Model '665'
Intermediate Ventilator
User's Manual

Model '665' Intermediate Ventilator 55-0798

Model '665A' Intermediate Ventilator 55-0806

HARVARD
APPARATUS

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General Information

Serial Numbers

All inquires concerning our product should refer to the serial number of the unit. Serial numbers are located on the rear of the chassis.

Calibrations

All electrical apparatus is calibrated at rated voltage and frequency. While the flow will stay calibrated, the peak will vary.

Warranty

Harvard Apparatus warranties this instrument for a period of one year from date of purchase. At its option, Harvard Apparatus will repair or replace the unit if it is found to be defective as to workmanship or material.

This warranty does not extend to damage resulting from misuse, neglect or abuse, normal wear and tear, or accident.

This warranty extends only to the original customer purchaser.

IN NO EVENT SHALL HARVARD APPARATUS BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. **THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR USE, OR OF ANY OTHER NATURE.** Some states do not allow this limitation on an implied warranty, so the above limitation may not apply to you.

If a defect arises within the one-year warranty period, promptly contact ***Harvard Apparatus, Inc. 84 October Hill Road, Building 7, Holliston, Massachusetts 01746-1371*** using our toll free number 1-800-272-2775. Goods will not be accepted for return unless an RMA (returned materials authorization) number has been issued by our customer service department. The customer is responsible for shipping charges. Please allow a reasonable period of time for completion of repairs, replacement and return. If the unit is replaced, the replacement unit is covered only for the remainder of the original warranty period dating from the purchase of the original device.

This warranty gives you specific rights, and you may also have other rights which vary from state to state.

Repair Facilities and Parts

Harvard Apparatus stocks replacement and repair parts. When ordering, please describe parts as completely as possible, preferably using our part numbers. If practical, enclose a sample or drawing. We offer a complete reconditioning service.

CAUTION

This pump is not registered with the FDA and is not for clinical use on human patients.

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Specifications

Model '665' Ventilator Specifications

Volume	Adjustable from 4 to 100 cc/stroke while Ventilator is running
Rate	Adjustable from 10 to 100 strokes/min while Ventilator is running
Phase Control	Percentage of inspiration can be adjusted from 25 to 50% of respiratory cycle while Ventilator is running
Port Size:	8 kg (17 lb)
ID	6.4 mm (1/4 in)
OD	7.9 mm (5/16 in)
Dimensions, H x W x D	35 x 45 x 20 cm (14 x 18 x 8 in)
Weight	18 kg (37 lb)

Catalog No.	Model	Power
55-0798	665	115 VAC, 60 Hz
55-0806	665A	230 VAC, 50 Hz

Accessory

55-2810	Overhaul Kit for Intermediate Animal Ventilator; contains O-rings, valve springs, lubricants, etc. to overhaul Ventilator

Description & Features

Model 665 is a positive pressure, artificial respiration pump for use with small animals. It consists of a 1/15 H.P. permanent magnet motor operated by a solid state motor speed control, linkages, cylinder and piston assembly and cam operated slide valve. All of the mechanics and electronics are contained in a sheet metal housing.

The linkages are so designed that the piston almost touches the end of the cylinder at each stroke regardless of the stroke volume. This insures that all of the air taken into the pump is expelled at each stroke. The volume is adjustable while the pump is running by means of the black knob on the top. The volume is indicated on the side.

The pump is designed to use one of three different sized pistons; 25cc, 50cc, and 100cc. In all cases the piston travel is the same but the cylinders are different diameters.

