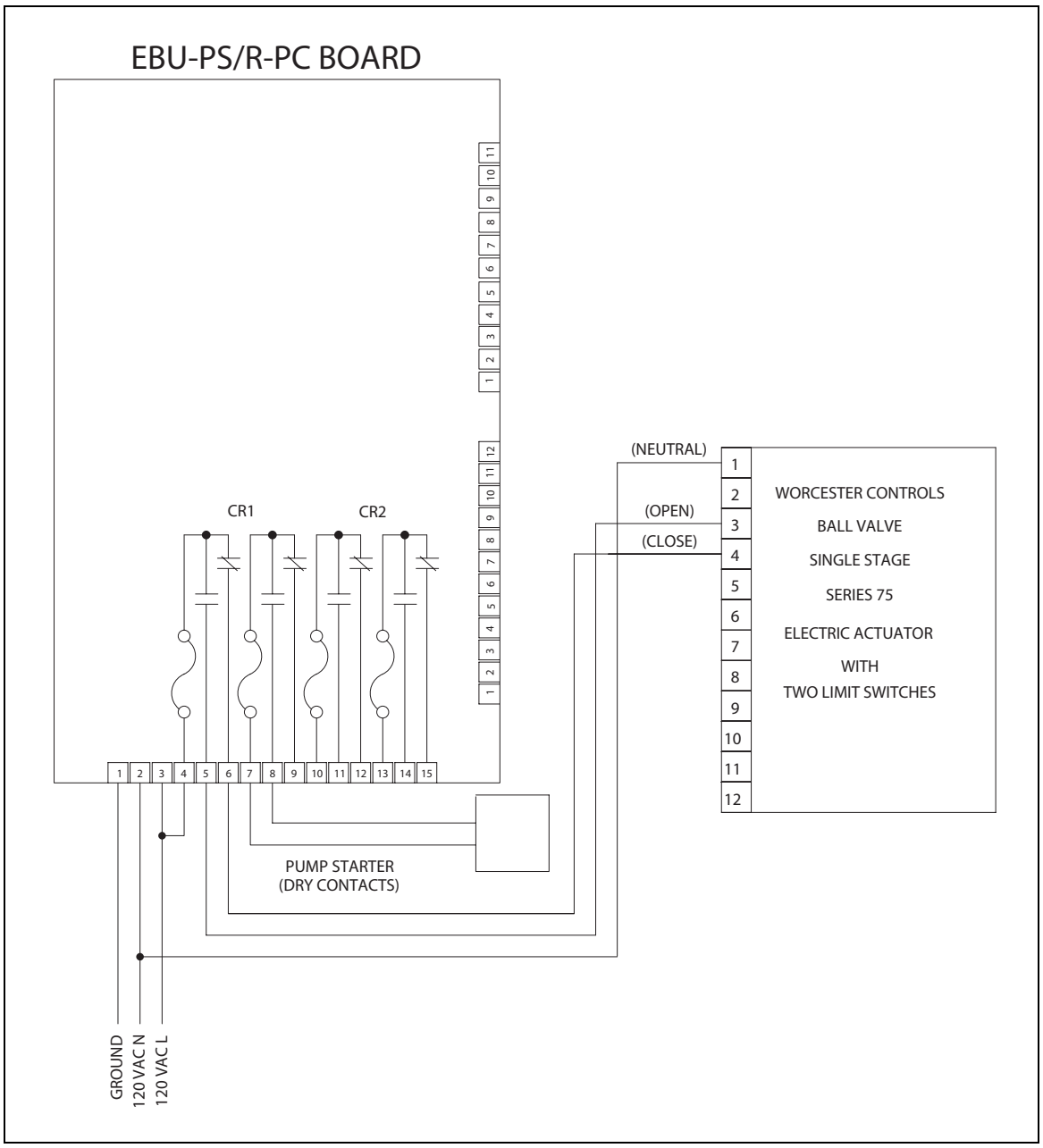
## 5.9 EBU-8 Solenoid Valve & Pump Starter Diagram



