CV-100
Automatic Changeover System

Operation and Maintenance Manual

Hydro Instruments
CV-100 Automatic Changeover System

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SAFETY PRECAUTIONS

GENERAL: Be sure to follow all applicable safety precautions when operating this equipment.

ELECTRICAL: The circuit board and incoming A/C power line carry the risk of shock and short circuit. Do not touch any part of the circuit board or A/C power line unless you are certain that A/C power has been disconnected from the system.

I. OVERVIEW

1. Contents

This instruction manual describes the Series CV-100 automatic changeover controller and its use in an automatic changeover system. See the circuit board diaphragm Figure 2 on page 5.

2. General Specifications

Enclosure Size:	295mm x 238mm x 146mm
Power Supply:	230V(±10%), 50/60Hz
Power Consumption:	10W
Operating Temperature:	-10°C to 70°C
Ambient Temperature:	-10°C to 70°C
Control Settings:	On/Off & Manual/Automatic
Inputs:	2 pressure switch input channels
	1 Remote alarm silence input switch
	2 analog 4-20mA input channels for scales
Outputs:	2 control signals for electronic ball valves
	2 contact relays indicating pressure switch condition
	2 contact relays indicating valve position (open/closed)
Display:	2 line, 20 character LCD display
LEDs:	6 LED indicators
Audible Alarm:	1 90 dB audible alarm (horn)

