FRIGIDAIRE RAILWAY AIR CONDITIONING SYSTEM

The Frigidaire railway air conditioning system consists of three separate units; namely, the compressor motor unit, the condenser unit and the air conditioning unit. A typical layout is shown in Figure 61. A description of the various parts follows:

COMPRESSOR MOTOR UNIT

The compressor motor unit consists of the standard Frigidaire 4-cylinder compressor driven by a 12 H.P., 2 speed, D.C. motor. The compressor and motor are mounted in a framework, RY 10. Special rubber mounts insulate the unit from the car members. Four safety bolts are used to prevent the unit from dropping, in the event of failure of the rubber mounts. There is no enclosure around the compressor motor unit; however, a belt guard prevents unauthorized persons or workmen from accidentally catching their fingers or clothing in the belts. Care should be exercised to stand free of the unit when operating, and it should never be run without this belt guard in place. The motor is suspended from the frame by a swivel mounting. Belt tension is maintained by means of a belt adjusting rod and bracket fastened to the side of the motor. This arrangement simplifies belt adjustments as it is no longer necessary to loosen the four motor base bolts. The commutator-end head has a heavy aluminum plate that fits tightly against the machined-end head itself, and it can be rotated to expose the four brush access ports. *CAUTION:* This movable plate should be turned so that it covers the brush access ports except during time of maintenance. They are not to be left open for ventilation as the motor is ventilated through a baffle chamber on the bottom. The brush box assembly is similar to Westinghouse type. See Figure 62, Compressor motor shown in Figure 63.

The compressor supports have been arranged so that the compressor will slide out without interfering with the frame work. Shut-off valves are on both the suction and compressor discharge manifold. In this way it will be possible to perform the necessary service operation on the compressor without pumping down the complete system. Flexible couplings in both the suction line and discharge line serve to prevent vibration being transmitted into the lines. The high pressure and low pressure gauges, as well as the high-low pressure safety switch, are located on the condenser unit.

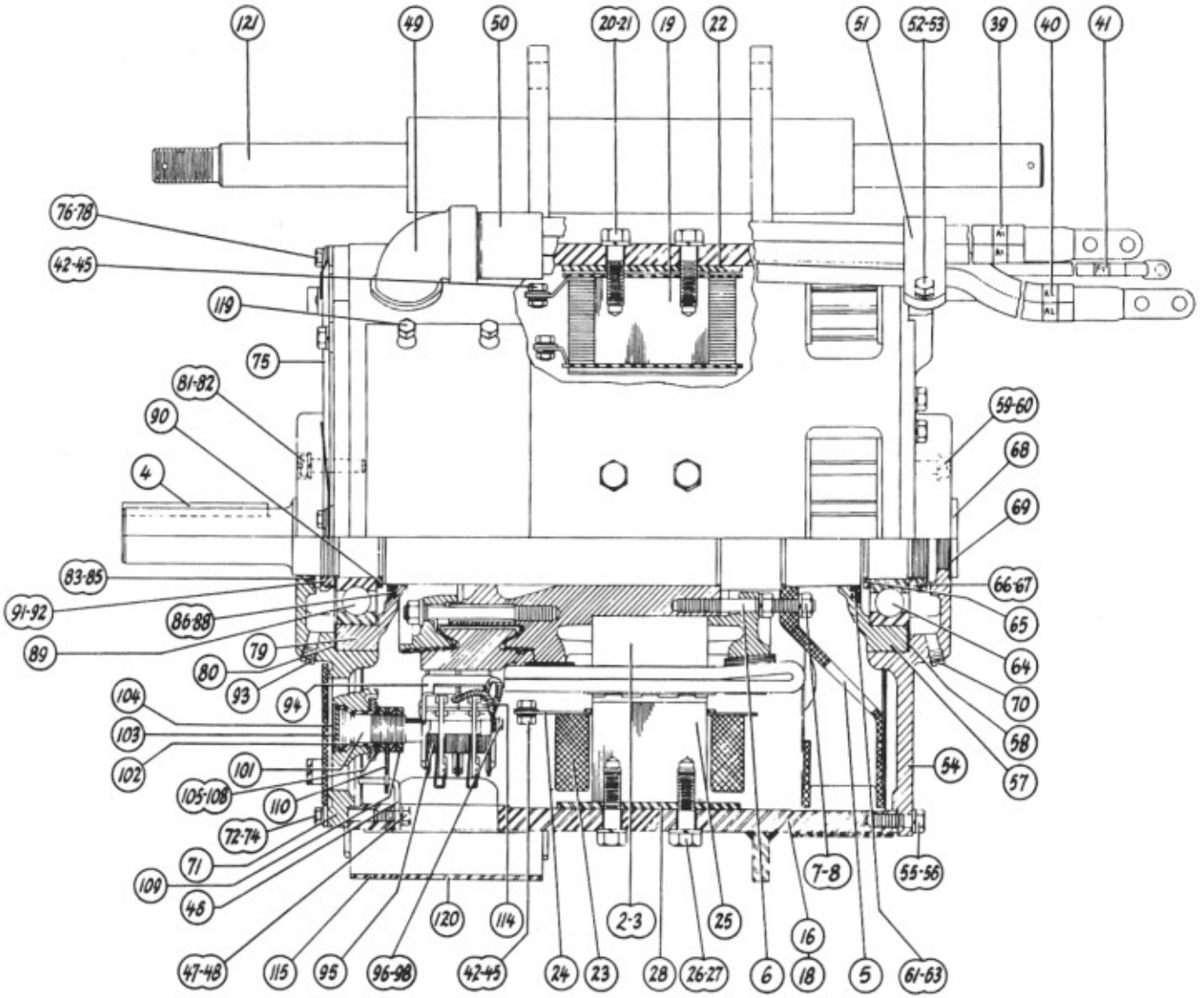
Six B-section Endless Vee Belts 84" long are used. Typical unit is shown on Figure 64.

The compressor is of the reciprocating type Model No. 118060, having four cylinders in line. It is identical to Model No. 1130221 described on Page 163 of A.C. Manual, except for the addition of a sight glass cover. Compressor shut-off valves are bolted to the compressor body and are not provided with handles. A 1/2" square socket wrench must be used to operate valves, and valve caps will be reapplied after work is completed. For details of valve, see Figure 65.

PARTS LIST - RAILWAY COMPRESSOR MOTOR UNIT EM - 15530 - K-15233

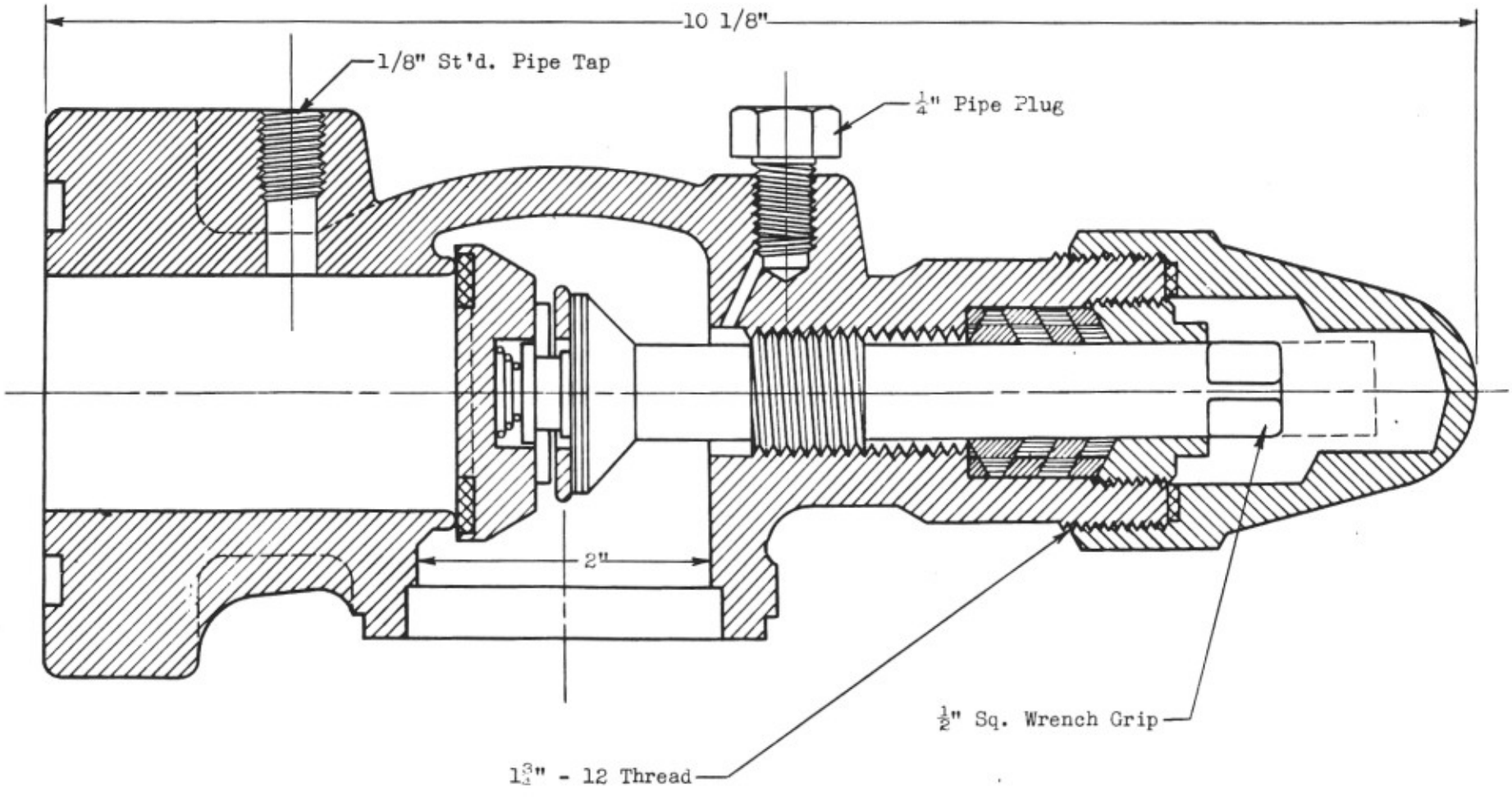
Piece Or Drawing No.	No. per Unit.	Name
	1	RAILWAY UNIT ASSEMBLY
EA-118060	1	COMPRESSOR BODY ASSEMBLY
640103	1	Fly-wheel - Compressor
640082-K-2814	1	Washer - Plain (Fly-wheel Mtg.)
635941-K-3138	1	Nut - 3/4-16 (Fly-wheel Mtg.)
617078	1	Cotter Pin (Fly-wheel Mtg.)
642540	4	Lock Washer (Comp. Body Mtg.)
642545	4	Screw 3/4-16 (Comp. Body Mtg.)
1136289-K-13119	1	SUCTION VALVE ASSEMBLY (1133435 Alternate)
96287-K-3056	1	Plug - 1/4 Pipe (Mt. in Valve)
615812-K-5495	1	Connector - 1/8 Pipe to 1/4 Tube (Mt. in Valve)
98959-K-5497	1	Dead Head - 1/4 Tube (Mt. on Conn.)
613539	1	Flare Nut - 1/4 (Mt. on Conn.)

N.H.



A 7168 MOTOR

Figure 63



FRIGIDAIRE COMPRESSOR SHUT-OFF VALVE

Figure 65

PIECE OR DRAWING	No. PER UNIT	NAME
640052-K-3167	1	Gasket (Valve Mtg.)
640054	4	Screw - 5/8-18 (Valve Mtg.)
EA-75598	4	Lock Washer (Valve Mtg.)
642564	1	Scale Trap Body
640052-K-3167	1	Gasket (Body Mtg.)
635954	4	Stud (Body Mtg.)
EA-75598	4	Locker Washer (Body Mtg.)
EA-49651	4	Nut (Body Mtg.)
1149161	1	STRAINER ASSEMBLY (Mt. in Body)
96287-K-3056	1	Plug-1/4 Pipe (Mt. in Body)
EB-72006-K-13120	1	SUCTION ASSEMBLY (Mt. on Body in Field)
EB-72260-K-13121	1	FLEXIBLE SUCTION CONNECTION ASSEMBLY 1-5/8"
EB-72007-K-13122	1	Discharge Assembly
EB-72261-K-13123	1	Flexible Discharge Connection Assy. 1-1/8"
1136289-K-13119	1	DISCHARGE VALVE ASSEMBLY (1133435 Alternate)
96287-K-3056	1	Plug - 1/4 Pipe (Mt. in Valve)
615812-K-5495	1	Connector - 1/8 Pipe to 1/4 Tube
98959-K-5497	1	Dead Head - 1/4 Tube (Mt. on Conn.)
613539	1	Flare Nut - 1/4 (Mt. on Conn.)
640052-K-3167	1	Gasket (Valve Mtg.)
EA-117473	2	Stud - 5/8-18 (Valve Mtg.)
640055-K-2841	2	Nut (Valve Mtg.)
EA-118061	2	Screw - 5/8-18 (Valve Mtg.)
EA-75598	4	Lock Washer (Valve Mtg.)
ED-18032	1	FRAME ASSEMBLY
642536	6	Spacer (Mt. Frame to Comp. Support Assembly)
642537	6	Nut - 7/8-14 (Mt. Frame to Comp. Supp. Assembly)
A-7168	1	Motor
EB-72286	1	SCREW SPACER ASSEMBLY
EA-118314	1	Spacer
EA-72251	2	Screw - 3/4-16
EA-118315	2	Retainer - Screw
EB-72324	1	SCREW SPACER ASSEMBLY
EA-118480	1	Spacer
EA-118315	2	Retainer
EA-72251	2	Screw
EC-28504	1	Motor Hanger Brkt. (Front)
EA-112254	1	Bearing - Bushing
EC-28503	1	Motor Hanger Brkt. (Rear)
EA-112254	1	Bearing - Bushing
EA-112265	2	Screw 1/2-13
EA-79410	2	Lock Washer
642540	4	Lock Washer (Mt. Hang. Brkt.)
EA-112240	4	Nuts (Mt. Hang. Brkt.)
EA-112244	4	Cotter Pin - 1/4 to Lock Nuts.

N.H.

