

SERVICE MANUAL

MODEL:

7575-10 Masterflex[®] L/S[®] Digital Console Drive, 115 / 230 Vac, .1 to 600 r/min

PROPRIETARY

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INTRODUCTION

Service for this product is performed at three levels: the customer, distributor/COLE-PARMER and factory/depot repair. This manual describes distributor/COLE-PARMER service procedures.

Customer service procedures are described in the operator's manual. Customers are encouraged to perform service as described in the operator's manual as well as in special circumstances where special skills and safety are not considerations.

To use this manual, begin with the troubleshooting section to isolate the fault to a replaceable part. The functional description and check-out procedure sections are also helpful in determining the faulty part. Distributor/COLE-PARMER repair is limited to replacement of modules as detailed in the replacement parts list section. The repair procedures section details disassembly and assembly procedures. After repair, the product should be calibrated and checked for proper performance.

Please refer to the operator's manual for:

- A) Applications Data
- B) Product Description
- C) Installation
- D) Setup
- E) Operation
- F) User Calibration
- G) User Troubleshooting & Maintenance
- H) Accessories
- I) Specifications

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SAFETY CONSIDERATIONS

Servicing must be performed only by personnel trained and skilled in the methods of troubleshooting and repair of electromechanical products. Use of procedures other than those described in this manual may result in a safety hazard to service personnel and/or customers.

When servicing any component of this unit make absolutely sure that all power to circuitry is removed. If any functional checks are to be performed while power is applied and chassis is disassembled, care must be exercised for the following:

- A) THIS IS A LINE OPERATED DEVICE AND IS NOT ISOLATED FROM GROUND. USE OF AN ISOLATION TRANSFORMER IS HIGHLY RECOMMENDED.

- B) DO NOT INADVERTENTLY SHORT ANY PART OF THE PRINTED CIRCUIT CARD TO GROUND, AS SEVERE DAMAGE WILL RESULT.

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FUNCTIONAL DESCRIPTION

The Masterflex digital peristaltic pump drive/dispenser delivers accurate amounts of fluids at adjustable flow rates. The use of a hall effect sensing device allows the user to obtain consistent flow rates with excellent speed regulation with load, line voltage and temperature variations over the range of speed settings. The high-performance and reliable control of flow rates is accomplished control of an electronically-commutated, three phase brushless permanent-magnet motor. The drive provides a nominal calibration for each available tubing size for nominal delivery rates from 0.100 to 3400 mL/min. A "Calibrate" control adjusts the nominal calibration to account for variations in tubing material and mechanical tolerances. One calibration point is stored for each tubing size. For maximum flexibility, to accommodate new tubing sizes or pump types, a menu field labeled (CUSTOM) is provided for manual calibration of the maximum flowrate. Non-volatile memory stores the latest settings as well as current user and factory calibration points prior to power down.

The drive has up to three modes of operation: operator keypad control, remote control by an external 4-20 mA current supply, or remote control by an external 0-10 V voltage supply. Remote inputs and outputs are provided on the drive to easily interface to larger systems for data logging and for closed-loop process control by means of a PLC. Panel/remote operation is selected via a front panel menu field. Remote 4-20 mA and 0-10V inputs are provided on a fluid resistant circular connector that is located on the rear of the unit. The connector also includes both 4-20 mA and 0-10V outputs for indicating flowrate and switch closure inputs for Remote CW/CCW, Remote Start/Stop, and Remote Prime/Purge. A hand-held control and a footswitch are available to provide optional remote Start/Stop, CW/CCW, and Prime/Purge operation.

The operator interface, motor power and control, IO, and display electronics are all housed in a 316 stainless steel enclosure rated NEMA 4X- INDOOR USE (IP66). Drives are comprised of a motor with a PCB for power electronics mounted directly on it and a separate PCB for handling inputs, outputs, display drivers, and serial communications to the motor control PCB. A sealed switch keypad containing navigation controls, a start/stop input, and a prime input is mounted on the front of the enclosure. A 128 X 64 graphical LCD provides user information. The enclosure is a stainless steel box that the motor mounts directly to. A power switch is mounted to the rear of the drive along with a power cord and IEC connector that enters via a water tight compression fitting.

