FORM NUMBER:
DATE:
REVISED:

WARREN//SHERER

INSTALLATION & OPERATION MANUAL

MODEL:

MODEL:

DUAL ---- METIC

CONDENSING UNITS

THIS REFRIGERATOR CONFORMS TO THE COMMERCIAL REFRIGERATOR MANUFACTURERS ASSOCIATION HEALTH AND SANITATION STANDARD.

CRS-SI-78

WARREN//SHERER

DIVISION OF KYSOR INDUSTRIAL CORPORATION

1600 ROCKDALE INDUSTRIAL BLVD., CONYERS, GEORGIA 30207/404•483•5600

THE WARREN/SHERER "DUAL METIC SYSTEM"

The advantages of parallel refrigeration systems are well known and accepted in the industry for their past performances. The simplicity and compactness of design make the addition of hot gas defrost, and/or heat reclaim a simple and economical feature. The most important point in planning an installation of the Warren/Sherer Dual Metic system is the total load required by the system.

The selection and design of the system is based on the needs of the individual customer. This information must be passed on to the design engineer and must be complete and accurate. Due to the individuality of each customer and his needs it is therefore impossible to categorize the Dual Metic system. The customer must make his needs known to the sales engineer, and he in turn must be sure that this information is passed on to the design engineer who will in turn design the system.

In operation, the Warren/Sherer Dual Metic System will have one compressor designated as the main, or lead compressor and will for all practical purposes run continually; the second compressor will start and stop as the load of the system demands.

Component parts have been selected for their dependability and availability to keep service problems to a minimum. Simplicity of design has also made the Warren/Sherer Dual Metic one of the easiest to service and install.

RECEIPT AND INSPECTION OF EQUIPMENT

Inspect the dual metic units and any accessories shipped with them for damages or shortages before and during unloading. If there is any damage, the carrier should be notified immediately and an inspection requested. The delivery receipt "must" be noted that the equipment was received damaged. If damage is of a concealed nature you must contact the carrier immediately or no later than three (3) days following delivery. A claim must be filed with the carrier, by the consignee for all damage.

NOTE: Your equipment, when delivered, will have a sticker attached advising what must be done to report any damage.

In the following pages will be found explanations of system components, wiring and piping diagrams, control settings, and operational guides. Any additional information may be obtained by calling the Sales Engineer in your area, or contacting the Warren/Sherer plant in Conyers, Georgia.

DUAL METIC CONSTRUCTION

The basic construction of the Dual Metic System is made up of carefully selected over-the-counter items that can be readily obtained at refrigeration wholesalers. As previously mentioned, each system is custom designed to meet the needs of each customer. The following is a description of a Dual Metic System containing all of the components available.

ELECTRICAL

All solenoids, contactors, controls, timeclocks, and crank case heaters are installed and wired at the factory. Electrical connections to the Dual Metic System include main three phase power, and control circuits. These are made in the control panel. The control panel is located above and to the rear of the compressors and is serviced from the front of the system.

Dual Metic units are available with compressors rated at 208/230/3/60 or 440/480/3/60 and a single power feed is required for the unit. If the compressors are 440/480/3/60 a separate 208/230/1/60 control circuit supply is required. If electric defrost is used a 208/230/3/60 supply is required, which may be combined with the control circuit supply. An optional transformer may be added to step down the 440V for the control circuit on each unit.

All field wiring must be in compliance with the NEC and local codes. Minimum unit wiring ampacity and maximum fuse sizes as calculated per the National Electric Code are shown on the dual metic nameplate.

Typical 208/230 and 440/480 volt wiring diagrams are shown with typical circuit wiring for different types of circuits on page . All types of defrost circuits may be intermixed in the panel depending on the individual state requirements. The wiring diagram sent with each dual metic is the diagram for that particular unit and shows the circuit wiring for the circuits as set up for that specific application.

Dual metic units with optional heat reclaim require two wires from the store environmental control panel supplying voltage requested by the customer.

COMPRESSORS

The compressors are solid mounted using the Warren/Sherer oil system or the optional AC & R pressurized system. Crankcase heaters and compressor cooling fans are installed and wired. High/Lo and oil failure controls are installed and wired. Liquid and suction filter core is also factory installed while the liquid line filter/drier cores are supplied for field installation.

PIPING

All piping leaving the unit is equipped with a shut-off valve with the exception of the heat reclaim line, this can be added at the customer's request. The system is sealed and leak tested before leaving the factory, and is shipped with a holding charge.

HOT GAS DEFROST

Due to the compactness of the Dual Metic System, and the availability of hot gas at the unit, hot gas defrost can be readily incorporated into the total system design. The hot gas header is installed between the liquid and suction headers at the rear of the unit and each circuit is piped into the suction line. Manual shut-off and solenoid valves are installed and wired; refer to Page diagram. The hot gas line is piped into the suction line up-stream of the EPR valve. All controls, valves, and piping come factory installed. Cases are equipped when ordered.

When defrost is initiated by the timeclock, the main liquid line solenoid is energized on defrost. Circuit liquid line solenoid (if used) and suction stop are de-energized. The hot gas enters the suction line and travels to the evaporator; (Reverse cycle). As the hot gas condenses in the evaporator, it travels around the expansion valve through a built-in check valve, and back through the liquid line to the liquid line header. This returning liquid in turn feeds the circuits still calling for refrigeration. Should the returning liquid not be adequate for the demand, the pressure in the liquid header will start to drop. When a difference of twenty (20) pounds between the liquid header and main liquid line pressures occur, a twenty (20) pound differential check valve piped in parallel with the main liquid line solenoid will open and supply the required liquid.

UNIT DESIGNATION

Units come numbered, and circuits are designated including condenser and heat reclaim coils. All refrigeration circuits are numbered from one to eight and from left to right facing the electrical panel.

EXAMPLE UNIT DESIGNATION:

DM 2 - 2000 FC

TOTAL NOMINAL H.P.

DUAL METIC

APPLICATION TEMP & TYPE FREON	
R-12 Med. Temp.	FC
R-502 Med. Temp.	RC
R-502 Low Temp.	RL

HEAT RECLAMATION AND HEAD PRESSURE CONTROL

The basic concept of refrigeration is to transfer heat from one place to another. Heat is removed from the case and its contents, and transferred to the outside, or ambient air. By incorporating a multi-circuited coil in to the air handling system of the store, this heat can be diverted to heat the store properly.

HEAT RECLAIM

The valving comes factory installed. Piping and wiring from the controls, and the heat reclaim coil are field installed. Warren/Sherer requirements for piping are shown on Page .and are at the customer's choosing. The check valve required for series piping is field furnished.

The heat reclamation coil is installed in the store duct system and is integrated with the heating and air-conditioning system. The coil must be downstream of the AC coil and upstream of any booster heaters. The air should enter the refrigerant outlet side of the coil and the liquid outlet of the coil should be lower than the gas inlet.

HEAD PRESSURE CONTROL

Simply speaking, a diverting valve is installed in the discharge line of the compressor, and is piped to the normal condenser, and the heat reclaim coil. This valve is equipped with an electric solenoid that is activated by the environmental control panel. There is an additional constant pressure valve installed on the discharge line from the compressor, Item #7 on Page 7. It should be noted that this valve is after the supply to the hot gas header, and maintains a constant pressure to the hot gas header. The hot gas needed for defrosting is more critical than the reclaim, should it call for both at the same time. Warren/Sherer incorporates the series system of piping in heat reclaim; the gas passed from the heat reclaim coil to the condenser and back to the receiver. Should the receiver pressure drop below the setting of the hot gas bypass valve, the valve will open to keep the pressure on the liquid receiver.

CONDENSERS

All condensers should be located at an elevation higher than the dual metic unit to assure liquid drainage from the condensers to the receiver. If the condenser has dual drop legs to a single dual metic unit an elevation difference of at least 6 ft. is required. The dual drop legs should be dropped the 6 ft. before being joined together. This is to prevent the possibility of some of the condenser tubes being logged with liquid.

The remote air-cooled condensers must be located so as to receive free air flow through the coil. Exhaust heat from any source must not be allowed to interfere with condenser operations. Vertical air flow condensers must be cross-leveled.

OIL SYSTEMS

The Warren/Sherer oil systsem is comprised of vent line from the suction header and an oil supply line from the oil separator to the common suction and an equalizing line. The AC & R oil system is comprised of an oil float on each crankcase, a common reservoir with high and low indicators, and the vent lines. The oil from the separator is stored in the reservoir under pressure, and is fed into the individual compressor by the float when needed. This is an option.

THE WARREN/SHERER OIL SYSTEM

A. Standard - Balance Line Between Compressors.

The Warren/Sherer oil system consists of an oil separator, a vent line between compressors, an oil supply line from the oil separator to the common suction, and an oil equalizing line between compressors. This system is used only with like compressors. Care must be taken to keep the oil level in the bottom half of the compressor sight glass. To check the oil level it is necessary to shut down both compressors and allow the oil level to stabilize. If this is not done an erroneous determination of oil supply may be made and unneeded oil added to the system. A new system should require approximately 3 to 4 gallons of oil on start up.

B. AC & R Oil Control System.

The AC & R oil control system provides a method of regulating the oil level in each individual crankcase. It does not require that the compressors be the same make or model. The AC & R oil control system uses three basic components:

1. Oil Level Regulators 2. Oil Reservoir 3. Oil Separator

Each compressor has an oil level regulator attached to control the oil level in each individual compressor. The regulators are supplied oil by the common oil reservoir, which in turn is supplied by the oil separator.

The oil level regulator controls the oil level in each indi idual crankcase with a float operated valve. It holds back excess oil until the oil level in the compressor crankcase drops, lowering the float and opening the valve. Oil from the oil reservoir will then be admitted into the crankcase, raising the float. When the correct level is reached the valve will close, stopping the flow of oil to that particular crankcase.

The oil level observed in the sight glass should be within 1/8" of the center of the sight glass on S-9110 series regulators and within the lower quarter of the sight glass on S-9120 series regulators. Maximum differential working pressure is 50 PSIG on the float mechanism. The regulator is U.L. approved at 450 PSIG working pressure design with 2250 PSIG burst strength.

A reserve of oil is necessary for the operation of the AC & R oil control system. The oil reservoir is the holding vessel for this stand by oil. It has two sight glass ports on the shell to observe the oil level inside the vessel. Oil is fed into the oil reservoir by the oil separator.

The valve on the top of the oil reservoir automatically receives oil from the oil separator (open positon). To add oil to the oil reservoir manually, close the valve and fill the oil reservoir throught he 1/4" flare connection on the side of the valve. Open valve after filling.

The valve on the bottom of the oil reservoir is the distribution valve to the oil level regulators (open position). To remove oil from the oil reservoir, close the valve and use the 1/4" flare connection on the side of the valve to drain the oil out. Open valve after draining.

AC & R Oil Control System (continued)

On system start-up of a new parallel system, oil should be added to the oil reservoir to the upper sight glass port, NOT ABOVE IT. It is commonly accepted that in a new refrigeration system, some oil will be absorbed by the refrigerant as the system becomes balanced out. After two hours of operation, the oil reservoir, if necessary should again be filled to the upper sight glass and also after two days, by which time the entire refrigeration system should be balanced out. Then the oil reservoir must be observed on each service call. No oil should be added again until the oil level falls below the lower sight glass port.