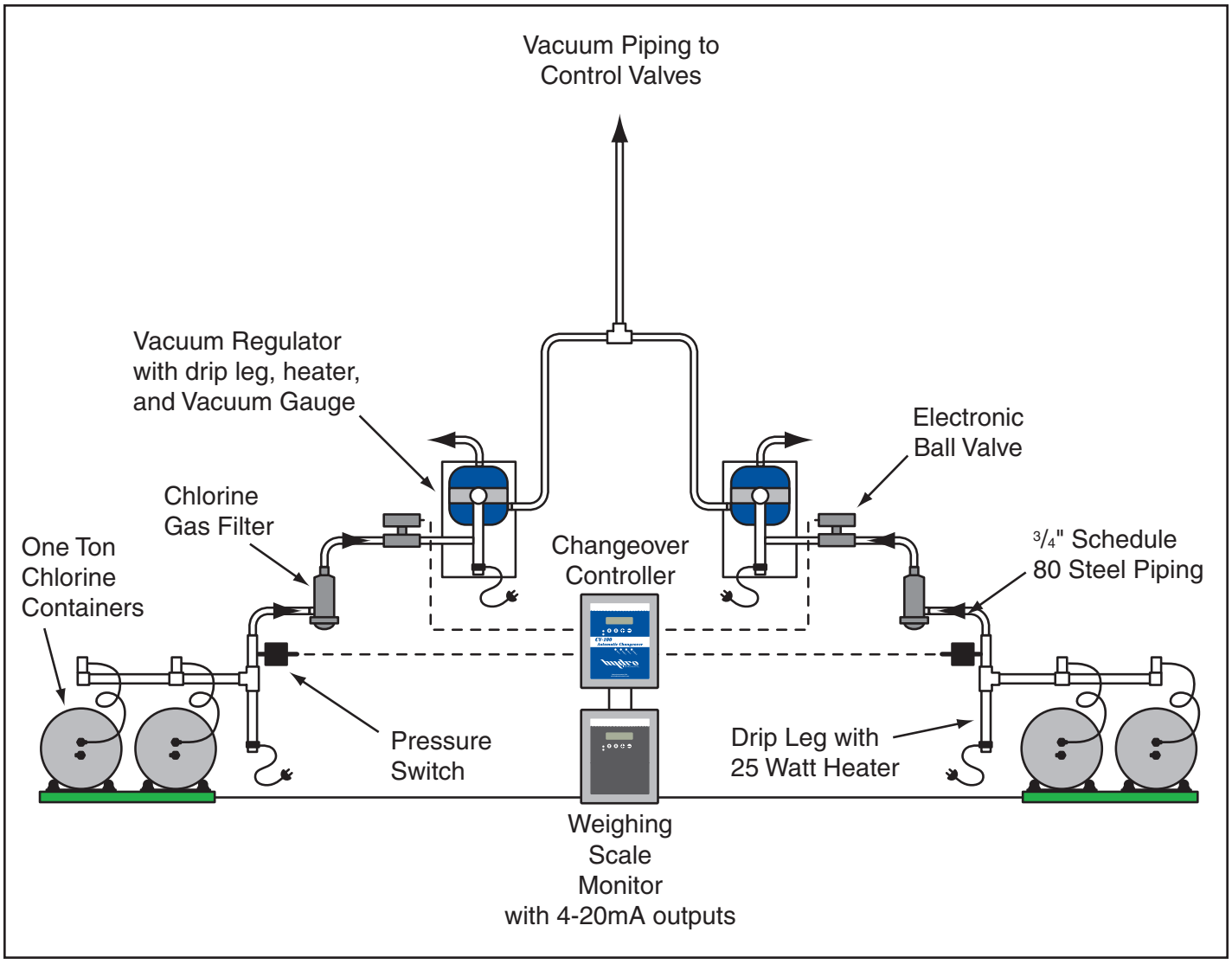
3. Function Overview

This equipment is used to control changeover from working to standby chlorine containers either manually or automatically. The controller accepts two pressure switch signals and provides control signals to operate two electronic ball valves. LEDs and an LCD display indicate the operating conditions of the system. Two 4-20mA input channels are also provided to accept optional weighing scale signals. Figure 1 shows the typical system layout for the Series CV-100 system.

The display indicates the time of day, date of the year, records the length of time that each side of the manifold has been in the working condition (electronic ball valve open) and (optionally) the chemical weight as indicated by weighing scales.. The LEDs indicate which side is in operation and also if one or both sides is empty.

The details of operation are described in Section III below.

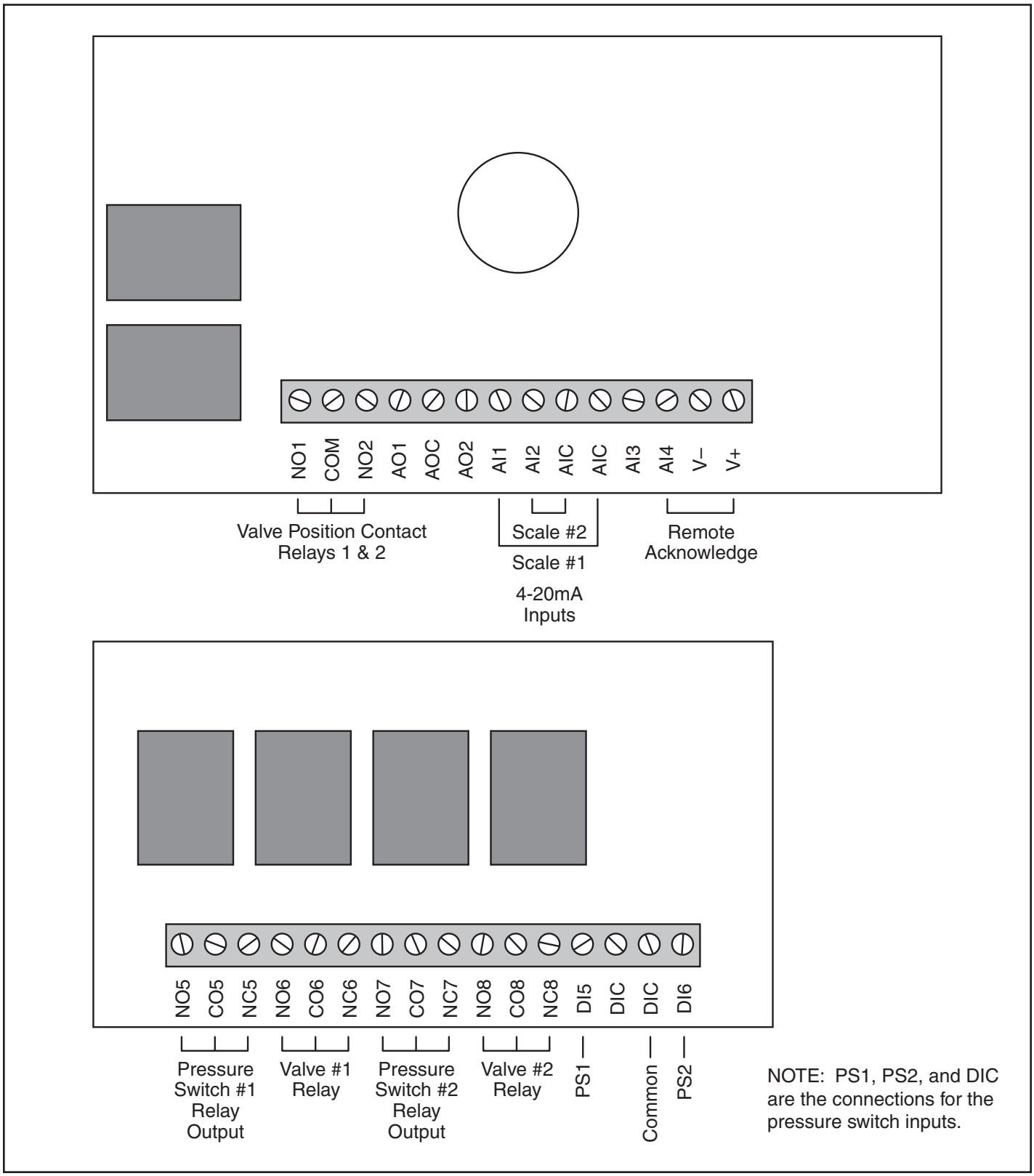
FIGURE 1 - TYPICAL SYSTEM INSTALLATION DRAWING



