Control Guard FCS
Instruction Manual
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CAUTION: Wear protective clothing and eyewear when dispensing chemicals or other materials. Observe safety handling instructions (MSDS) of chemical mfrs.

CAUTION: To avoid severe or fatal shock, always disconnect main power when servicing the unit.

CAUTION: When installing any equipment, ensure that all national and local safety, electrical, and plumbing codes are met.
SPECIFICATIONS

- Pollution Degree II
- Installation category I
- Altitude 2000m
- Humidity 5 to 95%
- Electrical supply 115/230VAC, 50/60Hz, 2A
- For Indoor Use Only
- Temperature 5°C to 40°C
- Mains supply voltage fluctuations are not to exceed 10% of the nominal supply voltage
- The unit shall not be positioned so that it is difficult to operate the power disconnecting means
- Protection is impaired if the product is used in a manner not specified by the manufacturer
- Replacement Fuse for 115V model: 2Amp, 250V, 6.3x32mm, Fast-Acting
- Replacement Fuse for 230V model: 2Amp, 250V, 5x20mm, Fast-Acting

SAFETY SYMBOL EXPLANATIONS

Listed below are explanations of the safety symbols that appear either on the unit, in the instruction manual, or both. Please familiarize yourself with the meaning of each symbol.

GENERAL CAUTION: This symbol indicates a general safety caution.

SHOCK HAZARD: This symbol indicates that hazardous voltages are inside the enclosure.

READ MANUAL: This symbol indicates to read the manual for important instructions and procedures related to safety.
PRE-INSTALLATION

(1) Check all applicable plumbing and electrical codes before installation. This will help to ensure that the system is installed in a safe and suitable manner.

(2) Get a wiring schematic of the washer machine (provided by the machine manufacturer or may be on the machine itself).

(3) Check to make sure that all functions of the washer are operating properly. Including; timer, water solenoids, water level switch, pump motor, and drain valve.

(4) Check the proposed location for a 115, or 230 VAC power source (based on the model you will be using).

(5) Check voltage of all washer chemical signals that will be used. Measure voltage between chemical signal and signal common with a voltmeter. Do not check signal voltage between supply signal and case (earth) ground.

(6) Check mounting location for chemical injection anti-siphon valves. Verify port size with fittings you have for installation.

Before beginning the installation, make sure you have the following tools and materials ready...

- Flat and Phillips screwdrivers.
- Drill and drill bits.
- Suitable wire for main power and signals (check local codes).
- Wire cutters, wire strippers, and pliers.
- Wire terminal connectors and a crimping tool.
- Voltmeter (or multi-meter).
- Drywall inserts and mounting screws.
- Electrical tape and wire nuts.
- Chemical test kit.
- Injection check valves.
- Braided vinyl hose for 3/8" ID.

INSTALLATION

Mounting

Mounting feet and screws are provided with the unit. Attach the mounting feet to the back of the unit by putting the screws into the brass inserts in the upper corners. Hang the unit on a wall in a suitable location that is close to the chemical containers and also the chemical injection point(s). Mounting height should be no more than 10’ vertically above the chemical containers.

Main Power

Connect leads to a 115, or 230 VAC power source (based on the model you have) that is “on” when the machine is “on.” This will provide power for all pumps, however the system will only pump chemical when electrically signaled. Whenever possible, use the machine’s ON/OFF switch as the main power source. Avoid using the machine’s pump motor as main power. Check the voltage select switch on the circuit board to ensure its set for the correct main power voltage. Important: If EDP pumps will be used, they must match the main power voltage.

Pump 1 Signal

A trigger signal is required to activate the probe sensing operation, or to trigger the repeat cycle mode initial charge. For Probe mode, check the washer for a power source that is active during the wash cycle only, for example, the magnetic contactor that controls the wash pump motor. You can also jumper main power to the signal input when a constant power up condition is applicable. Connect leads to the pump 1 signal source. Signal voltage range is 14 - 240 VAC. For repeat cycle mode initial charge, check for a signal that will activate only when the machine is filled with a fresh tank of water.

