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SECTION I INSTALLATION

1-1 SAFETY

Servicing of our air conditioning systems should be performed by qualified personnel only, because of hazards due to electrical components and system pressures. Basic maintenance such as cleaning coils and the replacing of filters can be performed by untrained personnel. When performing service or maintenance on the system, power to the unit should be off. Wear safety goggles and gloves when working with refrigerants. Do not attempt to braze on a system which is under pressure; remove refrigerant first. A quenching cloth, which is used as a heat-sink, is recommended when brazing. Keep a fire extinguisher on hand for all brazing operations.

When using nitrogen and refrigerant for leak testing, always charge the refrigerant in first.

1-2 DESCRIPTION

Our Vari-Master Series, Large Commercial Units, are self-contained heat/cool or cooling only units, designed for both new and renovated commercial and industrial buildings. They provide complete individualized conditioning for multizone applications with nominal capacities available from 25 to 40 tons.

The 803 Series (heat pump version) will operate with modulating air volume when the unit is in the cooling mode and constant air volume when the unit is in the heating mode.

The 903 Series (cooling only version) will operate with continuous modulating air volume.

Each unit is assembled, wired and factory-tested before delivery.

1-3 PRE-INSTALLATION NOTES

Inspect the unit and report any damage or missing parts to the carrier's agent. Request an inspection and a report.

Check the rating plate of the unit to make sure that it matches your application.

1-4 LOCATION AND MOUNTING OF THE UNIT

The unit is to be mounted inside the building. Adequate space should be allowed for the unit, to insure that the access panels may be removed easily and the unit can be serviced.

The unit must be level to allow proper drainage of condensate water. If isolation springs are used, see installation instruction shipped with the springs.

After the unit is securely mounted, the compressor hold-down bolts are to be loosened and the shipping spacer removed. Rubber grommets (shipped in the high voltage control compartment) are to be inserted into the compressor mounting holes.

1-5 DUCTWORK CONNECTIONS

To isolate sound and vibration from the ductwork, isolation collars should be used between the unit and the supply and return air ducts.

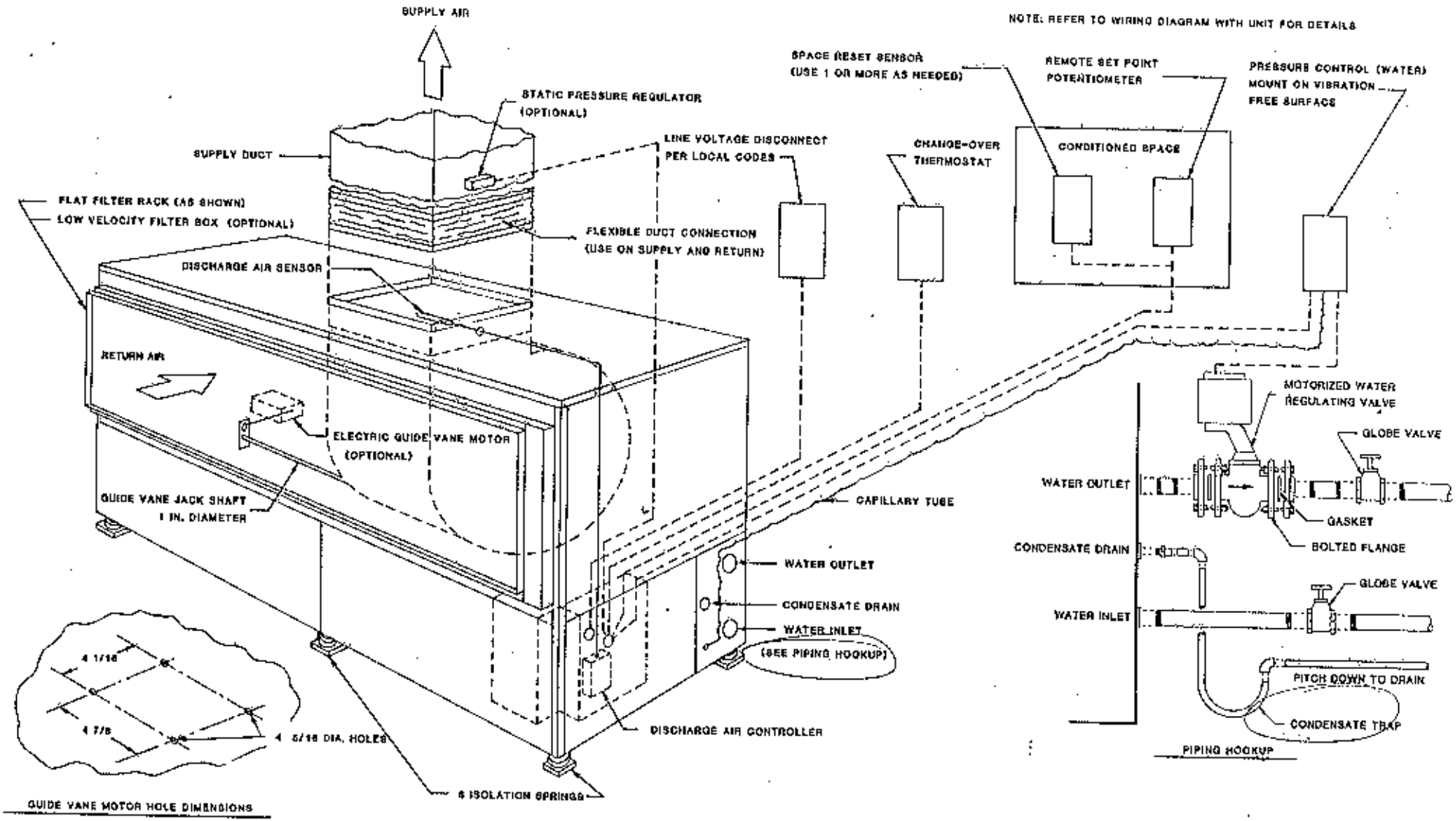
Ducts passing through an unconditioned space must be insulated and covered with vapor barrier in accordance with the latest issue of SMANCA (Sheet Metal and Air Conditioning Contractors of America) and NESCA (National Environmental Contractors Association) minimum installation standards.