II. INSTALLATION INSTRUCTIONS

1. **Electric Connections**: Refer to the following drawings for wiring connections on the Model CV-100 controller circuit board.

FIGURE 2 – MODEL CV-100 CIRCUIT BOARD



2. **General Discription** *(Refer to Figure 2, 3, 4, and 5)*

   a. **A/C Power Connections** (Accepts 230V @ 50/60 Hz)

      L1: L2: GND: (Ground)

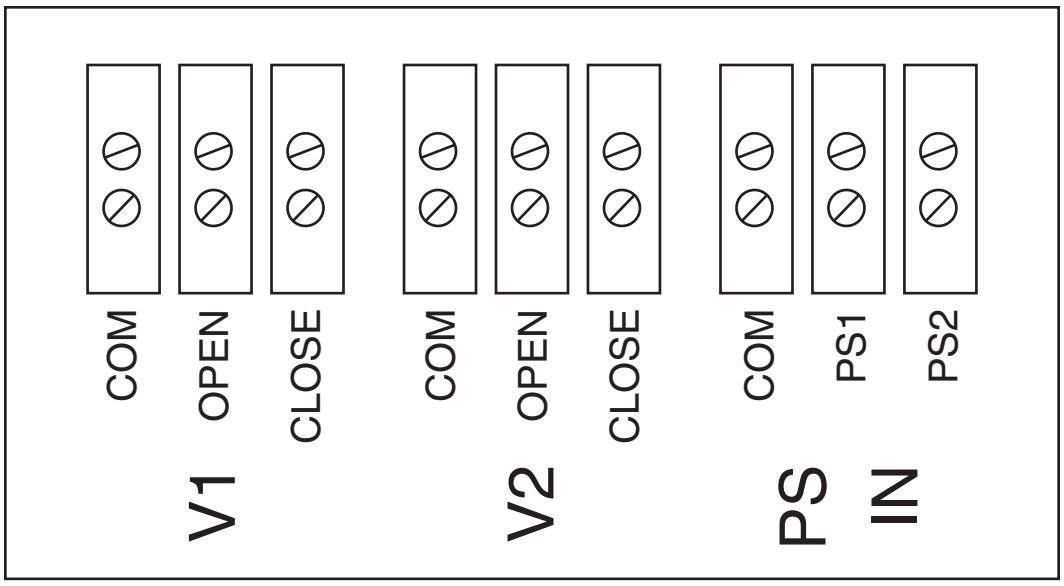
   b. **Remote Acknowledge Alarm:** Remote Alarm silence input switch (Normally Open). If an alarm condition exists then providing a closed contact switch signal to this input channel will silence and clear the alarm conditions. The connections should be made to pins AI4 and V+.

   c. **Pressure Switches:** Pressure switch signal input channels (Normally Open Operation)

      COM: Pressure switch signal common input (for both pressure switches)
      PS1: #1 container pressure switch Normally Open signal input
      PS2: #2 container pressure switch Normally Open signal input

      The pressure switches should be wired to the controller circuit board as shown in Figure 3.