PIECE OR DRAWING	NO. PER UNIT	NAME
EA-112255	2	Set Screw 1/2-13 (Shaft to Motor)
EA-112253	2	Washer (Mt. on Ends of Shaft)
EA-112245	2	Cotter Pins 3/16 (Mt. on Ends of Shaft)
EA-112247	1	Nut 1" -14 (Mt. on End of Shaft.)
EA-112243	1	Cotter Pin - 1/8 (Mt. on End of Shaft.)
EB-70462-K-13127	1	Rod - Belt Adjusting
EA-112248-K-13128	3	Nuts - Motor Adjusting
EA-112264	1	Washer (Assem. on Rod)
EA-112245	1	Cotter Pin 3/16 (Assem. Rod)
	6	Belt (Match in Sets of 6) (See Opt. Sheets).
	1	Pulley (See Opt. Sheet)
	2	Set Screw (See Opt. Sheet)
EB-72318	1	Chain - Safety
EA-117966	4	Shackle - Chain
EA-117965	4	Pin - (Mt. Shackle)
EA-117967	4	Cotter Pin (Mt. in Pin)
EB-25539	4	Mounting Assembly - Rubber
EA-79923	8	Screw - 3/8-16 (Mt. Assembly to Frame)
EA-79437	8	Nut - 3/8-16 (Mt. Assembly to Frame)
EA-79409	8	Lock Washers (Mt. Assembly to Frame)
EC-46975-K-13347	1	Belt Guard Assembly
EA-79437	2	Nut - Belt Guard Mtg. (Upper)
EA-79412	2	Washer - Belt Guard Mtg. (Plain) (Upper)
EA-79409	2	Washer - Belt Guard Mtg. (Lock) (Upper)
EA-118184	2	Screw - Belt Guard Mtg. (Lower)
EA-79412	2	Washer - Belt Guard Mtg. (Plain) (Lower)
EA-79409	2	Washer - Belt Guard Mtg. (Lock) (Lower)

OPTIONAL ITEMS

PART NO.	QTY. PER UNIT	DESCRIPTION
	BELTS	
EB-25717-K 290	6	Belt 84"
	PULLEYS	
EC-21942-K 13124	1	Pulley - 5"
	PULLEY SET SCREW	
EA-78191	2	Set Screw
	MOTOR	
A-7168 - K 14918	1	Motor 12-7½ H.P., 72 Volt D.C., 1750-1100 rpm, Ball Bearing Type.

SPACER DATA

9/16 Clearance			1 1/8 Clearance	
SPACER	SCREW	QUANTITY	SPACER	SCREW
EA-49517	EA-49549	8	EA-71717	EA-118057

N.H.

SERVICEABLE PARTS - A-7166

Illus. No.	Description	No. Requ'd		A-7166
2	Armature, Fan & Shaft Assembly	1		5393955
3*	Armature & Shaft Assembly	1		5388285
4	Key, Shaft Extension	1		1064311
5	Fan	1		5393733
6	Stud, Fan Retainer	6		5327775
7	Nut, Fan Retainer	6		5312255
8	Lockwasher, Fan Retainer	6		120382
16	Frame & Field Coil Assembly, D.C.	1		5393953
18	Frame	1		5393710
19	Interpole Coil & Pole Piece Assembly	4		5393744
20	Bolt, Pole Piece Mounting	8		122446
21	Lockwasher, Pole Piece Mounting	8		120384
22	Shim, Pole Piece	4		1069975
23	Shunt Coil	4		5393823
24	Series Coil	4		5393851
25	Pole Piece, Shunt & Seires	4		5393820
26	Bolt, Pole Piece Mounting	8		122446
27	Lockwasher, Pole Piece Mounting	8		120384
28	Shim, Pole Piece	4		5393857
29*	Lead Assembly Shunt Coil to A 2 Junct.	1		5393895
30*	Lead Assembly Shunt Coil to Shunt Coil	3		5393840
31*	Lead Assembly, Shunt Coil to F1 Junct.	1		5393841
32*	Lead Assembly, Shunt Coil to Series Coil	1		5393896
33*	Lead Assembly, Interpole Coil to Brush	2		5387804
34*	Lead Assembly, Interpole Coil to Series Coil	2		5387803
35*	Lead Assembly Interpole Coil to Series Coil	1		5387843
37*	Lead Assembly Series Coil to Brush	1		5387802
39	Lead Assembly, A 1	1		5388278
40	Lead Assembly, A 2	1		5388272
41	Lead Assembly, F 1	1		5393870
46	Brakcet, Lead Retainer	4		5393855
51	Clamp, Lead to Frame	1		5314584
54	End Frame (Opposite Commuatator End)	1		5393830
57	Bearing Housing Assembly	1		5393742
58	Gasket, Brg. Housing	1		5312229
61	Felt Seal	1		1079145
62	Washer, Seal Retainer	1		5316993
63	Expansion Ring Seal Retainer	1		1078259
64	Bearing	1		5364645
68	Plug, End Frame Center	1		5381885
69	Gasket, Plug	1		043216
71	End Frame & Brush Holder Assembly (Comm. End)	1		5393826
75	Cover Plate Assembly	1	5393963	5393962
76	Spring, Cover Plate Retainer	4		5392974
79	Bearing Housing Assembly	1		5393743
80	Gasket, Bearing Housing	1		5312229
81	Screw, Bearing Housing Mounting	4		1057178
82	Lockwasher, Bearing Housing Mounting	4		120382
83	Felt Seal (Outer)	1		5324298
84	Washer, Seal Retainer (Outer)	1		5327756
85	Expansion Ring, Seal Retainer (Outer)	1		1078262
86	Felt Seal (Inner)	1		1079145
87	Washer, Seal Retainer (Inner)	1		5316993
88	Expansion Ring, Seal Retainer (Inner)	1		1078259
89	Bearing	1		5364645
94	Brush Holder & Spring Assembly	4		5393836
95	Spring, Brush Tension	8		5310593
101	Brush Holder Stud & Insul. Sleeve Assem.	4		5385684
102	Insulating Sleeve	4		5312128
103	Insulating Disc, Stud End	4		5317124
104	Expansion Plug, Disc Retainer	4		1070969
105	Insulating Washer, Brush Holder Stud	4		5313422
106	Insulating Washer, Brush Holder Stud	4		5312127
107	Insulating Washer, Brush Holder Stud	4		5386534
110	Terminal Clip, Brush Holder Stud	4		5393832
114	Brush	8		5388271
115	Cover Band & Baffle Assembly	1		5393862
116*	Gasket, Cover Band	1		5385746
117	Cover Band & Clamp Assembly	1		5393863
118	Gasket, Cover Band	1		5385747
120	Cover Band Assembly, Fan	1		5388935
121	Shaft, Mounting Pivot	1		5323788
122*	Bracket, Belt Tension Mech.	1		5393739

* Not Illustrated. Numbers not listed are standard items.

N. H.

CONDENSER UNIT

The condenser unit is mounted on the car adjacent to the compressor motor unit. Figure 66 shown a typical unit but without the water sprays. The water spray system is shown on Figure 67. The condenser coils are the air-cooled type constructed of copper tubing with copper fins plated to resist corrosion. The two condenser coils are identical, one located at each end of the assembly.

The water sprays are placed between condenser coil and condenser fan so that the air blast blows the water into the condenser coil. These water sprays are controlled by an automatic water valve actuated by the operating head pressure. The water valve is adjusted to open at approximately 150 lbs. head pressure. This pressure will be reached with an outside temperature of 85° to 90°. The water for the sprays is taken from the car water supply which should be set for 20 lbs. pressure to provide breaking the water stream into a fine mist. The operating range of the valve can be adjusted. See Figure 68.

The 1 H.P. 220 volt, 3 phase, 1750 rmp motor is double shaft extended and centrally located between the condensers. The motor support base is welded to the liquid receiver. The two stainless steel fans can be removed by loosening the four cap screws holding the fan blades to the bronze hub, or by loosening the set screws in the hub and sliding the entire fan assembly forward. There is sufficient clearance to permit the fan blade assembly to be completely removed from the motor shaft.

The liquid receiver is provided with shut-off valves on the " Liquid In " and " Liquid Out" ports. A sight glass is also provided to observe the operating liquid level of this system. The refrigerant charge for the entire system consists of 50 lbs. F-12.

The condenser unit is mounted to the car structure by means of rubber mounts. These rubber mounts are fairly solid and are used to absorb the severe car coupling shocks and prevent transmission of noise.

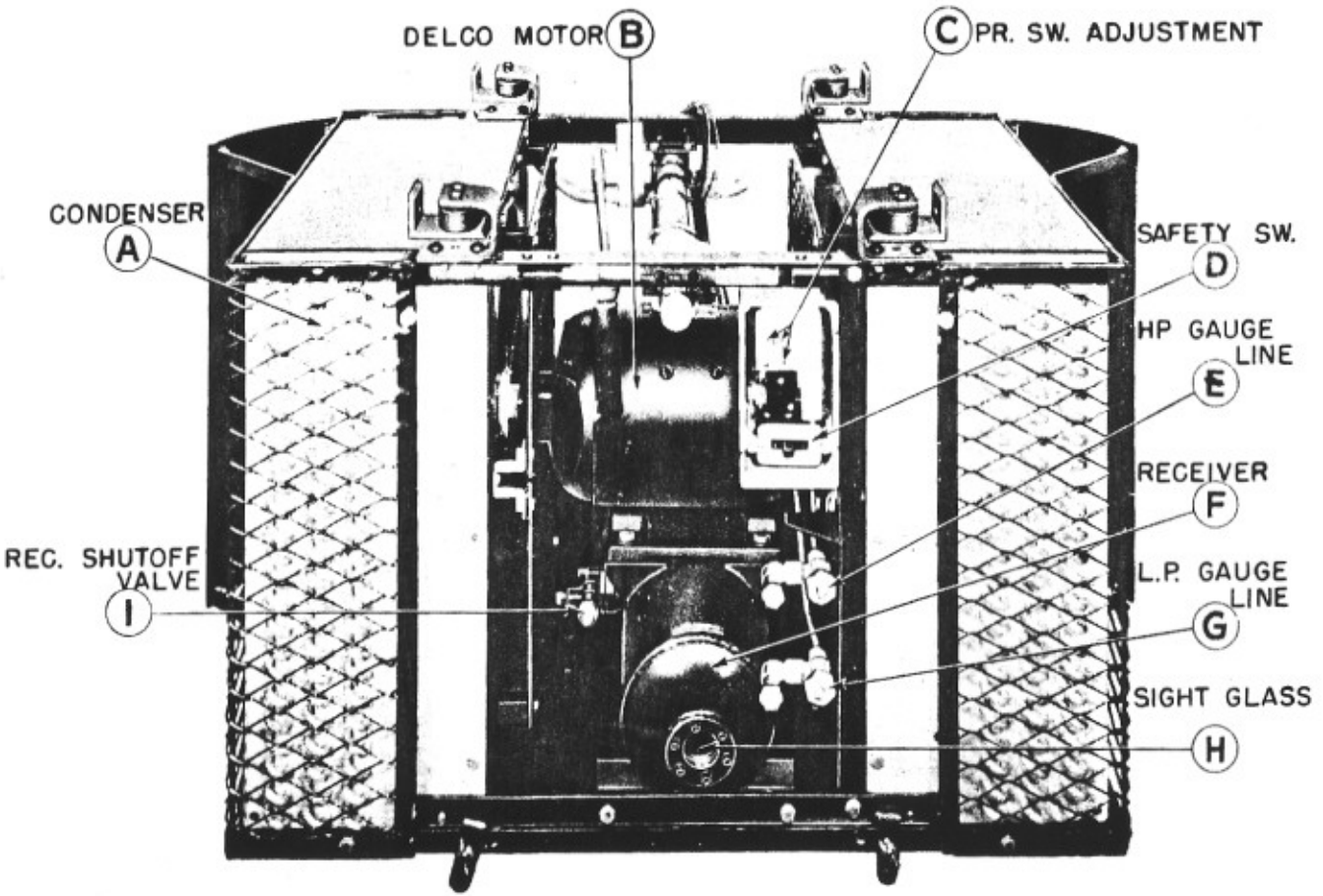
Suitable screens are provided over the entire unit as well as split section screens in front of each fan. A solid pan protects the bottom.

A disc type water filter is used in the water supply line. This filter is cleaned by turning the Tee handle at the top. This scrapes the sediment from the edges of the discs and it falls into the body of the filter. This sediment can then be flushed out by opening the 1/2" globe valve at the bottom of the filter. The condensers are of ample capacity so that it will be unnecessary to use the water sprays should the cars be in north-south service in the wintertime. The spray system should, therefore, be turned off for winter operation. The system can be drained by closing the supply valve on the car water tank and opening the globe valve on the filter and the by-pass valve as well as the two petcocks on the sprays. This completely drains the water circuit.

The spray nozzles are 60 lbs. per hour capacity; that is, they will pass 60 lbs. or approximately 7 gallons of water per hour with the water pressure maintained at 20 lbs. per square inch. At higher water pressures more water will be used.

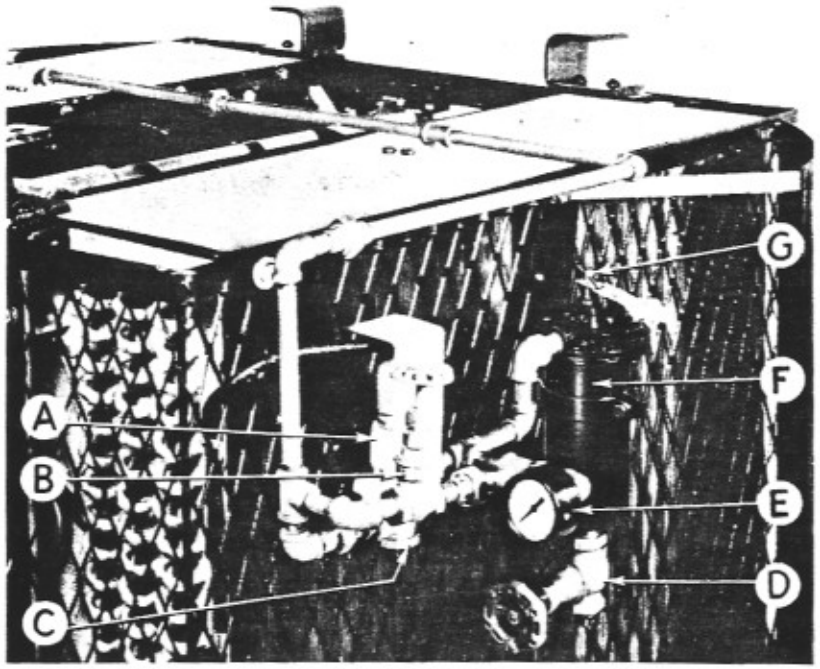
NOTES

N.H.