1-6 WATER CONNECTIONS AND DRAIN PIPING

The water regulating valve will be shipped separately for VAV units and will be field-mounted by the installer. A globe valve should be installed on the water inlet and also after the water regulating valve on the outlet. See typical installation diagram (figure 1). The drain pipe should be pitched 1/4" per FOOT for proper evacuation of condensate. The condensate drain trap must be filled with water prior to the start-up of the unit. Differential trapping is required (see figure 1).

FIG. 1

TYPICAL HOOKUP
SELF-CONTAINED VAV UNITS
VARI-MASTER SERIES (WITHOUT ECONOMIZER)



TOP CW SUPPLY-FRONT RETURN UNIT AS SHOWN

FIG 1
ORIGINAL DWG CHANGED 2-4-86 JB

1-7 ELECTRICAL REQUIREMENTS

All wiring should be in accordance with the national electric code and local building codes.

Check the dimensional specifications (figure 6). A straight EMT connector for power supply conduit connection is provided within the control box.

Each unit must have a separate branch circuit fused disconnect mounted nearby for easy access when servicing. Refer to the electrical specifications (figure 2) for proper wire and fuse sizes.

ELECTRICAL DATA

MODEL NO.	POWER SUPPLY	COMPRESSOR			BLOWER MOTOR**				MIN. CIRCUIT AMPACITY	FUSE SIZE AMPS	POWER SUPPLY WIRE SIZE ***	GRD WIRE SIZE
		QTY	RLA	LRA	QTY	HP	FLA	LRA				
240	230/60/3	1	69.7	188*	1	15	40	216	127	175	1	6
240	460/60/3	1	34.8	154	1	15	20	108	63.5	90	2	8
300	230/60/3	1	80	250*	1	15	40	216	140	200	1/0	6
300	460/60/3	1	40	214	1	15	20	108	70	110	4	6
360	230/60/3	1	94	292*	1	20	50	290	168	250	2/0	4
360	460/60/3	1	47	235	1	20	25	145	84	125	3	6
480	230/60/3	1	130	340*	1	25	63	340	226	350	4/0	3
480	460/60/3	1	65	297	1	25	31.5	170	113	150	2	6

VARIOUS

* PART WINDING START
** BASED ON BLOWER DRIVE SELECTED TO DELIVER RATED CFM AT 2.5" ESP FOR CONSTANT VOLUME UNITS AND 4.0" ESP FOR VARIABLE AIR VOLUME UNITS
*** BASED ON 60° C INSULATION FOR MINIMUM CIRCUIT AMPS ≤100° A
BASED ON 75° C INSULATION FOR MINIMUM CIRCUIT AMPS >100° A
NOTES: FLA = FULL LOAD AMPS
LRA = LOCKED ROTOR AMPS
RLA = RATED LOAD AMPS