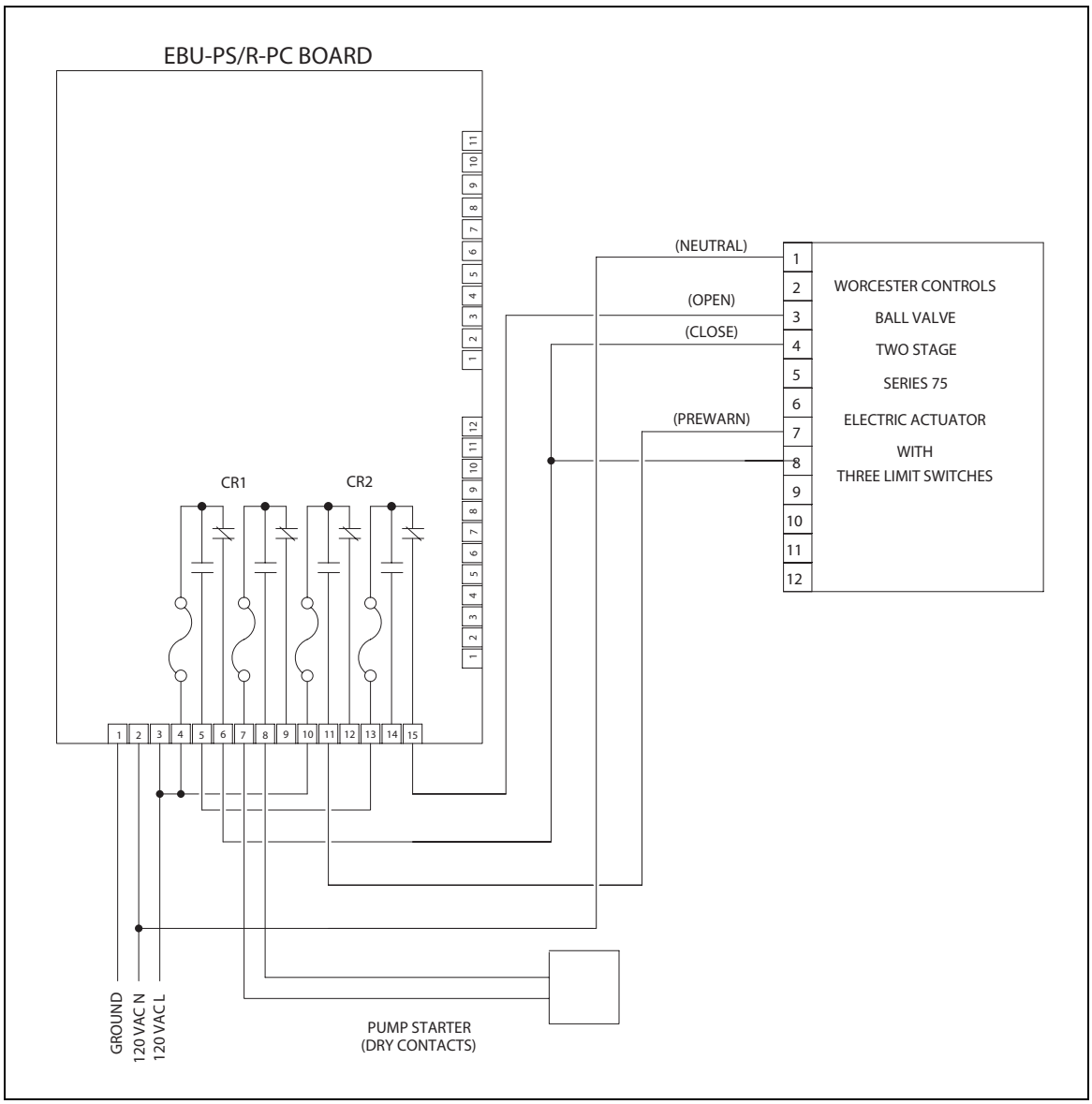
## 5.10 EBU-9 Two Valve Two Stage Closure Diagram