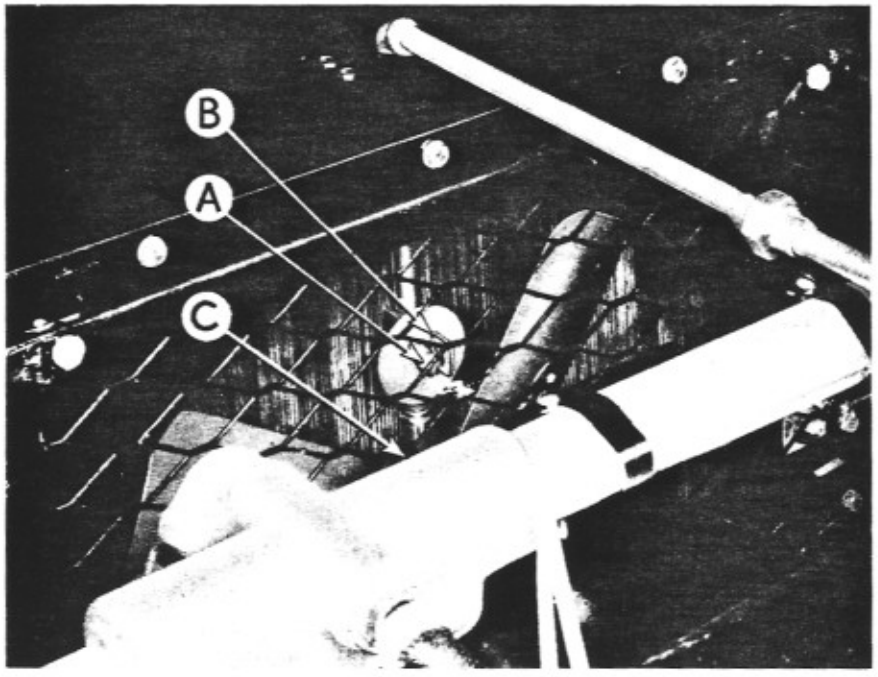
Condenser Unit

Figure 66



EM 16075 FRIGIDAIRE CONDENSER WITH EM 15766 SPRAY ATTACHMENT ASSEMBLY

a. Automatic Water Valve
b. By-Pass Valve
c. Water Valve Adjusting Screw
d. Filter Drain Valve
e. Water Pressure Gauge
f. Filter
g. Filter Cleaning Handle



FRIGIDAIRE CONDENSER WITH SPRAY ATTACHMENT

a. Spray Nozzle b. Anvil c. Location of Petcocks

Figure 67

SERVICING EM-13901 WATER VALVE: The Model EM-13901 water valve is constructed with a non-eroding seat, which is easily replaced. To replace a valve seat, proceed as follows:

1. Shut off the water supply.
2. Remove the bottom seal plug, Figure 68.
3. Remove the valve closing spring.
4. Remove the 3/16" nut and valve disc.
5. Using special valve tool No. SA1556, remove the valve seat.
6. Clean the parts removed and flush the valve.
7. Insert a new seat and tighten in place.
8. Replace the valve disc, 3/16" nut, and closing spring.
9. Replace seal plug and tighten.

If necessary to change the opening point of the valve, it may be adjusted by inserting a screw-driver in the slotted adjusting screw, Figure 68, which turns in either direction. By turning the adjusting screw clockwise, the flow of water through the valve is delayed. Turning the screw counterclockwise permits the water valve to open quicker.

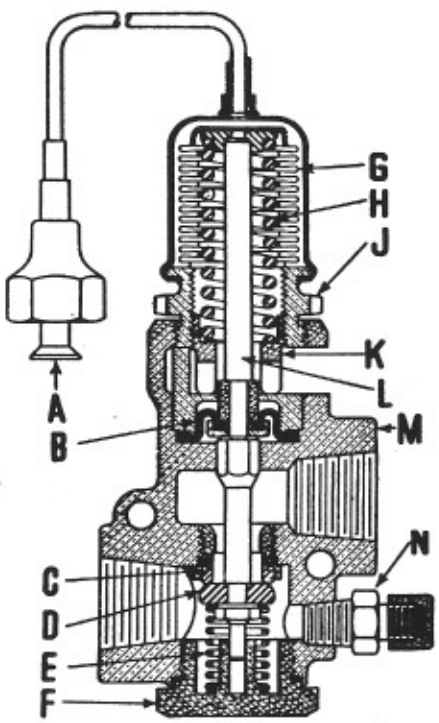
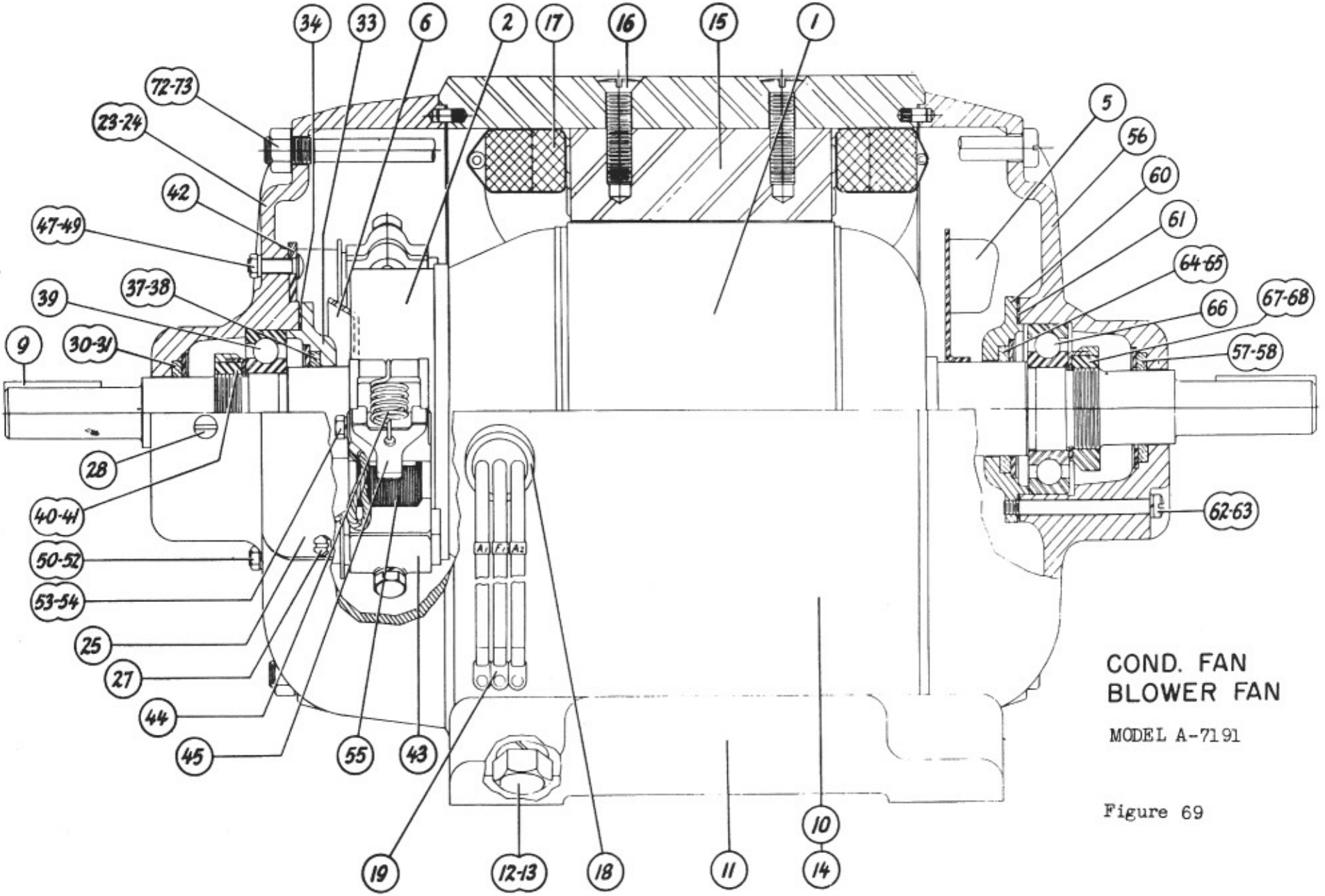


Figure 68

Cross Section of Model "30" Water Valve

A. Pressure Tube
B. Water Seal Diaphragm
C. Valve Seat
D. Valve Disc
E. Closing Spring
F. Seal Plug
G. Operating Bellows
H. Adjusting Spring
J. Power Element Assy.
K. Adjusting Screw
L. Valve Stem
M. Valve Body
N. Air Pump Connection



COND. FAN
BLOWER FAN

MODEL A-7191

Figure 69

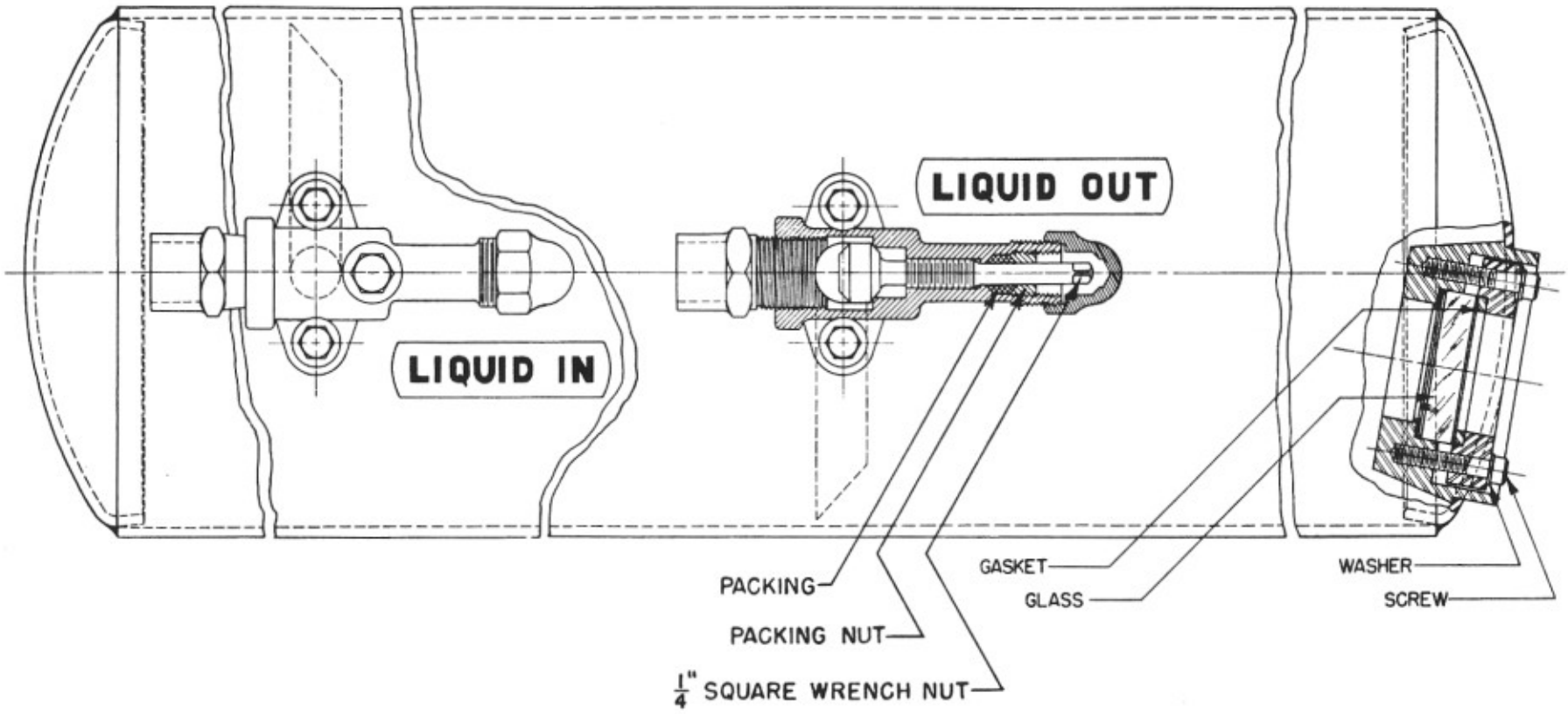


Figure 70

PARTS LIST
CONDENSER UNIT EM-16075-K 15245

PIECE OR DRAWING NO.	NO. PER UNIT	NAME
ED-18072	1	Bottom Panel-K 12790
EC-29872	1	Support Bottom Front (Condenser)-K 12791
EC-29871	1	Support Bottom Rear (Condenser)-K 12792
EA-118181	6	Screw 3/8-16 Support Mtg.
EA-79409	6	Lock Washer
EA-79412	6	Plain Washer
ED-18066	1	RECEIVER ASSEMBLY-K 12793
640563	2	Connector 3/4 Pipe x 3/4 Tube
96287	2	Plug - 1/4" Pipe
114209	2	VALVE ASSEMBLY-K 12794
633773	2	Stem Valve - K 12795
622921	4	Packing-K 12796
613544	4	Gasket K 12875
613529	2	Nut
642683	2	Gasket (Valve Mtg.)-K 12797
635658	4	Screw (Valve Mtg.)-K 5052
613518	2	Cap (Valve)-K 12798
636263	1	Sight Glass-K 3045
640477	1	Gasket - Lead Tin (Glass Mtg.)-K 3046
640476	1	Gasket - (Glass Mtg.)-K 3047
640475	1	Retainer (Glass Mtg.)-K 2800
EA-117930	6	Screw (Glass Mtg.)-K 13107
625932	6	Lock Washer (Glass Mtg.)-K 2802
96287	1	Plug 1/4 Pipe (Nut in Spud)-K 3056
EA-118184	4	Screw 3/8-16 (Rec. Mtg.)
EA-79409	4	Lock Washer (Rec. Mtg.)
EB-72046	1	Tube-Liquid (Mt. Rec. Valve)
EA-46849	1	Bushing Reducing (Mt. on Rec. Valve)
Top - inlet Manifold Tube Connection to Condensers.		
EB-72231	1	Tube - Long-K 12801
EB-72255	1	Tube - Short-K 12802
EB-72325	1	Tee and Bracket Assembly-K 12803
EA-118129	1	Tee - 7/8 x 7/8 x 1-1/8
EA-118188	1	Support Top Connection
EA-118189	1	Support Liquid Tube
Bottom outlet Manifold Tube Connection to Condensers.		
EA-118099	1	Tube short 3/4" -K 12806
EA-118511	1	Tee - 3/4" Tube
EA-118128	1	Tube (Tee to Receiver)-K 12807
EB-72047	1	Tube Long 3/4"-K 12808
EA-78454	2	Bushing - 7/8-3/4" - use with bottom connection assembly
EA-118181	1	Screw - 3/8-16 (Mtg. Top Conn. Assembly)
EA-79412	1	Washer plain (Mtg. Top Conn. Assem.)
EA-79409	1	Washer lock - (Mtg. Top Conn. Assem.)
ED-18050	2	CONDENSER ASSEMBLY
ED-18310	1	CONDENSER COVER (RH) (MT. WITH TOP SUPPORT) - K-12831
ED-18311	1	CONDENSER COVER (LH) (MT. WITH TOP SUPPORT) - K 12832
EB-72242	1	SUPPORT FRONT TOP ASSEMB. (CONDENSER)
EA-118181	12	Screw 3/8-16 (Mtg. Cover & Supp. to Cond.)
EA-79409	12	Lock Washer (Mtg. Cover & Supp. to Cond.)
EA-110997	4	Screw 3/8-16 (Mtg. Cover to Cond.)