FIG 2

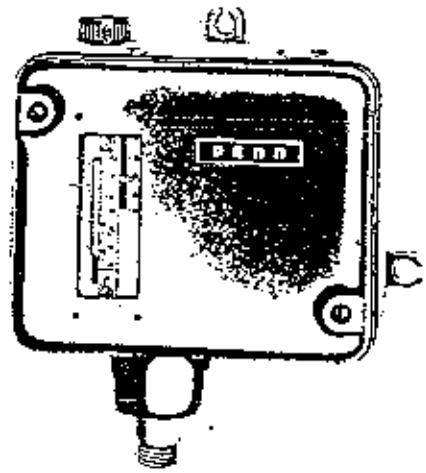
IMPORTANT

The continuous operating voltage must be keep within + 10% of the rated voltage or damage to the unit may result.

I-8 WATER VALVE AND PRESSURE REGULATOR

PRESSURE REGULATOR Mount on a vibration free location, where the cap tube may be easily routed from the control, to port on the liquid line shut-off valve (803 Series) or the access valve on the refrigerant/water heat exchanger (903 Series), whichever is applicable. The knockout located on the water connections panel (see figure /) is to be used for routing the cap tube to the port location. A protective insulator is to be used to protect the cap tube from the edges of the knockout. Pressure regulator is provided with 36" long cap tube. For longer lengths, add an extension piece. Note: 903 Series unit -- use 1/4" flare swivel nut with core depressor between the pressure regulator cap tube and the access valve on the refrigerant/water heat exchanger. For electrical hook-up, refer to the wiring diagram located on the access panel of the machine control box. Set the pressure regulator at 210 PSI and the differential at minimum.

WATER VALVE The water valve is to be mounted as shown on Figure 1 typical installation. The flange and gasket at the water "out" connection and also the globe valves will not be provided by Friedrich.



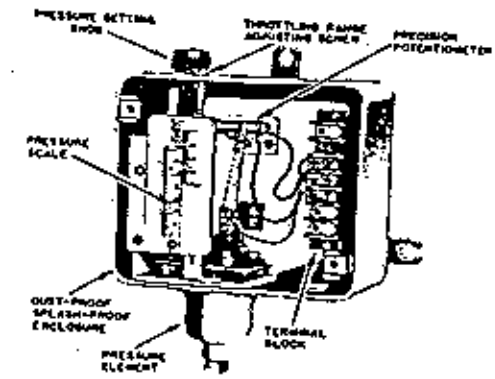


Fig 3

1-9 REMOTE POTETIOMETER AND SPACE SENSORS

Mount the remote potetiometer in a location where the settings will not be subject to tampering by unauthorized personnel. Install in a standard 2 X 4 outlet box at the location selected, the box may be surface mounted or recess mounted for flush mounting of the control. The box must be at least 1 3/4 inches deep. (~~Refer to figure for mounting~~.)

The space sensors are to be located on an inside wall about 5 feet from the floor. The location should be in an area where freely circulating air of average room temperatures are sensed. One or more sensors may be used to provide a signal proportional to the average building temperature. (Refer to figure for hook-up of more than one sensor.) Use the diagram shown in figure 4 along with the wiring diagram located on the inside panel of the machine control box. Do not locate space sensors in return air duct, contact factory for space sensors fan return air duct location.