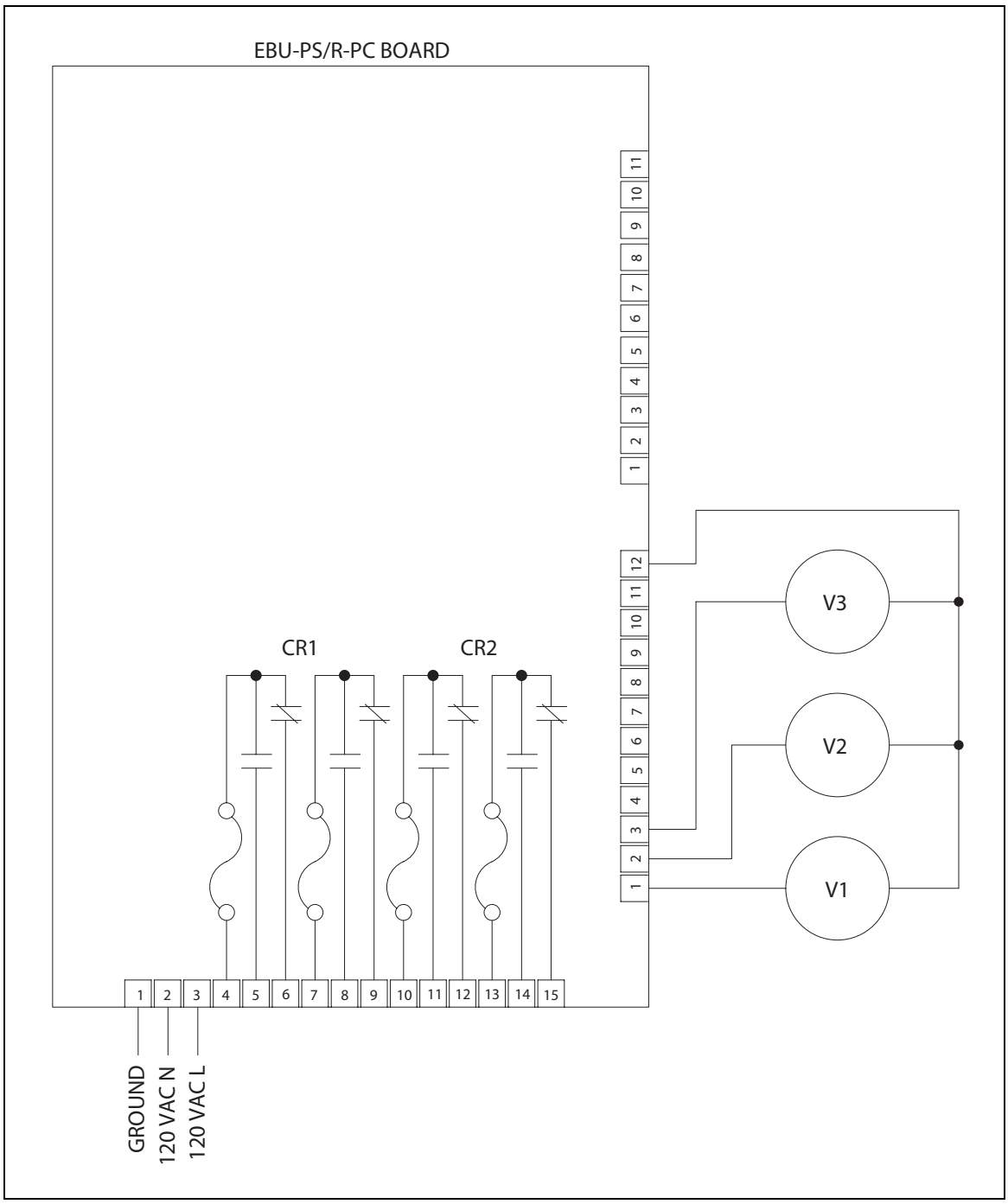
## 5.11 EBU-10 Single Stage Ball Valve & Pump Control



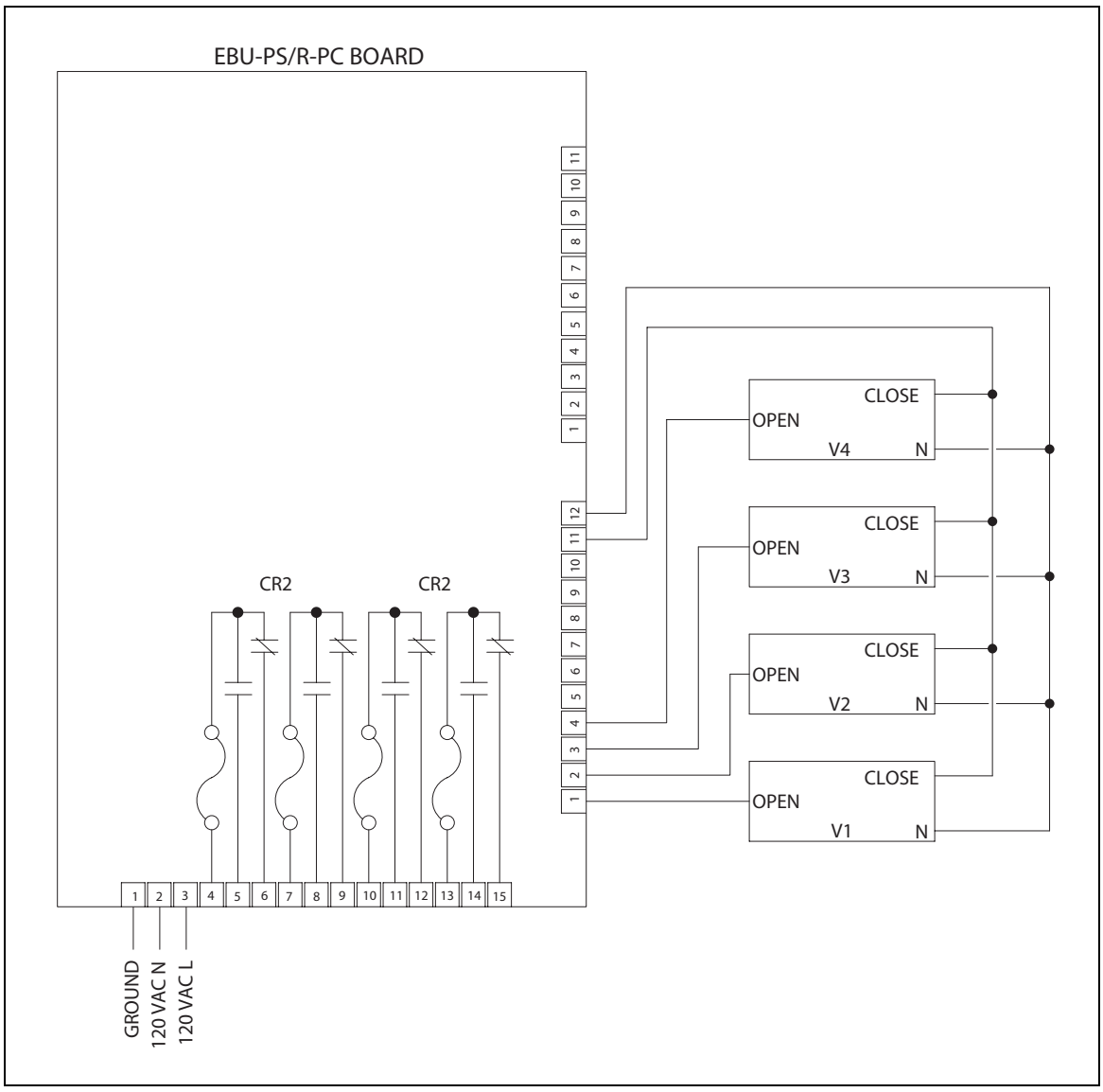
## 5.12 EBU-11 Two Stage Ball Valve & Pump Control