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TROUBLESHOOTING

Repairs on this unit are confined to the replacement of the unit's IO Display assembly, Keypad, Enclosure assembly, and/or Drive Motor assembly.

Where possible, swap known good parts to localize and isolate the problem. The following is a list of possible problems and remedies:

VERIFY AC POWER IS OPERATIVE.

MOTOR DOES NOT ROTATE, DISPLAY DOES NOT LIGHT:

- | | |
|-------------------------------------|--------------------------------|
| 1. fuse blown | - replace fuse |
| 2. unit connected to dead outlet | - verify supply is ON |
| 3. power cord defective | - check & replace |
| 4. AC power switch failure | - replace switch assembly |
| 5. drive motor power supply failure | - replace motor assembly |
| 6. display board failure | - replace I/O display assembly |

UNIT BLOWS FUSES:

- | | |
|----------------------------------|---|
| 1. motor winding / drive failure | - check using known good drive motor assembly |
| 2. wrong fuse installed | - check fuse rating |

MOTOR DOES NOT ROTATE, DISPLAY LIGHTS:

- | | |
|--------------------------------|--|
| 1. wrong operating MODE | - remote control menu set to local control for front panel operation, mA or V for remote operation |
| 2. defective Remote Control | - replace Remote Control |
| 3. drive set to zero speed | - change speed/flowrate |
| 4. dispense volume set to zero | - change volume setting |
| 5. start/stop input required | - close start/stop input or change start/stop menu settings |

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NO REMOTE OPERATION:

- | | |
|----------------------------------|------------------------------------|
| 1. defective Remote Control | - replace Remote Control |
| 2. defective IO display assembly | - replace Main PCB IO Display assy |

NO DISPLAY OR GARBLED DISPLAY:

- | | |
|---------------------------------|------------------------------------|
| 1. display connector not seated | - reseal ZIF |
| 2. display failure | - replace Main PCB IO Display assy |
| 3. defective drive motor | - replace drive motor assembly |

IMPROPER KEYPAD OPERATION:

- | | |
|-------------------|------------------------------------|
| 1. keypad failure | - replace Main PCB IO Display assy |
|-------------------|------------------------------------|

DISPLAYED ERROR CODES

Error Definitions

Error #2 Motor Overspeed

Description: The drive has exceeded commanded speed value.

Error Condition(s): The motor has exceeded the commanded speed value by 20%.

Actions: Drive will stop immediately. Verify load is correct and power cycle drive.

Error #3: Instantaneous Over-Current

Description: Motor is drawing too much current for a short duration of time.

Error Condition(s): The motor current is above 4.0 Amps peak.

Actions: Drive will stop immediately. Verify that pump head is not binding and that the load is not above recommended maximum load.

Error #4: Bad Flash Checksum

Description: Run-time checksum (checked at power-on) contains a bad checksum value

Error Condition(s): Checksum is checked at power-on for an invalid value.

Actions: Power cycle the drive. If error persists consult factory.

Error #7: Bad EEPROM Checksum (Settings)

Description: Bad EEPROM checksum on parameter values and settings, or its' data is out of range.

Error Condition(s): 1) Checksum value in EEPROM does not match calculated value.
2) Data in EEPROM is out of range.

Actions: Error will be cleared after 10 seconds and parameters will be reset to default values.

Error #8: Bad EEPROM Checksum (Factory Cal)

Description: Bad EEPROM checksum for Factory Cal

Error Condition(s): 1) Checksum value in EEPROM does not match calculated value.
2) Data in EEPROM is out of range.

Actions: Error will be cleared after 10 seconds and parameters will be reset to default values.

If error persists consult factory.

Error #9: EEPROM Write Verification Error

Description: Data written to EEPROM does not match.

Error Condition(s): Data values do not match.

Actions: Error will be cleared after 10 seconds and parameters will be reset.

Error #10: Bus Over Voltage

Description: The measured AC voltage reported by the drive is too high.

Error Condition(s): The drive voltage is above 260 VAC.

Actions: The pump will stop immediately, check the supply line voltage.

Error #11: Bus Under Voltage

Description: The measured AC voltage reported by the drive is too low.

Error Condition(s): The drive voltage is below 90VAC.

Actions: The pump will stop immediately, check the supply line voltage.

Note: This error when displayed during power down is considered normal and proper.

