
KNIGHT
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**OP-500 On-Premise Series
Instruction Manual**

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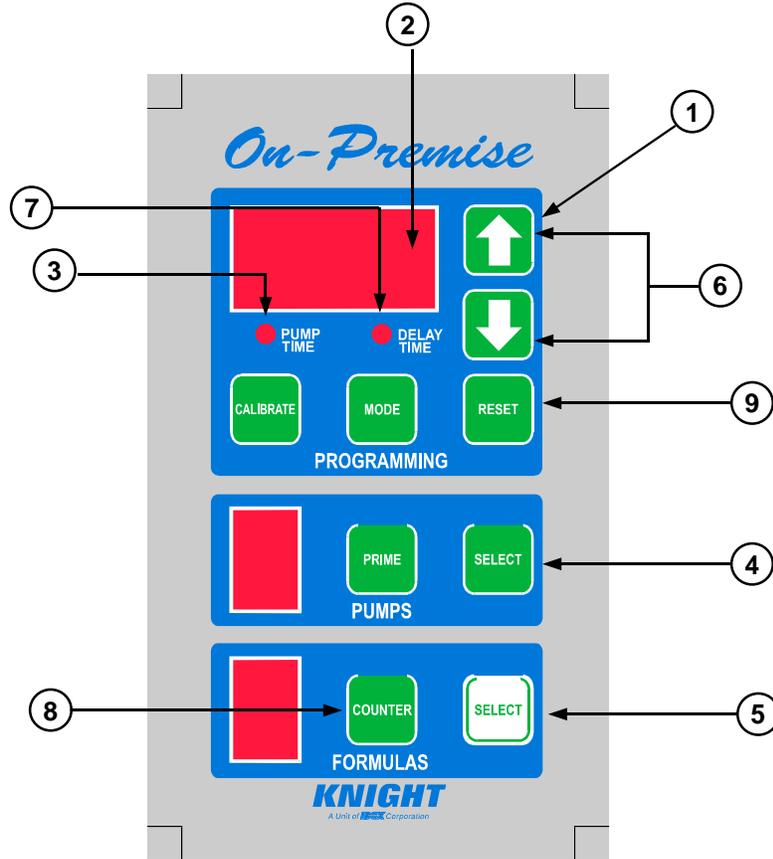


CAUTION: The On-Premise System has high voltage connected to the transformer.
Always disconnect main power when servicing the unit.

QUICK-REFERENCE

The following is a quick-reference guide for setting features that are explained in detail throughout this manual. As a reminder, you must have access (enter access code) to change any of the settings below.

Setting	Formula #	Pump #	Range/Choice
Access code	A	1	0 – 255
Signal lockout time	A	2	0 – 255 Seconds
Delay units	A	3	060 = 0-99 Minutes or 001 = 0 – 255 Seconds
Pump 7 & 8 enable	A	4	000 = Disabled 001 = Enabled



QUICK-START PROGRAMMING

- (1) Press ↑ once (for 000 access code).
- (2) The display will flash briefly and pump time LED will be lit. You now have access.
- (3) Pump time LED will stay lit.
- (4) Press pump SELECT until desired pump number is displayed.
NOTE: If using flush manifold, program pump "F" on all formulas to set flush time.
- (5) Press formula SELECT until desired formula number appears.
- (6) Use ↑/↓ to input the pump time or flush time (or delay time) in seconds.
- (7) To program a pump delay time, press MODE...delay time LED will be lit. Repeat steps 4 – 6.
- (8) Press the counter button; the PUMP TIME/DELAY time indicators will turn off. Then use the pump SELECT button to choose the desired pump number that will be used to count the loads for each formula. After a few seconds the pump time LED will return indicating that your entry has been saved.
- (9) Press RESET when finished programming and ready to run.

More details and complete programming information are included in the following pages.

INTRODUCTION

The OP-500 has been designed to meet today's laundry chemical injection needs with economy and flexibility in mind. Through advanced microprocessor technology, the OP-500 is one of Knight's least expensive laundry injectors, yet has all of the required features to meet every type of on-premise laundry condition. The OP-500 has multi-formula capability for various soil conditions, combined with independent pump run times to provide specific volume injections. Each pump has separately programmable delay times for all wash formulas, which gives greater flexibility with "fixed" timer washwheels. All programmed data is stored in a non-volatile memory which cannot be altered by voltage spikes or power outages. The OP-500 utilizes simple, fast programming for up to 8 pump outputs. A separate Flush Mode function, optional flush solenoid with case mount, and integrated flush manifold, provide single line diluted chemical injection to the washer. LED indicators mounted on a remote control panel always let the user know what is being programmed, which pump is being signaled, and which formula is active. The signal input circuitry will accept and verify a signal anywhere between 24 and 240 volts.