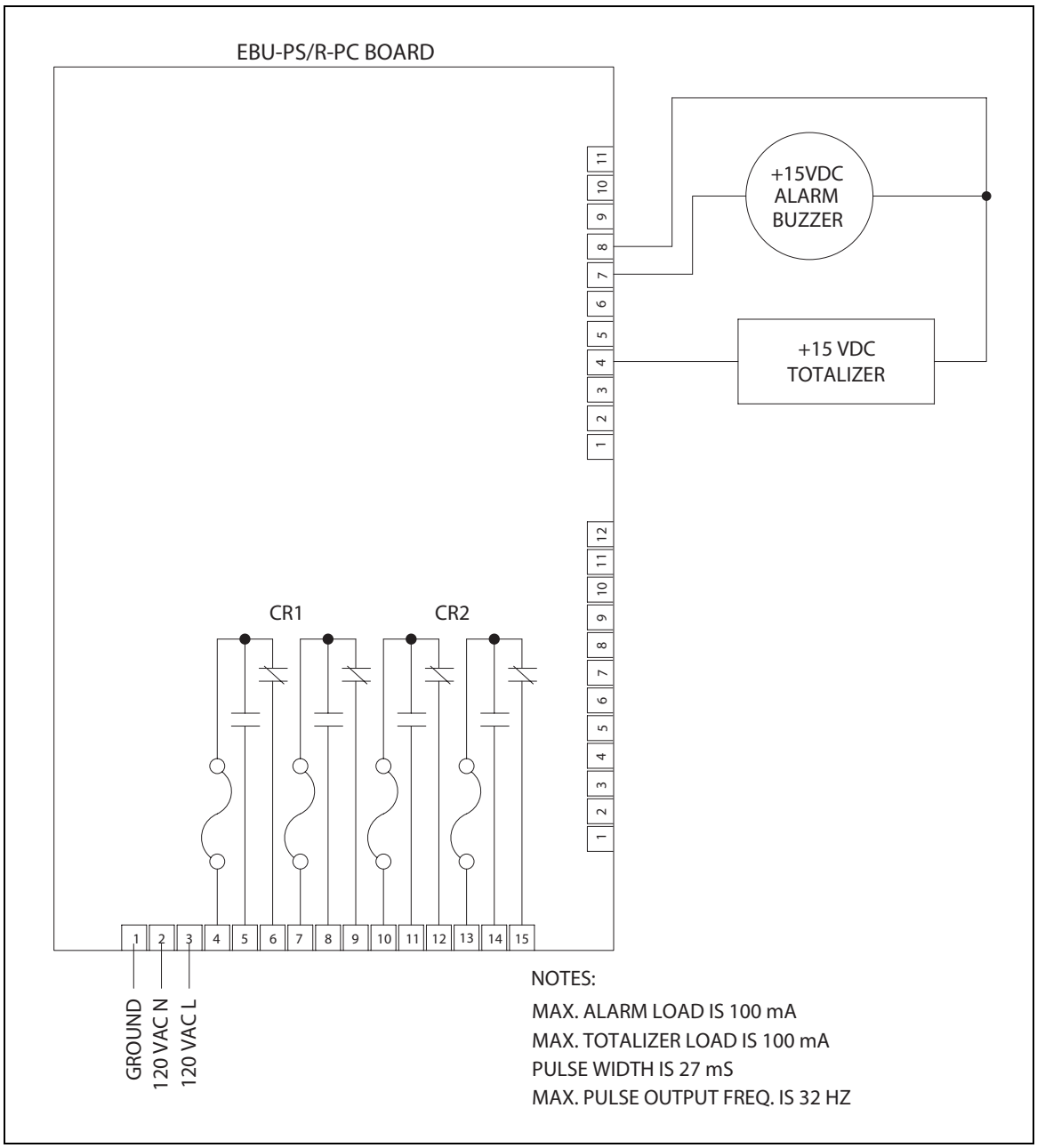
## 5.13 EBU-12 Ten Position Selector Switch – 3 Solenoid Valves (Opt.)



