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INSTRUCTION MANUAL

FOR THE

CONSOLE MASTERFLEX

DEC 25 2001

Catalog Numbers

7562, 7562-10 (115 VAC Input)

7563, 7563-10 (230 VAC Input)

Cole-Parmer Instrument Co.
7425 North Oak Park Avenue
Chicago, Illinois 60648

(312) 647-7600

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DESCRIPTION:

The Masterflex Console consists of two basic parts; a motor - generator, and an electronic controller. The motor-generator is a motor and a generator built into one housing, on one shaft. The motor drives the pump head and the generator produces a feed back signal to the controller. The controller is a solid state amplifier circuit. The signal from the generator is compared to a reference in the controller. The controller circuitry, after this comparison, provides more or less power to the motor to maintain a constant output speed. If any outside condition, such as back pressure, changes the output speed, the controller will return the unit back to its original speed. Maximum motor speed variation will be 3% of the set speed. This system provides speed stability which is far superior to most commonly used motor speed controllers.

The pump heads are designed to accept a continuous length of tubing. The continuous tubing length eliminates interconnecting fittings and simplifies system connection. Also, as the tubing in the pump head shows signs of wear, an unused section of the tubing can be repositioned in the pump head, without emptying or contaminating the liquid in the tubing.

The system is primarily intended to be used for metering and transferring liquids and gases at atmospheric pressure. Liquid pressures of 25 PSI continuous and up to 40 PSI intermittent can be obtained, depending upon the head size and speed used. Masterflex Pumps are self priming. Six pump heads are available, each accepting a certain size of tubing (inside diameters varying from 1/32" to 7/16"). Six basic flow ranges are thus available.

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Pump heads and the meter scales are numbered (7013, 7014, etc.). Reading of output flow only requires that the appropriate scale is read for the pump head in use. Each head features a highly efficient 3-roller compression rotor assembly within a uniquely designed, full visibility polycarbonate housing.

Operation of the pump head is trouble free; all parts are ruggedly built and rotate on ball bearings for minimum wear of components and for maximum tubing life.

The 7562 is wired for 115 VAC, 50/60 cycle operation. The 7563 is wired for 230 VAC, 50/60 cycle operation. The operating and calibration characteristics of the 7563 are the same as the 7562. The 7562-10 is wired for 115 VAC, 50/60 cycle, and the 7563-10 for 230 VAC, 50/60 cycle. Their operating characteristics are similar to the 7562, but their output flow values and calibration points are different.

OPERATION:

The operation of the unit is preceded by two steps, selecting the proper size pump head for the flow desired and calibrating the unit. After completing those steps, the actual operation of the unit has been made as easy as possible. One control knob both turns on the unit and controls the speed. The mirror scale will prevent parallax reading errors. A reversing switch is provided on the rear of the unit. Stop the motor before using the switch to reverse the direction of liquid flow. As the length of the tubing increases, frictional losses increase and these losses will tend to reduce the maximum flow. Changes in outlet tubing length are not as critical as inlet tubing length. Using the system to lift a liquid with a long length of tubing on the pump's inlet side would produce the greatest reduction in flow. Greatest changes in

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flow occur with the 7013 and 7014 pump heads. Feel free to consult with the Cole-Parmer Engineering Department in the event unusually long tubing runs or pumping against great heights is required.

CALIBRATION INTRODUCTION:

Meter calibration has been divided into two parts; (1) a factory calibration provided at time of manufacture and (2) a specific calibration to be completed by the customer. Under normal conditions, factory calibration should not be changed by the operator. It is described here only as a reference in case internal repair work requires the operator to reset it.

For best results, the system, with a pump head and tubing, should be left on and running for approximately 15 minutes before calibrating.

Using the factory calibration, flow errors may be as large as ±12% of full scale. This is due to variations in elastomer tubing and tubing position in pump heads. Using the specific calibration,flow errors may be as large as ±7% of full scale if the entire span is used and ±5% if only part of the span is used.

The system must be recalibrated each time a new section of tubing is placed in the pump head.