Pump 2 Signal

In addition to running pump 2, the pump 2 signal triggers the recharge injection if repeat cycle mode is selected. For probe mode, check the washer for a signal source that is active when you want the pump to run. For repeat cycle mode, check the washer for a signal source that will be used to trigger the recharge injection. Connect leads to the pump 2 signal source. Signal voltage range is 14 - 240 VAC.
**Conductive Probe Installation (optional)**

1. Install the probe in the wash tank below the water level. It should be away from incoming water supplies, near the recirculating pump intake, and 3 to 4 inches from corners, heating elements, or the bottom of the tank. If an existing mounting hole cannot be located, cut or punch a 7/8" hole.

2. Use 18 AWG multi-stranded copper wire for the probe connection. Avoid running the wire near high voltage AC lines. Do not route probe wires through the same conduit as power and signals.

3. Connect leads to the probe. Ring-type terminals are recommended (be sure to connect them to the probe terminals with “backing” nuts to prevent the probe tips from being pulled out of the probe). The ring terminals should be secured between the inner (backing) nuts and outer nuts.

**Inductive Probe Installation (optional)**

1. The probe should be mounted in the washer tank with the hole oriented vertically. Start by feeding the wire end through the mounting hole from the inside of the tank. One rubber washer should already be mounted on the threaded mounting stud.

2. After the plastic probe body has been firmly secured to the mounting hole with a rubber washer on each side of the tank, feed the wire lead through a strain relief on the bottom of the Control Guard unit.

3. With the wire lead routed through the strain relief, attach the four wires to the circuit board per the wiring diagram. The wire colors must match the colors shown on the terminal strip.

**Peristaltic Pump Connections**

1. Cut a suitable length of braided tubing and connect between the discharge (right) side of the pump’s squeeze tube and the injection point. Use barb fittings (supplied) and hose clamps to secure safely.

2. Cut a suitable length of braided tubing and connect between the suction (left) side of the pump’s squeeze tube and the chemical pickup tube. Use of barb fittings and hose clamps is recommended.

3. Insert pickup tube into chemical container.

**Air Pump Installation (optional)**

1. Attach air input fitting to the air inlet port on the pump.

2. Attach inlet and outlet barb fittings.

3. Mount the pump as close as possible to the chemical supply and no more than 6 ft above chemical containers.

4. Connect pickup line to input side of pump.

5. Connect discharge line between output side of pump and point of injection.

6. Cut 3/8" poly tubing to length needed and connect between air input fitting on pump and the outlet fitting on the air solenoid at the control box.

7. Cut 3/8" poly tubing to length needed and connect between the inlet fitting on the air solenoid at the control box and the available air supply. Be sure to use a clean, dry, source of compressed air for optimal performance.

8. Insert pickup line into chemical container.

**EDP Pump Installation (optional)**

1. Mount the pumps as close as possible to the chemical supply and no more than 10 ft above chemical containers.

2. Install braided tubing between the discharge (right) tube side of the pump and the injection point. Use stainless steel hose clamps and barb fittings to secure braided tubing to pump.

3. Install braided tubing between the suction (left) tube side and the barb fitting on the PVC pickup tube. Use stainless steel hose clamps and barb fittings to secure braided tubing to squeeze tube.

4. Insert pickup line into appropriate chemical container.

5. Connect each pump to corresponding terminals on the circuit board (see wiring diagram).
OPERATION

Probe Mode

When the pump 1 signal is "on", the probe senses chemical concentration. When concentration drops below the setpoint, the control automatically turns on chemical feed. As the chemical feeds, the control senses the rate at which the concentration is approaching the setpoint. The control then begins to pulse feed (intermittent on/off) to prevent over-use of chemical. The pulse feed rate will depend on how fast the setpoint is being approached.

The low product alarm will sound if the setpoint is not reached within the alarm delay time period. The alarm can be temporarily muted if desired (see button functions). A "feed limit" feature allows you to set the unit to automatically shut off the chemical feed when the alarm has been activated.