FIGURE 3 – PRESSURE SWITCH AND MOTORIZED VALVE WIRING DIAGRAM



   d. **Ouput cables for controlling two electronic ball valves:** The power cables for the two electronically actuated ball valves are pre-wired to the controller and are provided with plug-style connectors. Once mechanical installation of the ball valves is complete, simply connect the ball valves to the power cables using the plug-style connectors provided.

      NOTE: Take care to be sure of which valve is selected as V1 (Valve #1) and which is selected as V2 (Valve #2).

   e. **Analog (4-20mA) Inputs for Weighing Scales:** As shown in Figures 1 and 2, there are two input channels provided. These can accept a 4-20mA signal from one scale on each side of the changeover. For weighing scale #1 the output 4-20mA signal + wire should be connected to AI1 and the – wire should be connected to AIC. Similarly, for weighing scale #2 the output 4-20mA signal + wire should be connected to AI2 and the – wire should be connected to AIC. Both AIC (Common) are connected electrically and can be used unterchangeably.

f. Relay outputs indicating valve position: Contact relay 1 (NO1 & COM) will close upon valve #1 closing and relay 2 (NO2 & COM) will close upon valve #2 closing.

g. Relay Outputs indicating pressure position: Contact relay 5 will close upon switch #1 closing and relay 7 will close upon switch #2 closing. These contacts can be utilized as "normally open" or "normally closed".

III. OPERATION INSTRUCTIONS

1. Keypad Operation

The keys are used as outlined here below. However, detailed instruction will follow in Section III-C.

⬆ Automatic/manual switch key. This key has three functions.

a. This key is used to manually switch from one container to the other. Pressing this key will manually change from one side to the other.

b. In the stop state, if the containers are not empty, this key can be used to enter the normal operating mode.

c. In the configuration mode, this key allows the operator to revisit the previous parameter (screen).

⬇ Configuration control key. This key is used to enter (via password) and move through the time setting options. Press this key one time to enter the password screen. Enter "100" using the ⊕ & ⊖ keys then press this key once to enter the configuration menu. The parameter selected to be adjusted will blink. After making the time adjustments continue to press this key until there no longer is a flashing parameter.

⊕ This key has two uses.

1. In the normal operating mode, pressing this key will close both electronic ball valves. It is used to close the two sides at the same time and then the display will read "off".
2. This key is also used to increase the time parameter in time setting mode.

⊖ This key has two uses.

1. In the configuration mode, this key is used to reduce the parameter selected for editing.
2. If it is not in the configuration menu, this key is used to clear the alarm and to clear the container empty LED. When there is an empty container alarm, press this key the first time to turn off the audible alarm. After changing chlorine containers and opening the cylinder valves, press this key a second time to turn off the empty indication LED and clear the previous time records.

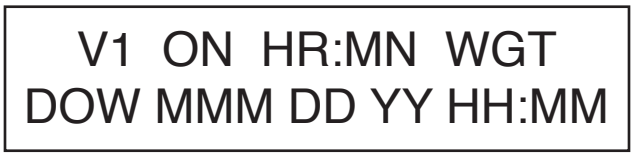
2. Display and LED Description

LEDs – The Model CV-100 Controller includes the following LEDs on the front panel.

WORK1: #1 working indication LED (green).
WORK2: #2 working indication LED (green).
EMPTY1: #1 empty indication LED (red).
EMPTY2: #2 empty indication LED (red).
RED: Low pressure condition exists.
GREEN: Indicates state of normal operation.

DISPLAY – The Model CV-100 Controller Display has the following display layout.