Before connecting signal wires to the OP-500, always check the schematic of the washwheel controller. These schematics can be obtained in the instruction manual of the machine or by the machine manufacturer.

SYSTEM OVERVIEW

The OP-500 is a two component system, with each component performing a specific function. The circuit board located inside the pump housing, receives the supply signals from the washmachine. Signals are then routed to the Remote (hand-held) Control, which is responsible for all timing and programming functions. Pump run times and delay times are activated, based on what formula number has been selected - the pumps then run for the correct amount of time. Accessories for installation, and other optional components, are available for the OP-500; contact your nearest Knight representative for details.

PRE-INSTALLATION

Before the equipment is installed, you should survey the installation site thoroughly. At the very least, your survey should include the following:

- (1) Check to make sure that all functions of the laundry machine are operating properly. Such functions may include: drain valve, hot/cold water solenoids, flush down valves, water level switch, card reader or timer, and machine motor.
- (2) Check the proposed location for a 115, 208, or 230 VAC power source.
- (3) Check the signal voltage output from the laundry machine. Measure the voltage between control signal and signal common, NOT control signal and case ground.
- (4) Measure the distance(s) from chemical supply container to pump housing and from pump housing to injection point inside the washmachine.

INSTALLATION

- (1) Mount injector in a convenient location on a wall near supply containers — no higher than 8' above, and within 10' horizontally, of supply containers. This is usually near the washmachine, however, dispenser can be mounted as a remote pumping system.
- (2) Mount the OP-500 Remote Control using the stainless steel mounting bracket provided. Use the provided mounting screws or Dual-Lock fastening strips to secure the bracket to the washer. If using Dual-Lock, be sure to clean the mounting surface in preparation, as Dual-Lock's adhesive will not stick to a dirty surface. The Remote Control should be mounted to the front of the washer, near the washer control switches where the operators can access it easily.
- (3) Ensure that the power voltage matches one of the three available voltage connection to the XFMR
- (4) It is very important to measure the signal voltage between the signal wire and the signal common (NOT case ground). This measurement must be taken when the washmachine is operating and when products are being called for.

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- (5) BEFORE CONTINUING TO THE NEXT STEP, DISCONNECT ALL ELECTRICAL CONNECTIONS TO THE WASHMACHINE, CARD READER (IF SO EQUIPPED), AND INJECTOR. VERIFY THIS WITH A VOLTMETER.
 - (6) Run all electrical wires through suitable conduit. Check any applicable electrical wiring codes
 - (7) Inspect wiring diagram of washmachine and card reader (if so equipped). They are available from the mfr. upon request.
 - (8) Insert one end of the suction tube into the left side of the squeeze tube in the peristaltic pump(s).
 - (9) Cut the suction tube to length and insert the other end into the appropriate supply container using PVC pipe as a support.
 - (10) Insert one end of the discharge tubing into the right side of the squeeze tube in the peristaltic pump(s).
 - (11) Form an anti-siphon loop (with the loop pointing "down") with the other end of the discharge tubing and insert the end into the supply pocket of the machine.
 - (12) Connect the 115, 208, or 230 VAC supply voltage to the system.
 - (13) Program the system via the PROGRAMMING instructions in this manual.
 - (14) Make any adjustments to programming which can be due to product viscosity, distance pumped, etc.
 - (15) Energize washmachine and card reader (if so equipped). The system should now be operational and service free.

SPLIT COMMONS

For installations that require two separate commons for supply signals, please cut and remove resistor labeled "Split Com" located just above common A input terminal. See wiring diagrams (pages 12-14) for physical location of resistor. Warning! Wiring two commons to the On-Premise circuit board without removing the "Split Com" resistor will damage circuit board and void warranty.

GETTING STARTED

One of the key features in the OP-500 system is controlled access. A personal access code in the OP-500 prevents unauthorized personnel from changing run times which could result in damaged and irreversible wash results. No timing or formula features can be programmed without knowledge of the access code. The code can be changed to a number which only the programmer may know. Each OP-500 shipped from the factory has an access code of "000".