Repeat Cycle Mode

This type of operation controls chemical concentration without a probe, based on timed feed modes. The initial charge feeds chemical to bring the machine to working concentration when initially filled with fresh water. The initial charge feed is activated by a trigger signal, which also increments the initial charge counter for each activation.

Recharge time feeds chemical to maintain concentration strength as fresh water dilutes the machine. The recharge is triggered after a specified number of washes.

BUTTON FUNCTIONS

- ENTER: Holding the enter button for 3 seconds (approx.) switches between run and program modes. Enter also advances through programming menus.

- SCROLL: The scroll button moves the position of the cursor in menus where text or number changes are done. The scroll button will "wrap around" at the end of a line of characters, meaning that the cursor will advance to the beginning of the line automatically. The scroll button toggles between choices in menus that have selectable settings. The scroll button also shows the wash count and initial charge count during normal operation.

- UP (↑): Increases numeric values or advances upward through available characters. Hold the button down to rapidly advance. The UP button also acts as pump 2 prime during normal operation.

- DOWN (↓): Decreases numeric values or advances downward through available characters. Hold the button down to rapidly advance. The DOWN button also acts as satellite pump 1 prime during normal operation.

Alarm Mute

During operation, the low chemical alarm (probe mode) can be silenced by pressing the SCROLL and UP buttons simultaneously for 1 full second. The display will show "Alarm Muted" and the audio alarm will turn off for 5 minutes.

OPERATING PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default Value</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pass Code</td>
<td>0000</td>
<td>0 – 9, A – Z</td>
</tr>
<tr>
<td>Language</td>
<td>English</td>
<td>English, Spanish, French, German, Dutch, Italian</td>
</tr>
<tr>
<td>Pump 2 Speed</td>
<td>50%</td>
<td>0%-100% (of full speed)</td>
</tr>
<tr>
<td>Wash Time</td>
<td>10 sec</td>
<td>10 – 255 sec</td>
</tr>
<tr>
<td>Chemical Mode</td>
<td>Probe</td>
<td>Probe/Repeat Cycle</td>
</tr>
<tr>
<td>Chemical Type</td>
<td>Liquid</td>
<td>Liquid / Dry / Small Tank</td>
</tr>
<tr>
<td>Chemical Concentration</td>
<td>25 Knight Units</td>
<td>0 — 999 Knight units</td>
</tr>
<tr>
<td>Alarm Delay</td>
<td>180 sec</td>
<td>1 – 512 sec</td>
</tr>
<tr>
<td>Initial Charge</td>
<td>1 sec</td>
<td>1 — 128 sec</td>
</tr>
<tr>
<td>Recharge Time</td>
<td>1 sec</td>
<td>0 – 255 sec</td>
</tr>
<tr>
<td>Wash Count</td>
<td>0</td>
<td>0 – 65536</td>
</tr>
<tr>
<td>Repeat Cycle Interval</td>
<td>10</td>
<td>10 — 255 Washes</td>
</tr>
<tr>
<td>Feed Limit</td>
<td>On</td>
<td>On/Off</td>
</tr>
<tr>
<td>Detergent Run Time</td>
<td>0</td>
<td>9999 Minutes</td>
</tr>
</tbody>
</table>
PROGRAMMING

You may find it helpful to read through the programming instructions before getting started. This will better familiarize you with the operation of the Control Guard FCS, and will make the actual programming go much quicker. Be aware of the following notes.

- If you wish to return to normal operating mode at any point during programming, hold down the ENTER button for 3 seconds to exit the programming mode.

- While programming, if no buttons are pressed for approximately 2 minutes, the system will automatically return to normal operating mode.

- Programming changes can be made while the unit is operating — changes will take effect immediately. This allows you to make minor adjustments “on-the-fly” and fine tune the performance of your system.

When you’re ready to get started, hold down the ENTER button for about 3 seconds to go into the programming mode. Release the button when you see the following display...

- ENTER PASS CODE: 0000 PRESS ENTER
  
  All new systems are shipped from the factory with the pass code set at 0000. If the system is new, press ENTER to continue.