FACTORY CALIBRATION PROCEDURE:

To calibrate the 7562 or 7563: mount pump head with tubing (unit could be pumping air only, to provide a load). Allow the pump to operate for approximately 15 minutes to stabilize, before calibrating, using the proper input voltage.

(1) Set internal calibration potentiometer to approximately the mid point of its travel.

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(2) Set the front panel calibration control to approximately the mid point of its travel.

(3) Turn speed control knob to its full clockwise position

(4) Reset the internal calibration potentiometer so that the pump speed is 525 RPM (tolerance: plus 5, minus 0). (See note)

(5) Reset front calibration control so that the meter pointer is at the red calibration mark, located on the right side of the dial. Using only this calibration, flow errors as large as ±12% of full scale may exist. It is recommended that the customer complete and use the Specific Calibration Procedure to reduce the flow error if greater accuracy is required.

NOTE: The 7562-10 and 7563-10 are calibrated at 95 RPM, plus 2, minus 0. The rest of the calibration procedure is the same as stated above.

SPECIFIC CALIBRATION PROCEDURE:

Assemble the pump with tubing. Let the pump rotate during warm up at approximately half speed. After a 15 minute warm up period, with the control knob set full clockwise, the meter should be at the calibration mark (red line) on the right hand side of the dial. Calibrate at the center of the span which will be used. If the full meter span is to be used, calibrate at mid scale. If, for example, only the first one half of the scale is required, calibrate at the 1/4 position (again, the mid point of the span).

The system is calibrated to the pump head as follows (assuming that the full meter span will be used): The speed control knob is set so that the meter is at approximately mid span. The actual liquid flow is measured vs. time. One possible method is a graduated cylinder and a stop watch. Using a 7013 pump head, assume a flow of 39 ml. in 3 minutes. Using the front panel calibration reset the meter to the correct value without changing the speed control knob.

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In this assumed example, the meter would be reset to 13. The speed control is then reset to approximately mid scale (15 on the dial). The flow is again rechecked. A second smaller correction is occasionally required. The calibration is then completed. If the meter setting is within 2% of the actual measured flow, the maximum error at any division will be 7% of full scale. After step 2 is completed, the meter pointer may not return to the calibration mark with the knob set to full CW. This is a characteristic of the unit and is not a defect. The calibration should be performed using the same tubing length and placement (vertical lifting height) as will be used during the actual operation of the system.

CALIBRATION EXAMPLES:

Two examples are given to clarify the relationship between the calibration point and the span used.

Example A:

Using part of the scale and a 7013 pump head

(1) Choice of scale: use scale labeled 7013

(2) Desired span: assume 0 to 20 ml.

(3) Calibration point: 10 ml (mid point of span)

Example B:

Using the entire meter scale and a 7015 pump head

(1) Choice of scale: use scale labeled 7015

(2) Desired span: 0 to 800 ml.

(3) Calibration point: 400 ml (mid point of span)

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TUBING INFORMATION:

It is highly recommended that silicone tubing be used with the Console Masterflex. The tubing has good chemical resistance, dimensional stability and greater life than most other types of tubing. Tubing life is related to pump speed. Approximately 110 hours can be expected at full speed. Greater life will exist at lower speeds. Other types of tubing can be used but they will create some difficulty. Some types have a shorter life and some have a tendency to take a 'set' with use, so that a considerable change in flow will take place during use, requiring repeated recalibration. Longer tubing life is possible using a larger pump head at a lower speed rather than a small pump at full speed.

The use of Cole-Parmer tubing is strongly recommended. Dimensions have carefully been chosen so that the tubing will perform satisfactorily. If some other source is used, the tubing dimensions should be identical to the Cole-Parmer tubing. Oversize tubing will create overcompression, resulting in early tubing failure. Undersize tubing will permit it to travel in the pump head, causing the pump to jam and stop rotating. Improper bore dimensions may cause reduced liquid flow or reduced output pressure.