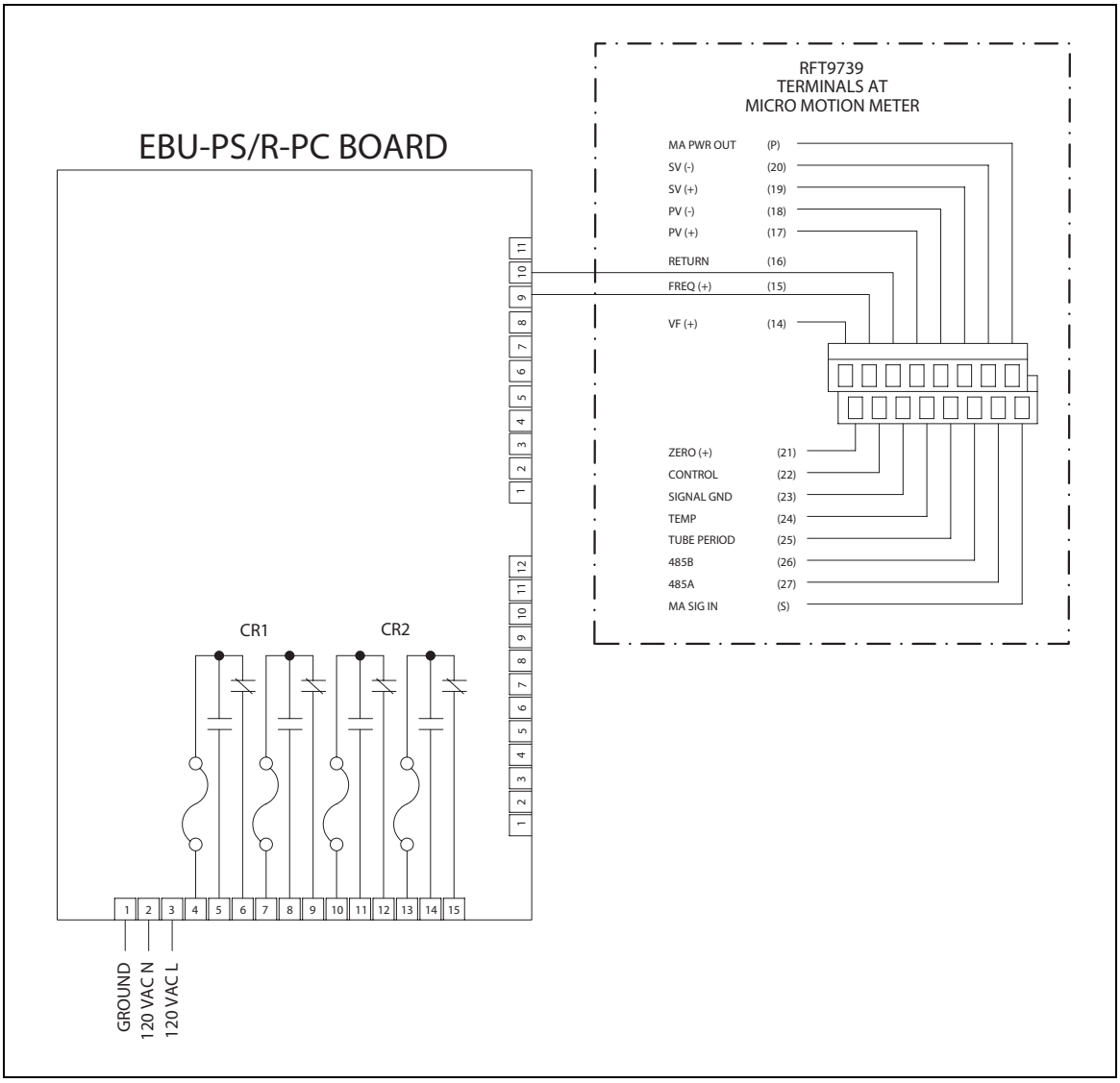
## 5.14 EBU-13 Ten Position Selector Switch – 4 Motor Driven Valves (Opt.)