Error #12: Motor Stall / Motor Under Speed

Description: The motor was commanded to run, but has either slowed down significantly or has stopped.

Error Condition(s): The motor speed is below 95% of the desired speed for too long a period of time.

Actions: The motor will be commanded to stop. Verify the pump turns freely and is not binding.

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Error #14: Ambient Over Temperature

Description: The motor is overheating.

Error Condition(s): The temperature value from motor is over a given threshold value.

Actions: The pump will stop immediately. Verify the ambient air temperature is less than 40C. Verify the pump turns freely and that there is no restriction of air flow.

Error #15: Motor Feedback Fault

Description: Communications to the motor is not correct, has disappeared, or some other communications fault.

Error Condition(s): No data coming back over the serial port from the motor.

Actions: The drive will attempt to stop the pump. Power cycle drive, if error persists consult factory.

Error #16: Invalid Interrupt or Address

Description: Software jumps to an invalid address, invalid interrupt, or other abort/exception (i.e. Data Abort Exception). This may occur due to invalid pointer references, or ram memory corruption, etc.

Error Condition(s): These are handled by an Abort Exception/Interrupt within the CPU and should branch out to their respective exception handler functions.

Actions: Power cycle the drive to reset error. If error persists consult factory.

Error #18: Watchdog Error

Description Program has stopped running as the watch dog has not been updated. i.e. Software Locked up.

Classification Major Fault

Error Condition(s): Interrupt triggered when the Watchdog has not been updated.

Actions: Power cycle drive to reset error. If error persists consult factory.

SPECIAL KEY PRESSES

1. Restore English language – hold up and down keys during power up.
2. Restore defaults – hold right and left keys during power up.

FOR ADDITIONAL INFORMATION REGARDING YOUR UNIT PLEASE REFER TO THE OPERATOR'S MANUAL.

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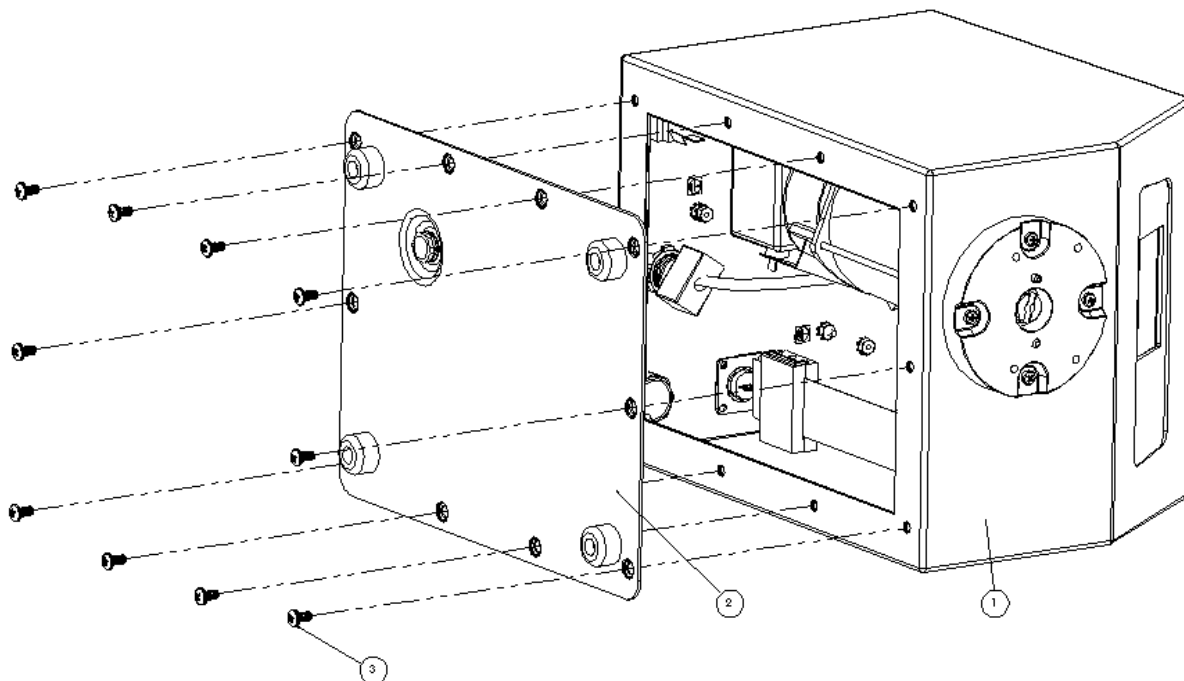
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REPAIR PROCEDURES