TUBING DIMENSIONS AND TOLERANCES:

PUMP HEAD	SILICONE TUBING (I.D. x O.D.)	
7013	6411-41	.0315 x .1625
7014	6411-43	.0655 x .1945
7016	6411-02	.1250 x .2510
7015	6411-45	.1925 x .3920
7017	6411-47	.2550 x .3900
7018	6411-09	.3130 x .4390

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PRESSURE SPECIFICATIONS:

The 7015 pump head can deliver liquids at pressures of 25 PSI, continuous, and 40 PSI, intermittently. The other five pump sizes can deliver liquids at pressures of 20 PSI, continuous, and 35 PSI, intermittently.

LOADING CONSIDERATION-CAUTION:

Complete loading instructions are sent with the pump head. Allowing excessive slack, or stretching the tubing, during assembly will shorten tubing life. Properly placed in the pump, the tubing will have a triangular shape, spanning the three rollers.

If the tubing is not periodically changed, it may rupture in the pump head. Depending upon the liquid, complete pump failure may result. The liquid may wash the lubricant out of the bearings, causing the bearings to fail.

REVERSING SWITCH:

The switch it located on the rear panel of the console. The console will not operate if the reversing switch it in its center position. It must be either in the extreme left or right position. Before reversing the rotation of the pump, bring the motor to a complete stop. Reversing the direction while at full speed will damage the electrical components in the system.

STERILIZATION:

Stainless steel pump heads are available, that is, they use the same plastic bodies but all metal parts are stainless steel. These can be gas sterilized using the ethylene oxide long cycle (normally at 70°F). The silicone tubing should be allowed to stand for 48 hours to ensure degassing of ethylene oxide. The parts are also autoclavable if gas sterilization is not desired.

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DUAL HEAD OPERATION:

The 7562 and 7563 are designed to use only one pump head at a time. The 7562-10 and 7563-10 can operate two pump heads at once, ganged together on the same shaft. Any of the six pump heads (7013 to 7018) can be chosen. Only silicon tubing should be used. Normal tolerances in the tubing may combine so that one head produces less flow then the other, even even though both are the same catalog number and operating at the same speed. The meter could be set to read either head or an average of the two heads.

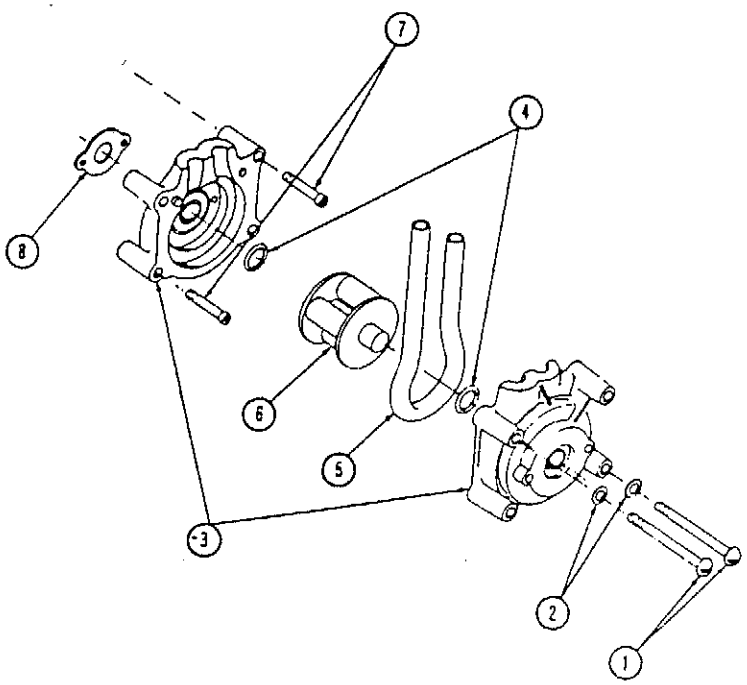
PUMP HEAD SELECTION:

When selecting a pump head, it should be noted that there is a nearly linear relationship between tubing life and pump speed. As the pump speed is reduced the tubing life will increase. It is, therefore, more desirable to select the next larger pump head and operate it at a lower speed, rather than drive a smaller head at high speed. However, if pulseless flow is desired, a smoother output will be obtained by using a smaller head at moderate speeds instead of a larger head at very low speeds.

PUMP HEAD VS FLOW (ML/MIN.)