  If the pass code has been changed from the default of 0000 (explained later in this manual) use ⬆/⬇ and SCROLL to type in your code, then press ENTER to continue.

- SELECT LANGUAGE: ENGLISH
  
  If you wish to change the menu language, press SCROLL to advance through the available choices until your desired language name is shown on the display. Press ENTER to continue.

- SET PUMP 2 SPEED: 50% OF FULL SPEED
  
  Use ⬆/⬇ buttons to change the speed of pump 2. The pump will begin running when either button is pressed. When the desired setting has been reached, press ENTER — the pump will stop running, and you will advance to the next menu.

- CHEMICAL MODE: PROBE
  
  Use the SCROLL button to choose probe or repeat cycle chemical feed mode, then press ENTER to continue.

- CHEMICAL CONCEN: 25 KNIGHT UNITS
  
  Chemical concentration is set in Knight Units, millisiemens, or percentage. A chart is provided on page 11 to show the relationship between Knight Units and conductivity. This chart can be used as a general reference for setting the desired concentration.

  Use ⬆/⬇ to change the concentration setting, then press ENTER to continue.

Continue on next page
Use this menu to select if you wish to display the wash tank temperature. Use the scroll button to select degrees Fahrenheit or Centigrade, or to turn the temperature display off. Use SCROLL to set your display choice, then press ENTER to continue.

NOTE: The system can only display wash tank temperature when using an inductive probe. No special wiring is required for the inductive probe. It connects to the system per the wiring diagram.

This setting allows you to choose which chemical concentration unit of measure you wish to use. The available choices are “Knight Units” (K), Millisiemens (mS) or percentage (%) concentration.

Use SCROLL to select the concentration units that will be used, then press ENTER to continue.

You will only see this menu prompt if you chose percentage (%) as your unit of measure for displayed chemical concentration. Choose yes if you are initially setting up the system, or if you wish to change the calibration value. Use SCROLL to choose yes or no, then press ENTER to continue.

If selecting % Concentration for controlling/displaying concentration values you will need to temporarily set the control to mS 00:00 to establish the P1X and P2X Data points. These data points are needed to teach the Control Guard the % Concentration range you want to control. Follow these steps to determine P1X and P2X:

1. Determine total tank size in gallons or liters.
2. Determine the % concentration (by volume) of chemical needed to clean/treat.
   
   **Example:**
   Tank Size = 300 Gallons (38,400 ounces)
   Desired Concentration = 1.25 %
   Chemical % @1.25% = 480 ounces

3. Divide 480 ounces by 4 (result is 120 ounces -or-.31%). This will be amount of chemical you will manually place into the washer to determine value P1X.
4. Fill the system with water (with control in mS 00:00 mode) then pour in the 120 ounces of chemical. Once the chemical concentration is stable (mS 00:00) program this number as your P1X and enter the % concentration value as .31%.
5. To determine P2X multiply 480 ounces by 1.5. This will be the amount of chemical you will manually place in the washer to determine P2X.
6. Place 720 ounces of chemical into the same wash tank and note concentration value in mS 00:00. Enter this value as P2X and program the % concentration as 1.87%.
• If you are done programming PROBE mode, go to page 10.
• If you chose to use REPEAT CYCLE mode instead of PROBE mode, you will see the following menu structure...

**CHEMICAL CONCEN:**

This setting allows you to choose if you wish to see the actual concentration reading on the display during normal operation. Use SCROLL to turn the concentration display on or off, then press ENTER to continue.

**ALARM DELAY:**

180 SEC

Alarm delay is a time frame that the chemical setpoint is expected to be reached within. If the setpoint is not achieved within the set time, the alarm will sound intermittently until the problem is resolved or power is cycled.

This setting should be slightly longer than the time it takes for the unit to achieve the setpoint with a fresh tank of water. Use /bup /bdown to choose from 1 to 512 seconds, then press ENTER to continue.

**DET RUN TIME**

0000 MIN

This display shows the total accumulated run time for pump #1. This feature tracks the total chemical output from the pump in minutes. Press SCROLL if you wish to reset accumulated run time. Press ENTER to continue.