N.H.

PIECE OR DRAWING NO	NO. PER UNIT	NAME
EA-79409	4	Locker Washer (Mtg. Cover to Cond.)
EA-118181	12	Screw 3/8-16 (Mtg. Cond. to bottom Supp.)
EA-79409	12	Lock Washer (Mtg. Cond. to bottom Support)
ED-18107	2	FAN PANEL-K 12835
EA-118185	32	Screw 5/16-18 (Mt. fan panel)
EA-79408	32	Lock Washer (Mt. fan panel)
ED-18073	2	END SCREEN ASSEMBLY-K 12836
ED-18083	2	GUARD - END SCREEN-K 12837
EB-72066	4	Bracket
EA-118184	16	Screw - 3/8-16 (Mt. Screen, Guard & Brkt.)
EA-79409	16	Lock Washer (Mt. Screen, Guard & Brkt.)
EA-110996	4	Screw - 3/8-16 (Mt. Brkt. to Guard)
EA-79409	4	Lock Washer (Mt. Bracket to Guard)
EA-79926	4	Nut - 3/8-16 (Mt. Bracket to Guard)
EA-118151	4	Support - Screen-K 12839
EA-110996	4	Screw - 3/8-16 (Mt. Supp. to Cond. top)
EA-79409	4	Lock Washer (Mt. Supp. to Cond. top)
EA-110996	4	Screw - 3/8-16 (Mt. Screen to supp.)
EA-79409	4	Lock Washer (Mt. Screen to Supp.)
EB-71989	1	FAN ASSEMBLY - R.H.-K 12840
EB-71988	1	FAN ASSEMBLY - L.H.-K 12841
	Motor	(See Optional Sheet)
EA-79390	4	Screw - 1/2 13 (Mt Motor)
EA-79410	4	Lock Washer (Mt. Motor)
EA-118311	4	SUPPORT & NUT ASSEMBLY (5/16-18)-K 12842 (Motor)
EA-79932	4	Screw - 5/16-18 (Mt. Supp.)
EA-79408	4	Lock Washer (Mt. Supp)
EA-79932	16	Screw - 5/16-18 (Hand Guard Mtg.)
EA-79408	16	Lock Washer (Hand Guard Mtg.)
EC-29867	1	SUPPORT ANGLE ASSEMBLY - H.P. & L.P. CUTOUT & VALVES
EA-118184	2	Screw - 3/8-16 (Mt. Supp.)
EA-79409	2	Lock Washer (Mt. Supp.)
1128851	1	H.P. - L.P. CUTOUT-K 14988
EA-79932	2	Screw - 5/16-18 (Mt. Cutout)
EA-79408	2	Lock Washer (Mt. Cutout)
EA-79460	2	Nut (Mt Cutout)
EC-29913	1	WIRING CONDUIT ASSEMBLY
EA-118143	1	U-Bolt - 1/4-20 (Conduit Mtg. Rear)
EA-79407	2	Lock Washer (Conduit Mtg. Rear)
EA-79489	2	Nut - 1/4-20 (Conduit Mtg. Rear)
EA-118144	1	U-Bolt - 1/4-20 (Conduit Mtg. Front)
EA-79407	2	Lock Washer (Conduit Mtg. Front)
EA-79489	2	Nut - 1/4-20 (Conduit Mtg. Front)
EA-117685	1	Cover - Motor Wire
EA-78203	2	Clamp - Cover
EA-117686	1	Insulation - H.P. & L.P. Wire
EA-118372	2	PACKLESS VALVE ASSEMBLY-K 12847
1133580	2	NEEDLE, BELLOWS & STEM ASSEMBLY-K 12848
636238	2	Nut - Clamp
EA-118395	2	Elbow - 3/8 Fl. x 5/8 Sweat

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PIECE OR DRAWING NO.	NO. PER UNIT	NAME
629651	4	Screw - 1/4-28 (Valve Mtg.)-K 12849
EA-79407	4	Lock Washer (Valve Mtg.)
EA-79458	1	H.P. Gauge (Mt. in Valve)-K 12849
EA-70582	1	L.P. Gauge (Mt. in Valve)
EA-117662	2	TUBE - CUTOUT TO TEE
613539	2	Nut - 1/4 Flare
639991	2	Tee - 1/4"
EB-72251	1	TUBE - L.P. VALVE TO TEE
613539	1	Nut - 1/4 Flare
EC-29905	1	Tube - L.P. Tee to Rear of Unit
EB-72252	1	TUBE - H.P. VALVE TO TEE
613539	1	Nut - 1/4" Flare
EC-29906	1	Tube - H.P. Tee to Rear of Unit
EA-117584	3	Clamp - H.P. & L.P. Line
EA-117657	3	Screw - 1/4-20 Rd. Hd. (Clamp Mtg.)
EA-79407	3	Lock Washers (Clamp Mtg.)
EA-79489	3	Cut (Clamp Mtg.)
EA-118163	1	PACKLESS VALVE ASSEMBLY
1133567	1	Needle and Bellows Assembly-K 12858
636238	1	Nut - Clamp
636239	1	Wheel - Hand-K 12859
620773	1	Washer-Hand Wheel Mtg. (Lock)
625540	1	Screw-Packless Valve Mtg.
629077	2	Screw-Packless Valve Mtg.
EA-79481	2	Washer-Packless Valve Mtg. (Lock)
EC-47083	1	TUBE ASSEMBLY 3-WAY VALVE TO TEE
EC-47084	1	Tube 3 way valve to tee
613539	1	Nut - 1/4 Flare
EB-72291	1	TUBE ASSEMBLY 3-WAY VALVE TO H.P. VALVE
EB-72292	1	Tube 3 way valve to H.P. valve
613539	2	Nut - 1/4 Flare
EC-29865	1	GUARD - FRONT ASSEMBLY-K 12864
EA-117600	2	CLAMP ASSEMBLY - GUARD-K 12765
EA-117601	2	Wing Nut - 3/8-16
EA-117661	2	Clip - Retainer-K 12866
EC-29866	4	GUARD ASSEMBLY - HAND-K 12867
EA-118187	1	Clamp - 5/8 Liq. Line-K 12868
EA-79608	1	Screw - 1/4-20 (Clamp Mtg.)
EA-79925	1	Washer - Plain (Clamp Mtg.)
EA-79407	1	Washer - Lock (Clamp Mtg.)
EA-79489	1	Nut - 1/4-20 (Clamp Mtg.)
EA-118352	4	Hanger Support - Condenser
EA-118338	4	MOUNTING - COND. UNIT
EA-118356	16	Screw - 3/8-24 Hex
EA-79409	16	Lock Washer 8 to mount UNIT to support, 8 to mount UNIT to condenser
A-7191	1	Motor-1 H.P. 30-36 Volt, D.C, 1200-K 12907 1250/1750 rpm. Sleeve Bearing Type

SERVICEABLE PARTS FOR DELCO-FRIGIDAIRE MOTORS

Illus. No.	Description	A-7191
1	Armature & Fan Assembly	5365475
2	Commutator Assembly	5319231
3	Insulating Tube	939294
4	Insulating Tube	5396362
5	Fan	042243
6	Balance Disc	1072389
7	Balance Weight	038194
8	Balance Weight	038195

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Illus No.	Description	A-7191
9	Key Shaft	048488
10	Base, Frame & Coil Assembly	1075215
11	Base	1064517
12	Screw Base Mounting	120650
13	Lockwasher Base Mounting	103323
14	Frame	1068577
15	Pole Piece	1058641
16	Screw Pole Piece Mounting	1070426
17	Field Coil Assembly	5393800
18	Nipple Lead Conduit	5365448
19	Terminal Lug	1053856
20	Condenser	1880376
21	Screw, Condenser Mounting	115402
22	Lockwasher Condenser Mounting	106497
23	End Frame & Brush Bracket Assembly	5388739
24	End Frame	1069056
25	Cover Plate End Frame	1079700
26	Gasket Cover Plate	5331305
27	Screw Cover Plate	5321076
28	Pipe Plug Bearing Reservoir	1062157
30	Felt Seal	1079138
31	Washer Seal Retainer	1070518
33	Bearing Cover	5351658
34	Gasket Bearing Cover	5351655
35	Screw Brg. Cover Mounting	132161
36	Lockwasher Brg. Cover Mounting	106497
37	Felt Seal	1070537
38	Washer Seal Retainer	1070514
39	Bearing	5379898
40	Locknut Bearing	1071139
41	Lockwasher Bearing	1067505
42	Brush Bracket & Holder Assembly	5396356
43	Brush Holder	5312458
44	Brush Spring	049835
45	Brush Arm	5354004
46	Insulating Tube Brush Holder	5364170
47	Bolt Bracket Locking (Top)	5364172
48	Nut Bracket Locking (Top)	120375
49	Lockwasher Bracket Locking (Top)	103319
50	Bolt Bracket Locking (Bottom)	037972
51	Nut Bracket Locking (Bottom)	5337834
52	Lockwasher Bracket Locking (Bottom)	106497
53	Screw Brush Lead Terminal	1065723
54	Lockwasher Brush Lead Terminal	106496
55	Brush	5308736
56	End Frame (Opp. Comm. End.)	1067128
57	Felt Seal	1079138
58	Washer Seal Retainer	1070518
60	Bearing Cover	5351659
61	Gasket Brg. Cover	5351655
62	Screw Brg Cover Mounting	132161
63	Lockwasher Brg. Cover Mounting	106497
64	Felt Seal	1070537
65	Washer Seal Retainer	1070514
66	Bearing	5379898
67	Locknut Bearing	1071139
68	Lockwasher Bearing	1067505
70	Pipe Plug Bearing Reservoir	1062157
72	Thru Bolt End Frame Mounting	1069191
73	Nut Thru Bolt	042454
74	Name Plate	5365449
75	Drive Screw Name Plate	5327153

N.H.

NOTES

AIR CONDITIONING UNIT

The air conditioning unit consists of a direct connected blower fan and motor assembly, an evaporator steam coil, drip pan and Neoprene rubber duct connection between blower and evaporator unit. The motor is No. A 7182-1250 rpm shown in Figure 74.

The evaporator coil is somewhat different from older types in that it has smaller tubes, but more of them per square foot; and tubes are staggered for better heat transfer. The evaporator is equipped with distributors (see Figure 71) which meter a fixed quantity of liquid Freon to each set of tubes (either 4 or 8), thus permitting all tubes to handle equal heat transfer. Distributors have only fixed orifices and will require no adjustment. The evaporator coil is split in two sections (horizontally) with expansion valves on each section and a solenoid for stopping liquid flow when modulation is required. Former practice has been to cycle equipment "FULL ON" or "FULL OFF", resulting in a large variation of wet bulb temperature inside the car. This was due to moisture being re-entrained in the air stream from the evaporator coil during "Off" cycle. To eliminate this condition a modulated or reduced refrigeration capacity is provided by cutting the evaporator surface and the compressor capacity in half (reducing its speed), as controlled by the car thermostat.

The evaporator is equipped with two Frigidaire MX-49 ECC "Modulex" expansion valves. This valve is used only with distributor type coils and is provided with an equalizer connection, as shown in Figure 72. The equalizer assists bellows to open valve overcoming pressure drop through the distributor and coils. Generally the equalizer is used where pressure drop of 5 lbs. or more is encountered. It is tapped in to the evaporator at the last return bend for the top row of tubes for each section(Figure 73).

FRIGIDAIRE MODULEX REFRIGERANT CONTROL VALVE

Remember that an expansion valve is only a liquid Freon metering device and not a temperature control device, and no attempt should be made to use it as such.

The temperature of the Freon vapor leaving the evaporator should be only a few degrees (5° to 7°) higher than the liquid in the evaporator. The pressure within the evaporator as read on the low pressure gauge should be 35-40 pounds with inside car temperature 70° and 40-45 pounds with an 80° car temperature during the full speed operation. The MX-49 ECC valve is factory adjusted for 5° to 7° super-heat. If valve adjustment is required it must be removed from car, and tested in accordance with instructions outlined on Drawing YD-A-561, February 14, 1947 and letter June 11, 1947.

The operation of the MX 49 valve is as follows

At the top of the valve (Figure 73) is a power element connected to a bulb by a small diameter tube. The power element is charged with inert gas (CO_2). The bulb is filled with absorbent material (activated carbon) which releases the CO_2 gas as the bulb temperature rises and absorbs the CO_2 gas as the bulb temperature decreases. This action increases and decreases the pressure in the power element and bulb. The operating bellows of the valve is therefore, subject to the refrigerant pressure in the cooling unit on the lower side via the equalizer line and to the pressure of the power element on the upper side. There are three operating pins which extend from the lower side of the bellows to the upper side of the needle carriage. Below the needle carriage there is an adjustable spring. The spring tension plus the cooling unit F-12 pressure opposes the pressure in the power element.

The seal around the adjusting screw consists of a packing gland, packing, and packing nut. A valve cap and gasket are used to prevent moisture from condensing around the adjusting screw and also serves to prevent refrigerant leaks in cases where the packing is not tightened properly.

With unit idle we have the combined pressures of the refrigerant in the cooling unit and the adjusting spring tension holding the valve closed. When the condensing unit starts, the F-12 pressure in the cooling unit and the low side of the valve is reduced; when the pressure is reduced to the point where the pressure in the power element is greater than the combined pressures of the refrigerant and the spring, the bellows in the top of the valve is compressed and pushes down on the operating pins forcing the needle off its seat allowing liquid refrigerant to flow through the valve into the cooling unit. The amount of liquid permitted to flow is in exact proportion to the condensing unit s ability to pump out the vaporized refrigerant, which has absorbed heat from the air stream. This action continues until the cooling unit is flooded sufficiently so that the temperature of the suction line at the point where the valve bulb is clamped is reduced. The cooling of the bulb causes the material in the bulb to absorb a portion of the

N.H.

vapor in the power element, thus reducing the pressure. This reduction of pressure in the power element permits the combined pressure of the refrigerant and the spring to force the needle towards its seat, reducing the flow of liquid refrigerant. With the reduced flow of liquid refrigerant, the compressor is able to reduce this suction pressure, thereby lowering refrigerant temperature. This action continues, and so long as we reduce bulb temperature while reducing suction pressure and refrigerant temperature, the valve continues to replenish the liquid which is absorbing heat and vaporizing.

During the operating cycle for all practical purposes, superheating of the vapor in the cooling unit is held constant. This is accomplished by the valve maintaining the same degree of flooded condition in the cooling unit at all times, regardless of the fact that the suction pressure and refrigerant temperature are being lowered.

The degree to which the cooling unit is being flooded with liquid refrigerant depends upon the adjustment of the expansion valve. The valve should be adjusted to maintain from 5° to 7° superheat at the outlet of the evaporator.