	7013	7014	7016	7015	7017	7018
7562 & 7563	1-30	5-110	40-400	20-800	20-1400	30-1890
7562-10 & 7563-10	2-6	5-22	2-80	4-160	4-280	6-378

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Masterflex Tubing Pump Head: Exploded View

ITEM NO.	DESCRIPTION
1,2,7	Mounting Hardware
3	Pump Head Section
4	Thrust Washers
5	Tubing
6	Rotor Assembly
8	Gasket

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MASTERFLEX PUMP HEAD REPLACEMENT PARTS

(PLATED STEEL METAL PARTS)

ITEM NO.	DESCRIPTION	QTY. PER HEAD	PUMP HEAD					
			7013-20	7014-20	7016-20	7015-20	7017-20	7018-20
1,2,7	Mounting Hardware	1 Pkg.	B-1238-8	B-1238-8	B-1238-8	B-1238-8	B-1238-8	B-1238-8
3	Pump Head Section	2	A-1106-2	A-1106-3	A-1106-5	A-1106-1	A-1106-4	A-1106-6
6	Rotor Assembly	1	B-1289-1	B-1289-1	B-1289-1	B-1289-2	B-1289-1	B-1289-1

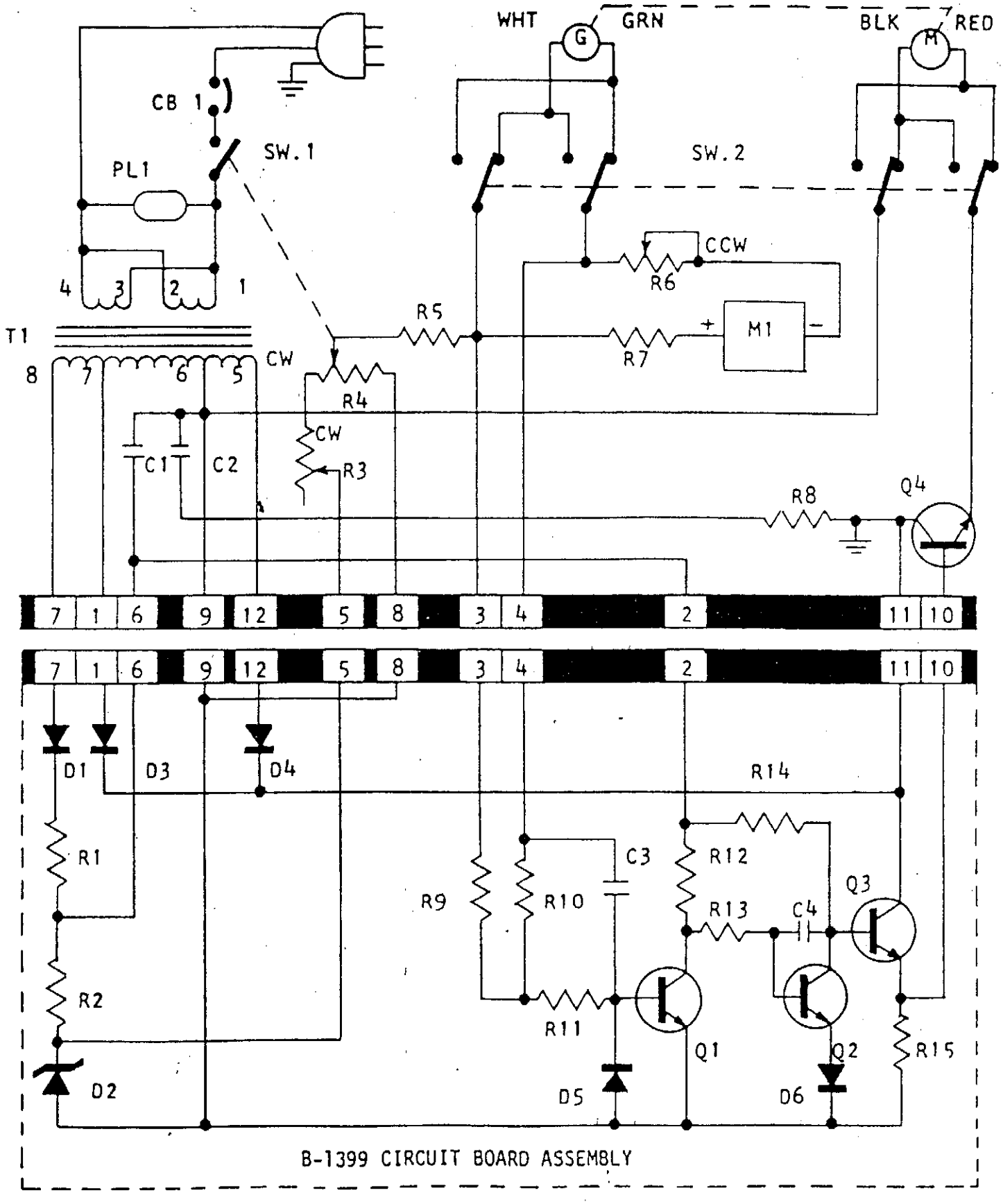
(STAINLESS STEEL METAL PARTS)