Recommended Control Settings

A. Set (A7) Discharge Pressure Regulator at 180 PSIG with R-502: 110 PSIG with R-12 and gauge on compressor discharge service valve.

B. Set (A9) Receiver Pressure Regulator at 160 PSIG with R-502; 90 PSIG with R-12 and gauge on receiver outlet valve.

C. High Low Pressure Controls:

DUAL METIC
PRESSURE SETTING CHART

Low Pressure

System	Compressor	Cut-Out	Cut-In
R-502	Comp 1	1	9
LT	Comp 2	9	15
	Satelite (Ice Cream)	1	6
R-~~502~~ 12	Comp 1	20	30
MT (+~~2~~0°F)	Comp 2	29	38
R-~~12~~ 502	Comp 1	30	41
MT (~~+20~~ ~~10~~°F) +2	Comp 2	41	48
R-502	Comp 1	30	41
MT (+20°F)	Comp 2	41	48
R-12	Comp 1	8	15
MT (+~~2~~0°F)	Comp 2	15	19

High Pressure

R-502	Both Comp	350
R-12	Both Comp	275

D. Adjustable Time Delay Controls

1. First compressor - Approximately 90 sec. (optional)
2. Second compressor - Approximately 180 sec.

E. Defrost and EPR Settings

See Engineering Bulletin #79-130-3

SATELLITE

A compressor may be added to the Dual-Metic unit for ice cream cases. This compressor would maintain lower suction pressure than the main suction header and provide several advantages over a remote unit.

Hot gas defrost would be available to the ice cream circuit if desired, and the suction would be connected to the main header providing assistance on pull down and standby protection should the satellite compressor fail.

LOCATION OF EQUIPMENT

The dual metic must be located so they are level and easily serviced. A minimum of 30" service clearance between units and any other walls or stationary equipment is recommended. For dual metic units placed end to end 18 inches between units is adequate. The dual metic is designed so that all pressure regulating valves can be adjusted from the front of the unit should installation in an outdoor machine house be desired or if machine room size necessitates sacrificing service. The machine room ventilation system should provide for approximately 100CFM of air flow for each compressor horsepower. The air intake should be positioned for the air flow to pass over the units.

LIFTING INSTRUCTIONS

The dual metic unit is a heavy piece of machinery and careful considerations of lifting procedures should be made before the unit is lifted by any means. The only part of the unit designed to carry any of the lifting load is the base. The unit may be lifted at the base with a forklift or by means of cables at the four corners of the base. If cables are used the lifting cables should be prevented from contacting any of the unit piping or electrical components.

TROUBLE-SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
A. COMPRESSOR DOES NOT RUN.	1. MOTOR LINE OPEN	1. CLOSE START OR DISCONNECT SWITCH
	2. FUSE BLOWN	2. REPLACE FUSE
	3. TRIPPED CIRCUIT BREAKER	3. RE-SET / CHECK OPERATION
	4. CONTROL CONTACTS DIRTY OR JAMMED IN OPEN POSITION.	4. REPAIR OR REPLACE
	5. PISTON SEIZED	5. REMOVE MOTOR - COMPRESSOR HEAD. LOOK FOR BROKEN VALVE AND JAMMED PARTS.
	6. FROZEN COMPRESSOR OR MOTOR BEARINGS.	6. REPAIR OR REPLACE
	7. TIME DELAY DEFECTIVE	7. REPLACE TIME DELAY ON COMP #2
B. UNIT SHORT CYCLES	1. CONTROL DIFFERENTIAL SET TOO CLOSE.	1. WIDEN DIFFERENTIAL
	2. DISCHARGE VALVE LEAKING	2. REPLACE VALVE PLAT
	3. MOTOR-COMPRESSOR OVER-LOAD	3. CHECK FOR HIGH HEA PRESSURE, TIGHT BEARINGS, SEIZED PISTONS, FOULED WATER - COOLED CON DENSER.
	4. REFRIGERANT SHORTAGE	4. REPAIR LEAK AND RECHARGE.
	5. REFRIGERANT OVERCHARGE	5. PURGE.
	6. CYCLING ON HIGH PRESSURE CUT-OUT.	6. CHECK CONDENSER AN TOWER PUMPS
C. COMPRESSOR WILL NOT START - HUMS INTER-MITTENTLY (CYCLING ON OVERLOAD).	1. IMPROPERLY WIRED	1. CHECK WIRING AGAIN DIAGRAM.
	2. LOW LINE VOLTAGE	2. CHECK MAIN LINE VOLTAGE - DETERMIN LOCATION OF VOLTAG DROP.
	3. RELAY CONTACTS NOT CLOSING.	3. CHECK BY OPERATING MANUALLY. REPLACE RELAY IF DEFECTIVE

	4.	OPEN CIRCUIT IN STARTING WINDING	4. CHECK STATOR LEADS IF LEADS ARE ALL RIGHT, REPLACE COMPRESSOR.
	5.	STATOR WINDING GROUNDED	5. CHECK ALL STATOR LEADS. IF LEADS ARE ALL RIGHT REPLA COMPRESSOR.
	6.	HIGH DISCHARGE PRESSURE	6. ELIMINATE CAUSE OF EXCESSIVE PRESSURE. MAKE SURE DISCHARGE SHUT-OFF VALVE IS OPEN.
	7.	TIGHT COMPRESSOR	7. CHECK OIL LEVEL - CORRECT BINDING.
D. UNIT OPERATES LONG OR CONTINUOUSLY	1.	REFRIGERANT SHORTAGE	1. REPAIR LEAK AND RECHARGE
	2.	CONTROL CONTACTS STICKING IN CLOSED POSITION	2. CLEAN POINTS OR REPLACE CONTROL.
	3.	DIRTY CONDENSER	3. CLEAN CONDENSER
	4.	AIR IN SYSTEM	4. PURGE
	5.	COMPRESSOR INEFFICIENT	5. CHECK VALVES AND PISTONS
	6.	IMPROPER WIRING	6. CHECK WIRING AND CORRECT IF NECESSAR
E. FIXTURE TEMPERATURE TOO HIGH	1.	REFRIGERANT SHORTAGE	1. REPAIR LEAK AND RECHARGE
	2.	CONTROL SET TOO HIGH	2. RESET CONTROL
	3.	CONTROL WIRING LOOSE	3. CHECK WIRING TO CONTROL
	4.	EXPANSION VALVE OR STRAINER PLUGGED	4. CLEAN AND REPLACE
	5.	COMPRESSOR INEFFICIENT	5. CHECK VALVES AND PISTONS
	6.	EXPANSION VALVE SET TOO HIGH	6. LOWER SETTING
	7.	ICED OR DIRTY COIL	7. DEFROST OR CLEAN
	8.	CLOGGED OR SMALL GAS LINES.	8. CLEAR CLOGGING OR INCREASE LINE SIZE
	9.	OIL LOGGED SYSTEM	9. REMOVE EXCESS OIL, CHECK REFRIGERANT CHARGE

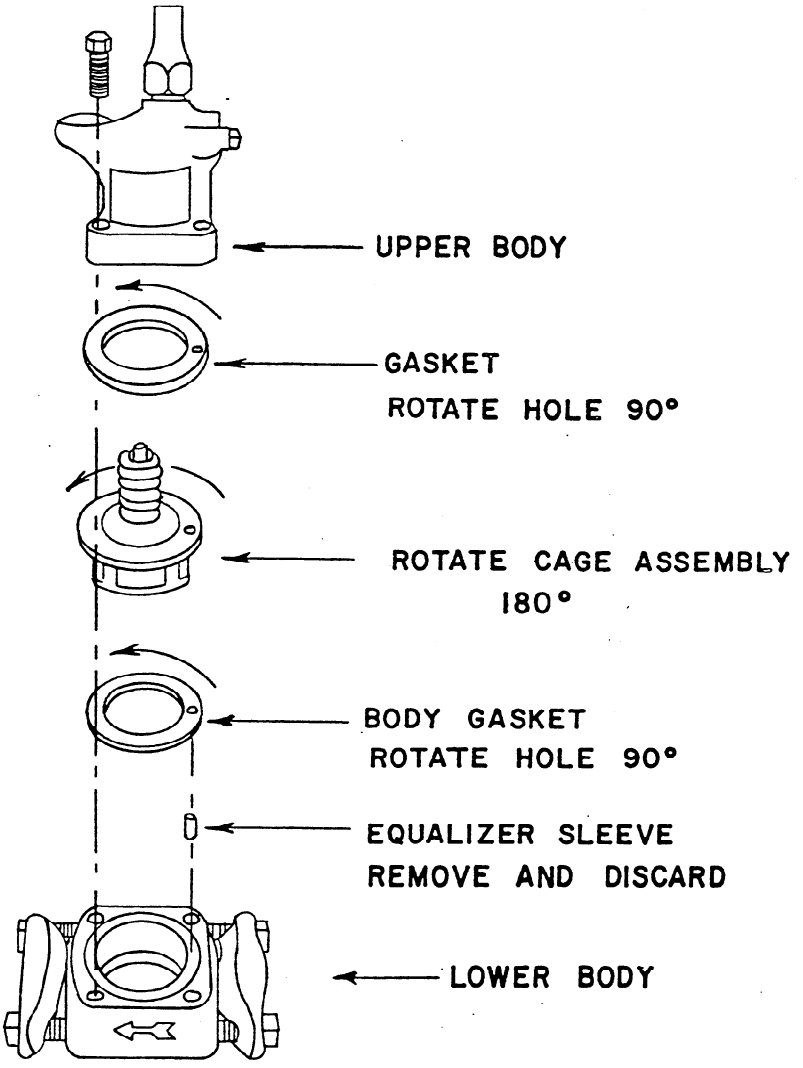
F.	HEAD PRESSURE TOO HIGH	1. REFRIGERANT OVERCHARGE	1. PURGE
		2. AIR IN SYSTEM	2. PURGE
		3. FOULED WATER COOLED CONDENSER	3. CLEAN CONDENSE: CHECK WATER TREATMENT METH(
		4. HIGH SIDE RESTRICTION	4. REMOVE BLOCKAG:
		5. WATER REGULATING VALVE SET INCORRECTLY	5. READJUST
G.	HEAD PRESSURE TOO LOW	1. REFRIGERANT SHORTAGE	1. REPAIR LEAK ANI RECHARGE
		2. COMPRESSOR SUCTION OR DISCHARGE VALVES INEFFICIENT	2. CLEAN OR REPLAC LEAKY VALVE PLATES
		3. COLD AMBIENT	3. NO REMEDY AS EF ICIENCY IS GEN- ERALLY INCREASE HOWEVER, IF CON DENSING TEMP. I BELOW 85°F EXP/ VALVES WILL NOT BE ABLE TO FEEI PROPERLY AND SC FORM OF HEAD PRESSURE CONTRC MUST BE PROVIDE
		4. WATER REGULATING VALVE SET INCORRECTLY	4. READJUST
H.	NOISY UNIT	1. INSUFFICIENT COMPRESSOR OIL	1. ADD OIL TO PRO- PER LEVEL
		2. TUBING RATTLE	2. BEND TUBES AWAY FROM CONTACT
		3. MOUNTINGS LOOSE	3. TIGHTEN
		4. OIL SLUGGING OR REFRIGERANT FLOODING BACK.	4. ADJUST OIL LEVE OR REFRIGERANT CHARGE. CHECK EXPANSION VALVE FOR LEAK OR OVERSIZE ORIFIC
		5. UNBALANCED FAN OR DEFECTIVE FAN MOTOR	5. REPLACE BENT OR BROKEN FAN BLAD CHECK MOTOR BEA INGS