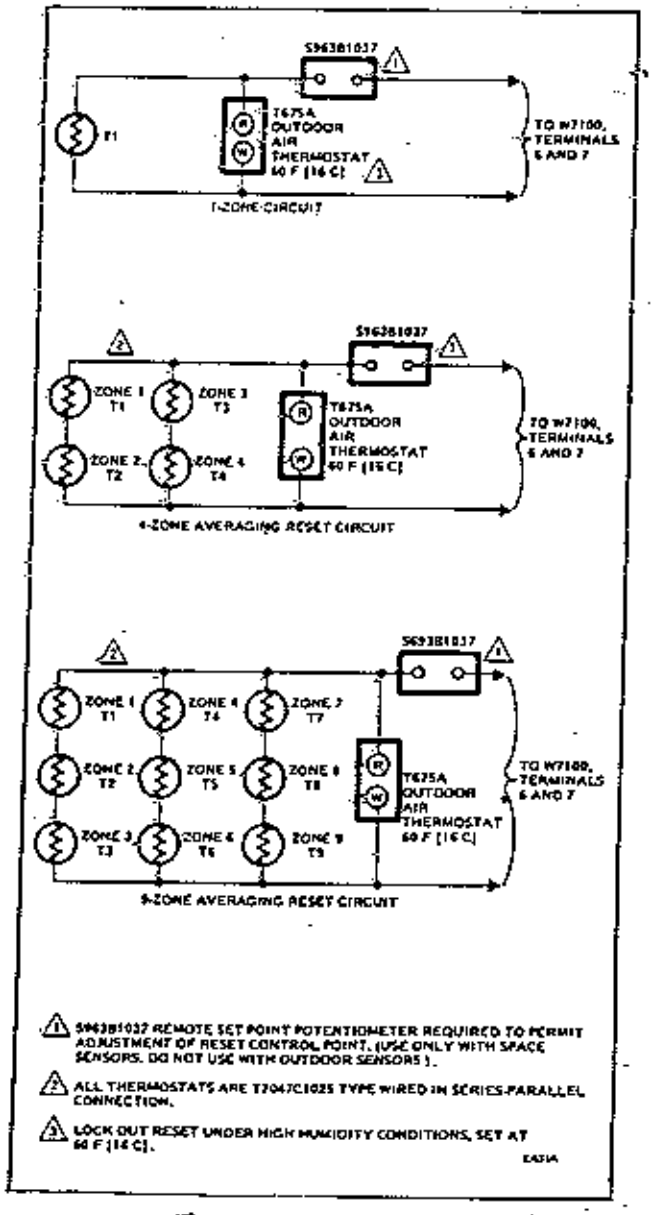
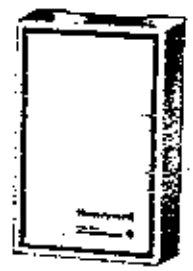


Fig 4



SPACE SENSOR

S963B

REMOTE POTENTIOMETER

1-10 CHANGEOVER THERMOSTAT

The thermostat may be mounted in a convenient position that provides easy mounting of the sensing element. The element is to be exposed to the average temperature of the return air or in a location applicable to the setting of the controller where changeover from heating to cooling is to take place. The sensing element is to be held in place with a capillary holder or compression fitting. Sharp bends or kinks in the capillary tubing affect the efficiency of the controller and must be avoided. Excess capillary should be carefully coiled and left directly beneath the controller. (Refer to the electrical diagram on the access panel of the unit control box for wiring.)

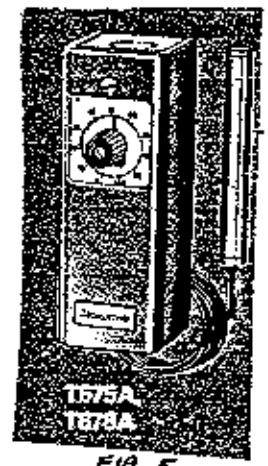


Fig 5
Change over Thermostat

1-11 STATIC PRESSURE REGULATOR

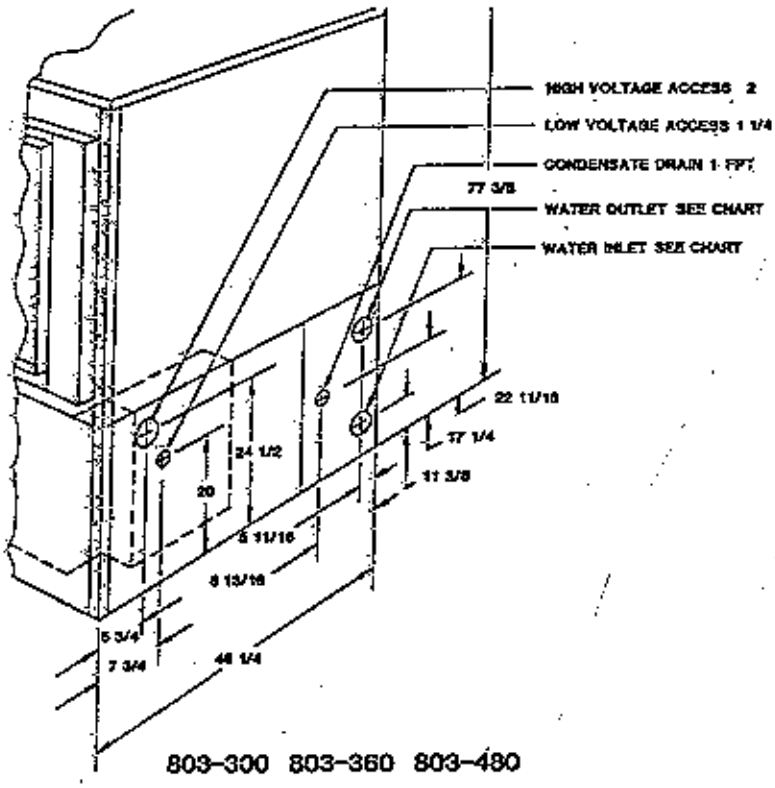
The static pressure regulator may be provided by Friedrich, if so, it shall be field installed and wired by others. (Refer to the wiring diagram located on the access panel to the control box of the unit.)