ITEM NO.	DESCRIPTION	QTY. PER HEAD	PUMP HEAD					
			7013-21	7014-21	7016-21	7015-21	7017-21	7018-21
1,2,7	Mounting Hardware	1 Pkg.	B-1239-10	B-1239-10	B-1239-10	B-1239-10	B-1239-10	B-1239-10
3	Pump Head Section	2	A-1400-1	A-1400-2	A-1400-5	A-1400-3	A-1400-4	A-1400-6
6	Rotor Assembly	1	B-1291-1	B-1291-1	B-1291-1	B-1291-2	B-1291-1	B-1291-1

Notes

A) Exploded view of pump head shows location of item nos.
B) Both plated steel and stainless steel heads use the same gasket (Item 8) A-1113, and thrust washers (Item 4) A-1184.
C) Pump head sections are supplied with bearings.

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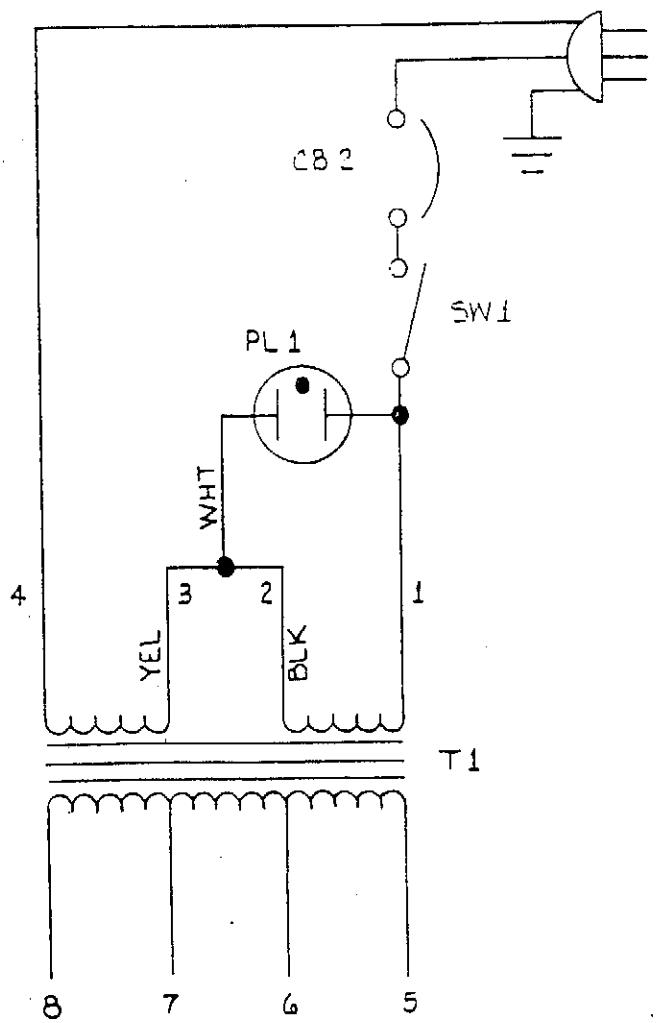


SCHEMATIC DIAGRAM (7562 AND 7562-10)

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INPUT POWER:

The 7562 and 7562-10 Console Masterflex units are wired to operate on 115 VAC, 50/60 cycle input power. The 7563 and 7563-10 units have basically the same circuit except that the power transformer has been connected to operate on 230 VAC, 50/60. The included figure indicates the wiring change.