I. COMPRESSOR LOSES OIL	1.	SHORTAGE OF REFRIGERANT	1. REPAIR LEAK AND RECHARGE
	2.	GAS-OIL RATIO LOW	2. ADD 1 PT. OIL FOR EACH 10 LBS. OF REFRIGERANT ADDED TO FACTORY CHARGE.
	3.	PLUGGED EXPANSION VALVE OR STRAINER.	3. CLEAN OR REPLACE
	4.	OIL TRAPPING IN LINES	4. DRAIN TUBING TOWARD COMPRESSOR
	5.	SHORT CYCLING	5. REFER TO PART B.
	6.	SUPERHEAT TOO HIGH AT COMPRESSOR SUCTION.	6. CHANGE LOCATION OF EXPANSION VALVE BUL OR ADJUST VALVE TO RETURN WET GAS TO COMPRESSOR.
J. FROSTED OR SWEATING SUCTION LINE	1.	EXPANSION VALVE ADMITTING EXCESS REFRIGERANT	1. ADJUST EXPANSION VALVE.
K. HOT LIQUID LINE.	1.	SHORTAGE OF REFRIGERANT	1. REPAIR LEAK AND RECHARGE
	2.	EXPANSION VALVE OPEN TOO WIDE	2. ADJUST EXPANSION VALVE
	3.	IMPROPER WATER FLOW	3. CHECK WATER PUMPS TOWER FANS AND SYSTEM CLEANLINESS
L. FROSTED LIQUID LINE	1.	RECEIVER SHUT-OFF VALVE PARTIALLY CLOSED OR RESTRICTED.	1. OPEN VALVE OR REMOVE OBSTRUCTION
	2.	CLOGGED DEHYDRATOR OR STRAINER	2. REPLACE CLOGGED PAR
M. UNIT IN VACUUM FROST ON EXPANSION VALVE ONLY	1.	ICE PLUGGINGS EXPANSION VALVE ORIFICE.	1. APPLY HOT WET CLOTH TO EXPANSION VALVE. IF SUCTION PRESSURE NOW INCREASES, THERE IS MOISTURE IN THE SYSTEM AND A DRIER SHOULD BE INSTALLED IN THE LINE.
	2.	PLUGGED EXPANSION VALVE	2. CLEAN STRAINER OR REPLACE EXPANSION VALVE.

N.	COMPRESSOR FAILURE	TO MAINTAIN PARTIAL REFRIGERATION, CLOSE LIQUID HAND VALVES UNTIL AMP DRAW ON RUNNING COMPRESSOR IS WITH IN NAME PLATE LIMITS. REPLACE DEFECTIVE COMPRESSOR.

NOTE: FOR START UP AND OPERATIONAL INFORMATION, REFER TO THE INSTALLATION/OPERATION MANUAL.

IF AN EPR VALVE IS PURCHASED FROM A REFRIGERATION WHOLESALER THE ILLUSTRATED MODIFICATION MUST BE MADE FOR PROPER VALVE OPERATION.



TYPE UP

W A R R E N / S H E R E R

Dual Metic System

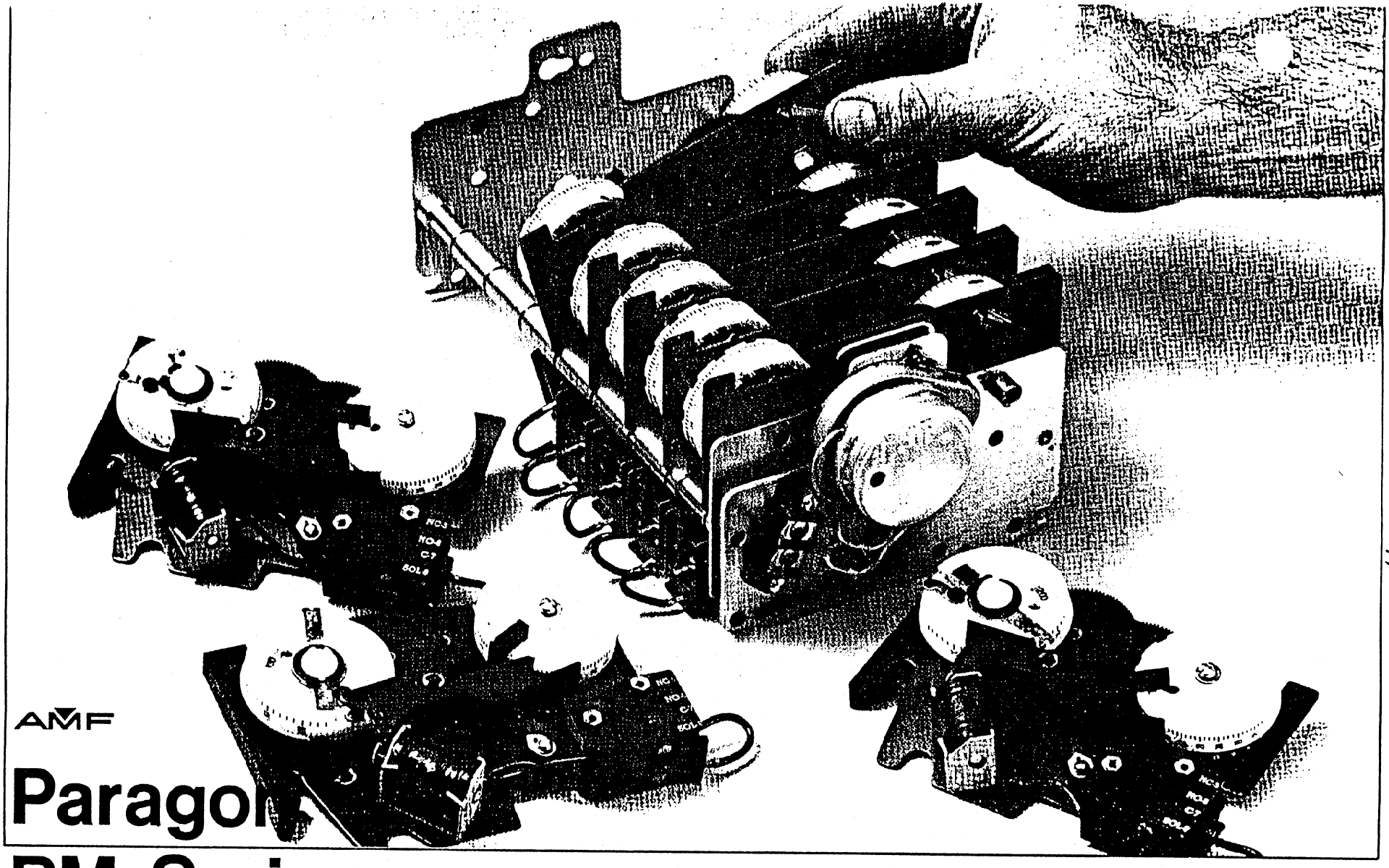
TYPICAL DEFROST SCHEDULE

TIME OF DEFROST — A.M.

UNIT NO.	CIRCUIT NO.	FIXTURE	FAILSAFE SETTING	0:30	1:00	1:30	2:00	2:30	3:00	3:30	4:00	4:30	5:00	5:30	6:00	6:30	7:00	7:30	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00
A	1	24'-MAA	49												X												X
	2	47'-MIA	49	X																X							
	3	24'-DG (DELI)	40		X												X										
	4	32'-DG (DELI)	40			X												X									
	5	24'-DGR	40				X												X								
	6	24'-DGR	40					X												X							

TIME OF DEFROST — P.M.

UNIT NO.	CIRCUIT NO.	FIXTURE	FAILSAFE SETTING	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30	17:00	17:30	18:00	18:30	19:00	19:30	20:00	20:30	21:00	21:30	22:00	22:30	23:00	23:30	24:00
A	1	24'-MAA	49												X												X
	2	47'-MIA	49									X															
	3	24'-DG (DELI)	40		X												X										
	4	32'-DG (DELI)	40			X												X									
	5	24'-DGR	40				X												X								
	6	24'-DGR	40					X												X							



AMF

Paragon

RM Series

Installation Instructions

I. Installing to Panel

1. Drill holes in panel to accept #12 screws. Follow the dimensional diagram enclosed. (See back page.)

2. Install all brackets to panel with #12 screws. Arrow on side of bracket must point upward on a vertical panel surface.

3. Hang non-slotted frame rod of Master Unit (unit with motor module) on upper hooks of first two brackets.

4. If Slave Units are to be used, install coupling on circuit #8 of Master Unit.

5. Position non-slotted frame rod of Slave Unit on upper hooks of brackets. Be certain that the Frame Locking Tab is in the up position and does not interfere with the mounting feet. Be sure Slave Unit guide pins engage on the Master Unit. Be sure the tongue on Slave Circuit #1 engages the groove on the coupling. Be sure the black numbers on the 24-hour dials line up on both units. (See Instructions on Alignment of Program Modules, page 6.)

6. Push down evenly on all frames and snap the slotted frame rods over the lower bracket hooks.

7. Rotate the Frame Locking Tab so that it's lower edge enters the slot in the side of the mounting bracket and the top edge has snapped in place below the lower guide pin.

8. Check entire unit for operation by rotating the black reduction gear on the Motor Module. (See page 7.) Be sure all Module dials turn together when this gear is turned by hand.

II. Wiring

1. Each Program Module is equipped with two SPDT snap switches. Units equipped with integral solenoids have two additional terminals for the solenoid, one of which is factory-bridged to the Normally Open contact on one of the switches.

2. Wire line voltage to the Motor Module terminal block. (See page 6.)

3. Wire line to Common terminals of all switches.

4. Wire loads to N.O. or N.C. switch contacts in accordance with the Cabinet Manufacturer's wiring diagrams.

5. On solenoid-terminated units, wire the cycle limit switch for each Program Module in accordance with the Cabinet Manufacturer's wiring diagrams.

III. Programming

1. For each circuit (Program Module) insert black trippers into the slots in the 24-hour dial at the times of day (indicated by the black numbers) when a defrost cycle is to occur.