**PUMP 1 FEED LIMIT**

ON

Chemical feed limit works in conjunction with alarm delay. When this feature is "on", and the concentration setpoint is not reached within twice the alarm delay, the alarm will become continuous and chemical feed will be halted until the problem is resolved or power is cycled. Use SCROLL to turn the feed limit on or off, then press ENTER to continue.

**INIT PMP1 CHARGE**

01 SEC

The initial charge feeds chemical to achieve working concentration when the machine is initially filled with a fresh tank of water. The available timing range is 1 to 128 seconds. Use /bup to set the initial charge time, then press ENTER to continue.

**DET RUN TIME**

0000 MIN

This display shows the total accumulated run time for pump #1. This feature tracks the total chemical output from the pump in minutes. Press SCROLL if you wish to reset accumulated run time. Press ENTER to continue.

**PMP1 RECHARG TIM**

01 SEC

The recharge feeds chemical to maintain the working concentration as fresh water dilutes the washtank. The available timing range is 0 to 255 seconds. Use /bup to set the recharge time, then press ENTER to continue.

**INTERVAL MULTIPL**

01:

This setting allows you to choose how many washes will be counted before triggering the recharge feed. The range is 1 to 99 racks. Use /bup to set recharge wash count, then press ENTER to continue.

Continue on next page
<table>
<thead>
<tr>
<th>Menu Item Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘DOWN’ KEY TO RESET CYCLE COUNT</td>
<td>You will only see this display if using repeat cycle operation. If you wish to clear the cycle counter, press the DOWN button. The display will briefly flash the cycle counter screen to show that it was set back to zero, and will then return to the display at left. Press ENTER to continue.</td>
</tr>
<tr>
<td>DOWN TO RESET INIT CHARGE CNT</td>
<td>You will only see this display if using repeat cycle operation. If you wish to clear the initial charge counter, press the DOWN button. The display will briefly flash to the counter to verify that it was set back to zero, and will then return to the display at left. Press ENTER to continue.</td>
</tr>
<tr>
<td>‘SCROLL’ TO CHANGE DISPLAY NAME</td>
<td>This menu item allows you to change the display name. Press the SCROLL button once and you will see a screen with the current display name showing. Use ↑/↓ to change the selected character (the one that is underlined) and SCROLL to advance to the next character. When finished, press ENTER to continue.</td>
</tr>
<tr>
<td>CHANGE PASS CODE 0000 PRESS ENTER</td>
<td>This menu item allows you to change the pass code. Use ↑/↓ to change the selected character (the one that is underlined) and SCROLL to advance to the next character. When finished, press ENTER to continue.</td>
</tr>
<tr>
<td>ARE YOU SURE? 0000 IS NEW CODE</td>
<td>If you changed the pass code in the previous menu, you will be prompted to confirm your choice. If you wish to pick a different number, press SCROLL to return to the previous menu, otherwise press ENTER to continue.</td>
</tr>
<tr>
<td>INIT CHRG LOKOUT 01 MINUTES</td>
<td>You will only see this display if using repeat cycle operation. This setting locks out the initial charge for the time specified (from the previous initial charge). This prevents over-use of chemical if the trigger signal energizes unexpectedly during operation. Use ↑/↓ to choose from 0 to 120 minutes, then press ENTER to continue.</td>
</tr>
<tr>
<td>REPEAT CHRG INTE RV EVERY: 10 SEC</td>
<td>You will only see this display if using repeat cycle operation. The Repeat Cycle Interval is the time between chemical recharge events. As long as a signal to pump #1 input is present, this timing interval will cycle the pump to recharge your system. Use ↑/↓ to choose from 10 to 255 seconds, then press ENTER to continue.</td>
</tr>
</tbody>
</table>

Continue on next page
CHEMICAL TYPE: LIQUID

Use SCROLL to choose liquid or dry as the type of chemical, then press ENTER to continue.