Operation

Electrical Grounding

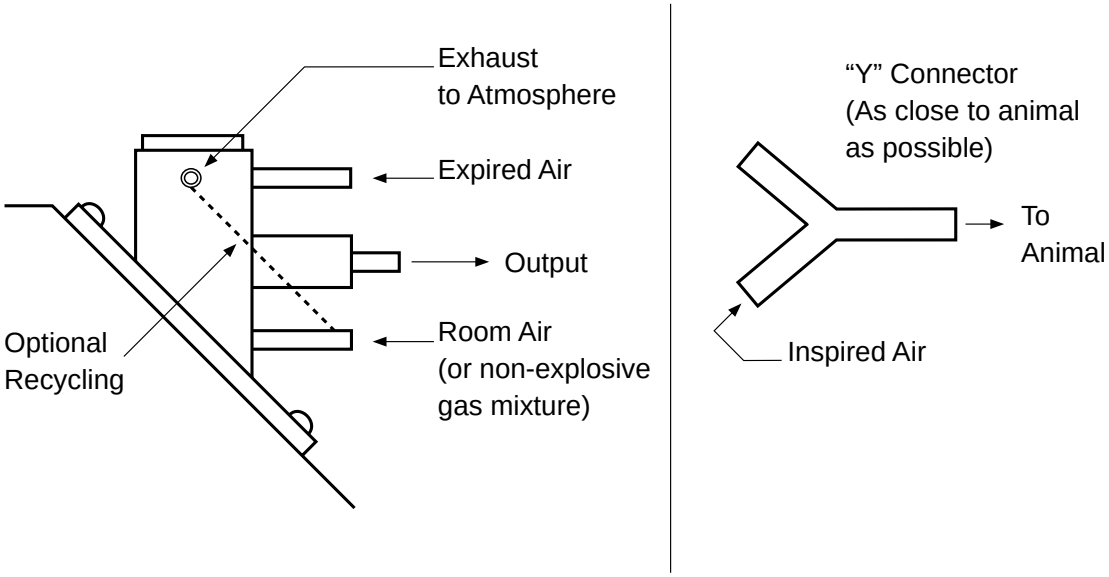
The pump is equipped with a three wire ground cord. The grounding should be kept intact.

Stroke Volume Adjustment

The stroke volume is adjusted by a large black knob at the top of the pump with the volume being indicated on the etched plate attached to the side of the pump housing. The smaller black knob on the volume pointer must be turned counterclockwise to unlock the large black knob at the top of the pump. Turn the smaller knob clockwise to lock the Stroke Volume Adjustment after positioning.

Hook-up to Animal

A "Y" Connection should be inserted between the connection to the animal (cannula, etc.), and the two tubes coming from the pump. Dead space is minimized if the "Y" is as close to the animal as possible.



Motor Control Rate

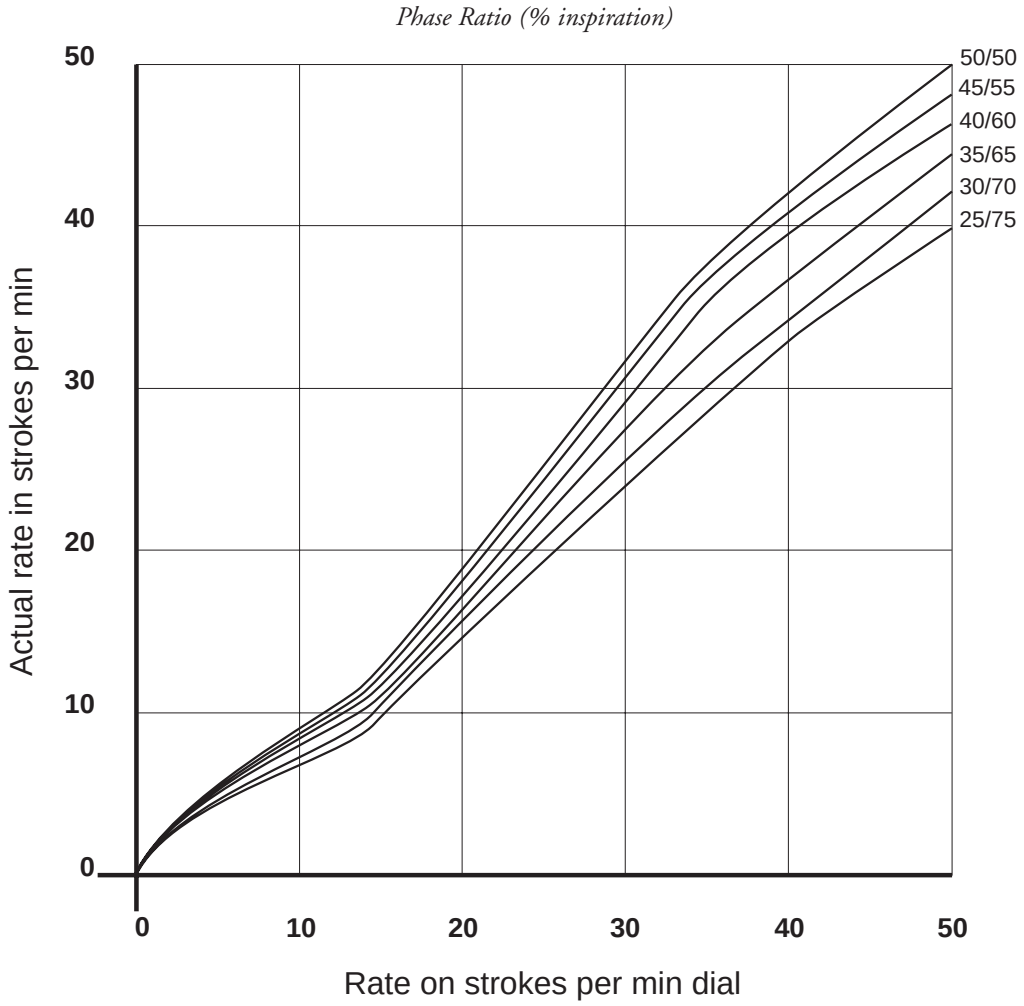
Rate – This control sets the number of complete strokes per minute of the piston pump.