The OP-500 has a built-in feature to automatically "disable" access if a pump is signaled, or if no buttons are pressed for a few minutes, after access has been gained. If this happens, simply re-enter the access code and continue where you left off. This prevents unauthorized use of the system in the event that pressing RESET is forgotten when done programming.

Entering the access code

- (1) Do not access system while pumps are being signaled from washer.
- (2) If the system is new, BRIEFLY press the UP ARROW once. If the system has had the access code changed from the factory default of "000" (explained later in this section) use the UP and DOWN ARROW keys to enter the code — after 2 seconds the display will flash to 000.
- (3) If the access code was correct, the display will show pump 1/formula 1, and the pump SELECT button will allow the pump number to be changed — using the pump SELECT button can be a helpful way to determine if access has truly been established (this can be done at anytime during programming). If the pump number cannot be changed, access has not been established and this procedure should be repeated again, starting at step 1.

NOTE: The Flush Pump will be disabled from its typical operation until RESET is pressed. This prevents flush activation while programming, however, the flush pump can still be primed and calibrated. Always press RESET when finished programming.

Clearing the memory:

The programming memory of the OP-500 should be cleared completely. Before Programming. This is **STRONGLY RECOMMENDED** when installing a new system, or re-installing a previously used system.

- (1) Enter access code
- (2) Simultaneously press the DOWN ARROW and the formula SELECT buttons — hold down for approximately 1 second.
- (3) The display will go blank for several seconds.
- (4) When finished, the display will return to normal, indicating that all memory has been cleared.

NOTE: When memory has been cleared, the access code will be set to "000", the load count pump reverts to pump 2, and pumps 7 and 8 are "disabled" by default.

Changing the access code:

It is **STRONGLY RECOMMENDED** that the access code be changed from its "factory setting" for security. Choose a number between 0 and 255 that will be easily remembered (i.e. three digits of a Social Security number, license plate numbers, etc.).

- (1) Access the system per previous instructions.
- (2) Select formula "A" and pump "1". This is the location where the access code is stored, much like a pump run time.
- (3) Use the UP and DOWN ARROW buttons to enter the new code - hold the button down to rapidly advance the numbers.
- (4) The display will flash after a few seconds, indicating that the number shown on the 3-digit display was accepted.
- (5) If the display flashes before the desired code has been entered, simply repeat step 3.

MODES OF OPERATION

The OP-500 has two modes of operation. In the standard mode, the system is capable of 8 user selectable formulas with each formula having unique run times and delay times for each pump. Signals from the washer trigger the pumps, then the OP-500's microprocessor takes control to count down delay and/or run times. The supervisor of the facility, or the machine operator, will typically select the formula by referring to a chart (provided by the programmer of the OP-500) showing which formula is correct for a particular wash load. The supervisor or operator then uses the formula SELECT button to choose the appropriate wash formula before the washmachine begins its cycle of operation.

In relay mode, pumps run for as long as their respective signals are present. To accomplish this, the system "by-passes" its run time and delay time capabilities during relay mode operation. Formula numbers are not selectable in relay mode (as they are not needed) — an "r" will be displayed in the formula number window to indicate that the system is in relay mode. Flush mode can be used in relay mode if chemicals are to be flushed with water to the washer. See page 7 for programming flush pump run times.

PROGRAMMING

BEFORE PROGRAMMING, NOTE THE FOLLOWING:

- The access code must be entered to program, prime pumps, or clear memory.
- Pump "F" is the flush pump — see the sections titled Programming Flush Pump run times and OPERATION for details.
- Formula "A" is only for storing the system's access code, setting signal lockout time, setting delay units, and enabling (or disabling) pumps 7 and 8. See the section titled ACCESSING THE OP-500 and the rest of this manual for details.
- Formula "r" indicates "relay" mode operation — see the section titled MODES OF OPERATION for details. To set the system for this mode; Enter the access code, then use the formula SELECT button to choose "r". Set the Load Count Pump as explained in the section titled LOAD COUNTS. Press RESET when finished.