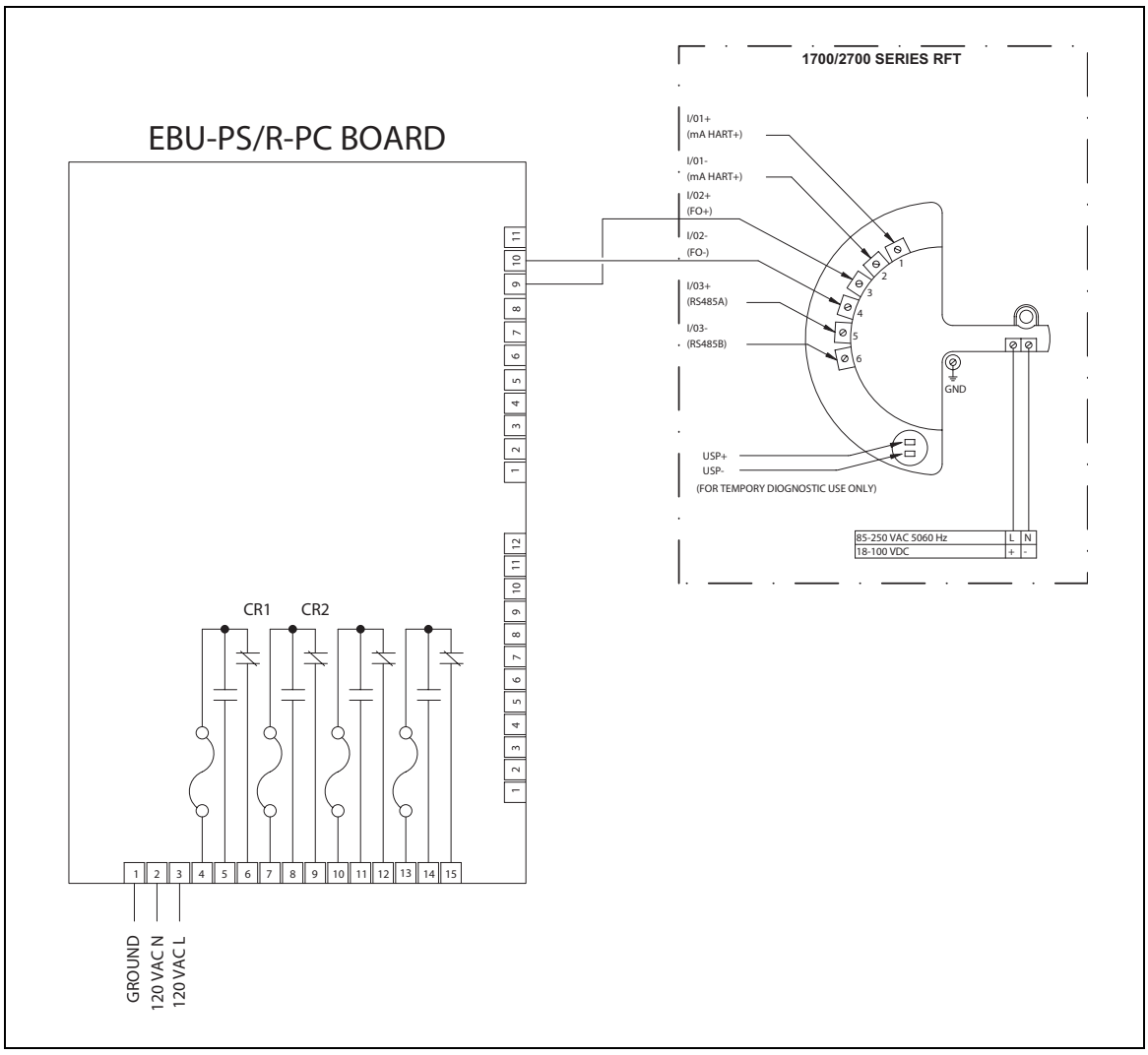
## 5.15 EBU-14 Remote Totalizer & Alarm



## 5.16 EBU-19 RFT9739 Micromotion Meter Pulse Output Diagram



## 5.17 EBU-20 1700/2700 Series Micromotion Pulse Output Diagram



# 6. WARRANTY, CONTACT, DISCLAIMER & OTHER PRODUCTS

## 6.1 In This Section


| | Section |
|---|---|
| • Contact Information | **6.2** |
| • Warranty | **6.3** |
| • Other Products Available From S.J. Controls | **6.4** |