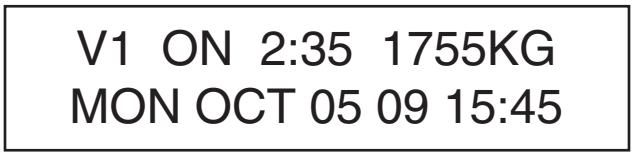
FIGURE 4 – DISPLAY LAYOUT



In Figure 4 above, the variables displayed are as follows:

V#: Either Valve 1 or Valve 2 is in the working state.
HR: Number of hours that this valve has been in the working state.
MN: Number of minutes that this valves has been in the working state.
WGT: Weight indicated by input signal from external scale device.
DOW: Day of the week (Mon, Tue, Wed, Thu, Fri, Sat, Sun)
MMM: Month
DD: Day
YY: Year
HH: Current time (hour of the day in 24 hour time).
MM: Current time in minutes.

FIGURE 5 – EXAMPLE DISPLAY READINGS



In Figure 5 above, the condition is as follows:

Valve 1 is in the working state and has been in the working state for a total time of 2 hours and 35 minutes. The day of the week is Monday, the time of day is 15:45 hours and the date is October 5, 2009. The remaining weight supplied through V1 is 1755 KG.

Working Time – The Model CV-100 controller will record and display the working time for each valve since the last time a pressure switch alarm signal was received from that side (i.e., since the last time that side had an empty alarm signal.) Therefore, if valve 1 is operating for 10 hours and then the system is manually switched to feed from valve 2 (without any alarm signal from side 1 pressure switch) and later the system is switched back to valve 1, the controller will indicate this working time starting again at 10 hours.

3. Basic Operation

a. Initial Power Up

When power is turned on to the Model CV-100 it will automatically go to the operating mode with valve 1 open (in the working state). The WORK1 LED and the GREEN LED should be illuminated.

b. Time / Date Adjustments

The display should indicate the correct date, day of the week and time of day. If not, then these parameters can all be adjusted. Press the ⬇ key one time to enter the configuration mode (via password: 100). The time of day minutes parameter will have a flashing cursor over it. You can adjust the minutes parameter with the ⊖ and ⊕ keys. Pressing the ⬇ key again will bring you to adjust the time of day hours parameter, then the day of the week, then the day of the month, month of the year and finally the year. Each parameter can be adjusted with the ⊖ and ⊕ keys as required.

c. Scale Set-up

In the configuration mode, the scale input channels can be enabled / disabled and configured (decimal position, scale (or span) and display units. To select the parameter to adjust, use the ⬇ and ⬆ keys. To edit the selected (blinking) parameter use the ⊖ and ⊕ keys.

d. Manual Changeover

In order to change from valve 1 to valve 2 in the working state, press the ⬆ key one time. The WORK1 LED will go dark and the WORK2 LED will illuminate while the controller closes valve 1 and opens valve 2.

e. Automatic Changeover

Under normal operation, one side should be in the working condition until the chlorine containers are nearly empty. When the chlorine containers are nearly empty the pressure will suddenly fall. The pressure switches should be set to alarm when the pressure falls below a user selected level (typically 1 to 5 kg/cm^2). When the operating side receives the pressure switch signal, the alarm will sound, the EMPX LED will illuminate and the controller will close that valve and open the standby valve. The scenario just described above is an automatic changeover. After a changeover has occurred, plant personnel must press the ⊖ key one time to silence the audible alarm.
The empty containers must also be replaced with new ones and connected to the manifold system again. After the containers have been changed, the ⊖ key must be pressed again to clear the EMPX alarm condition.

f. Stop Condition

If it is desired to close both sides of the system simultaneously then this feature should be used. During normal operation (i.e., if not in the time adjustment mode) to close both valves press the ⊕ key one time. Both valves will close and the audible alarm will sound. In order to re-enter normal operation mode (with Valve 1 in the working condition) press the ⬆ key one time. However, if there is an empty alarm condition present you will not be able to enter the normal working condition.

IV. MAINTENANCE

When system is working normally, do not open the enclosure cover, do not touch the power supply and the circuit board. If the equipment system is not working properly because of the influence of the outside factors, you can turn off the power supply to reset the system and clear the problem. This will not influence the recorded information.