When the desired car temperature is reached, the thermostat circuit should open, stopping the compressor. There is an immediate rise in the evaporator refrigerant pressure. The combined refrigerant pressure and spring tension overcomes the pressure in the power element and forces the valve closed.

During the "OFF" cycle of the system the pressures of the low side of the valve are always sufficiently higher than the pressure in the lower element, which holds the valve closed.

The Modulex control bulb is tightly clamped to the suction line, near the end of the evaporator. A heat exchanger is applied near the evaporator coil outlet to cool liquid Freon and warm the Freon vapor, insuring that no liquid Freon that might be spilled over by the coil will reach the compressor inlet.

AIR DISTRIBUTION: Air is drawn into the car through a fresh air grille 26½ x 22 3/4" located in the center of the vestibule ceiling.

Air filters used are as follows:

Two per car-Farr Co.'s Type "44R" size 15½ x 24½ x 2 - Cat. No. K 13739
For combination fresh air and recirculated air.

These filters are similar to, and maintained in the same manner as our present metal filters. Two odor filters, Dorex type G-3 series 800, 16" x 25" have been provided. These filters employ activated carbon in perforated metal tubes to absorb the gaseous eminations of smoke particles and other sources. The Dorex odor filters should have any dust and lint accumulation removed with low pressure air at the time the fresh and recirculating air filters are exchanged. After 12 months of service the odor filters should be removed and turned over to the storekeeper for further handling.

After passing through fresh and recirculated air filters, the air is mixed in a chamber, ahead of the blower fan.

Air is blown through the air conditioning unit and directed into the duct (located above hall) by a large curved canvas duct connector.

Air is taken from the duct and delivered to bedrooms through an Anemostat type "W" size No. 12.5 and to roomettes through an Anemostat type "W" size No. 10.

The Air duct follows the passageway to an outlet in passageway at end of car opposite overhead unit, which handles approximately 150 CFM.

An exhaust blower fan, Sturtevant 1/4 H.P.; size 6" type "O", located at blind end door, end of roomette hall ceiling, is used to exhaust air from all accomodations through an exhaust duct. This duct runs down the center of the car, and in the roomette hall is located above the AC air duct.

A 9" exhaust fan Westinghouse Electric Co.'s propeller type is used to exhaust air from the public toilet, and electric locker.

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AIR CONDITIONING UNIT (VALVE SIDE)

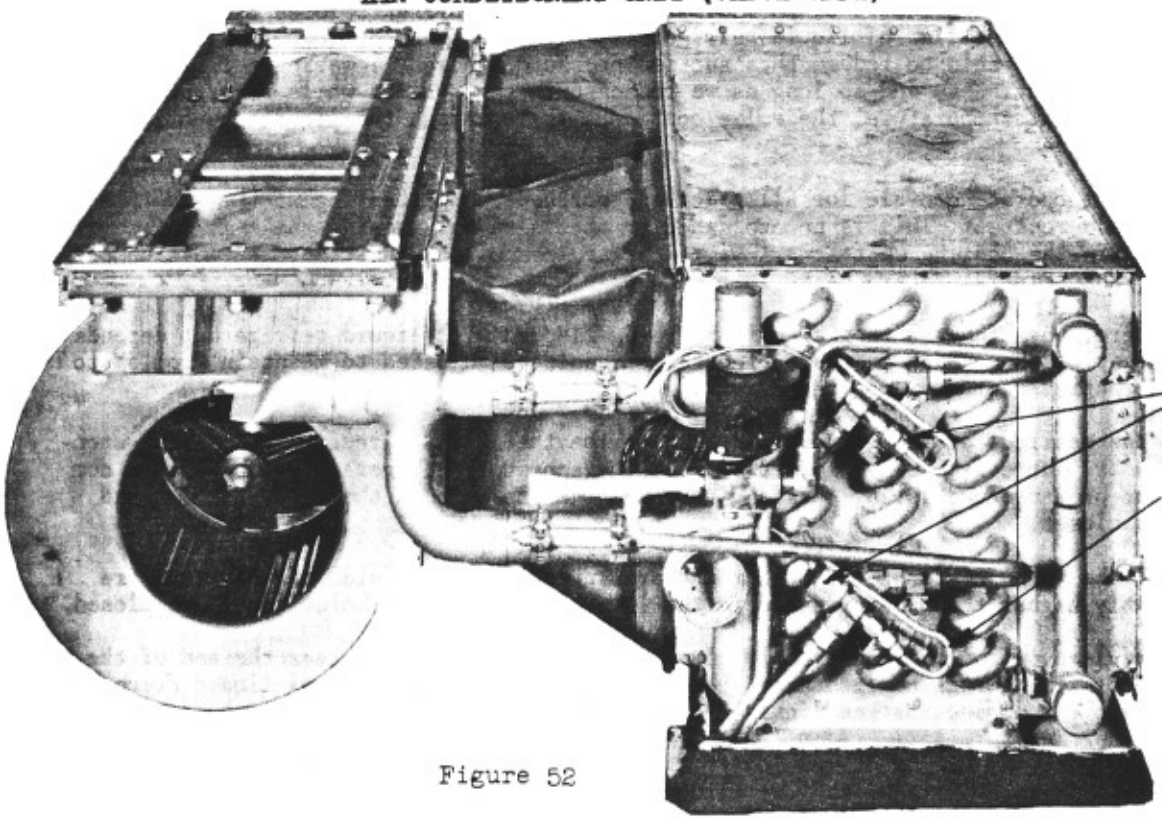


Figure 52

AIR CONDITIONING UNIT (DISTRIBUTOR SIDE)

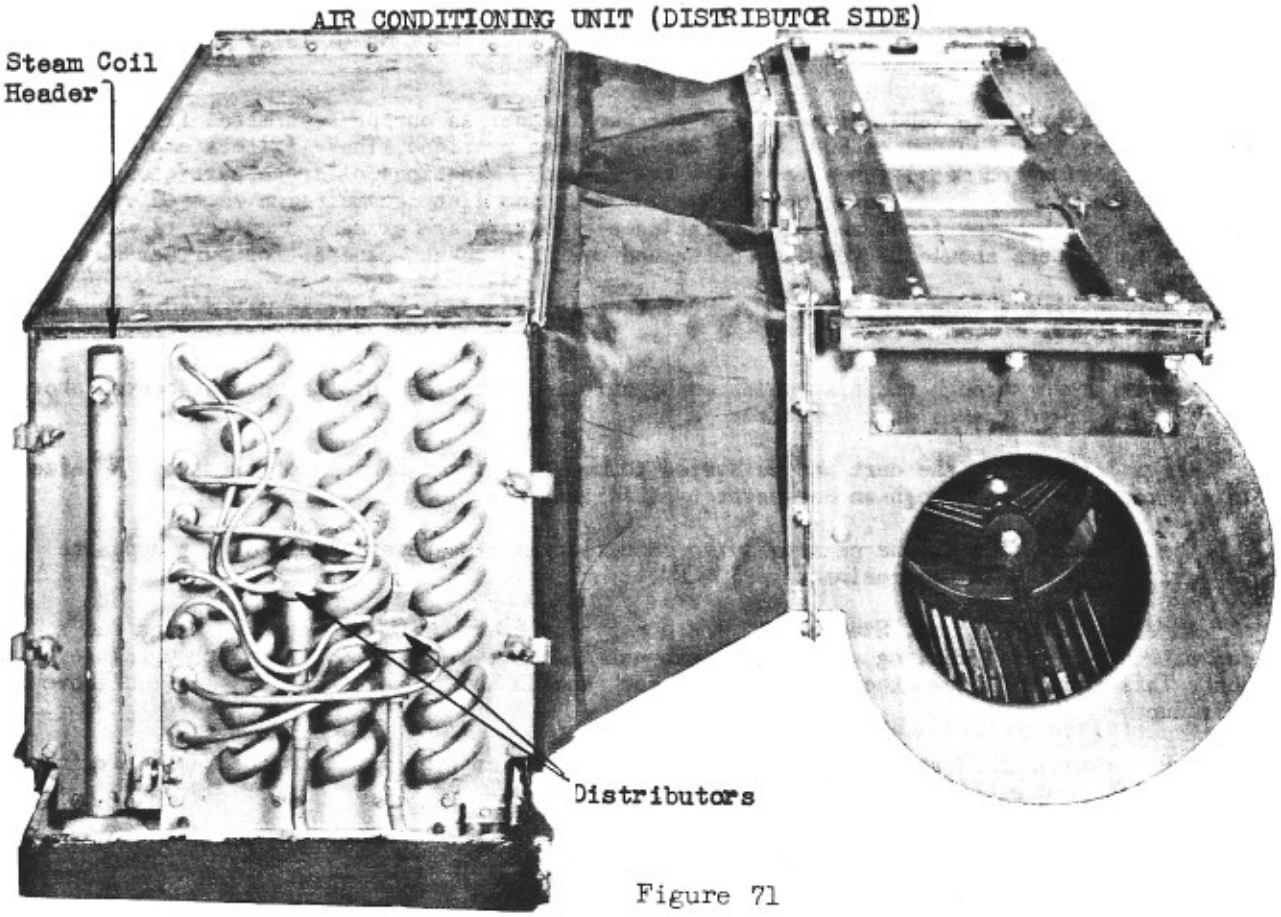


Figure 71

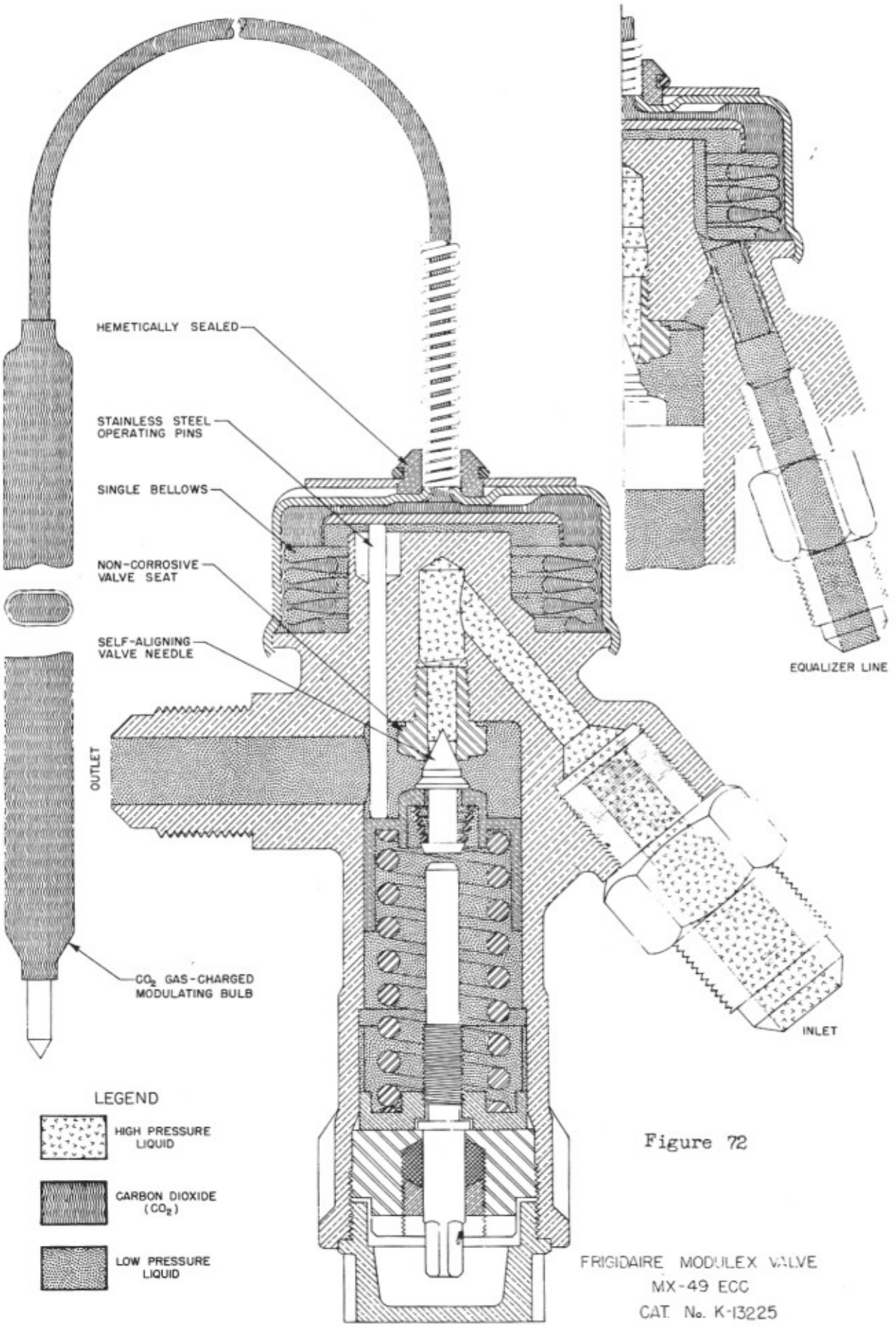
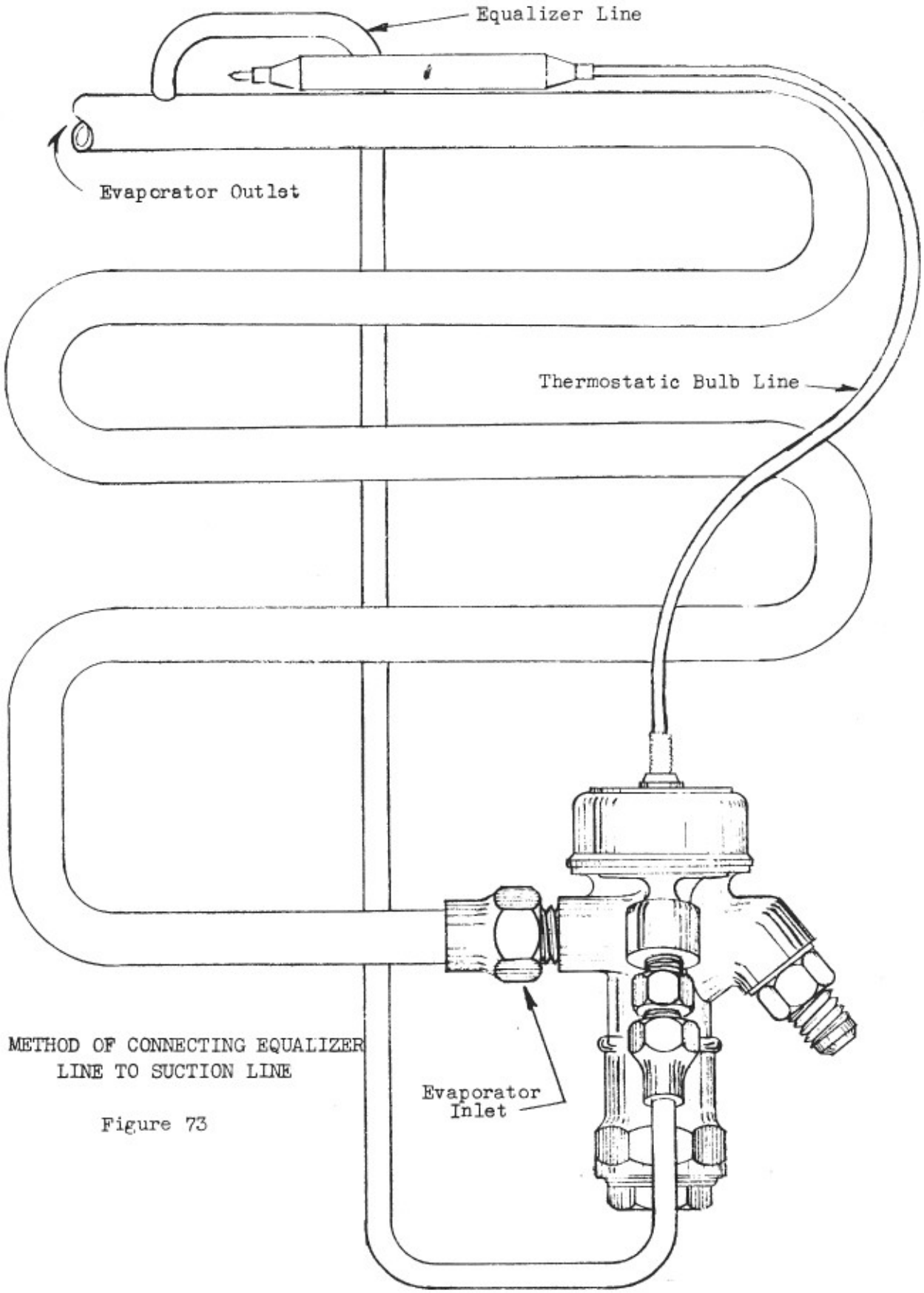