1-12 DAMPER MOTOR INSTALLATION

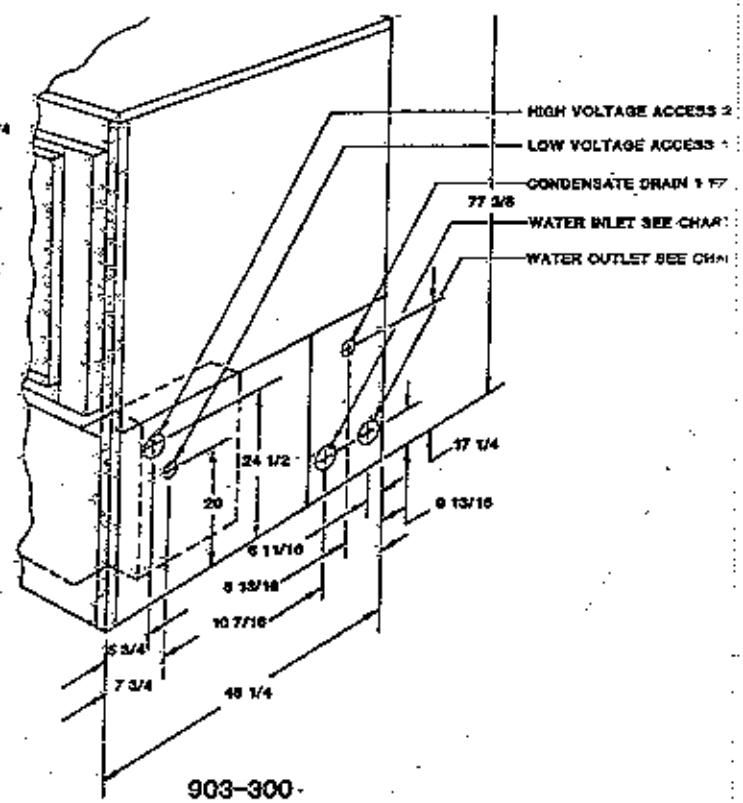
To provide application flexibility, Friedrich provides the blower guide vane linkage including the jack shaft. Friedrich does not provide the damper motor as standard equipment; however, if specified, a factory mounted electric motor is available.

When installing a motor in the field, other than the Friedrich electric motor option, mounting adaptors may be needed (see figure 14 for existing mounting holes). Linkage from the motor to the jack shaft will be provided by the installer.