- While any number between 0 and 999 can be entered in the 3-digit display, valid values are 0 - 255 only.
- You must program a “Load Count Pump” to count loads — see the section titled LOAD COUNTS for details. Pumps 1 - 6 have a second “level” feature that allows two different injection amounts during a formula – see the section titled OPERATION for details. Pump numbers and their corresponding second level are as follows:

PUMP NUMBERS						
LEVEL 1	1	2	3	4	5	6
LEVEL 2	A	B	C	D	E	0

Automatic calibrating of pump run times and delay times:

- (1) Press the MODE button to alternate between PUMP TIME and DELAY TIME.
- (2) Choose the desired pump and formula using their respective SELECT buttons. Press CALIBRATE to start the time count ; The display will begin counting — if PUMP TIME was selected, the corresponding pump will also begin running. A measuring cup or graduated cylinder should be used to verify the volume being dispensed.
- (3) When the correct amount of product has dispensed, press CALIBRATE again to stop time count; The display will flash after a few seconds to indicate that the time was accepted. When signaled by the washer, the pump will now dispense this volume.

Manual programming of run times:

- (1) Press the MODE button (if necessary) to illuminate PUMP TIME indicator light.
- (2) Choose the desired pump and formula using respective SELECT buttons.
- (3) Use the UP and DOWN ARROW buttons to enter or change the time shown on the 3-digit display.
- (4) The display will flash after a few seconds,

indicating that the time shown on the 3-digit display was accepted.

- (5) If the display flashes before the desired time has been entered, simply repeat step 3.

Selecting delay time units:

Delay times can be set on one minute increments for 0 - 99 minutes, or in seconds for 0 - 255 seconds. Determine the longest delay time required for each of the formulas you are to program and select the appropriate delay time units by doing the following:

- (1) Enter access code and scroll FORMULA SELECT button to formula “A”.
- (2) Push PUMP SELECT button to pump #3.
- (3) Push UP ARROW to “060” to select delay units of 0 - 99 minutes. Note: Minutes (060) delay setting allows setting delay times in 1 minute increments only. Use “minutes” delay units for applications requiring delay times in excess of 4 minutes.
- (4) After selecting “060” setting, wait 2 - 3 seconds and allow display to flash. After flash, setting shown on the display is saved.
- (5) To select 0 - 255 seconds delay units, press UP ARROW to “001”. Wait 2 - 3 seconds and allow display to flash.
- (6) Programming delay times
- (7) Press MODE button to illuminate DELAY TIME indicator light. If the 3-digit display reads -•• unit is in “minutes” delay mode. If unit is in “seconds” delay mode, display will show •••.
- (8) Select formula and pump.
- (9) Use the UP and DOWN ARROW buttons to select the desired delay time for each formula and pump required.
- (10) Allow display to flash and the hand-held control will save the programmed settings.

Note: During delay time countdown -•• will display indicating a countdown in one minute increments. If programmed to delay in seconds, the display will count down from the from the delay time to zero.

Programming Flush Pump run times:

- (1) Dispense a few ounces of chemical (preferably one with color) into manifold.
- (2) Choose the formula desired (formula "r" for relay mode) and pump "F", using respective SELECT buttons. Ensure that the PUMP TIME indicator is illuminated, then press the CALIBRATE button to start the time count ; The 3-digit display will begin counting and the water flush will activate.
- (3) Once all product has been cleared from the line to the washer, press CALIBRATE again to stop time count; The display will finish counting and water flush will stop. The display will flash after a few seconds, indicating that the flush time was accepted.
- (4) Repeat this procedure for each formula used —OR— note the time used to flush (from previous step) and manually program this time for pump "F" on each formula used. Refer to the sub-section titled "Entering/changing run times and delay times" for details.

- See Flush Manifold instruction manual for installing Flush Manifold to dispenser. Priming the pumps:

Pumps can be primed by either of 2 methods. Which method you choose will typically be determined by whether or not the pumps have already been programmed with run times.

- If the pumps do not have run times programmed; The CALIBRATE button will manually start/stop the pump. Run the pump as long as necessary, but remember, a time value will be recorded from the 3-digit display. This value will be over-written when actual pump run times are later programmed.
- If the pumps do have run times programmed; The PRIME button will activate the run time for the pump and formula presently selected. This method can also be used to verify that a pump will dispense the correct amount for the formula programmed. If the pump must be stopped during this prime function, press the RESET button.

Setting the Signal Lockout Time:

Signal Lockout Time is an optional feature that can be used to prevent multiple injections from signals received numerous times during a washcycle (i.e. using the washer's "fill" solenoid to trigger pumps — solenoid may inadvertently energize because of low water level in machine). The lockout time starts counting down when a pump finishes running — any signals received for that pump will be disregarded during the "count down" period. Any lockout time that is still counting down when the Load Count Pump activates will be terminated in preparation for the next formula.