There is also a “SMALL TANK” setting that can be selected for special applications to enhance dry chemical feed in probe mode (does not apply to repeat cycle). If SMALL TANK is selected, the chemical feed rate will be more aggressive when the concentration reading is within 5 Knight units of the setpoint. Additionally, the alarm (delay) function will be by-passed when the concentration reading is within 3 Knight units of the setpoint.

PUMP 2 RUNS WITH: PMP 2 INPUT SIGNAL

Use SCROLL to choose whether you wish to have pump 2 run (simultaneously) with pump 1, or when triggered with its own independent signal, then press ENTER to continue.

SCROLL & DOWN TO RESET EVERYTHING

You will be prompted if you wish to reset the system. This function is recommended for new installations and allows you to clear all memory and set the unit back to default parameters.

Hold down on the SCROLL and DOWN buttons until you see the message “RESETTING EVERYTHING” then release both buttons. After a few seconds, the memory will be cleared and the display will return to the display at left. Press ENTER to continue.

Control Guard FCS Concen(ms) vs. Knight Units

Note: The chart shown above is based on data that was derived using the inductive probe, and, should be used as a guide only. Actual titration testing of your chemical concentration is recommended to achieve the desired setpoint.
## REPLACEMENT PARTS

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7140566</td>
<td>Main Control Circuit Board</td>
</tr>
<tr>
<td>7140567-01</td>
<td>Pump Circuit Board</td>
</tr>
<tr>
<td>7140567-02</td>
<td>Pump Circuit Board (for Europe applications)</td>
</tr>
<tr>
<td>7164257-1</td>
<td>Transformer With Plug</td>
</tr>
<tr>
<td>1201701</td>
<td>Control Guard FCS Label</td>
</tr>
<tr>
<td>7010261</td>
<td>Gearmotor (for 500 series pump)</td>
</tr>
<tr>
<td>7018051</td>
<td>T-50-E Squeeze Tube (for 500 series pump)</td>
</tr>
<tr>
<td>7020148</td>
<td>Hose Clamp (for 500 series pump)</td>
</tr>
<tr>
<td>7501311-BK</td>
<td>500 Series Pump Body (black)</td>
</tr>
<tr>
<td>7502312</td>
<td>500 Series Pump Face Plate</td>
</tr>
<tr>
<td>7503450</td>
<td>500 Series Pump Roller Block Assy</td>
</tr>
<tr>
<td>1600747</td>
<td>1/4&quot; Barb x 1/4&quot; Barb Fitting</td>
</tr>
<tr>
<td>7010116</td>
<td>Gearmotor (for 800 series pump)</td>
</tr>
<tr>
<td>7018068</td>
<td>T-66-E Squeeze Tube (for 800 series pump)</td>
</tr>
<tr>
<td>7020144</td>
<td>Hose Clamp (for 800 series pump)</td>
</tr>
<tr>
<td>7630330</td>
<td>800 Series Pump Face Plate</td>
</tr>
<tr>
<td>7631331</td>
<td>800 Series Pump Body (black)</td>
</tr>
<tr>
<td>7633330</td>
<td>800 Series Pump Roller Block Assy</td>
</tr>
<tr>
<td>1600713</td>
<td>3/8&quot; Barb x 3/8&quot; Barb Fitting</td>
</tr>
<tr>
<td>7641069-D4</td>
<td>Air Solenoid Valve</td>
</tr>
<tr>
<td>7005190</td>
<td>Conductive Probe</td>
</tr>
<tr>
<td>1600698</td>
<td>Inductive Probe</td>
</tr>
<tr>
<td>0200503</td>
<td>Strobe Alarm</td>
</tr>
<tr>
<td>7140583</td>
<td>KTM-550 Circuit Board Assy</td>
</tr>
<tr>
<td>7142326</td>
<td>KTM-600 Circuit Board Assy</td>
</tr>
<tr>
<td>7140586</td>
<td>CT-550 Circuit Board Assy</td>
</tr>
<tr>
<td>7141600</td>
<td>CT-600 Circuit Board Assy</td>
</tr>
<tr>
<td>7142218</td>
<td>MT-300 Circuit Board Assy</td>
</tr>
<tr>
<td>7142228-2</td>
<td>MT-400 Circuit Board Assy</td>
</tr>
</tbody>
</table>
OPTIONAL KTM 550/600 CONTROL

Priming

1. Locate the dip-switch pack on the circuit board and set switch #6 to RELAY.
2. Press and hold the Start button until the chemical line is fully primed, then release the button.
3. Set switch #6 to SIGNAL (unless you intend to use relay mode).