Operation (Cont'd)

Phase Adjustment

Phase – This control sets the percentage duration of inspiration. If this control is set at 50, then the duration of inspiration and the duration of expiration are equal. It is recommended that the user verify the actual rate when using the phase control at maximum. The following page illustrates this effect.

Volume – Refer to the ventilation graph on page 4 to select the appropriate tidal volume as a function of body weight



Operation (Cont'd)

Typical Plot of Actual Stroke Rate at Various Phase Ratios and Strokes

Note: Actual I/E ratio range is 25/75 to 50/50.

The graph to left, taken from tests on a Harvard Model 613 Ventilator, is typical of the performance from a dual phase motor control pump. As observed, actual stroke rate varies considerably as the phase ratio reaches its outer limits. Users should be aware of this relationship and develop appropriate curves to assure accurate experimental data.

Maintenance

Pump Mechanism

The entire pump mechanism is available for inspection by removing the back panel (opposite side from volume calibration). All bearings and points of sliding contact should be lubricated every 3-6 months with a light machine oil (Part No. 0606-060, Oil - One oz. Btl). A finger full of the silicone lubricant provided should be smeared inside the cylinder. At the same time the slide valve block should be removed by removing the two outside screws and its center valve lubricated with the silicone grease. Do not misplace the "O" rings between the cylinder and valve block. Also, be careful not to cut the "O" rings when replacing valve in block.

Control

The solid state dual phase motor control needs no attention. A safety fuse is provided to protect the motor and control in the event of mechanical overload or accident. A schematic of the control is included.

Motor

The motor gearbox is equipped with oilers on the output shaft bearings. A few drops of light machine oil should be added every 3-6 months.

Mounting & Adjustment Instructions

General Information

The Model 665 Ventilator is designed so that 100 cc and 25 cc cylinder and piston assemblies can be interchanged.

Procedure

1. Remove the back panel of the pump (opposite side from volume calibration).
2. Remove the name plate by removing the three screws.
3. Remove the slide valve block by means of the two outside screws. Save the "O" rings.
4. Remove the side plate by removing the 2 screws. This will expose the fasteners holding the cylinder.
5. Rotate the motor by hand or electrically, until the hex block on the piston rod is visibly protruding from the cylinder.
6. Using a 3/32 Allen wrench, separate the piston assembly from the 3/8 round piston rod and push the piston into the cylinder.
7. Remove the screws holding the cylinder to the aluminum panel.
8. The entire piston and cylinder can now be removed.
9. Put the new piston assembly into the new cylinder and replace. Lubricate the piston and cylinder with a finger full of the silicone grease provided with the pump.
10. Adjust the position of the piston so that the piston is within 1/16" of the bottom of the cylinder at the extreme end of its travel. The motor must be rotated for this adjustment.
11. Replace the slide valve.
12. Change the volume plate.