TO DISASSEMBLE UNIT, PROCEED AS FOLLOWS:

- A) **Disconnect AC power.**
- B) Lay unit on the side of the unit away from the motor.
- C) Remove and save the ten screws (Item 3) holding the bottom plate (Item 2).
- D) Remove the bottom plate (Item 2).



TO REASSEMBLE UNIT, PROCEED AS FOLLOWS:

- A) Line up the ten holes in the bottom plate (Item 2).
- B) Install and tighten the ten screws (Item 3) holding the bottom plate to a torque between 25.1 and 28.9 lb-in. **DO NOT** substitute other screws.

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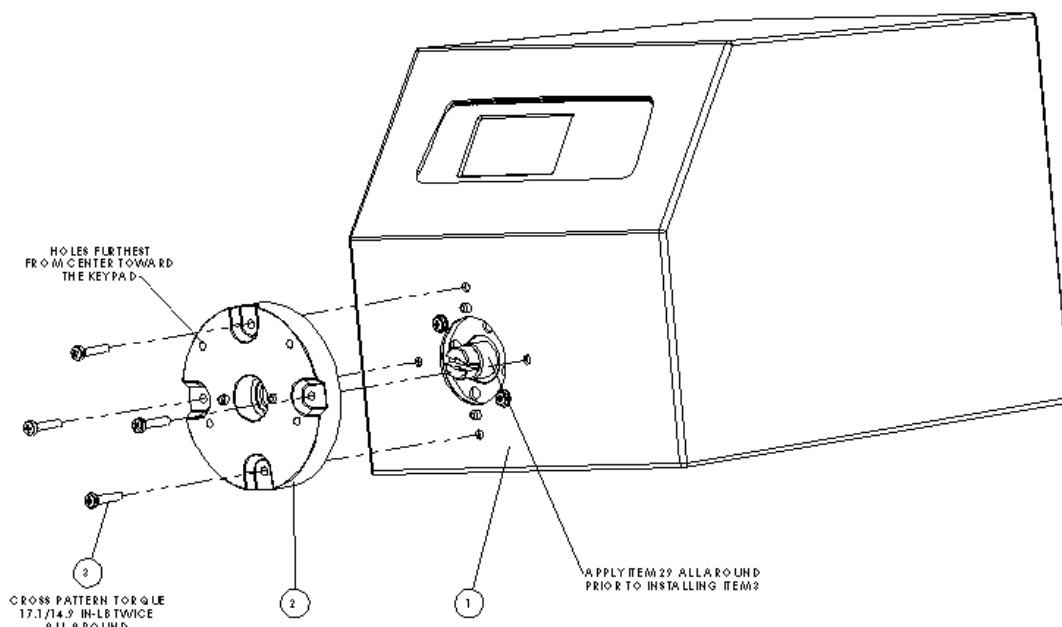
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TO REMOVE FRONT PLATE ASSEMBLY & INSPECT MOTOR SHAFT SEAL:

- A) Remove any pump(s) attached to the front of the drive. Clean any foreign material from the outside diameter of the drive shaft.
- B) Remove the (4) screws (Item B) that hold the front plate assembly (Item A) to the drive, and pull the front plate assembly off the drive. #8-32 screws may be installed in the pump-mounting holes to provide handles for pulling the plate assembly off. Retain Item B screws for Step B in "TO REPLACE FRONT PLATE ASSEMBLY". DO NOT substitute other screws.
- C) Turn the front plate over so that the seal side is visible. Wipe the elastomeric seal lips with a clean cloth to remove any grease and foreign material.
- D) Inspect the elastomeric seal lips for tears or cuts or missing material. If any of the mentioned conditions exist, replace the seal assembly using the 7575-01 Replacement Front Plate/Seal.
- E) Wipe the exposed part of the drive shaft with a clean cloth. Wipe from the drive outward, to
- F) remove all grease and foreign matter.
- G) Inspect the shaft surface in the area touched by the seal. Look for a rough finish, or grooves parallel to the shaft length. If the shaft end is worn or damaged, as described above, replace the gear and shaft with the 7575-02 kit. A polished groove, concentric to the outside of the shaft, is not a defect, as long as the groove is no more than 0.002 inches deep.