Programming Run Time

- Max run time: 12 min and 42 sec

1. Locate the dip-switch pack on the circuit board. Set switch #6 to SIGNAL, set switch #7 to RUN TIME and set switch #8 to PROGRAM MODE.
2. Using a measuring cup or flask, press Start switch and release when pump starts. Let the pump run until desired amount of chemical is dispensed then press Start switch again to stop. The run time is now programmed.
3. Set mode switch #8 to RUN MODE.

Programming Delay Time (optional)

- Max delay time: 12 min and 42 sec

1. Locate the dip-switch pack on the circuit board. Set switch #6 to SIGNAL, set switch #7 to DELAY TIME and set switch #8 to PROGRAM MODE.
2. Press Start switch and release when the LED begins flashing. When the desired delay time has passed, press the Start switch again. The delay time is now programmed. Repeat step if new delay time is required.
3. Set mode switch #8 to RUN MODE.

Setting Lock-Out Time (optional)

This feature defeats consecutive dispensing of product for a pre-determined interval. Select a combination of switches 1 – 5 to program total lock-out time.

Example: For 10 minute lock-out, set switches #2 and #4 to ON with all other switches OFF.

- For maximum lock-out (31 min) set all switches ON.
- For no lock-out, set all switches OFF.

Manual activation: Press the Start button for 1 full second. The control will begin counting down the delay time (if used) and will then run the pump for the amount of time programmed. Once the lock-out time expires the pump will be ready to restart.

Signal activation: When the signal input on the circuit board (see wiring diagram) receives a 14-240 VAC trigger signal for at least 5 full seconds, the delay time (if used) will begin counting down. Then the pump will run for the amount of time programmed. Once the lock-out time expires the pump will be ready to restart.

Relay Mode: Set switch #6 to RELAY. The pump will activate for as long as an external trigger signal is present, or for as long as the manual button is depressed. All other board functions (such as delay time and lock-out time) are by-passed in relay mode.
OPTIONAL CT 550/600 CONTROL

The CT-550/600 circuit board is a cycle timer that controls a pump by repeatedly cycling the “on” time at the end of every “off” time (interval time). The CT-550 version has a 24 VDC pump output, whereas the CT-600 version has a relay that switches power to a 115 or 230 volt motor (or other device). The board has the option to have the pump operate as soon as power is applied (“on” first) or after the “off” interval has expired (“off” first). See details below.

On-First / Off-First

DIP switch #7 is used to select on-first/off-first operation. Which setting you choose will be based on your application requirements and how you wish for the pump to operate. In the examples shown below, if the interval time is 10 minutes and the on time is 1 minute, then the pump will run every 10 minutes when the interval time expires. The first activation of the pump is based on DIP switch #7 setting.

- When set to “ON FIRST”, the pump will begin running for the on-time immediately when powered up.
- When set to “OFF FIRST”, the pump will start counting down the interval time when powered up (before running the pump).

Priming

The pump can be primed manually while the interval time is counting down (LED flashing). Ensure that the power is on, then press and hold the START button to prime the pump. The pump will run for as long as the button is pressed.

A remote prime switch can be connected to the START terminals on the circuit board if desired. This may be helpful in applications where the pump is not easily accessible.

Setting “On” Time

The maximum ON time is 12 minutes and 42 seconds. The on time must always be shorter than the interval time for the system to “cycle” properly. If the on time is inadvertently set longer than the off time, then the pump will run continuously and will not cycle off.

1. Locate the DIP-switch pack on the circuit board — set switch #8 to PROGRAM.
2. Using a measuring cup or beaker, press Start switch and release when pump starts. Let the pump run until desired amount of chemical is dispensed then press Start switch again to stop. The on time is now programmed.
3. Set mode switch #8 to RUN MODE.