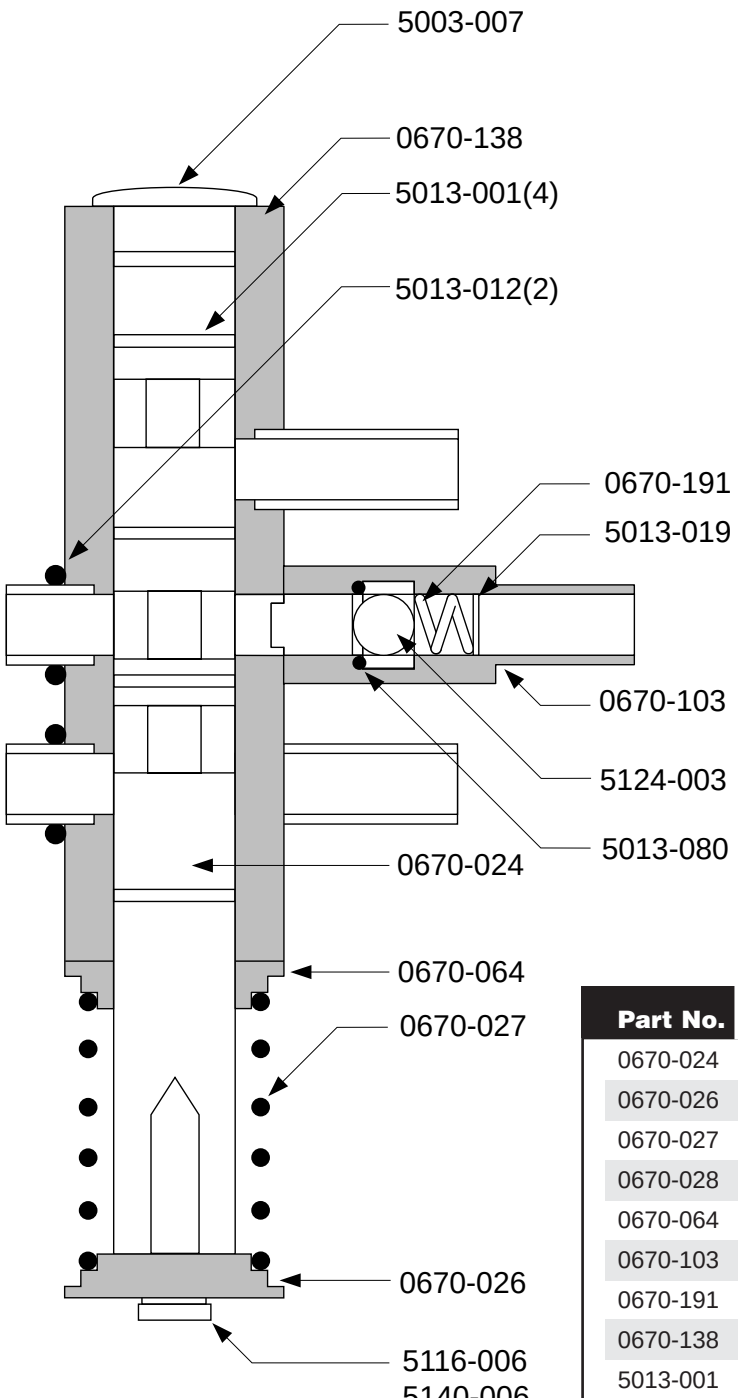
Adjustment Notes

The cylinder must be aligned on piston axis to prevent leakages or binding.

In some cases, the valve setting may need a slight readjustment for different cylinders. When the valve is adjusted correctly, suction and discharge pressures should be nearly equal. This can be tested by placing a finger over the port tubes.