Figure 72

FRIGIDAIRE MODULEX VALVE
MX-49 ECC
CAT. No. K-13225



METHOD OF CONNECTING EQUALIZER LINE TO SUCTION LINE

Figure 73

PARTS LIST
AIR CONDITIONING UNIT EM-16048-K 13209

PIECE OR DRAWING NO.	NO. PER UNIT	NAME
ED-18250	1	Evaporator Coil
EB-72093	1	Baffle Assembly - Center
625303	2	Rivet (Baffle Mtg.)
BC-47077-K 13240	1	Cover & Duct Retainer Assembly (Mt. with angles)
EB-72247-K 13238	1	Angle Coil Mtg. (Mt. on Evap. Coil)
EB-72248-K 13237	1	Angle Coil Mtg. (Mt. on Evap. Coil)
EA-75455	10	Rivet (Angle Mtg.)
EA-132060	3	Wire - Tie (Cover Mtg.)
EA-74484	6	Plate (Cover Mtg.)
ED-33692	1	Steam Coil
EA-118142	4	Screw - 5/16-18 (Coil Mtg.)
EA-79408	4	Lock Washer (Coil Mtg.)
ED-18248	1	Pan-Drip Assembly (Evap. Coil)
EA-118140	10	Screw - 1/4-20 (Pan Mtg.)
EA-79408	10	Lockwasher (Pan Mtg.)
622420	2	Screw (Mt. Baffle to Pan)
624469	2	Lock Washer (Mt. Baffle to Pan)
ED-18247-K 13230	1	Pan - Drip Assembly (Steam Coil)
EA-118142	2	Screw - 5/16-18 (Pull coils and pans together)
EA-79407	2	Lock Washer (Pull coils & Pans together)
EA-118140	6	Screw-1/4-20 (Pan Mtg.)
EA-79408	6	Lock Washer (Pan Mtg.)
ED-18112-K 13288	1	Pan - Drain
EA-130655	4	Screw (Pan Mtg.)
EA-117368	8	Clip - Duct
EA-79407	8	Washer - Lock (Clip Mtg.)
EA-79925	8	Washer - Plain (Clip Mtg.)
EA-77959	8	Nut 1/4-20 Wing (Clip Mtg.)
EA-118194	1	Bracket - Thermo Switch
626170	3	Screw (Brkt. Mtg.)
624469	3	Lock Washer (Brkt. Mtg.)
1130902	2	Expansion Valve
EA-112239-K 11589	2	Clamp - Valve (Valve Mtg.)
641155	4	Screw (Valve Mtg.)
EA-79481	4	Lock Washer (Valve Mtg.)
5442177	4	Thermo Bulb Clamp
613545	4	Screw - 10/32 Mt. Clamp
635160	4	Nut - 10/32 Mt. Clamp
EB-72258-K 13245	1	Bracket - Solenoid Valve
622420	2	Screw (Brkt. Mtg.)
624469	2	Lockwasher (Brkt. Mtg.)
EA-118242	1	Solenoid Valve
EA-118215	1	Elbow (Mt. in valve outlet)
EB-48961	1	Tube - Upper Exp. Valve
640757	1	Adapter (Mt. in valve inlet)
EA-118190	1	Tube - Conn. Sol. Valve (Mt. in adapter)
EA-118515	1	Tee (Mt. on tube)
EB-48962	1	Tube-Lower Exp. Valve(Mt. in Tee)

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PIECE OR DRAWING NO.	NO PER UNIT	NAME
EA-77344	1	Plug Assembly - 3/4
EA-79573	2	Screw - No. 10-32 (Solenoid Valve Mtg.)
624469	2	Lock Washer (Solenoid Valve Mtg.)
EA-79927	2	Nut - No. 10-32 (Solenoid Valve Mtg.)
EC-29785	1	Frame - Duct Rod
EA-117370	1	Retainer - Strip Duct
EA-117371	1	Rod - Duct Center
EA-118275	1	Duct
EC-29911	2	Blower Frame Assembly
ED-18035	2	Blower Housing Assembly
EB-71982	4	Support - Blower Housing
EA-77343	12	Screw 1/4-20 (Support to Hsg.)
624011	12	Nut 1/4-20 (Support to Hsg.)
629432	12	Lock Washer 1/4-20 (Support to Hsg.)
93650	8	Screw - 3/8-16 (Hsg. to Base
5413720	8	Lock Washer (Hsg. to Base)
93249	8	Washer - Plain (Hsg. to Base)
EB-71981	2	Lip-Blower
EA-118214	4	Clip - Blower Lip
EA-77343	10	Screw (Mt. Lip)
621186	10	Washer Plain (Mt. Lip)
629432	10	Lock Washer (Mt. Lip)
624011	10	Nut (Mt. Lip)
	1	Motor (See optional Sheet)
642664	4	Screw 1/2-13 (Mot. Mtg.)
EA-72592	4	Lockwasher (Mot. Mtg.)
A 7191	1	Motor (See optional Page)
EA-44788	2	Shaft Extension
5441800	4	Set Screw 3/8-24 Allen
EC-28511	2	Wheel Blower (9½ x 8)
EB-71980	2	Rail - (Frame Mtg.)
EB-23849	2	Pad (Rail Mtg.)
EA-28066	6	Bushing (Rail Mtg.)
EA-44778-K 13109	6	Washer - Plain (Rail Mtg.)
EA-71348	6	Screw 5/16-18 (Rail Mtg.)
60150	12	Nut
EA-79520	24	Screw - 1/4-20 (Mt. duct to blower)
EA-79407	24	Lock Washer (Mt. duct to blower)
EA-79489	24	Nut - 1/4-20 (Mt. duct to blower)
A-7182-K 15228	1	Motor - 1 H P., 60-72 Volt D.C. 1224-1275/1750 rpm - Sleeve Bearing Type

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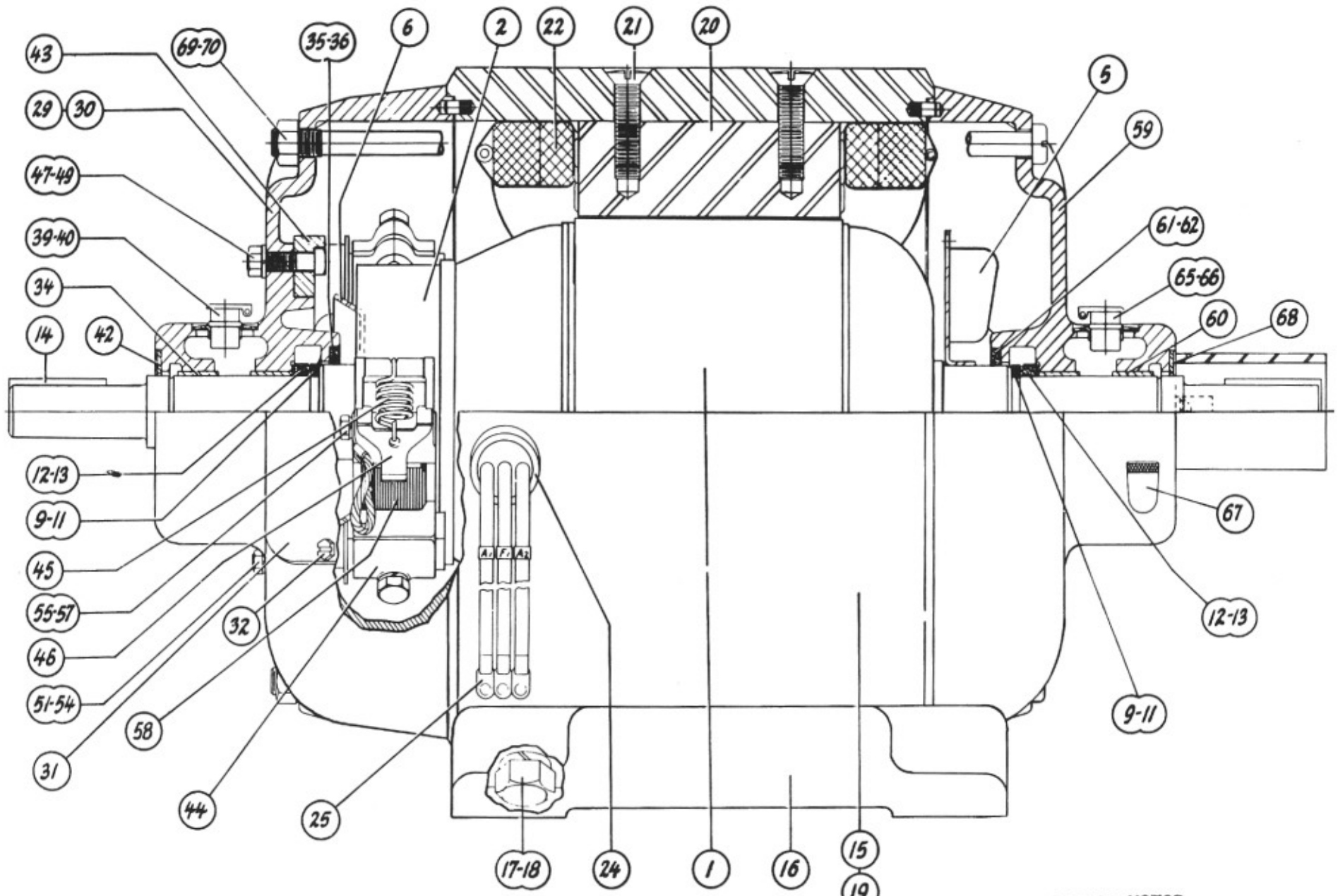


Figure 74

A-7182 MOTOR

SERVICEABLE PARTS FOR DELCO-FRIGIDAIRE MOTORS

Illus. No.	Description	No. Req'd.	A-7182
1	Armature & Fan Assem.	1	1069643
2	Communtator Assem.	1	5319231
3*	Insulating Tube	1	5396362
4*	Insulating Tube	2	039294
5	Fan	1	042243
6	Balance Disc	1	1072389
7*	Balance Weight	1	038194
8*	Balance Weight	1	038195
9	Thrust Washer (.010)	2	043145
10	Thrust Washer (.020)	1	037613
11	Thrust Washer (.030)	6	
12	Steel Collar, Oil Thrower	2	5305072
13	Cork Washer, Oil Thrower	2	5305071
14	Key, Shaft	1	048488
15	Base, Frame & Coil Assem.	1	1075217
16	Base	1	1064517
17	Screw, Base Mounting	4	120650
18	Lockwasher, Base Mounting	4	103323
19	Frame	1	5388797
20	Pole Piece	2	1058641
21	Screw, Pole Piece Mounting	4	1070426
22	Field Coil Assem.	1	5393800
23*	Grommet, Lead Insulator	2	
24	Nipple, Lead Conduit	1	5365448
25	Terminal Clip or Lug	3	042786
26*	Condenser Assem.	2	1880376
27*	Screw, Condenser Mounting	2	115402
28*	Lockwasher, Condenser Mounting	2	106497
29	End Frame & Brush Bracket Assem.	1	5388736
30	End Frame & Brg. Assem.	1	5388796
31	Cover Plate, End Frame	2	1079700
32	Screw, Cover Plate	4	5321076
33*	Gasket, Cover Plate	2	5331305
34	Bearing	1	1057141
35	Felt Seal	2	1067944
36	Washer, Seal Retainer	2	1068592
37*	Cup, Oil Thrower	1	
38*	Wicking	1	037654
39	Oiler, Upper	1	5319468
40	Expansion Plug, Oiler	1	5319469
41*	Oiler, Lower	1	5320447
42	Expansion Plug, Shaft Extension	1	1064955
43	Brush Bracket & Holder Assem.	1	5396356
44	Brush Holder	2	5312458
45	Brush Spring	2	049835
46	Brush Arm	2	5354004
47	Screw, Brush Bracket Locking	1	5364172
48	Nut, Brush Bracket Locking	1	120375
49	Lockwasher, Brush Bracket Locking	1	103319
50*	Insulating Tube, Brush Holder	2	5364170
51	Screw, Brush Bracket Mounting	1	037972
52	Nut, Brush Bracket Mounting	1	5337834
53	Washer, Brush Bracket Mounting	1	
54	Lockwasher, Brush Bracket Mounting	1	106497
55	Screw, Brush Lead Terminal	2	1065723
56	Washer, Brush Lead Terminal	2	
57	Lockwasher, Brush Lead Terminal	2	106497
58	Brush & Hook Assem.	2	5308736
59	End Frame & Brg. Assem. (Opp. Comm. End.)	1	5388794
60	Bearing	1	1057141
61	Felt Seal	1	1067944
62	Washer, Seal Retainer	1	1068592
63*	Cup, Oil Thrower	1	
64*	Wicking	1	037654
65	Oiler, Upper	1	5319468
66	Expansion Plug, Oiler	1	5319469
67	Oiler, Lower	1	5320447
68	Expansion Plug, Shaft Extension	1	1064955
69	Thru Bolt, End Frame Mounting	2	1069191
70	Nut, Thru Bolt	2	042454
71*	Name Plate	1	5365449
72*	Drive Screw, Name Plate	2	5327153

* - Not Illustrated

N.H.