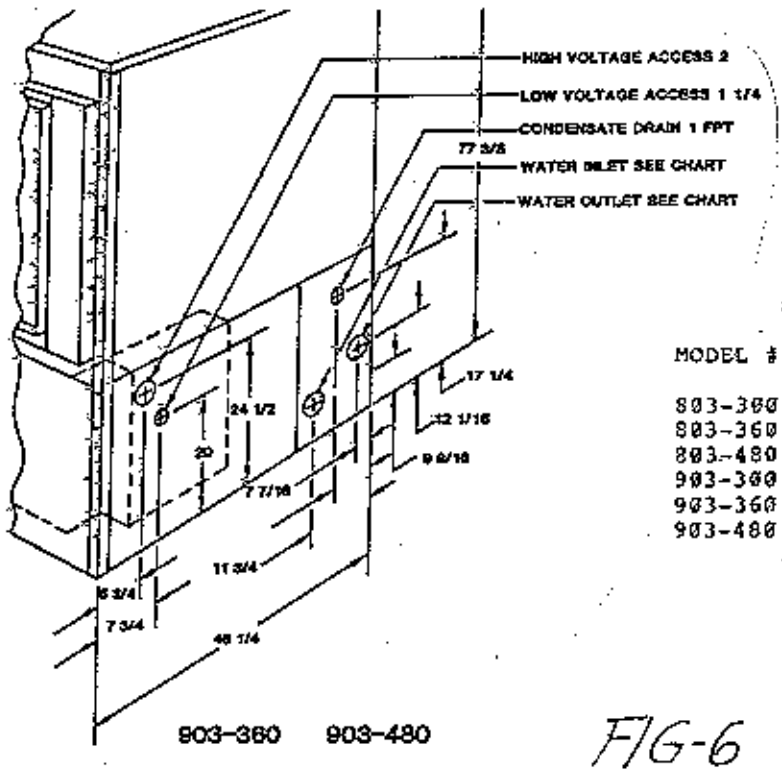
WATER & ELECTRICAL CONNECTIONS



803-300 803-360 803-480



903-300



903-360 903-480

SIZE OF WATER INLET AND WATER OUTLET

MODEL #	WATER INLET	WATER OUTLET
803-300	1 1/2 FPT	1 1/2 FPT
803-360	2 FPT	2 FPT
803-480	2 1/2 FPT	2 1/2 FPT
903-300	1 1/2 FPT	1 1/2 FPT
903-360	2 1/2 FPT	2 1/2 FPT
903-480	2 1/2 FPT	2 1/2 FPT

FIG-6

SECTION II OPERATION

2-1 DISCHARGE AIR CONTROLLER(D.A.C.)

The discharge air controller is a microprocessor based controller that maintains average discharge air temperatures by sequencing stages of mechanical cooling and heating. L.E.D.'s on the D.A.C. indicate what stage of heating or cooling are activated. The operating sequence of the D.A.C. is as follows:

Beginning at point A in figure 7, as the building load increases,the discharge temperature floats to the upper limit of the control ban at point B. At this time, the first stage of cooling energizes for a minimum period of four minutes. This brings the discharge air temperature within the control ban region. After four minutes, the first stage turns off, point C, and the temperature begins to rise again. At least four additional minutes have elapsed at point D, and the first stage turns on again. This time, however, the building load has increased until the space temperature rises to the outter limit at point E. At this point, the first stage locks on and the second stage cycles on, pulling the discharge temperature back within the control band region. This process continues through all connected stages. The highest number active state is always the cycling stage. In this way, the operating equipment is always matched to the required capacity as close as possible.

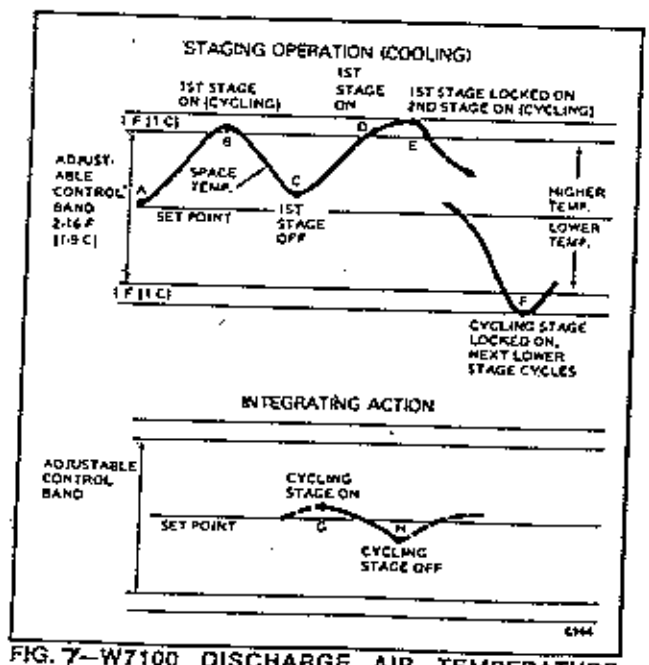


FIG. 7–W7100 DISCHARGE AIR TEMPERATURE CONTROL OPERATION.

2-2 RESET

Reset is accomplished by the use of the space reset sensors, in conjunction with the remote potentiometer. The space sensors respond to space temperature, the remote potentiometer is needed to permit adjustment of reset control point.