- (1) Select formula "A" and pump "2". This is the location where the lockout time is stored, much like a pump run time.
- (2) Use the UP and DOWN ARROW buttons to enter or change the time shown on the 3-digit display.
- (3) The display will flash after a few seconds, indicating that the number shown on the 3-digit display was accepted.
- (4) If the display flashes before the desired time has been entered, simply repeat step 2.

Enabling or disabling pumps 7 and 8:

If the circuit board inside the dispenser has less than 8 pump outputs, pumps 7 and 8 should be disabled to allow the dispenser to function correctly. A new dispenser from the factory will already have these pumps disabled. Also, when clearing the memory (per the directions in the next sub-section) pumps 7 and 8 will be disabled by default. To change the enable/disable status:

- (1) Select formula "A" and pump "4".
- (2) Use the UP and DOWN ARROW buttons to alternate between 000 (disable) and 001 (enable) on the 3-digit display.
- (3) The display will flash after a few seconds, indicating that the number shown on the 3-digit display was accepted.
- (4) If the display flashes before the desired selection had been made, simply repeat step 2.

LOAD COUNTS

The Load Count Pump of the OP-500 performs a number of functions upon activation. Its primary function is to increment the load counter for the formula in use. It also terminates any Signal Lockout Time that may still be counting down, and resets the "level" feature for pumps 1 - 6. Select the last pump that will receive a signal during any wash formula, including "relay" mode operation. The Load Count Pump must receive a signal at the end of each formula to guarantee every load will be properly counted by the OP-500. This signal should be received even if the pump is not programmed to dispense chemical for the formula selected.

Setting the Load Count Pump:

- (1) Press the COUNTER button; the PUMP TIME/DELAY TIME indicators will turn off and the current Load Count Pump will be displayed in the pump window.
- (2) Use the pump SELECT button to choose the pump number — do not use pump A, B, C, D, E, 0, or F.
- (3) The display will flash after a few seconds, indicating that the pump number was accepted.
- (4) If the display flashes before the desired pump has been entered, simply repeat steps 1 and 2.

To view/clear formula load counts:

NOTE: Entering the access code is not required for this function.

- (1) Choose the formula desired using the formula SELECT button.
- (2) Press the formula COUNTER button; the PUMP TIME/DELAY TIME indicators will turn off, the Load Count Pump number will appear in the pump window, and the load count will be shown on the 3-digit display for the formula selected.

- (3) After a few seconds, the display will flash and return to its previous appearance.
- (4) To clear a formula load count, press the DOWN ARROW button while the count is shown on the 3-digit display. If the display flashes before the count was cleared, press the COUNTER button again to bring count back up, then press DOWN ARROW.
- (5) Repeat the above steps for each formula count to be cleared.

OPERATION

The first time pumps 1 - 6 are signaled, they will run "level" 1. The next time these pumps are signaled, they will run "level" 2 providing that any Signal Lockout Time (if used) has expired. Pumps 1 - 6 will not run again until the Load Count Pump is signaled, or the formula number changed, or if RESET is pressed. Pumps 7 and 8 (if used) will run when they are signaled providing that Signal Lockout Time has expired. The Flush Pump turns on with any pump running, then activates its own programmed run time when the pump shuts off. The system "looks" for contact at the flow sensor terminals (see wiring diagram) to verify proper flush. If a flow sensor is not used, a jumper wire should be connected across these terminals. A "flush error" happens when no contact is detected (switch or jumper) by the flow sensor terminals while only the Flush Pump runs. Flush errors are indicated by the Remote Control flashing and "F" in the pump window. Also, the buzzer (optional) will sound. The following notes are provided to enhance the operation and use of your OP-500 system.

- Programming of pump "F" is only required for systems that will inject with a flush manifold.
- No more than 2 pumps (if applicable) should be allowed to run simultaneously.

Pumps 1 - 6 are the only pumps with "two level" capability. Level 1 can be "skipped over" if desired, by not programming any delay time or pump run time for that level. When the first signal is applied, no pump action will occur — the second signal will then activate level 2 as usual.

TROUBLESHOOTING

Remote control does not light up - power indicator does not come on:

- Check fuses on circuit board inside dispenser — replace if necessary.
- Check voltage at power input terminals inside dispenser — refer to wiring diagrams.

Pumps do not trigger from signals:

- Check signal voltage and duration.
- Check for flush error — press RESET to clear.
- Check pump run and delay time settings for formula(s) chosen.
- Pump may be counting down a "lockout" time (if used) from a previous activation.
- Pump may be trying to activate its "second level" feature (this applies to pumps 1 - 6 only).