Parts Listing

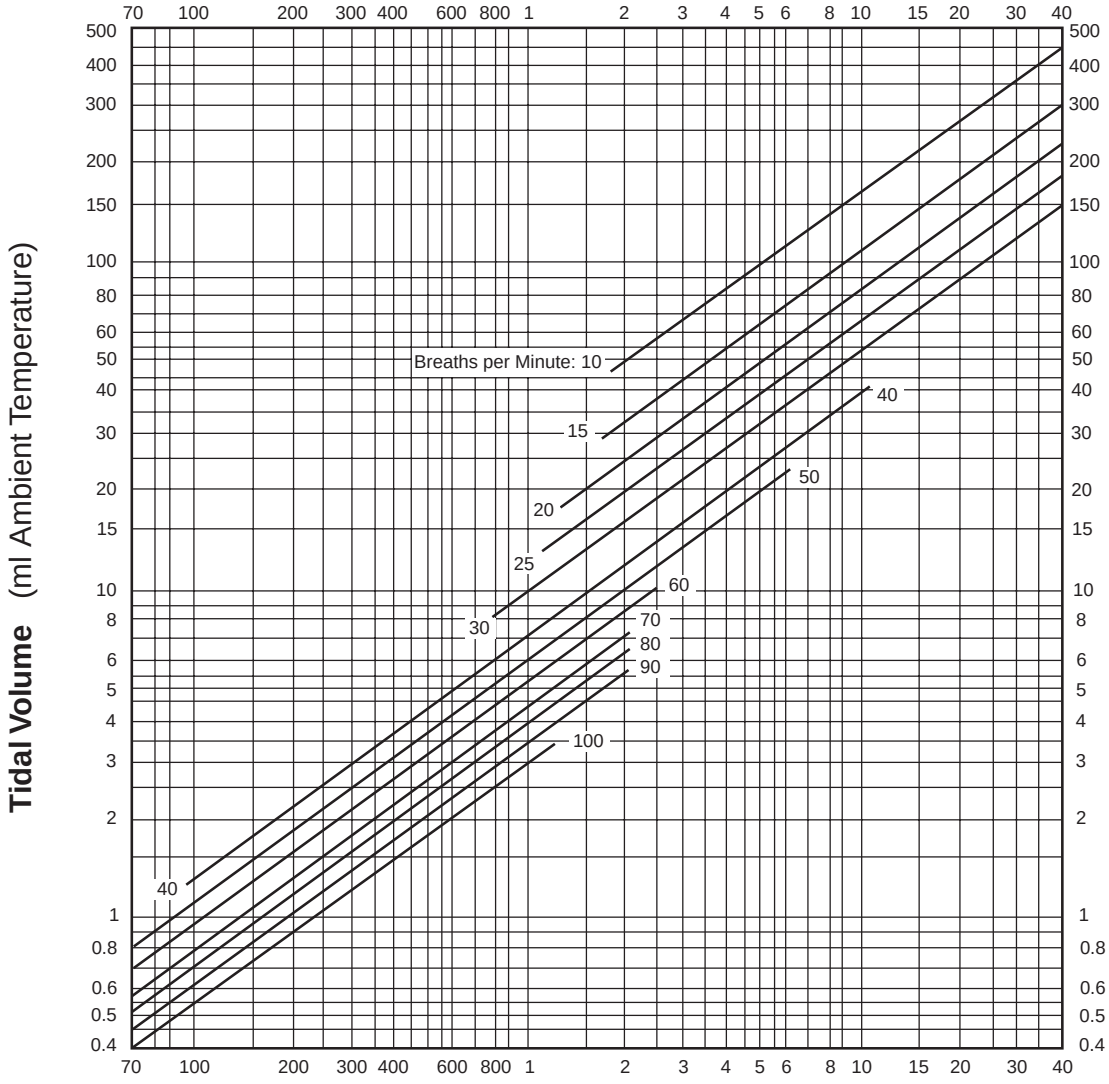
Valve Block Assembly for 25 and 100 cc Models