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TO REPLACE FRONT PLATE ASSEMBLY:

- A) Prior to re-assembly, re-lubricate the shaft and the seal with the food-grade lubricant provided with the unit. **CAUTION:** Do not contaminate the lubricant in the container, on the shaft or on the seal with foreign material. Failure to observe this precaution may result in damage to the seal and premature failure of the seal.
- B) Slide the front plate assembly back over the shaft and onto the locating pins, in the orientation desired. (4 configurations, each 90 degrees of rotation apart, are possible). Reinstall the 4 screws, removed during Step B in "TO REMOVE FRONT PLATE ASSEMBLY & INSPECT MOTOR SHAFT SEAL". **CAUTION:** No foreign matter should be allowed under the gasket on the back of the front plate or under the heads of the screws. Failure to observe this precaution may result in leakage during washdown of the drive.

TO REMOVE MOTOR ASSEMBLY (109668-CR):

- A) Follow the steps outlined in "TO REMOVE FRONT PLATE ASSEMBLY & INSPECT MOTOR SHAFT SEAL".
- B) Remove the ground, neutral, and line connection from the rear of the motor. Disconnect the 4 wire cable assembly from the rear of the motor. (This cable assembly contains the 24V power and communications to the IO Display Assembly).
- C) Remove the two bolts holding Motor Assembly to chassis.
- D) Remove the Motor Assembly

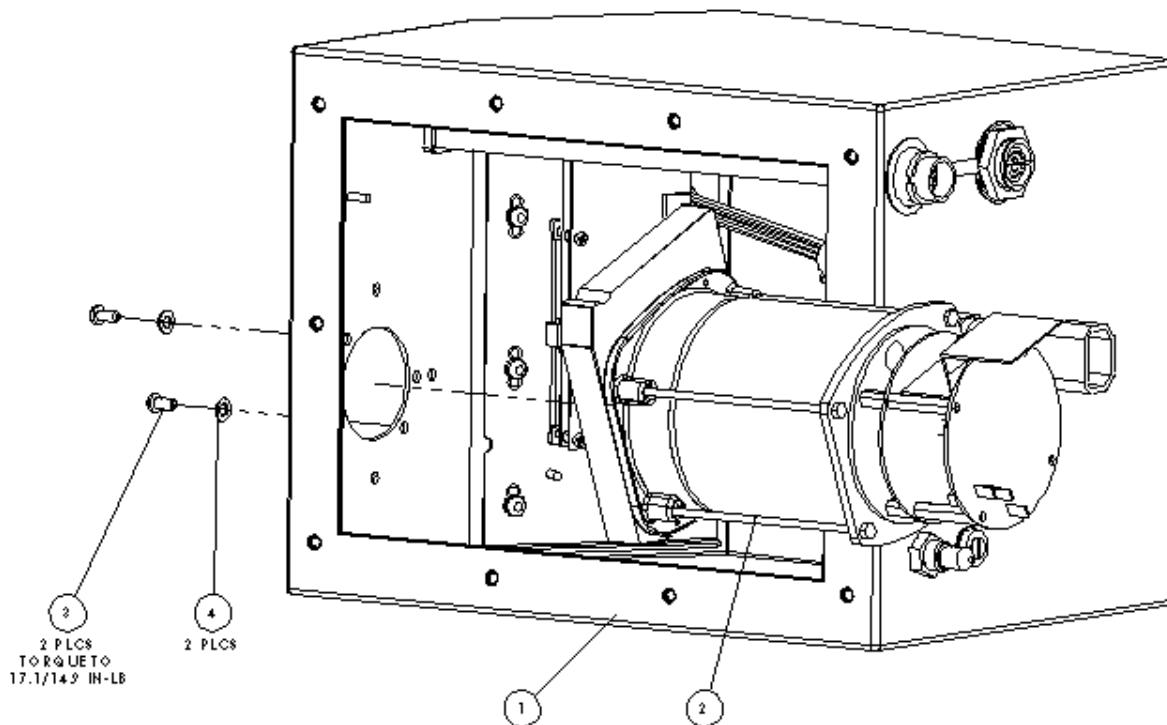
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TO REPLACE MOTOR ASSEMBLY (109668-CR):