Pumps will not turn at all when trying to prime, or during a washcycle:

- Check for loose pump motor wires.
- Check for voltage at motor output terminals on circuit board.

- Check for mechanical binding of moving parts.

Flush errors keep occurring:

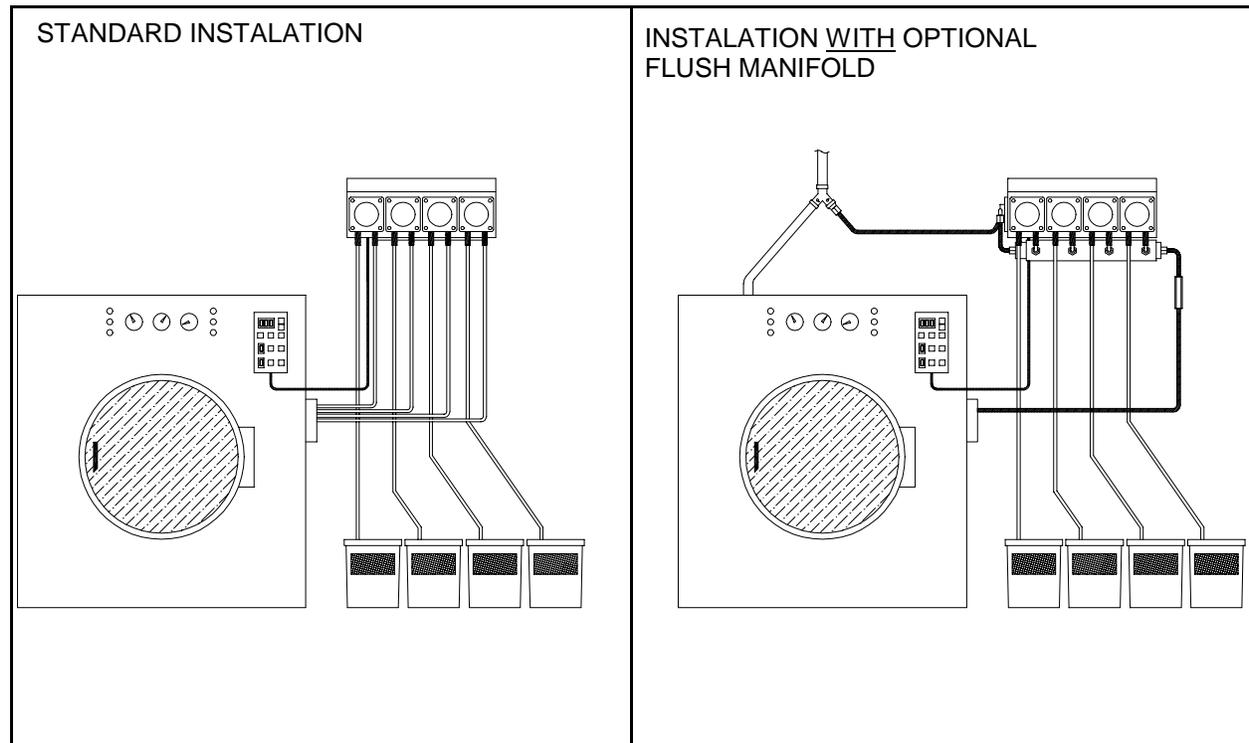
- Check to see if a flush manifold is used — if so, is it operating correctly?
- Check flow switch for proper connection to dispenser and proper water flow. A jumper wire should be connected across the flush switch terminals inside the dispenser if a flow switch is not used — see wiring diagrams for details.
- Press RESET to clear flush errors that occur for any reason — pumps will not run during flush error.