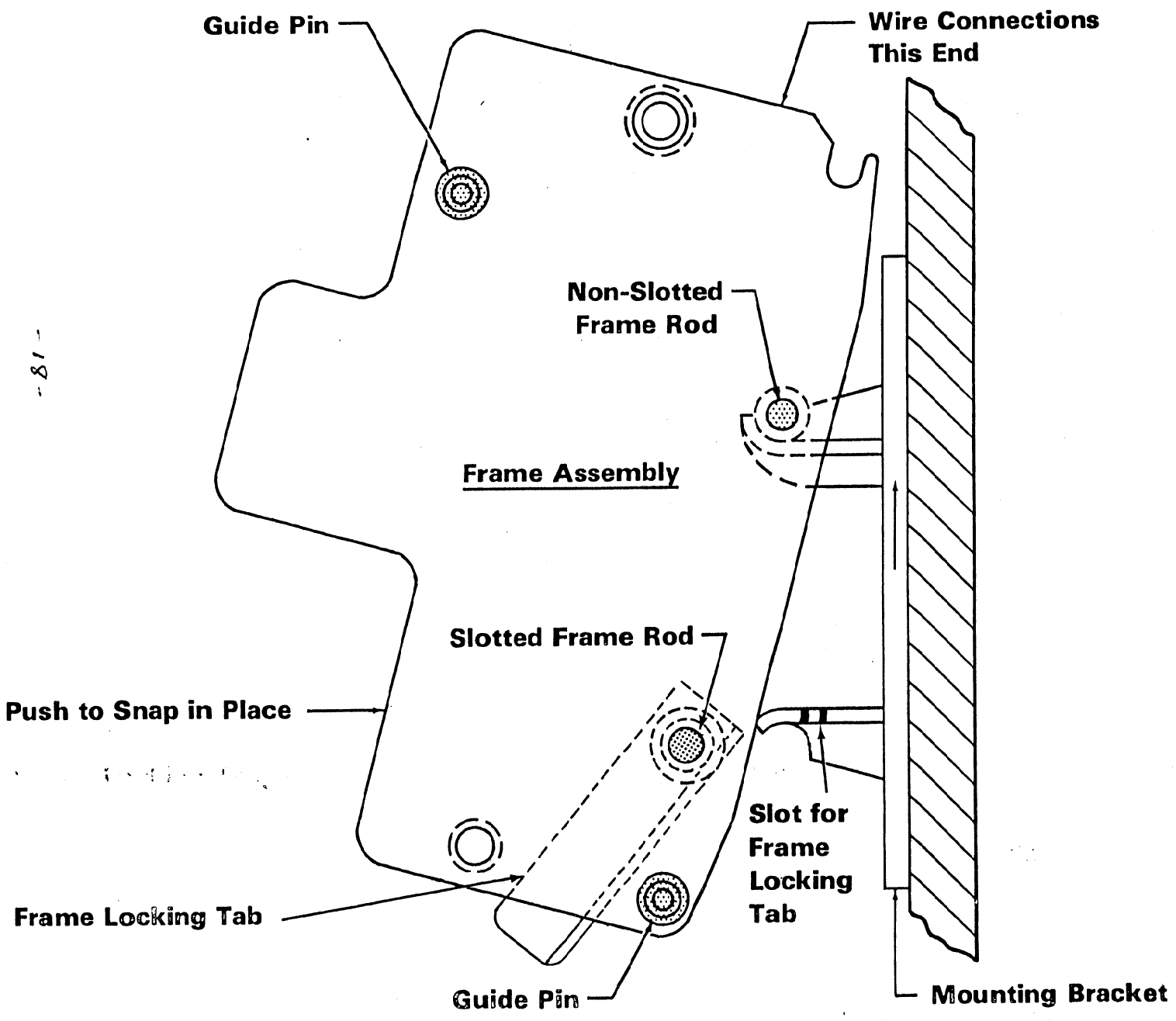
2. For each circuit, rotate the copper termination lever around the 2-hour dial to set the duration of each defrost cycle. NOTE: To rotate the terminating lever counter-clockwise, it must be pulled slightly away from the dial teeth with finger pressure. Do not bend the lever away from the teeth any farther than is necessary to disengage it from the dial teeth.

3. Set each Program Module per #1 and #2 above.

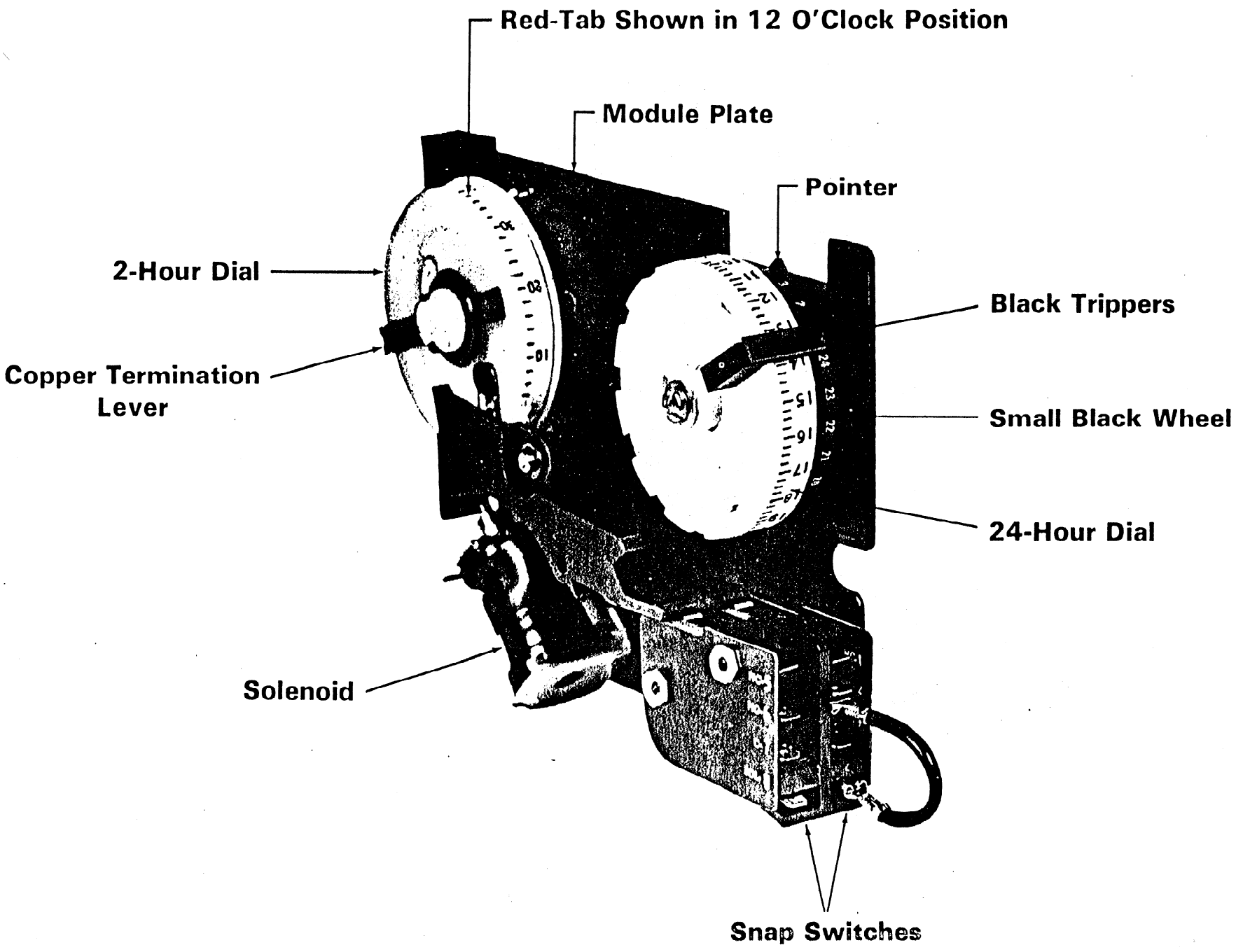
4. Use the black reduction gear on the Motor Module, see page 6, to rotate the entire assembly until the current time of day (indicated on the smaller black wheel behind each 24-hour dial) lines up with the pointer stamped behind it as part of the Module Plate.

5. The unit is now ready for application of line voltage to the Motor terminal block.

FRAME AND BRACKET



RM MODULE


Red-Tab Shown in 12 O'Clock Position
Module Plate
Pointer
2-Hour Dial
Black Trippers
Copper Termination Lever
Small Black Wheel
24-Hour Dial
Solenoid
Snap Switches

IV. Removal and/or Installation and Alignment of Individual Program Modules

1. To remove a Program Module, rotate the black reduction gear on the Motor Module until the Red Tabs on all the two hour program dials are in line with the spring mounting hole for the Module latching lever on the Module plate.

2. To re-install a Program Module, follow #1 above and rotate the trailing Modules by hand until all Red Tabs are in line with the spring mounting hole for the Module latching lever on the Module plate. Check to be sure that the black numbers on all the 24 hour dials are lined up. Rotate the 2 hour dial sections until this line up is obtained. Rotate the 2 hour dial of the Module to be installed until the Red Tab is in line with the spring mounting hole for the Module latching lever on the Module plate and the black numbers on the 24 hour dial are in the same position as those on Modules already in the frame. Then fit the Module cutout (located above the switches) into the slotted frame rod, align the tongue/groove on either side of the Module, and snap the Module down over the non-slotted frame rod. Check to be sure all Red Tabs line up and all 24 hour dial numbers line up.

V. Installation/Removal of Drive Module

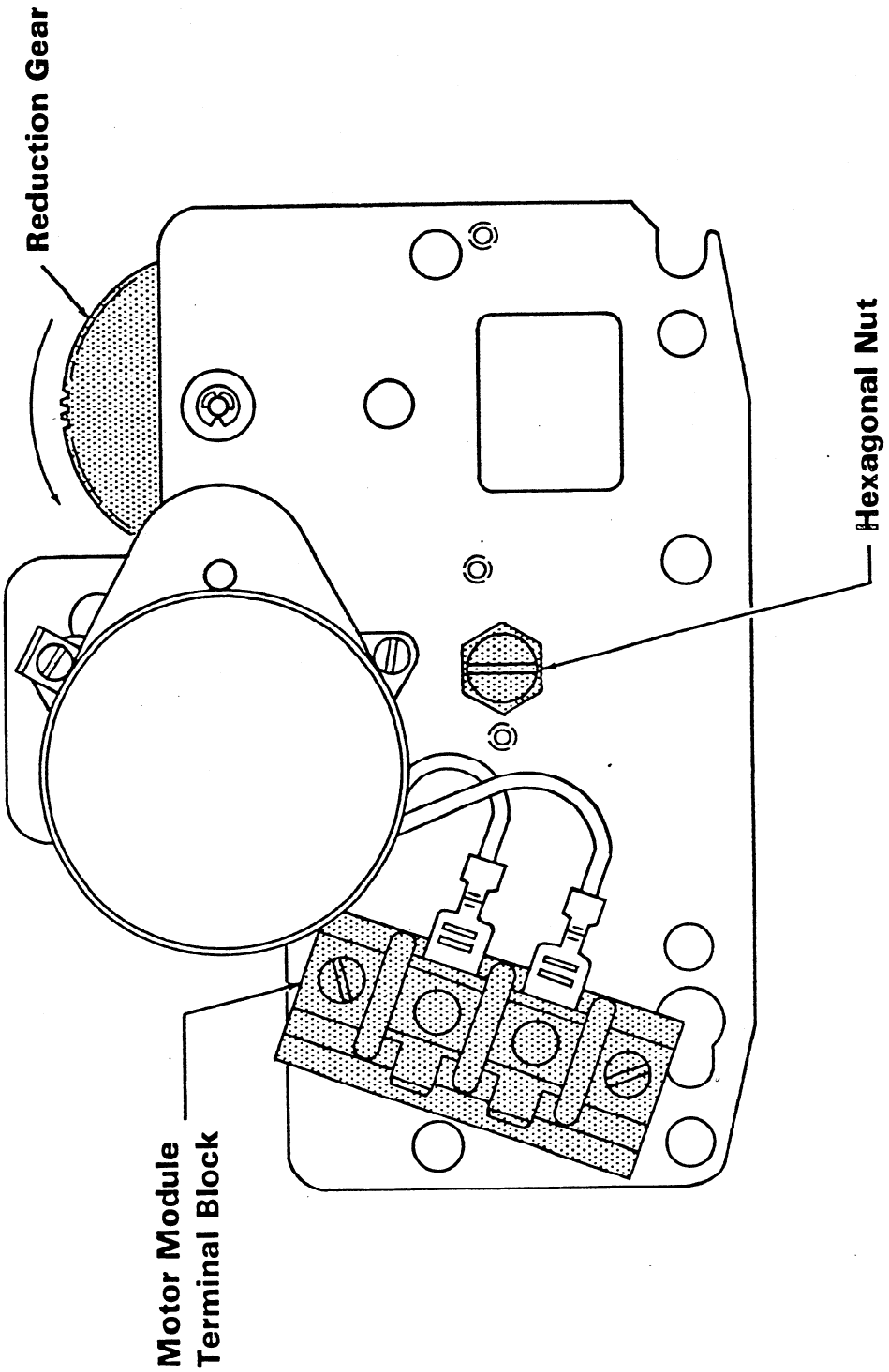
1. To remove Drive Module, rotate black reduction gear until tongue/groove with Program Module #1 is parallel to mounting surface.