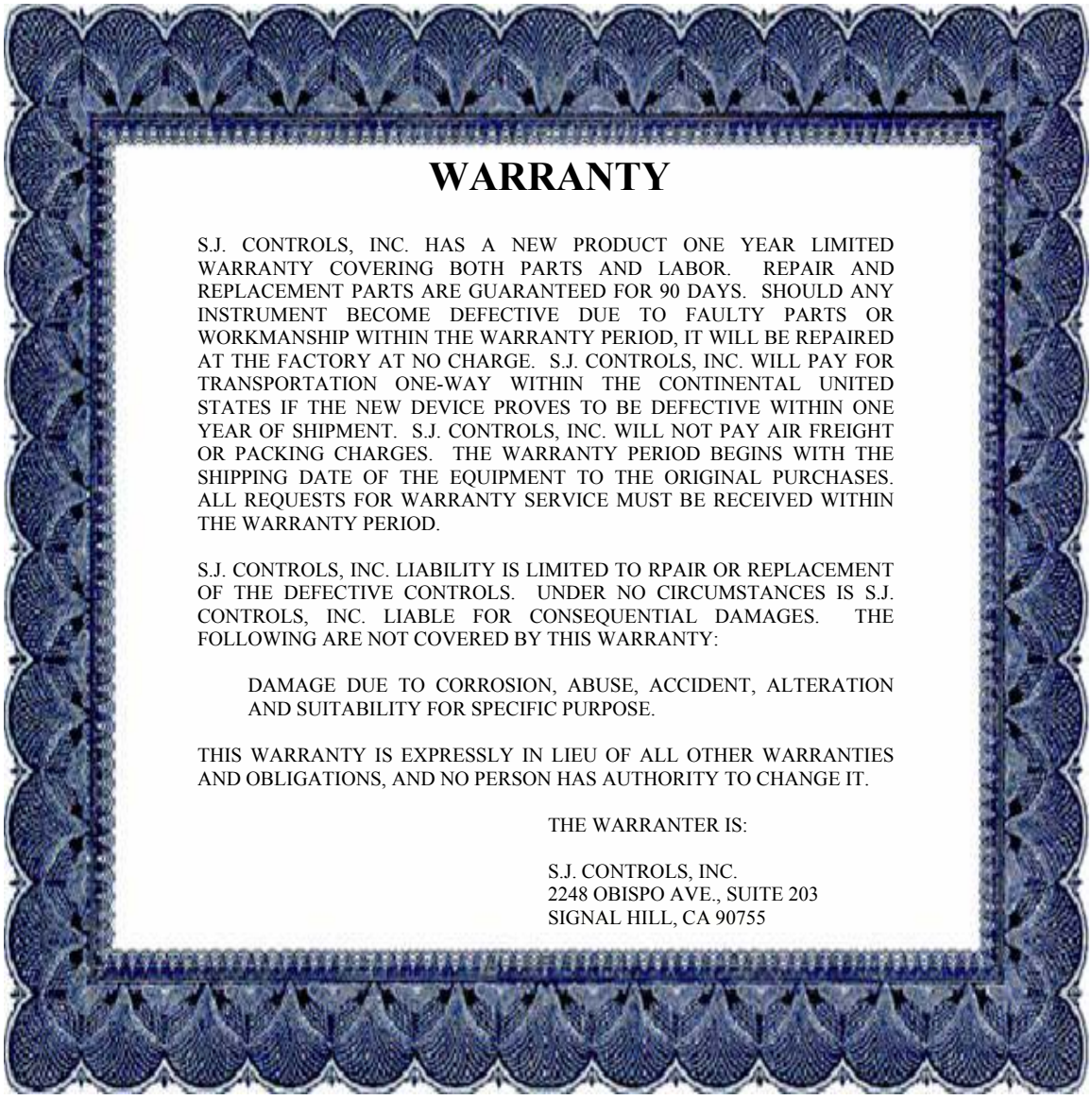

## 6.2 Contact Information


Phone: 565-494-1400
Fax: 562-494-1066

Email: info@sjcontrols.com
tech support@sjcontrols.com
Website: www.sjcontrols.com

Address: 2248 Obispo Ave, Suite #203
Signal Hill, CA 90755
U.S.A.