Pumps run but do not dispense product:

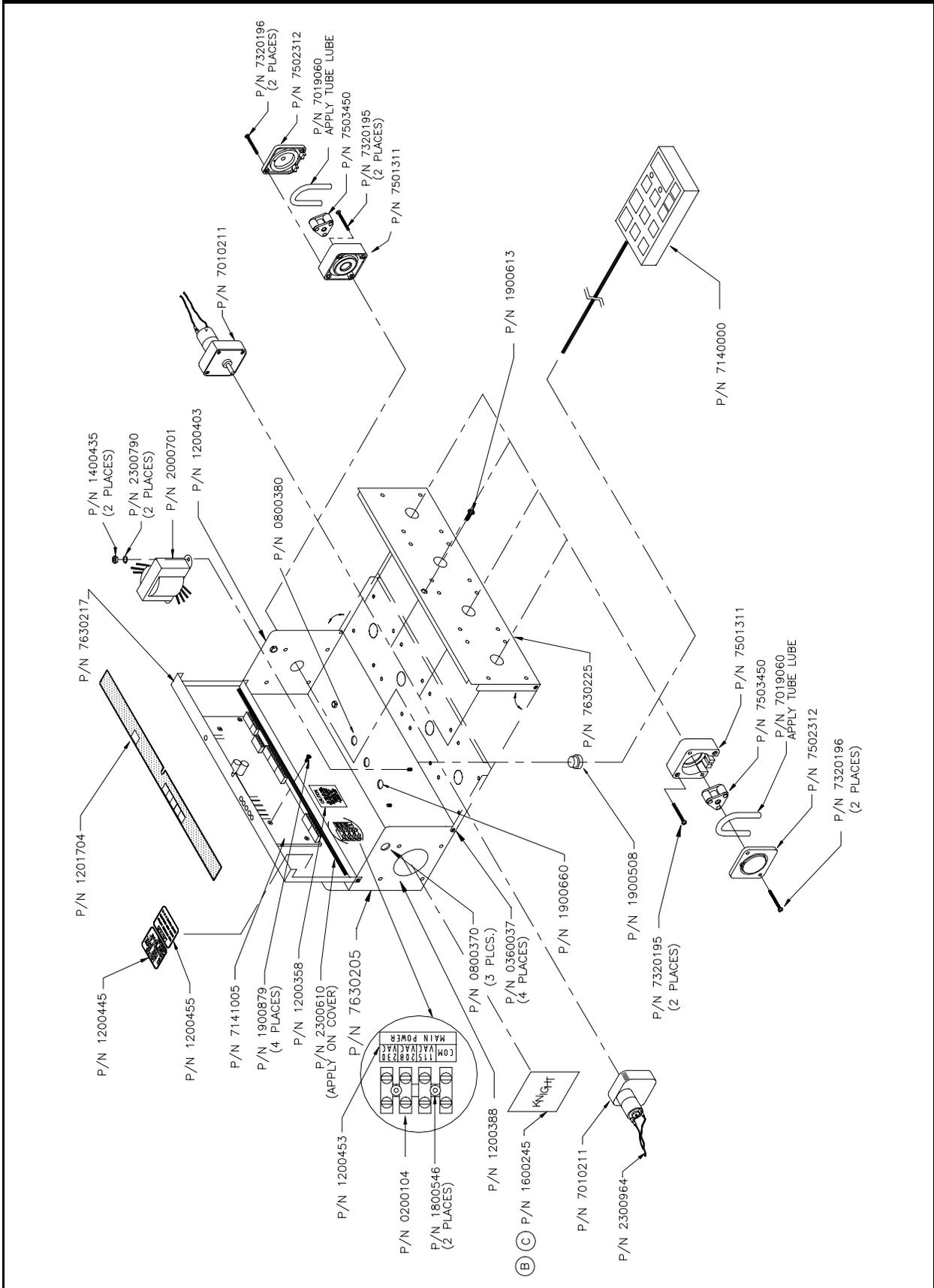
- Check squeeze tube for wear.
- Check condition of roller and pump housing.
- Check for air leak(s) on suction line.
- Check for blockage from pump tube into flush manifold (if used).