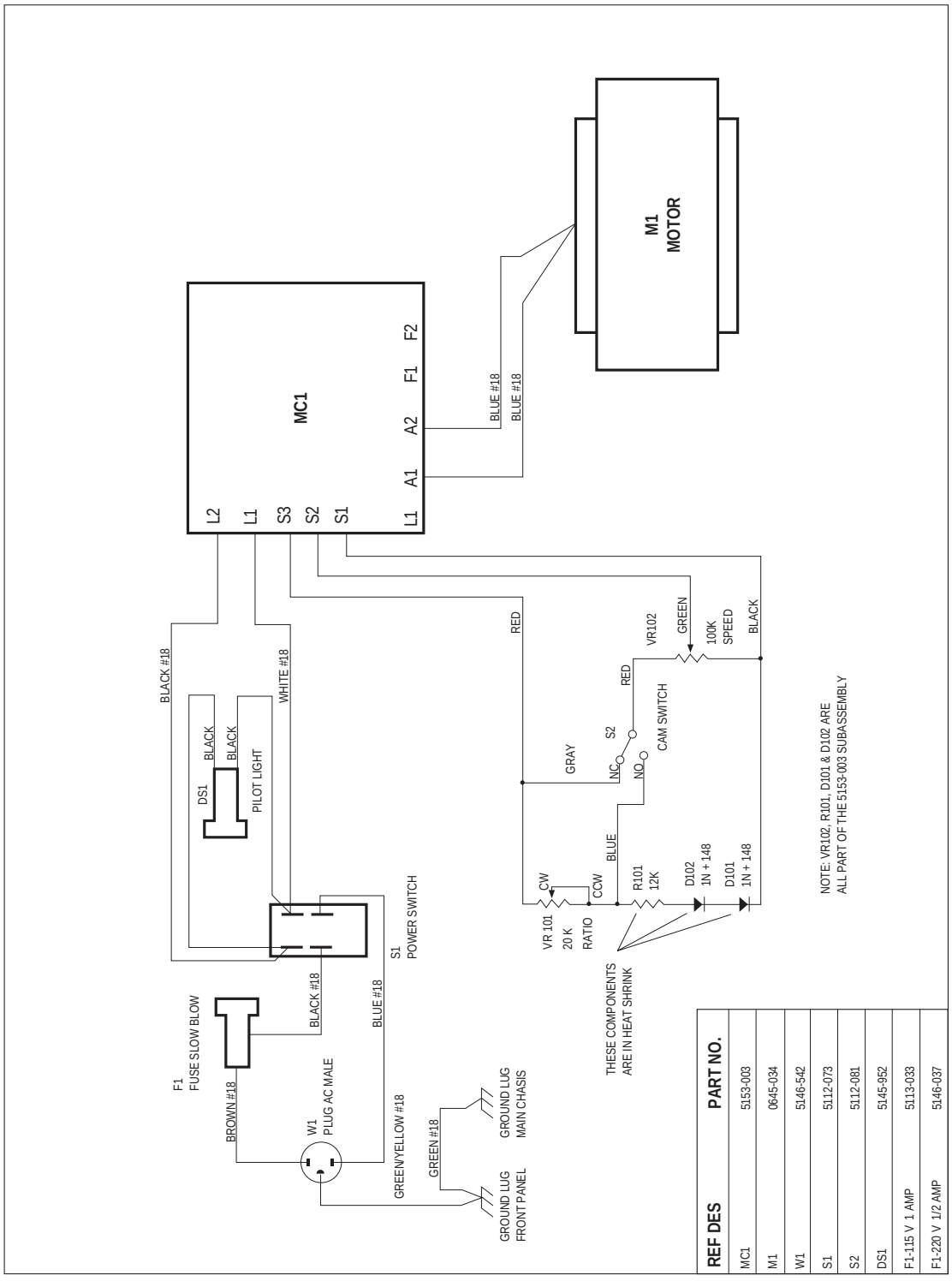
Part No.	Description
0670-024	Valve
0670-026	Retainer-Spring (small bore)
0670-027	Spring-Valve Rod
0670-028	Cap-Valve Block
0670-064	Retainer-Spring (large bore)
0670-103	Fitting Tube
0670-191	Spring-Ball
0670-138	Assy-Valve (black solder)
5013-001	'O' Ring - Parker #2-12
5013-012	'O' Ring - Parker #2-11
5013-019	'O' Ring - Parker #2-13
5116-006	Bolt - Hex HD 1/4-28 x 3/4
5124-003	Ball - Nylon 3/8 diam
5140-006	Washer - Lock Spring 1/4

Ventilation Graph

Tidal Volume vs. Weight & Rate
for
Laboratory Mammals in Resting State
(Apparatus dead spade must be added)



Schematic of the Ventilator



REF DES	PART NO.
MC1	5153-003
M1	0645-034
W1	5146-542
S1	5112-073
S2	5112-081
DS1	5145-952
F1-115 V 1 AMP	5113-033
F1-220 V 1/2 AMP	5146-037