2. Loosen hex nut fully.

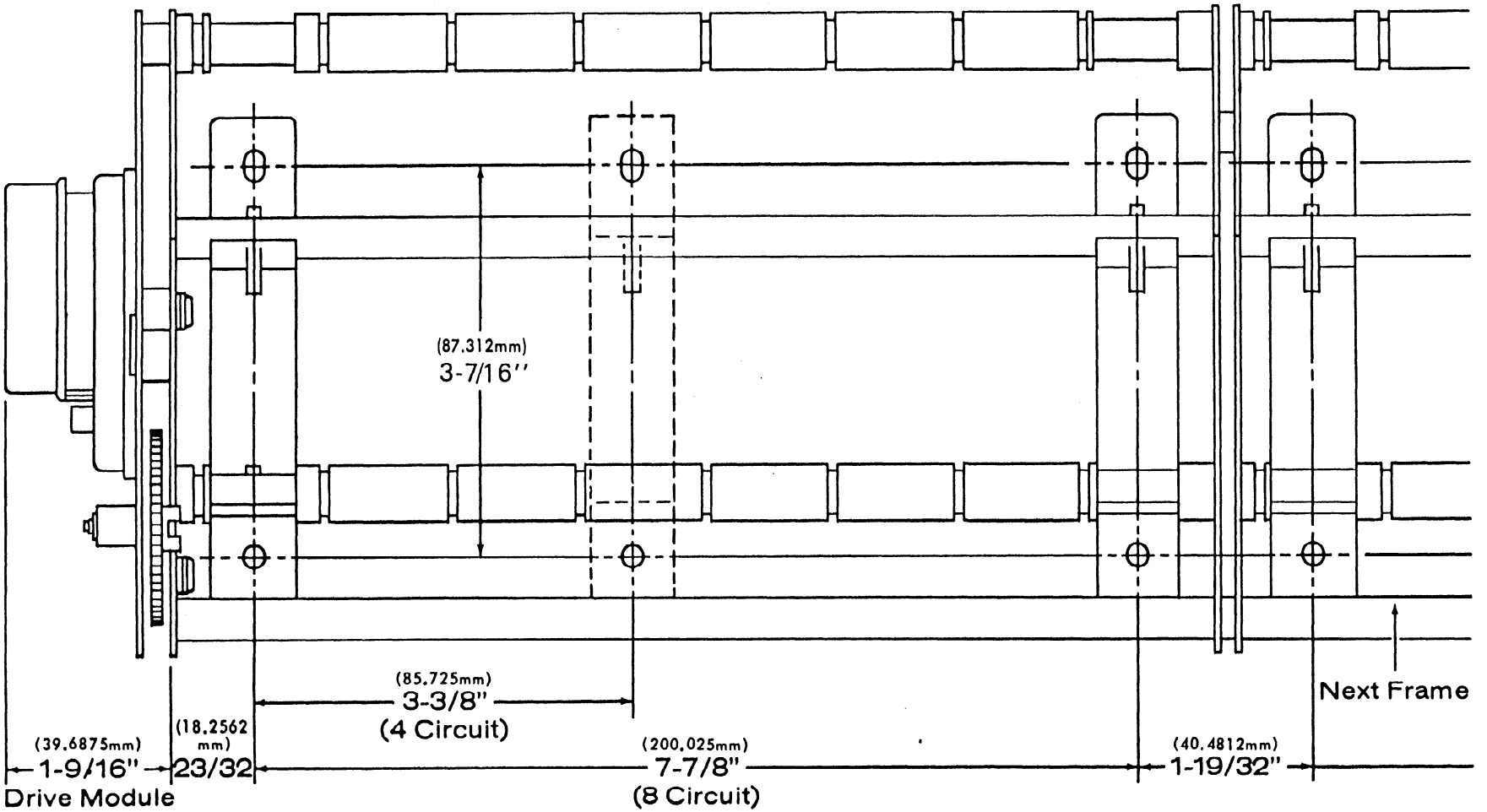
3. Slide complete Motor Module parallel to mounting surface and toward the 24-Hour Dials until the three locator studs clear their keyslots, then remove the Module.

4. To reinstall, reverse steps above.

MOTOR MODULE



DIMENSIONAL DIAGRAM



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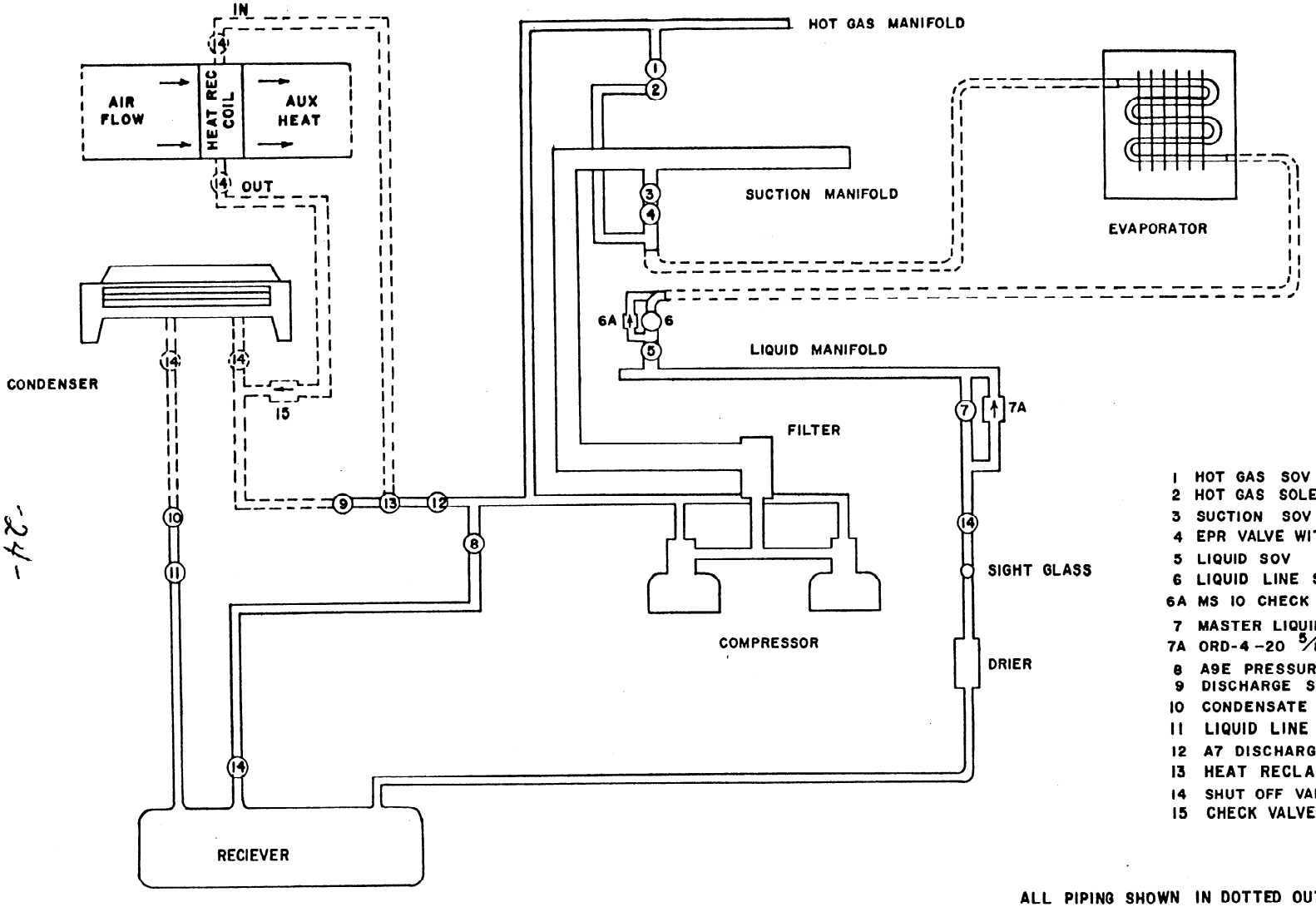
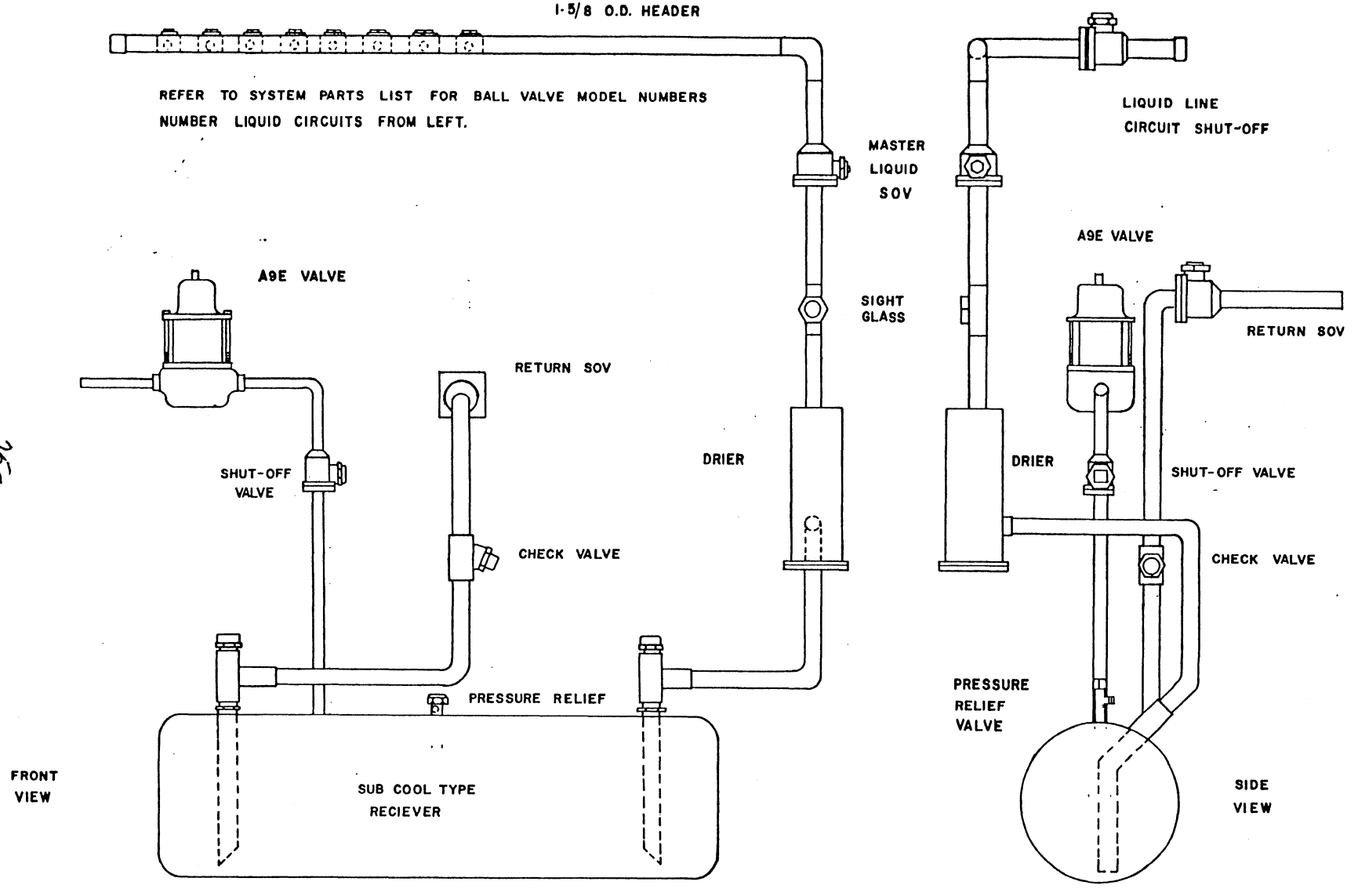