WARNING: Do not attempt to work on the unit without removing fuse and moving the arm on the safety switch to the " OFF " position.

ADJUSTING COMPRESSOR BELT TENSION: Proper belt tension is essential if excessive replacements are to be avoided. Loose belts permit slipping and belt failure caused by overheating. Tight belts overload the belt fabric and cause abnormal side wear and are to be avoided as much as loose belts. To check a belt for proper tension, press down on one belt at a time halfway between the pulleys, using one finger. The belt should be depressed approximately 1". The belts can be adjusted by raising or lowering the lock nuts on the belt adjusting rod. Raising the lock nuts on the rod causes the motor to be pulled away from the compressor thereby tightening the belts. Lowering the lock nut moves the motor closer to the compressor and loosens the belts. *CAUTION:* With this belt-adjusting device it is very easy to overtighten the belts; hence check the belts while tightening. The lock nuts should be securely tightened when the service operation is finished.

REPLACING COMPRESSOR BELTS: When any of the belts become frayed or broken, it is important to replace all of the belts on the unit. This is necessary in order to keep all of the belts the same length. To replace belts, lower the lock nuts on the belt-adjusting rod until the motor can be moved far enough towards the compressor to easily install the new set of belts. The belts are stocked in matched sets and should be applied as such.

USE OF PRESSURE GAUGES: Both high pressure and low pressure gauges are installed on the condenser unit. The gauges are protected by means of one-way, shut off valves. These shut-off valves should be turned to the closed position whenever the maintenance man has completed his service operations. A 1/4" valve key is used to open the valves. Proper operating pressure for various conditions are shown in Table 1 on Figure 75.

The refrigeration cycle is the same as for sysgems with which the yard forces are familiar. Methods used in routine jobs, such as checking compressor oil or refrigerant levels, adding Freon to system, testing for leaks, etc. will apply to this system as well. The piping is somewhat different physically and there are not as many shut-off valves as in earlier systems, but proper use of the valves will still allow isolation of parts for repairs.

REPLACING COMPRESSOR SEAL:

1. Pump system down in same manner as described on Page 216 in A.C. Manual.
2. Remove belt guard.
3. Remove compressor belts, flywheel, shaft key, and eight screws holding seal to compressor body.
4. Remove old seal and clean shaft shoulder with lacquer thinner or carbon tetrachloride to remove all traces of oil and dirt.
5. Steel ring is inserted in composition gasket and the two pieces slipping over shaft with gasket against shoulder.
6. Leaded bronze seal ring is inserted in composition gasket and the two pieces are then placed in recessed portion of bellows. A slight film of Frigidaire oil is placed on face of leaded bronze seal ring, being careful that no oil gets on gasket. The assembly is then placed on shaft and eight cap screws re-applied.
7. Replace shaft key, flywheel, and compressor belts.
8. Open all valves, run system a few minutes and test for Freon leaks. If none are found, let unit stand idle a few minutes and again test for leaks.

NOTE: When changing a seal, do not use a new bronze ring with old steel ring or vice versa; always apply new gaskets. The bellows does not have to be changed unless it is ruptured.

EXCHANGING COMPRESSOR:

1. Close suction valve and run compressor to pump system down until slight vacuum shows on low side gauge. If the pressure rises above one pound when compressor stops, run system again at intervals until gauge holds at 0 to 1 lbs. pressure. *CAUTION:* Be sure to remove compressor motor fuse whenever work is being performed on compressor.

2. Remove belt guard.

3. Close discharge valve at compressor.

4. Disconnect suction line from compressor by removing the four bolts holding suction valve to body.

5. Disconnect discharge line from compressor in same manner as for suction line.

6. Remove four compressor mounting bolts.

7. Remove compressor from unit.

8. Apply the new compressor by reversing the above operations. Use new gaskets at the suction and discharge valve connections.

9. After all connections have been made, open suction and discharge valves slightly and test for Freon leaks.

10. Run system and check operation.

ADDING OIL: Preventing air from being drawn into the system at the time oil is being added is of great importance, and should be closely watched. Never allow the height of the oil in the container to go below 2" from the bottom. The charging operation should be stopped when this level is reached. With the charging line on the bottom of the container, it will be impossible for air to be drawn into the system.

The oil charging line should have a separate shut-off valve to control the oil flow from container to the compressor. See Figure 76.

Remove low pressure gauge; apply test Tee in its place; re-apply low pressure gauge, and connect charging line. Be sure the valve in the charging line is closed. Purge the charging line by opening gauge valve and charging line valve. Then place line in oil.

Close the liquid valve and operate unit until suction pressure is reduced to 20". If pressure tends to build up after stopping, repeat the operation.

Stop the unit, be sure the end of the charging line is at the bottom of the container, open charging line valve, and watch oil in container. As soon as proper amount has been added, close shut-off valve, open liquid valve, and remove charging line.

REMOVING OIL: 1. Carefully loosen (loosen only) the oil drain plug on the bottom of the compressor crankcase. Gas pressure within the crankcase will force oil out around the loosened plug.

2. Wipe the area around the plug carefully and test for leak.

CHECKING F-12 LEVEL: The units are equipped with one sight glass in the receiver. For normal operation, the liquid level should be approximately half-way up the sight glass while the system is in operation under full load conditions. If the system is operating on half cooling and the compressor unit is running at low speed, the liquid level should be approximately three-quarters up the end sight glass.

ADDING F-12: The piping is somewhat different physically and there are not as many shut-off valves as in earlier systems, but proper use of the valves will still allow isolation of parts; therefore, instructions as covered in the A.C. Manual will apply.

When transferring F-12 from the cylinder to the car with the drum in an upright position, start the unit; shortly after the unit starts, feel the drum. The liquid level can be determined by noting where the drum begins to cool; in other words, that part of the drum with liquid will very quickly begin to get cold. The upper part or gas-filled portion, of the drum will remain warm. In this way the starting liquid level in the drum can be determined and the amount drawn out can be observed.

Care should be taken when tightening the screws around receiver sight glass, as an unevenly applied pressure may break the glass. Tighten the screws a little at a time in rotation.

N.H.

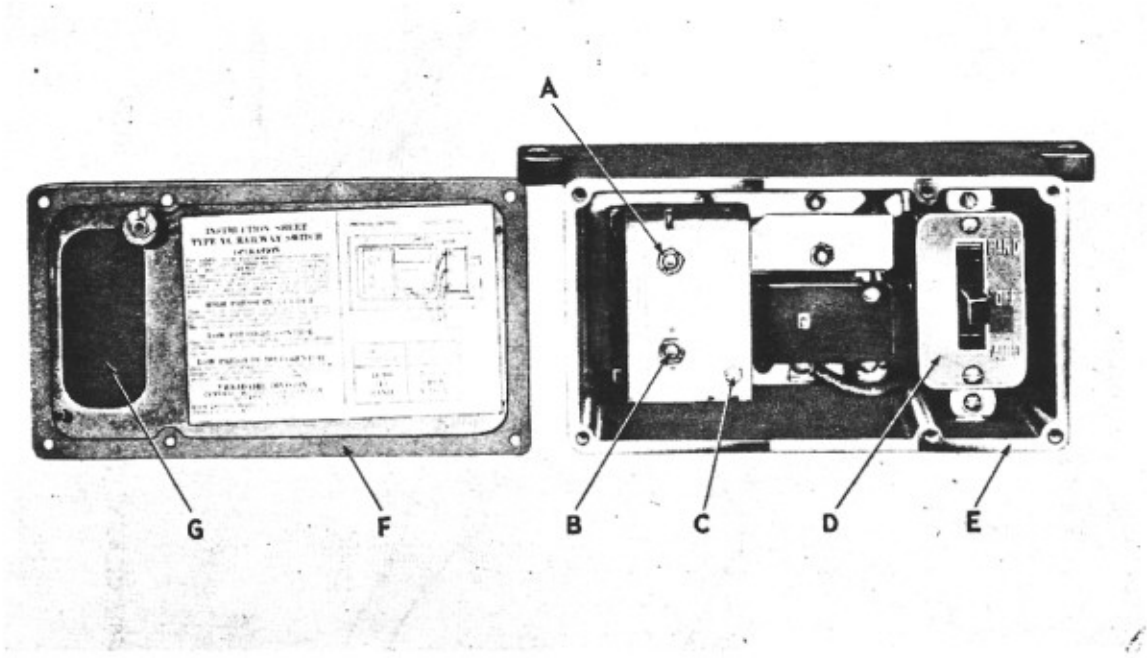


Figure 75

HIGH-LOW PRESSURE SWITCH

A. High Pressure Adjustment
B. Low Pressure Range Adj.
C. Low Pressure Differential Adjustment
D. Safety Switch
E. Cast Enclosure
F. Cover Plate
G. Savety Switch Access Door

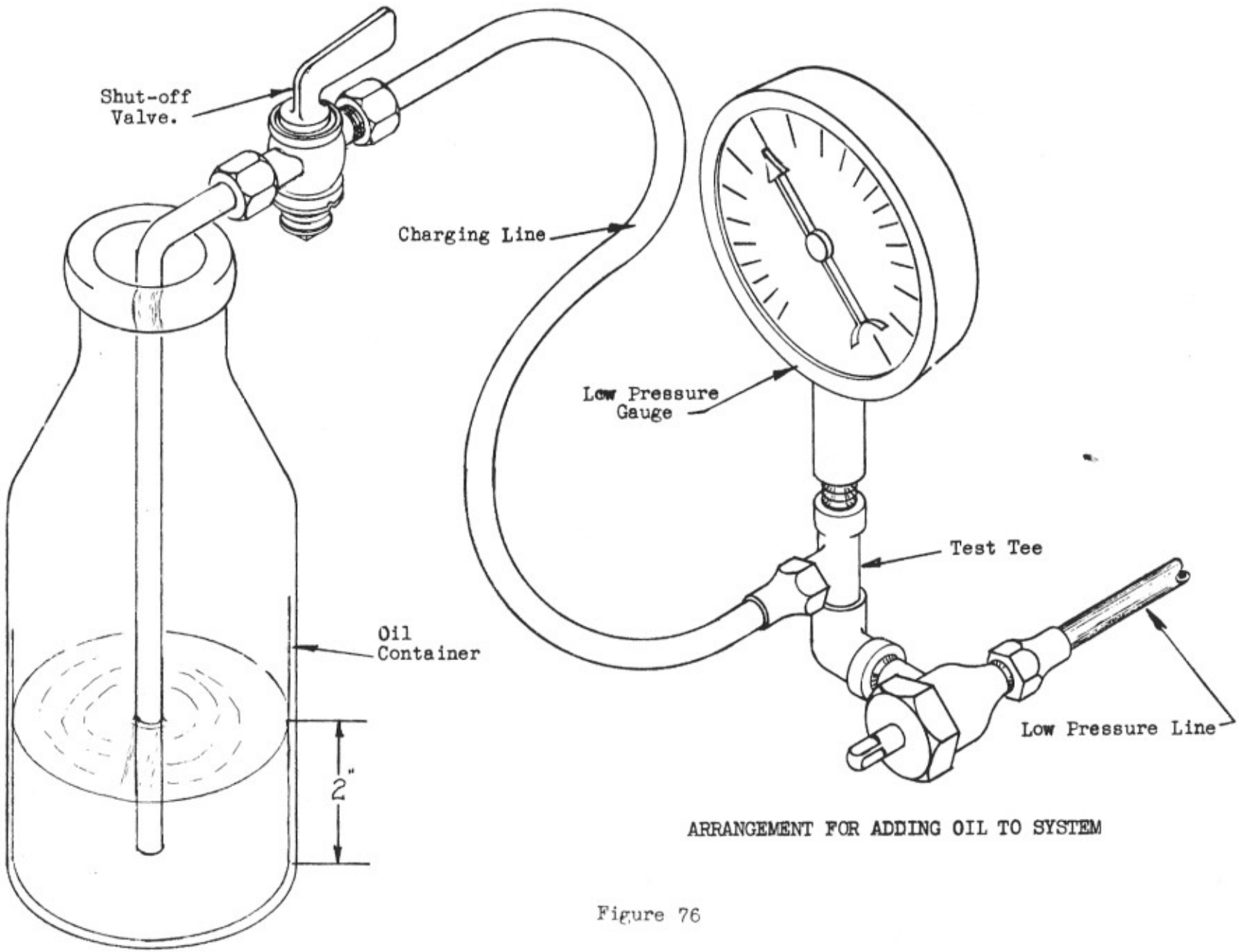
Set Switch as follows:

Low pressure setting	In 25#	Out 2#
High pressure setting	In 190#	Out 250#

TABLE 1

FULL SPEED OPERATION COMPRESSOR 560 R.P.M.

Outside Temperature	Car Temperature	Idle Head Pressure	Operating Head Pressure	Operating Suction Pressure	Condenser Spray
70°	74°	70	155	30	Off
80°	76°	84	165	42	On
90°	76°	100	165	42	On
100°	78°	117	165	42	On
		BATTERY OPERATION COMPRESSOR 410 R.P.M.			
100°	80°	117	160	52	On
		MODULATED SPEED COMPRESSOR 330 R.P.M.			
70°	74°		125	27	Off
80°	76°		135	28	Off
85°	76°		150	30	On



ARRANGEMENT FOR ADDING OIL TO SYSTEM

Figure 76

If leaks are detected around the compressor head screws tighten the screws uniformly, omitting none If this fails to stop the leak, new head gaskets as well as new copper gaskets under the four center screws should be installed. Pump the compressor down before making the change.

LEAKING SHUT OFF VALVES The liquid line shut-off valve may leak through the packing around the stem. Tighten the packing, using the packing nut wrench.

The suction line shut-off valve cannot be repaired in the yard. If it leaks, it should be replaced by a new one and the old one returned to the storeroom for further handling with the Frigidaire factory.

To remove the suction shut-off valve pump the system down. When installing a new valve, be sure to use new gaskets, taking care to remove any traces of the old gaskets that might stick to the compressor flange.

SERVICING THE EXPANSION VALVE If the valve requires adjustment it is to be removed from the car and tested and adjusted in accordance with instructions included on drawing YD-A-561 issued with A.C. Letter June 11 1947.

YL TYPE HIGH LOW PRESSURE SWITCH Is equipped with a manually operated switch for use when testing condenser or cooling operation. See photo of switch Figure 75. As indicated, switch has three positions "Auto" "Off" and "Hand". When in the Automatic position, the system is under control of the high low pressure switch. When placed in the Hand position the high-low switch is by-passed and system operated without pressure control. Switch must be placed in hand position by only competent craftsmen who should observe pressure gauges at the same time. Placing switch in "Off" position will render system inoperative.