When the average temperature (sensed by the reset sensors) drops to 3 degrees F or more below the set point of the reset sensors (potentiometer setting), the mechanical cooling setpoint (D.A.C. setting) is reset upward by the amount set at the reset adjustment of the D.A.C. If the average temperature is less than 3 degrees below the setpoint, the mechanical cooling setpoint is reset upward by a percentage of the amount set at the reset adjustment of the D.A.C. (see figure 10) for the space reset algorithym.

The reset circuit is very important for the heating mode, becuase it is that circuit that will increase the D.A.C. setpoint temperature upward to a D.A.C. temperature that is applicable for heating. The reset circuit works the same for cooling as it does for heating; however, the amount that is reset for heating is four times the amount that would be reset for cooling. For example, if the reset is set at 10 degrees F for cooling, the reset will be 40 degrees F in the heating mode. When the D.A.C. setpoint is at 60 degrees and the average temperature at reset sensor is more than 3 degrees F below the setting on the potentiometer, the D.A.C. setpoint will be reset to 60 degrees F and 10 degrees F (70 degrees F) in the cooling mode and will be reset to 60 degrees F and 40 degrees F (100 degrees F) in the heating mode. If the average temperature is less than 3 degrees F below the setting on the potentiometer, see the space reset algorithym (figure 8) to determine the amount of reset.

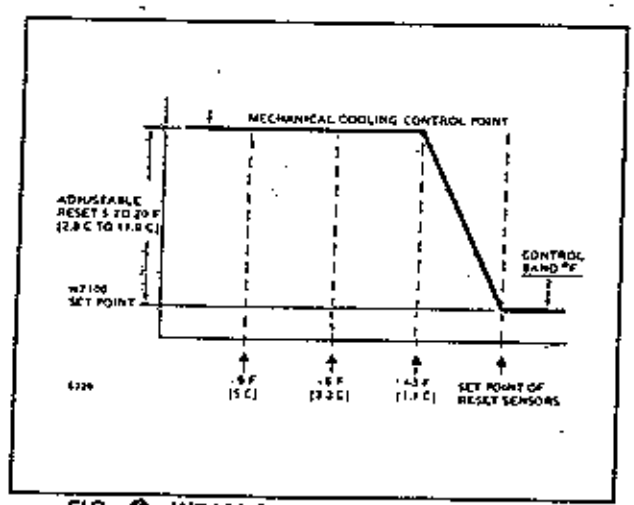


FIG. 8—W7100 SPACE RESET ALGORITHM.

2-3 SAFETY LIGHTS

Safety light, safety circuit (PL1) - this light is on when safety circuit lockout relay is energized.

Safety light, low oil pressure (PL2) - this light is on when there is low oil pressure.

Safety light, compressor (PL3) - this light is on when compressor contactor is energized.

2-4 OPERATION OF THE WATER VALVE

In the cooling mode, the modulating water valve regulates flow of water to the heat exchanger controlled by the water pressure regulator.

The water pressure regulator senses pressure at the liquid line service valve, which in turn opens and closes the motorized water valve in order to maintain a constant liquid line pressure.

In the heating mode, the water valve will be in the full open position and during the off cycle it will close.

The linkage at the motorized water valve is factory-adjusted, the installer should not attempt to adjust it. See Section 1 Item 8 for proper setting of the water pressure regulator.

2-5 CHANGEOVER THERMOSTAT

The changeover thermostat has an adjustable setpoint from 0 degrees F to 100 degrees F and a 3 degree F to 10 degrees F differential. The contacts between R and B will close when the temperature falls below the setpoint less differential, thus putting the unit into the heating mode. The contacts will open at the setpoint putting the unit back into the cooling mode. See the wiring diagram for field connections.