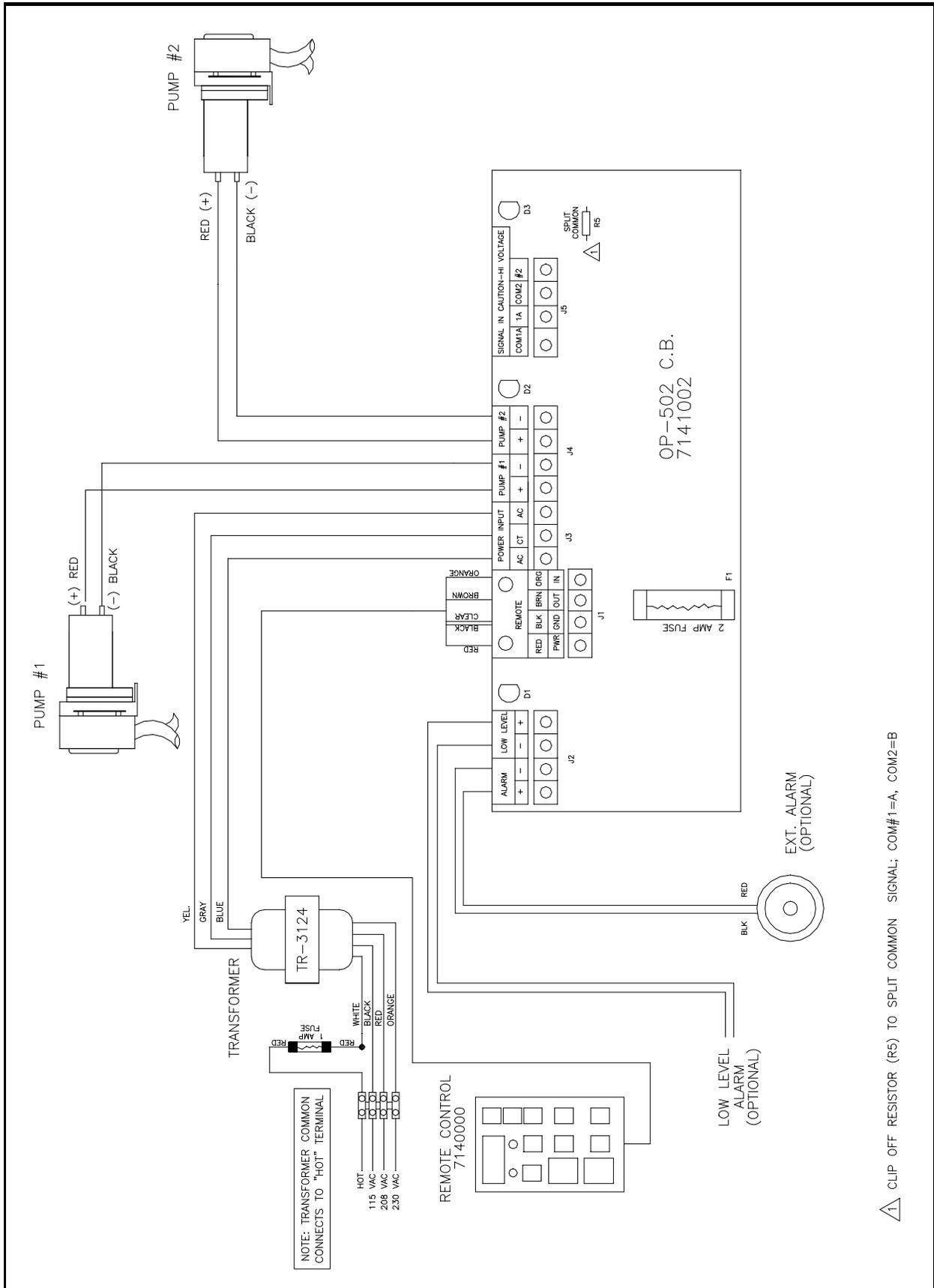
Pumps trigger more than once during cycle:

- Check supply signal input.
- Check signal lock-out function programming.



ASSEMBLY DIAGRAM





△ CLIP OFF RESISTOR (R5) TO SPLIT COMMON SIGNAL; COM#1=A, COM2=B

NOTE

DISCLAIMER

Knight Inc. 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 Inc.

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.

KNIGHT INC. A Unit of IDEX Corporation

World Headquarters: 20531 Crescent Bay Dr. Lake Forest, CA 92630-8825 USA TEL: (949) 595-4800 FAX: (949) 595-4801	Atlanta Branch: 8111 Technology Dr. NE Covington, GA 30014 USA TEL: (770) 787-9400 FAX: (770) 787-1155	Toronto Branch: 2880 Argentia Road, Unit 6 Mississauga, Ontario L5N 7X8 Canada TEL: (905) 542-2333 FAX: (905) 542-1536	London Branch: #15 Brunel Centre Newton Road, Crawley West Sussex UK RH102UB TEL: (44) 1293-615570 FAX: (44) 1293-615585	Sydney Branch: Unit 28, 317-321 Woodpark Rd., Smithfield NSW Australia 2164 TEL: 61-29-725-2588 FAX: 61-29-725-2025	Amsterdam Branch: Marssteden 68 7547 TD Enschede The Netherlands TEL: 31-53-428-58-00 FAX: 31-53-428-58-09
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