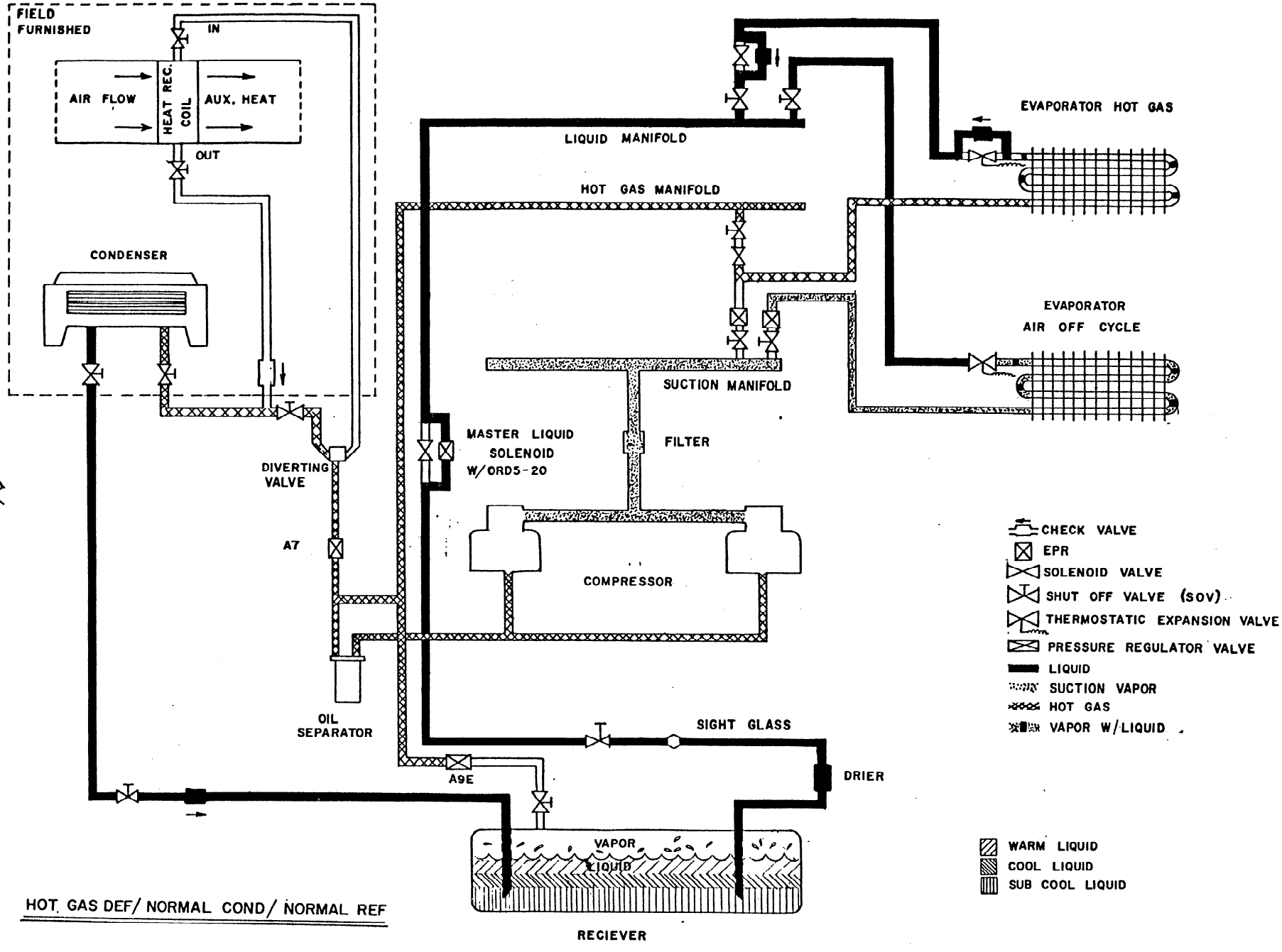
1 HOT GAS SOV
2 HOT GAS SOLENOID VALVE
3 SUCTION SOV
4 EPR VALVE WITH SUCTION STOP
5 LIQUID SOV
6 LIQUID LINE SOLENOID VALVE
6A MS 10 CHECK VALVE
7 MASTER LIQUID LINE SOLENOID VALVE
7A ORD-4-20 5/8 CHECK VALVE
8 A9E PRESSURE REGULATOR
9 DISCHARGE SOV
10 CONDENSATE RETURN SOV
11 LIQUID LINE CHECK VALVE
12 A7 DISCHARGE PRESSURE REGULATOR
13 HEAT RECLAIM DIVERTING VALVE
14 SHUT OFF VALVE
15 CHECK VALVE

ALL PIPING SHOWN IN DOTTED OUTLINE ARE FIELD INSTALLED AS PER CUSTOMER SPECIFICATIONS.

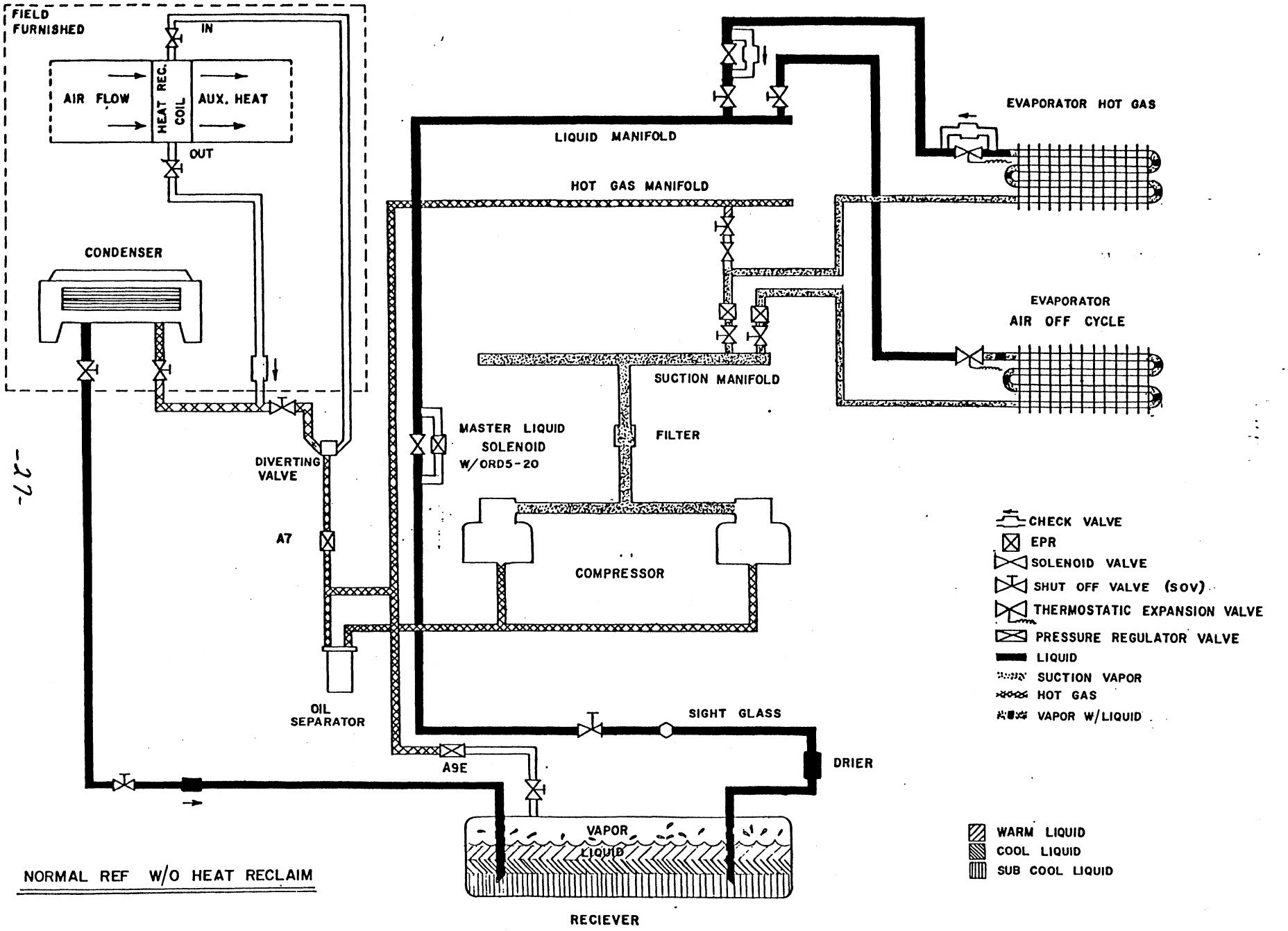
GENERAL PARALLEL SYSTEM LAYOUT OF PIPING