- A) Connect 24V (4 conductor) supply cable from IO Display Board to motor.
- B) Align pins in motor assembly to stainless enclosure. (NOTE: The pins on the front of the motor assembly will be aligned vertically with respect to the chassis.)
- C) Install 2 screws through enclosure into Motor Assembly at the 5 and 11 O'clock position when pump is aligned vertically.
- D) Connect ground, neutral, and line to spade terminals on Motor Assembly PCB.

TO REMOVE MAIN PCB DISPLAY ASSEMBLY (109803-CR, 111422-CR):

- A) Slide out the bottom plate to expose cables and wires, and remove all cables and wires from the Motor Assembly.
- B) Remove motor assembly per "TO REMOVE MOTOR ASSEMBLY".
- C) Disconnect Ribbon Cable from Main PCB Display Assembly noting orientation of red stripe.

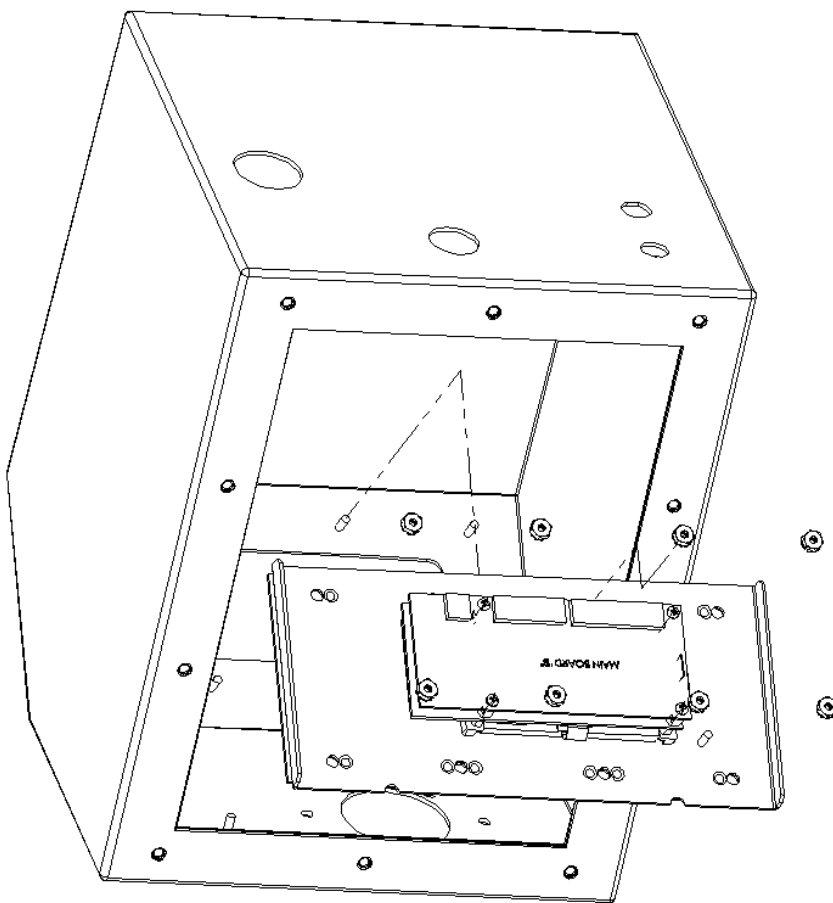
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- D) Remove the eight nuts that attach the bracket of the Main PCB Display Assembly to the stainless steel enclosure. Keep nuts.



TO REPLACE MAIN PCB DISPLAY ASSEMBLY (109803-CR, 111422-CR):

- A) NOTE: The Main PCB Display Assembly comes pre-calibrated ant the factory; no calibration is required. The correct service kit is date code dependant. Products manufactured prior to November 2012 use 109803-CR. November 2012 and later use 111422-CR. Date code for November 2012 is “L12”.