Setting “Off” (Interval) Time

The maximum OFF time (interval time) is 63 minutes. The interval time is set by selecting a combination of DIP switches 1 – 6. All switches that are turned ON will be added up to determine the total interval time. For example, if you wish to set a 20 minute interval time, set switches #3 and #5 to ON with all other switches OFF.

- For maximum off time (63 min) set all switches ON.
- When the interval time expires, it resets and begins counting down again. The pump runs for the duration of the on time each time the interval time resets.
OPTIONAL MT 300/400 CONTROL

Button Functions

PRGM: Steps you through the setup program.

PRIME 1 (_down): Manually activates the pump and shows clock when not programming.
Advances numbers downward when programming.

PRIME 2 (_up): Advances numbers upward when programming.

Security Feature — Remove Jumper JP1 To Program

To prevent unauthorized tampering, the programmed settings can be “secured” by placing a jumper on the JP1 pins on the circuit board. The jumper acts like a lock and key...when the board is secured (jumper on) the display will show “SECU” if the PRGM button is pressed. The PRIME buttons are not affected and will still function in their normal manner. Removing the jumper allows the board to be programmed or to change the time of day clock. Replace jumper when done programming if you wish to secure the system.

Programming

1. Press the PRGM button — set the clock to the current time of day. Use _up/down to set the clock (note AM/PM).
2. Press PRGM button again — PE 1 will be displayed. PE = Pump Events (“on times”) needed per day. Use _up/down to set the number of pump events per day that are required.
   NOTE: The system will activate only the number of pump events indicated by the PE #.
3. Press PRGM button again — E 1 will be displayed indicating that you are going to program the first event.
4. Press PRGM button again — pump start time will be displayed. Use _up/down to set the pump start time (note AM/PM).
5. Press PRGM button again — pump run time will be displayed. Use _up/down to set the pump run time (min:sec).
6. a: Press PRGM button again — E 2 will be displayed if you selected more than 1 pump events (PE) per day.
   Program all pump events the same as the instruction in steps 4 & 5.
   b: After all pump events are programmed, pressing the PRGM button will return you to the blank display.
7. To review your pump programming, press the PRGM button and slowly step through the program. Make changes as necessary referring to the above instructions.

Tip: If you hold down any of the buttons while programming, the numbers will scroll much faster.

Tip: If you get lost in the program, press PRGM until you return to blank display. Then repeat instructions above.
MT 300/400 WIRING DIAGRAM

MT-300 CIRCUIT BOARD

SEE SYSTEM WIRING DIAGRAM FOR ALL OTHER CONNECTIONS

PUMP 2 = INTERNAL DC GEAR MOTOR PUMP ASSEMBLY (24 VDC)

MT-400 CIRCUIT BOARD

SEE SYSTEM WIRING DIAGRAM FOR ALL OTHER CONNECTIONS

PUMP 2 = EXTERNAL AC GEAR MOTOR PUMP ASSEMBLY (115 OR 230 VAC)
DISCLAIMER

Knight LLC does not accept responsibility for the mishandling, misuse, or non-performance of the described items when used for purposes other than those specified in the instructions. For hazardous materials information consult label, MSDS, or Knight LLC. Knight products are not for use in potentially explosive environments. Any use of our equipment in such an environment is at the risk of the user, Knight does not accept any liability in such circumstances.

WARRANTY

All Knight controls and pump systems are warranted against defects in material and workmanship for a period of ONE year. All electronic control boards have a TWO year warranty. Warranty applies only to the replacement or repair of such parts when returned to factory with a Knight Return Authorization (KRA) number, freight prepaid, and found to be defective upon factory authorized inspection. Bearings and pump seals or rubber and synthetic rubber parts such as “O” rings, diaphragms, squeeze tubing, and gaskets are considered expendable and are not covered under warranty. Warranty does not cover liability resulting from performance of this equipment nor the labor to replace this equipment. Product abuse or misuse voids warranty.

FOOTNOTE

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