## 6.3 Warranty



# WARRANTY

S.J. CONTROLS, INC. HAS A NEW PRODUCT ONE YEAR LIMITED WARRANTY COVERING BOTH PARTS AND LABOR. REPAIR AND REPLACEMENT PARTS ARE GUARANTEED FOR 90 DAYS. SHOULD ANY INSTRUMENT BECOME DEFECTIVE DUE TO FAULTY PARTS OR WORKMANSHIP WITHIN THE WARRANTY PERIOD, IT WILL BE REPAIRED AT THE FACTORY AT NO CHARGE. S.J. CONTROLS, INC. WILL PAY FOR TRANSPORTATION ONE-WAY WITHIN THE CONTINENTAL UNITED STATES IF THE NEW DEVICE PROVES TO BE DEFECTIVE WITHIN ONE YEAR OF SHIPMENT. S.J. CONTROLS, INC. WILL NOT PAY AIR FREIGHT OR PACKING CHARGES. THE WARRANTY PERIOD BEGINS WITH THE SHIPPING DATE OF THE EQUIPMENT TO THE ORIGINAL PURCHASES. ALL REQUESTS FOR WARRANTY SERVICE MUST BE RECEIVED WITHIN THE WARRANTY PERIOD.

S.J. CONTROLS, INC. LIABILITY IS LIMITED TO RPAIR OR REPLACEMENT OF THE DEFECTIVE CONTROLS. UNDER NO CIRCUMSTANCES IS S.J. CONTROLS, INC. LIABLE FOR CONSEQUENTIAL DAMAGES. THE FOLLOWING ARE NOT COVERED BY THIS WARRANTY:

DAMAGE DUE TO CORROSION, ABUSE, ACCIDENT, ALTERATION AND SUITABILITY FOR SPECIFIC PURPOSE.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES AND OBLIGATIONS, AND NO PERSON HAS AUTHORITY TO CHANGE IT.

THE WARRANTER IS:

S.J. CONTROLS, INC.
2248 OBISPO AVE., SUITE 203
SIGNAL HILL, CA 90755

## 6.4 Other Products Available From S.J. Controls

**Custom Batching Systems**

**Positive Displacement Pump as a Flow Meter**

**Water Meter Systems**

**Flow Meter Sequencers**

**Plastic Flow Meters**

**Turbine Meters**

**Positive Displacement Meters**

**Rate of Flow Indicators**

**Rate of Flow Controllers**

**Inline Digital Blending Systems**

**Digital Tank Gauging Systems**

**Computerized Flow Controls**

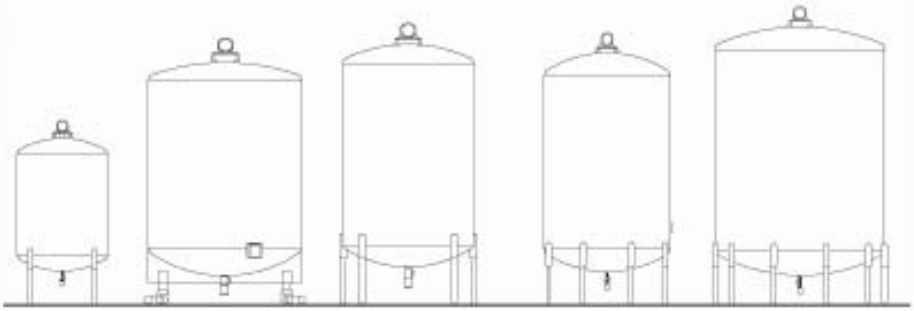
# S.J. Controls, Inc. "For tank inventory control"

* Continious inventory upgrade
* Accurate with tanks of any geometry
* Alarms high/low levels, eliminates over and under
* Field programmable, for output in any unit of mesure

S.J. Controls offers the most complete line of tank inventory systems available. This choice, plus customization where required, provides the best and most cost-effective system, whether you need a simple, single tank monitor, or an ultra-sophisticated, multiple-tank control.

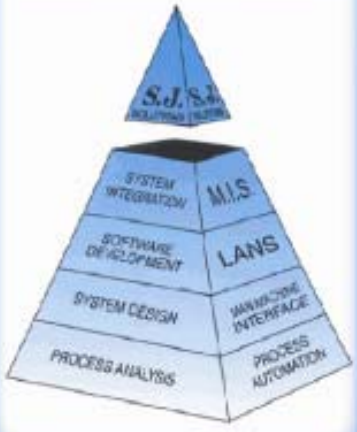
All S.J. units provide continuous, accurate display of tank contents with high/low level alarms. They can be field programmed to alow accurate inventory display for tanks of any size or shape, and in any unit of measurement. A security code prevents unauthorized changes, and analog avaraging provides a stable display.

Sanitary liquid level sensors, especially developed by S.J. for tank inventory systems, are also available. They feture 316 SS construction, flush diaphragm, zero/span adjustments, and are available to 3A standards.



**S.J. Controls, Inc.**

PROCESS SYSTEMS SOLUTIONS

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