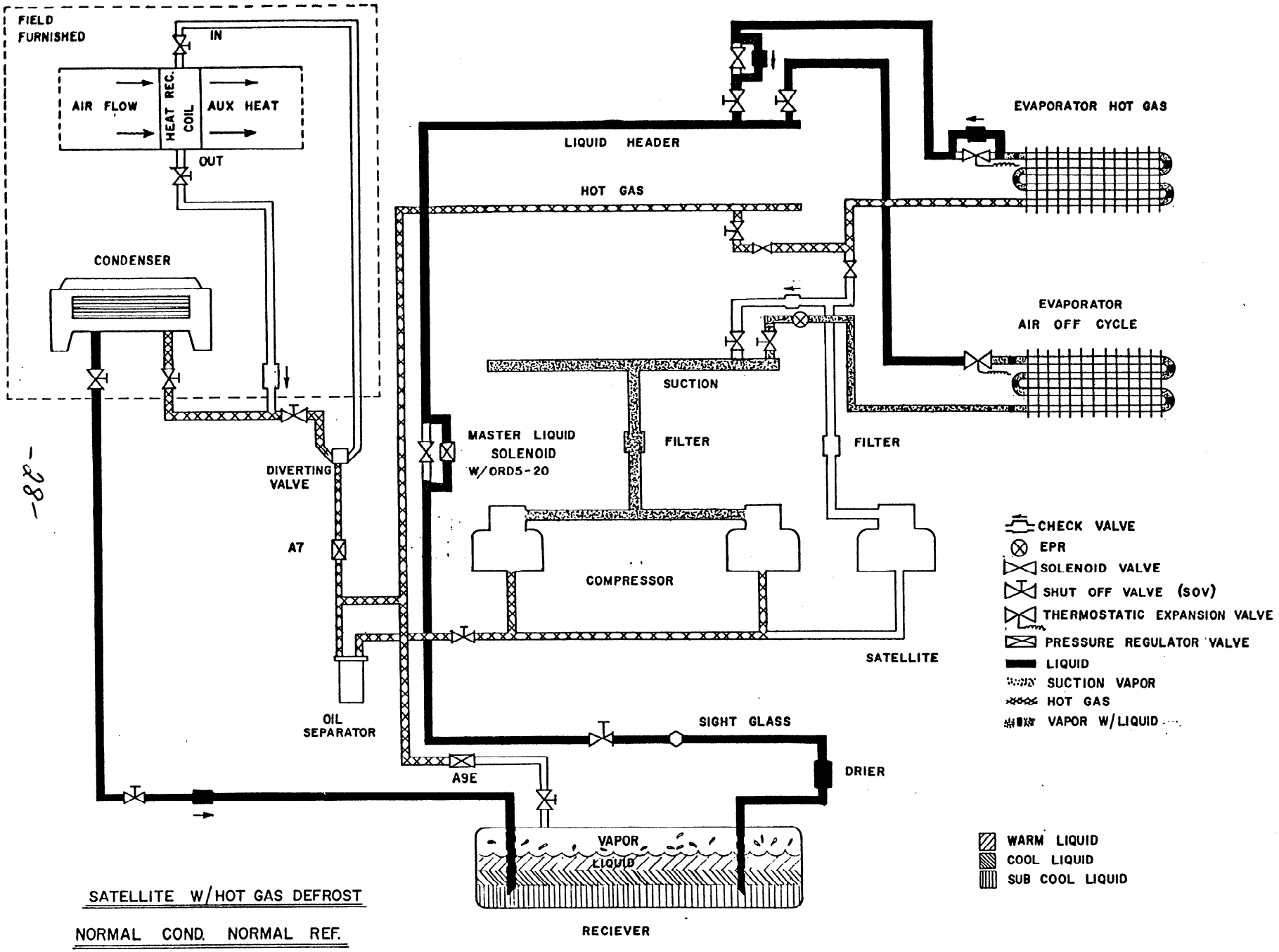
LIQUID MANIFOLD W/STANDARD PRESSURE CONTROL