(TRANSFORMER SECONDARY UNCHANGED)

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TROUBLE SHOOTING GUIDE:

A list of replacement pump parts with an exploded view showing their location in the pump head has been provided. A circuit diagram of the Console is included. Complex repairs requiring components on the printed circuit board should be performed by the COLE-PARMER Repair Department. Repairs to components not on the circuit board can be completed by the customer if desired. A list is provided which identifies the part, its circuit diagram symbol and the COLE-PARMER part number.

CONSOLE MASTERFLEX PARTS LIST:

SYMBOL	ITEM	PART NUMBER
M-G	Motor-Generator	D-1175
	Output Gear Assembly (7562, 7563) (7562-10, 7563-10)	7553-06 7553-08
MI	Meter (7562, 7563) (7562-10, 7563-10)	B-1590 B-1391
CI	Capacitor (250 MF, 50 VDC)	B-1114-23
PLI	Pilot Light	A-1001
TI	Transformer	A-1362
Q4	Output Transistor	A-1199-2
CB1	Circuit Breaker (115 VAC)	A-1188-2
CB2	Circuit Breaker (230 VAC)	A-1188-3
	Circuit Board Assembly	B-1399

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TROUBLE SHOOTING GUIDE:

Some solutions to common repair problems are described below:

PROBLEM	POSSIBLE SOLUTIONS
Pump does not rotate	Reset circuit breaker Reposition reversing switch (switch in center position) Replace resistor (R8) (open circuit) Replace transistor Q4 (open circuit) Replace output gear shaft assembly (shear pin or gear failure)
Pump at maximum speed cannot be regulated with speed control knob	Reverse generator connections (wrong polarity) Replace transistor Q4 (shorted)
Premature tubing failure	Replace tubing (oversize O.D. causes excessive tubing compression)
Tubing travels in pump head	Replace tubing (undersize O.D. - pump head does not grip tubing securely)

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MAINTENANCE:

Bearings within the pump head are permanently lubricated and do not require maintenance. The pump should be periodically disassembled and cleaned, particularly if the tubing within the head has ruptured during pump operation. Wipe with a damp cloth, only using soap and water, since some cleaning chemicals may attack the plastic. Do not immerse the plated steel parts in liquid for cleaning, since the lubricant maybe washed out of the bearings. While the head is disassembled, inspect all parts for obvious damage or wear and replace if necessary. The pump drive pin and gears do not require maintenance. The control circuit has solid state components which do not require servicing. A circuit breaker is located on the rear panel of the instrument. Depress the button to reset the breaker. The motor-generator brush life should exceed 3000 hours under normal operation. They can be replaced if necessary.

WARRANTY:

The COLE-PARMER INSTRUMENT COMPANY warrants this product to be free from defects in material and workmanship for a period of six months. If repair or adjustment is necessary and has not been the result of abuse or misuse within the six month period, please return, freight prepaid, and correction of the defect will be made without charge. (See note on Return of Items)

Out of warranty products will be repaired at nominal charge.

RETURN OF ITEMS:

Authorization must be obtained from our Customer Service Department before returning items for any reason. When applying for authorization, please include data regarding the reason the items are to be returned. A 15% restocking charge will be made on all unauthorized returns.

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For your protection, items being returned must be carefully packed to prevent damage in shipment and insured against possible damage or loss. COLE-PARMER will not be responsible for damage resulting from careless or insufficient packing.

NOTE:

Technical information and advice on the use of the Console Masterflex in specific applications may be obtained. Modifications can be made to adapt the unit to special customer applications. Contact the Engineering Department at the COLE-PARMER INSTRUMENT COMPANY for information.

COLE-PARMER INSTRUMENT COMPANY reserves the right to make improvements in design, construction and appearance of our products without notice.

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