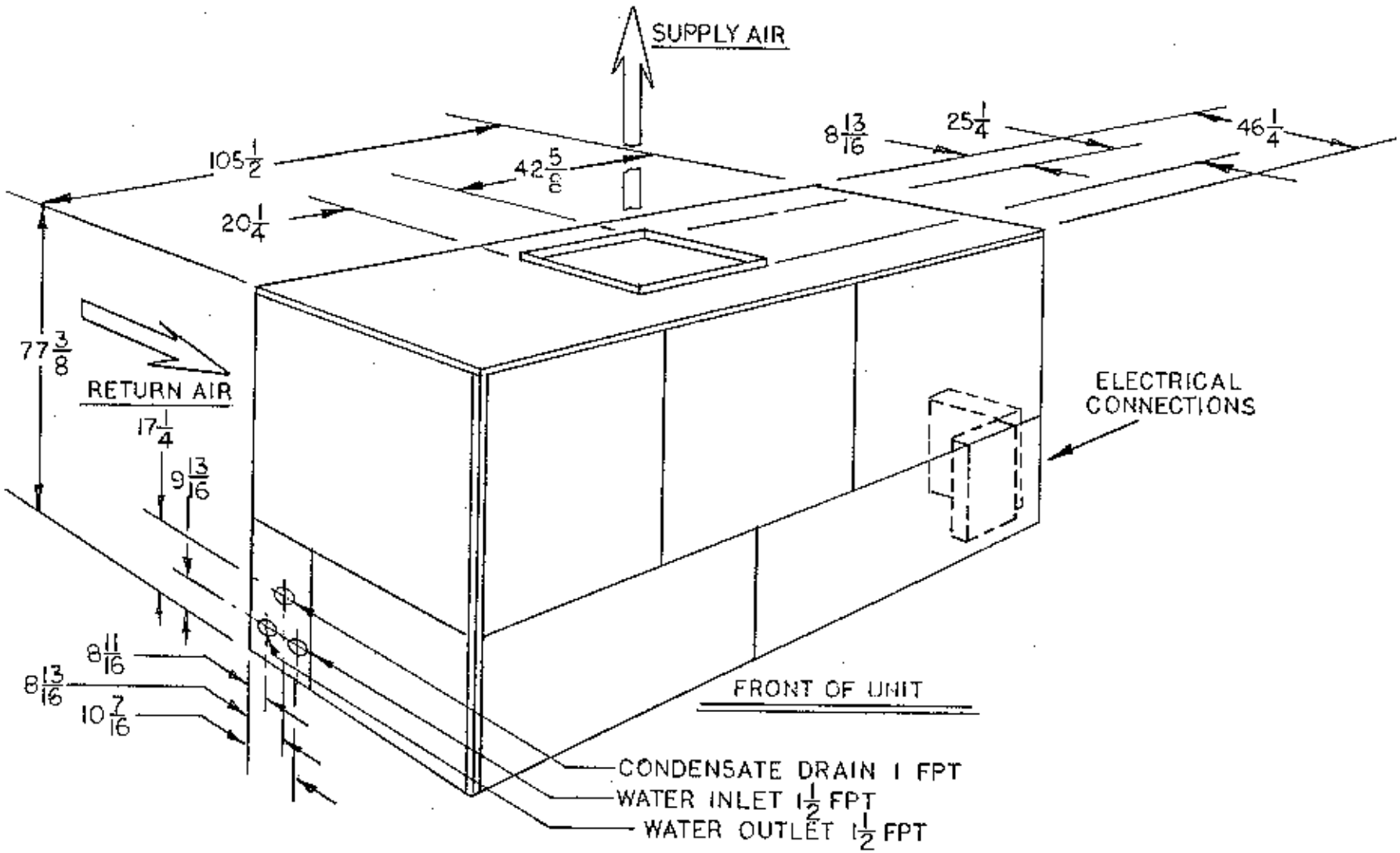
Note: The maximum safe bulb temperature is 125 degrees F.

SEQUENCE OF OPERATION

MODEL #	MODE	HEATING RELAY HR	COOLING RELAY CR	UNLOADING SOLENOID US1	UNLOADING SOLENOID US2	LIQUID LINE SOLENOID LLS	REVERSING VALVE SOLENOID RVS	HOT GAS BYPASS HGB	RELAY R
803-300	COOLING 1ST STAGE		X	X			X	X	
	COOLING 2ND STAGE		X	X		X	X		
	COOLING 3RD STAGE		X						
	HEATING 1ST STAGE	X							
	HEATING 2ND STAGE	X		X					
803-360	COOLING 1ST STAGE		X	X	X		X	X	
	COOLING 2ND STAGE		X			X	X		X
	COOLING 3RD STAGE		X		X				
	HEATING 1ST STAGE	X							
	HEATING 2ND STAGE	X							
803-480	COOLING 1ST STAGE		X	X	X		X	X	
	COOLING 2ND STAGE		X		X	X	X		X
	COOLING 3RD STAGE		X						
	HEATING 1ST STAGE	X							
	HEATING 2ND STAGE	X			X				

FIG-9

NOTE:
X = CONTROL IS ENERGIZED



903-240 TOP CCW SUPPLY – REAR RETURN