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- A) Replace the eight nuts that attach the bracket of the Main PCB Display Assembly to the chassis face – Keypad opening. NOT: It is critical to align keypad within window opening to ensure proper seal. Torque nuts to 8 IN-LBS
- B) Connect Ribbon Cable to back of Main PCB Display Board. Red stripe will be to the right when bracket is as show above.

TO REPLACE GEAR & SHAFT ASSEMBLY (7575-02):

See instructions furnished with Replacement Gear & Shaft Kit, 7575-02

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REPLACEMENT PARTS LISTING

The following is a list of stocked Drive, Front Panel Control, and Motor assemblies, and commonly used parts:

DESCRIPTION	THERMO part #
Fuse – T3.15A	B-1115-0057 (C/P # 77500-25)
Replacement Front Plate/Seal	C/P # 7575-01
Replacement Gear & Shaft Kit	C/P# 7575-02
Detachable Power Cord 115 Vac (USA)	B-3115 (C/P# 50001-68)
Detachable Power Cord 230 Vac (European)	B-2938 (C/P# 50001-70)
Power Cord Assembly (Fixed)	8386-CR
Main PCB IO Display Assembly*	109803-CR* or 111422-CR
Motor Assembly (Motor with Encoder)	109668-CR
Keypad (Use Main PCB Display Assembly)	Not Available
Hand-Held Remote Control	C/P # 7575-82
Foot Switch	C/P # 7575-84
Remote Control Cable (25 ft)	C/P # 7575-80

*Serial Numbers before Nov 2012 (date code) “L12” use 109803-CR.

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CALIBRATION

Due to the design of this product, there are no calibrations and/or adjustments to be performed other than set-ups performed by the customer. Calibration of the Analog I/O requires a special calibration fixture at the factory.

Additional technical specifications are available in the unit's OPERATORS MANUAL.

FUNCTIONAL TESTS

1.00 Test equipment required:

- 1.01 Contact Tachometer (C-P Cat. # 8203-50 or 8203-80)
- 1.02 Foot switch (C-P Cat. # 7575-84) or Remote Control (C-P Cat. # 7575-82)
- 1.03 Digital multimeter

2.00 TESTING:

- 2.01 Plug controller into 115 volts ac or 230 volts.
- 2.02 Turn the main power switch on (on the rear of the drive) and verify that the model number indicated on the LCD is the correct one.
- 2.03 Select language if necessary. Language can be found in the main menu.
- 2.04 Select Continuous Pump mode from the main menu. For more information on how to operate the drive, see the operator's manual (A-1299-7057 Thermo). Navigate to the flow rate field and enter using the $\sqrt{\quad}$ key. Increase the digits to their maximum value. For example, for size 13 tubing the flow rate on a 600 RPM drive should be a maximum of 36.00 ml/min. Press the Start/Stop key in the upper right hand corner of the keypad. Verify speed with handheld tach. When viewed from the front of the drive the drive should be rotating Clockwise.
- 2.05 Press the Start/Stop key again. If necessary connect a remote control device. Input via the foot switch or remote control a contact closure to the START/STOP pins (Pins 4 & 8). The drive should restart. Open the contacts and the drive should stop.

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Drive	Maximum Speed			Low Speed Check *		
	Setting	Max.	Min.	Setting	Max.	Min.
7575-10	600	603	597	10	11	9

*Note: The drive is capable of running at lower speeds.

- 2.06 Close the contacts again and with the drive running at maximum speed verify that the voltage output (Pins 2 & 9) is at approximately 10V. Note that the drives current output and voltage output signals are tied together in the software and the hardware. See the operators manual for scaling of the Current and Voltage outputs and inputs.
- 2.07 With the drive running apply an input to the CW/CCW pins. (Pins 6 & 8). The drive should change direction and run anti-clockwise.
- 2.08 Open the START/STOP input and apply a contact closure to the PRIME input (Pins 14 & 8). Verify the drive is running at full speed for as long as the contact closure is maintained.
- 2.09 Open the PRIME input to stop the drive. Turn the drive OFF (on the rear of the drive) and unplug it from the variac.

TESTS COMPLETED

ASSOCIATED DOCUMENTS

Current copies of the following documents are required for servicing the drive:

Operator's Manual:	A-1299-5151
Final Assy Dwg	109672
Chassis Assy Dwg:	109671

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