HOT GAS DEF/ NORMAL COND/ NORMAL REF



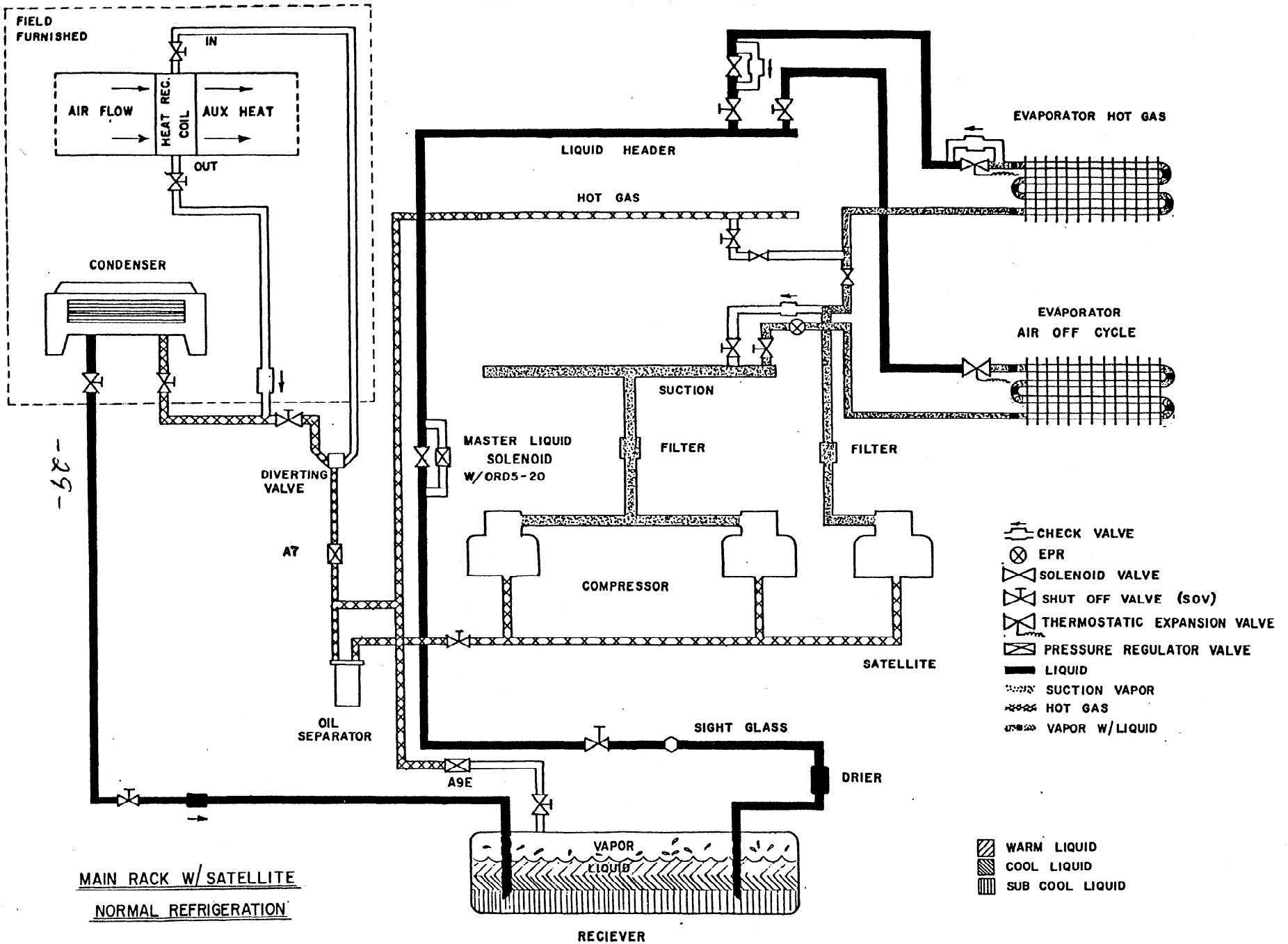
NORMAL REF W/O HEAT RECLAIM



-28-

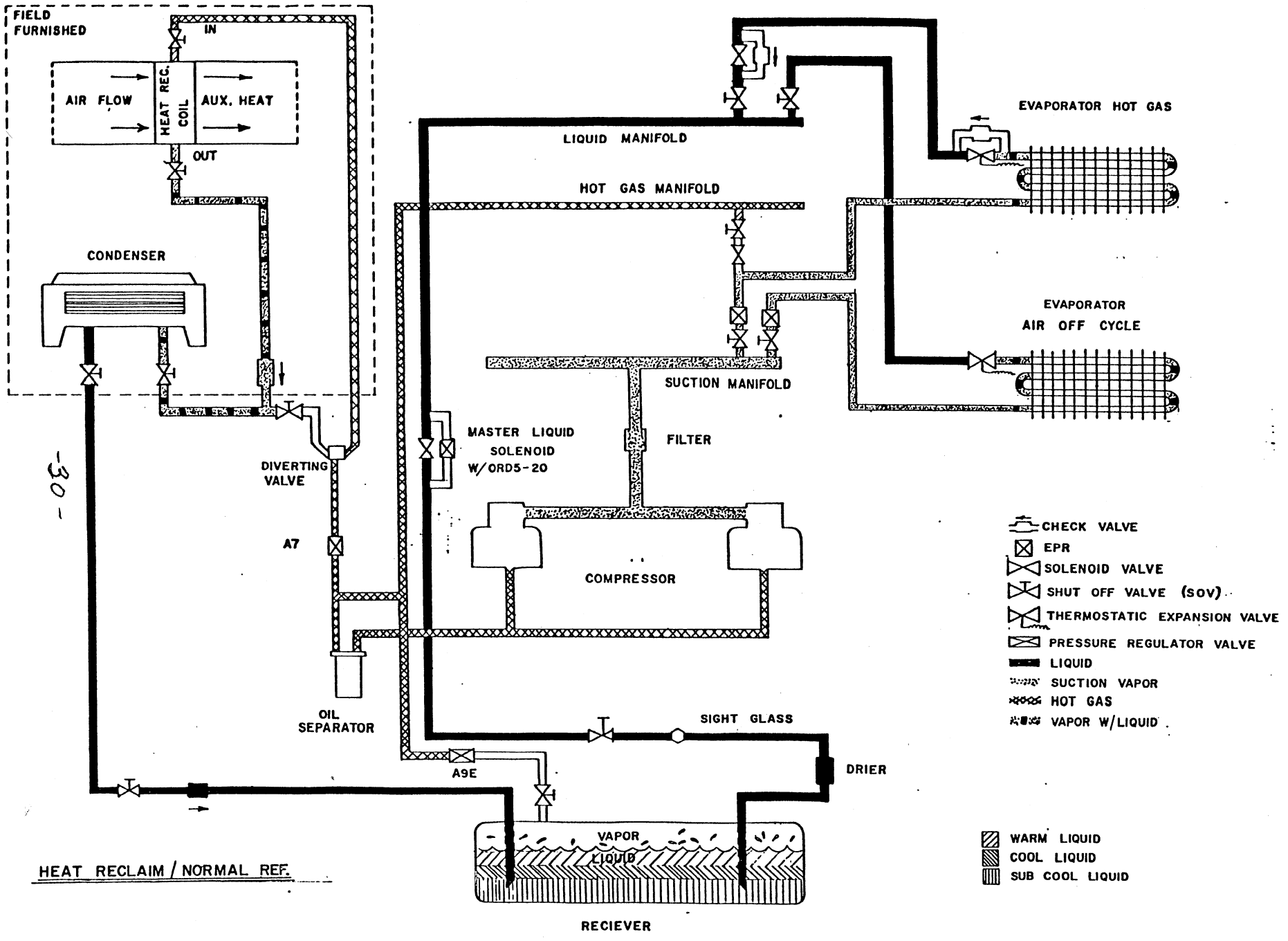
SATELLITE W/HOT GAS DEFROST

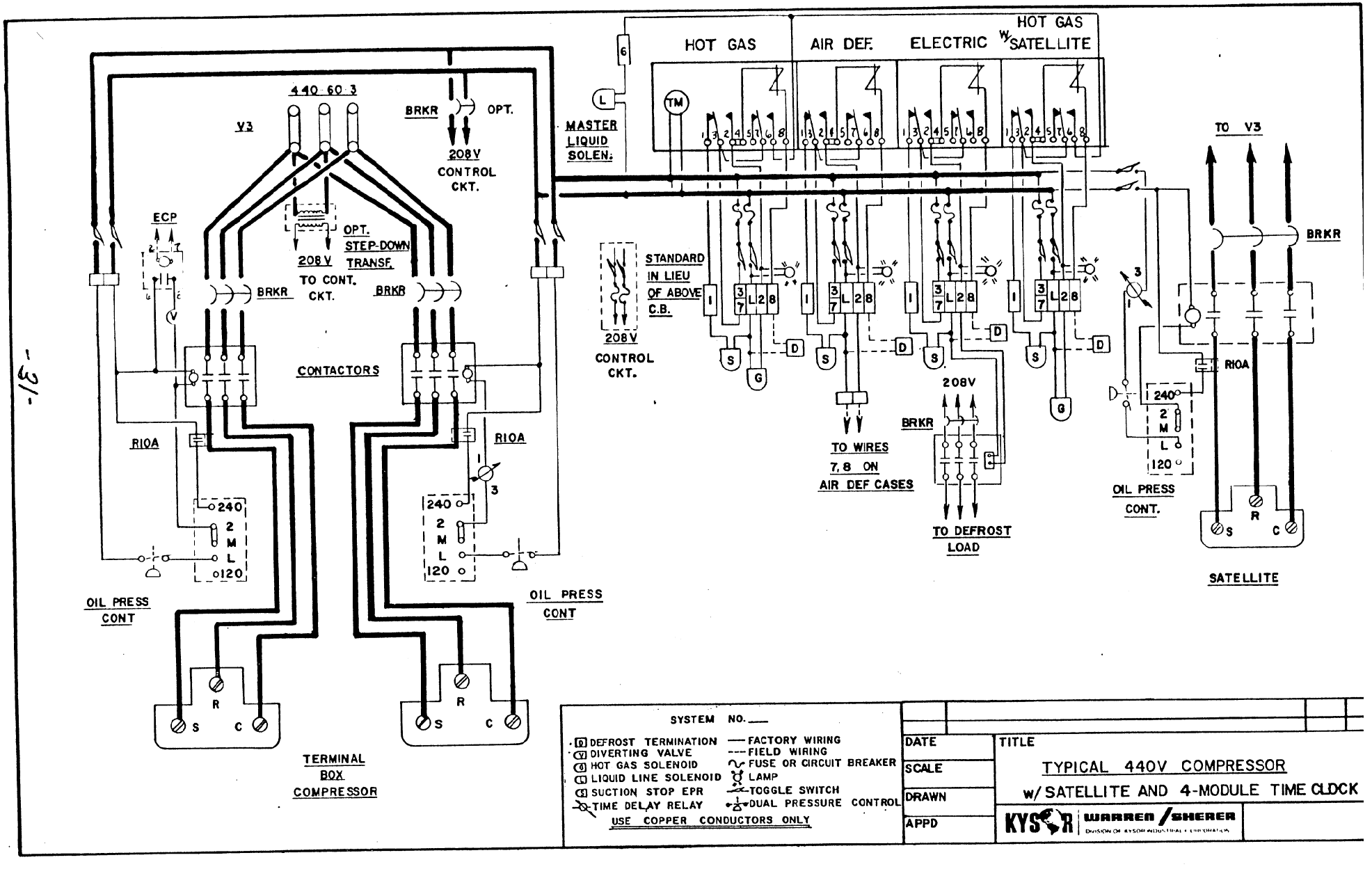
NORMAL COND. NORMAL REF.



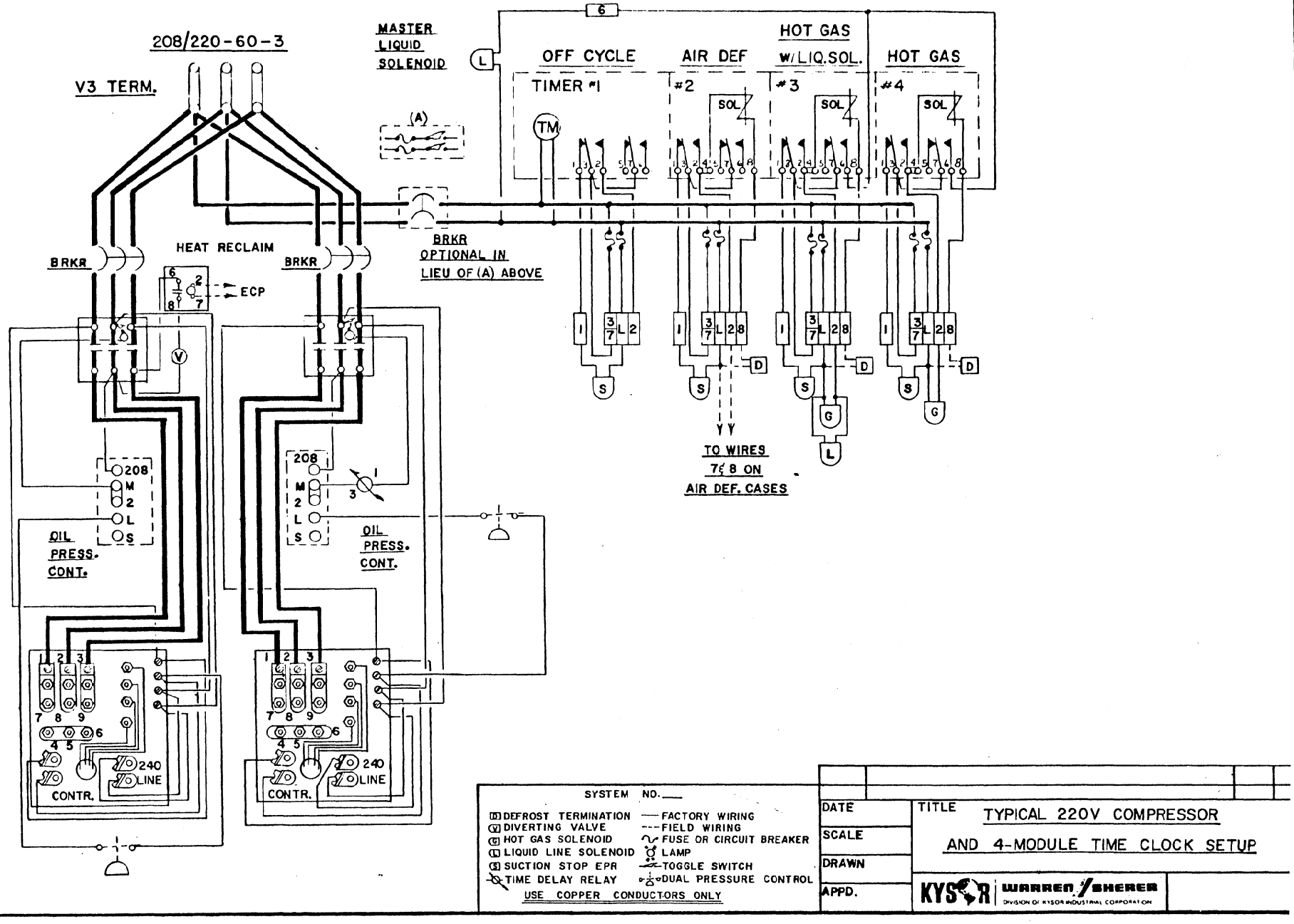
MAIN RACK W/ SATELLITE

NORMAL REFRIGERATION


FIELD FURNISHED
IN
AIR FLOW
HEAT REC. COIL
AUX. HEAT
OUT
CONDENSER
LIQUID MANIFOLD
HOT GAS MANIFOLD
EVAPORATOR HOT GAS
EVAPORATOR AIR OFF CYCLE
SUCTION MANIFOLD
MASTER LIQUID SOLENOID W/ORD5-20
FILTER
DIVERTING VALVE
A7
COMPRESSOR
OIL SEPARATOR
SIGHT GLASS
A9E
DRIER
VAPOR
LIQUID
RECIEVER
-30-
HEAT RECLAIM / NORMAL REF.
CHECK VALVE
EPR
SOLENOID VALVE
SHUT OFF VALVE (SOV)
THERMOSTATIC EXPANSION VALVE
PRESSURE REGULATOR VALVE
LIQUID
SUCTION VAPOR
HOT GAS
VAPOR W/LIQUID
WARM LIQUID
COOL LIQUID
SUB COOL LIQUID


HOT GAS
AIR DEF.
ELECTRIC
HOT GAS W/ SATELLITE
MASTER LIQUID SOLEN.
TM
L
6
440 60 3
V3
BRKR
OPT.
208V CONTROL CKT.
ECP
OPT. STEP-DOWN TRANSF.
208V TO CONT. CKT.
BRKR
BRKR
CONTACTORS
R10A
R10A
240
2
M
L
120
3
OIL PRESS CONT
OIL PRESS CONT
R
S
C
TERMINAL BOX COMPRESSOR
STANDARD IN LIEU OF ABOVE C.B.
208V CONTROL CKT.
TO WIRES 7, 8 ON AIR DEF CASES
208V
BRKR
TO DEFROST LOAD
OIL PRESS CONT.
TO V3
BRKR
R10A
SATELLITE
SYSTEM NO.___
D DEFROST TERMINATION
V DIVERTING VALVE
G HOT GAS SOLENOID
L LIQUID LINE SOLENOID
S SUCTION STOP EPR
TIME DELAY RELAY
FACTORY WIRING
FIELD WIRING
FUSE OR CIRCUIT BREAKER
LAMP
TOGGLE SWITCH
DUAL PRESSURE CONTROL
USE COPPER CONDUCTORS ONLY
DATE
SCALE
DRAWN
APPD
TITLE
TYPICAL 440V COMPRESSOR
W/ SATELLITE AND 4-MODULE TIME CLOCK
KYSOR
WARREN / SHERER
DIVISION OF KYSOR INDUSTRIAL CORPORATION

-13-


208/220-60-3
V3 TERM.
MASTER LIQUID SOLENOID
(A)
6
L
OFF CYCLE
AIR DEF
HOT GAS w/LIQ.SOL.
HOT GAS
TIMER #1
#2
#3
#4
TM
SOL
BRKR
HEAT RECLAIM
BRKR
ECP
BRKR OPTIONAL IN LIEU OF (A) ABOVE
TO WIRES 7 & 8 ON AIR DEF. CASES
208
M
2
L
S
OIL PRESS. CONT.
CONTR.
240
LINE
SYSTEM NO.___
DEFROST TERMINATION
DIVERTING VALVE
HOT GAS SOLENOID
LIQUID LINE SOLENOID
SUCTION STOP EPR
TIME DELAY RELAY
USE COPPER CONDUCTORS ONLY
FACTORY WIRING
FIELD WIRING
FUSE OR CIRCUIT BREAKER
LAMP
TOGGLE SWITCH
DUAL PRESSURE CONTROL
DATE
SCALE
DRAWN
APPD.
TITLE
TYPICAL 220V COMPRESSOR AND 4-MODULE TIME CLOCK SETUP
KYSOR
WARREN / SHERER
DIVISION OF KYSOR INDUSTRIAL CORPORATION