RECEIVER The receiver is equipped with sight glass to simplify the checking of the refrigerant level. For normal operation of the system the liquid level should be approximately half way up the sight glass while the system is in operation under full load conditions. If system is operating on half of cooling unit and the compressor motor is running at low speed the liquid level should be approximately three quarters up the sight glass. The receiver is constructed of a seamless brass body with end bells hydrogen brazed It is approximately 7" x 26" in size. It has a capacity of 55 pounds of Freon 12 and is ample in size to allow for complete evacuation of the refrigerant lines without resorting to outside facilities for storage of refrigerant.

PUMPING DOWN OF SYSTEM Pumping down of the system is accomplished in the conventional manner of closing the liquid out valve at the receiver operate unit until 0 pounds pressure is indicated and held on the compound gauge Crack line valve until 1 pound pressure is shown on compound gauge and then close liquid line valve. At this time the complete refrigerant charge can be captured and held in the receiver by closing the liquid in line valve

REFRIGERANT CHARGE Full refrigerant charge for the system is 50 pounds. This in addition to the 5 pounds contained in the compressor when shipped as a holding charge. The refrigerant charge is introduced into the system through the low side using the procedure as outlined in the A.C. Manual.

OIL CHARGE Full oil charge for the system is 11 pints The oil level in the compressor crankcase may be observed through the sight glass on the side of the crankcase. The normal oil level, (condenser unit in operation and crankcase level) is between the upper and lower edges of the sight glass. Remedial measures should be taken only if the oil level varies beyond these limits. During the idle period the crankcase oil will absorb Freon 12 and increase in volume, therefore, the level of the oil should be checked only after sufficient operation to assure that the absorbed gas has been removed Only 300 viscosity Frigidaire oil is to be used.

SERVICING THE SPRAY NOZZLES The spray nozzles should be checked to be sure they are in operating condition as they contribute materially to the low power requirements of the new system. They can be checked by opening the by-pass valve located at the side of the water valve. Opening this by-pass valve puts the sprays in operation regardless of whether the compressor is operating or not. If, during maintenance work, it is found that the spray nozzles are not operating properly, it is recommended that they be removed for maintenance. The sprays are of the pressure atomizer type which directs a stream of water against an anvil, thus breaking it into a fine mist which should cover area of approximately 12" diameter. The air blast from the fans will then force this water onto the condenser fins for evaporative cooling. The spray nozzle opening is .033 and a piece of wire the proper size should be used to clean the orifice taking care not to bend the anvil out of place. This anvil must be centered so that the stream of water is directed against it; otherwise, there would be a fan shaped spray instead of a circular spray. Do not try to reach into the condenser to clean the spray nozzles with a nail or wire of improper size this would damage the special stainless steel orifice.

N.H.

SUMMARY: In order to check the complete system for proper operation, it is necessary to know the operating pressures. In the event the pressures vary more than five pounds from those shown in Table 1, it is recommended that the gauges be checked to determine whether they are operating properly or not. The values shown in Table 1 were taken from the hot-room test of a car.

A quick check of both gauges to observe the readings is made before placing the system in operation as follows: Take the temperature reading of the air surrounding the condenser and compare it with the gauge readings. Both gauges will usually read the same within a few pounds and the needles should point to a temperature as shown on the red figure scale corresponding with the thermometer reading previously taken; for example, the thermometer indicates an air temperature of 70°, the gauges should indicate a pressure of 70 pounds on the black scale and a temperature of 70° on the red scale. For a 90° air temperature, the gauges will indicate 100 pounds pressure on the black scale and 90° temperature on the red scale. In each case note that the red scale and thermometer reading were the same. Should the head pressure gauge indicate pressures more than 5 pounds higher than the value shown in the Idle Head Pressure column while the low pressure gauge compares with the thermometer, there is a possibility that there is air in the condenser. Should both gauges read much lower than the Idle Pressures, then there is a possibility of the system being short of F-12. After Checking the Idle Pressures, Place the system in operation and, after approximately fifteen minutes operation, the pressure should be close to those shown under the Operating Head and Suction Pressure columns. *CAUTION* Be sure that the thermometer readings are taken at the condenser location; also note that there is a difference between full speed and modulated speed pressures.

NOTES

N.H.

COMPRESSOR MOTOR CONTROL PANELS

All cars are equipped with Type QGY Frigidaire Motor Control Panels designed for 64 volts. A typical panel (Type Q) is shown in Figures 77-78. The various parts are as follows:

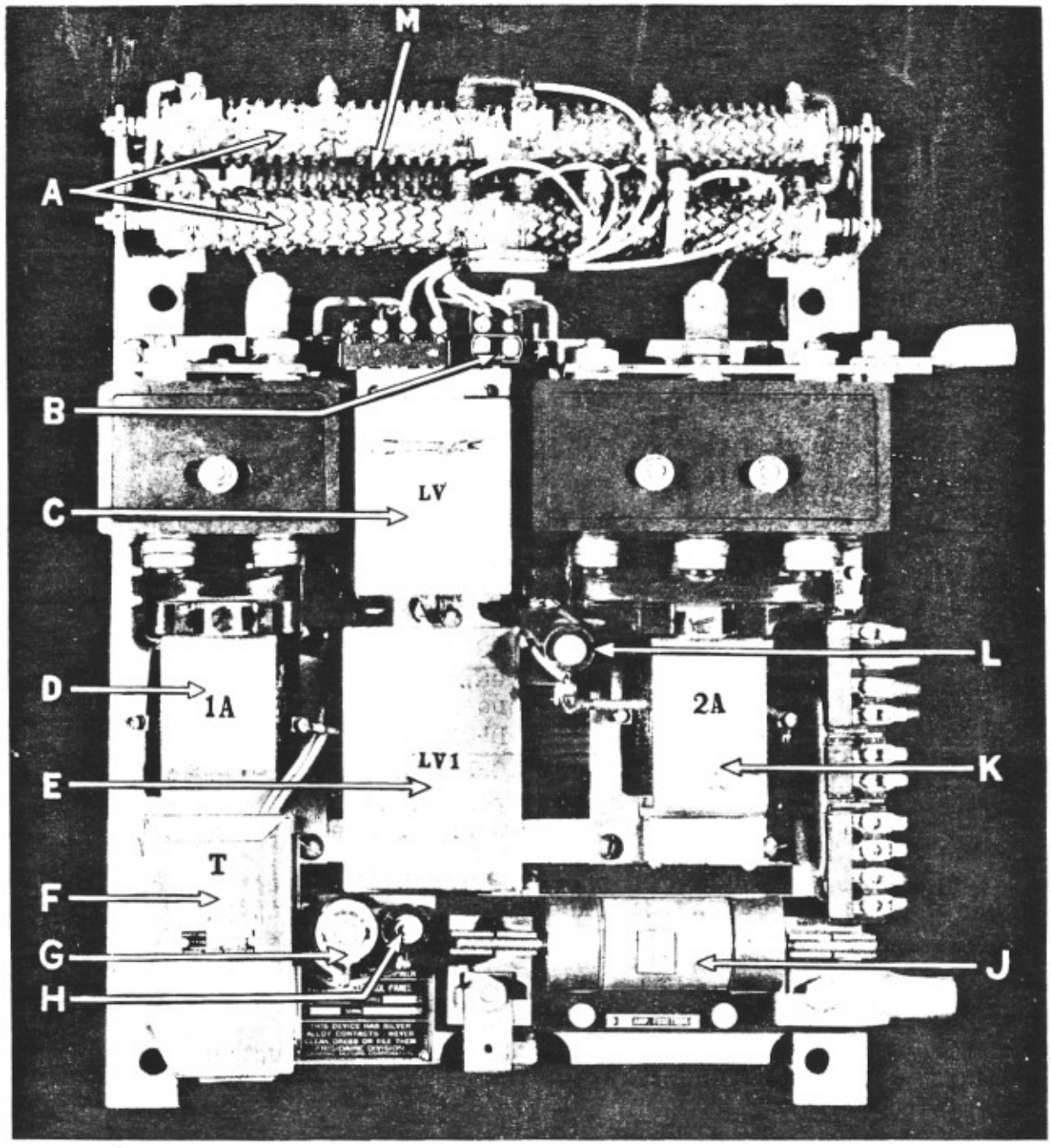
1. The four external field resistors for the compressor are mounted across the top portion of the panel.
2. Directly behind the field resistors is the wire-wound compressor motor armature resistor.
3. No. 1A is the solenoid type accelerating contactor. See Figure 79. These panels have a single accelerating contactor instead of two as on earlier panels, because of improved compressor motor design.
4. No. 2A is the solenoid type line contactor.
5. L V is the low voltage pilot relay with sealed cover, see Figure 80.
6. Directly above the L V relay is the field resistor terminal block with the lead and Edison battery adjustment line.
7. LV-1 is the low voltage power relay with cover, See Figure 80.
8. T is the pneumatic timer with seal cover.
9. Directly below 2A is the compressor motor fuse.

All terminals are clearly marked for easy reference. The various elements are assembled on a steel frame. The frame has four mounting holes and is provided with welded bushings to space the panel from the mounting surface. All contactors and relays are fastened to the frame by individual back plates and can be removed from the front. All wiring is front connected, eliminating the necessity of removing the control panel to replace control elements.

TYPE QGY CONTROL PANEL, STYLE EB-81428 K-15229

1A	Contactor complete with Timer	X-105321-K 14090
	Contactor only	X-105322
	Coil	RH-4717
	Stationary Contact Block	X-48389-K 14986
	Movable Contact	X-42365-K 14985
	Spring	B-11133
	Guard	B-8318
	Cup	B-8319
	Arc Hood Cover	F-11089
	Timer Assembly with Aux. Switch	X-105313
	Timer Only	X-105312
	Auxiliary Switch	X-93161
	Spring	B-14857
2A	Contactor Complete	X-105319
	Coil	RH-4717
	Stationary Contact Block	X-48389-K 14986
	Movable Contact	X-42365-K 14985
	Spring	B-11133
	Guard	B-8318
	Cup	B-8319
	Arc Hood Cover	F-11089
LV1	Relay Complete	X-65624
	Coil	RY-1909
	Cross Bar	X-43576
	Movable Contacts	X-68997
	LH Stationary Contact	X-48680-K 15193
	RH Stationary Contact	X-48681-K 15194
	Spring	B 10802
LV	Relay Complete	X-63899
	Voltage Coil	R-4310
	Voltage & Current Coil	R-4311
	Contact	X-63803
	Contact Lever	X-48584
Resistors		
	Resistor No. 1	X-106054
	Resistor No. 2	X-106060
	Resistor No. 3	X-106066
	Field Resistor Lower RH	X-106084
	Field Resistor Lower LH	X-106072
	Field Resistor Upper RH	X-106078
	External Armature Resistor Complete	X-106038
	Resistor Only	G-5811

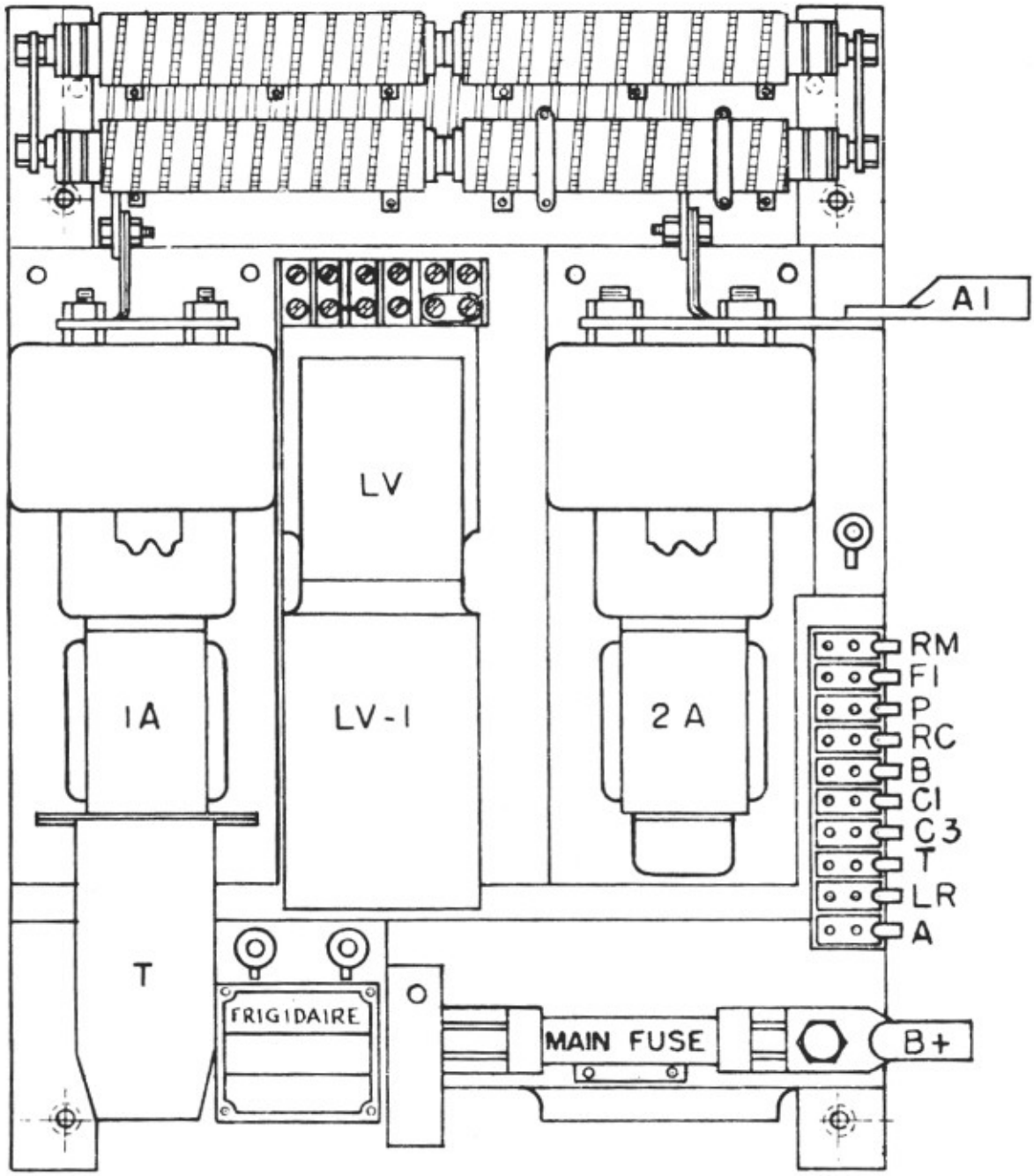
N.H.



QGY PANEL

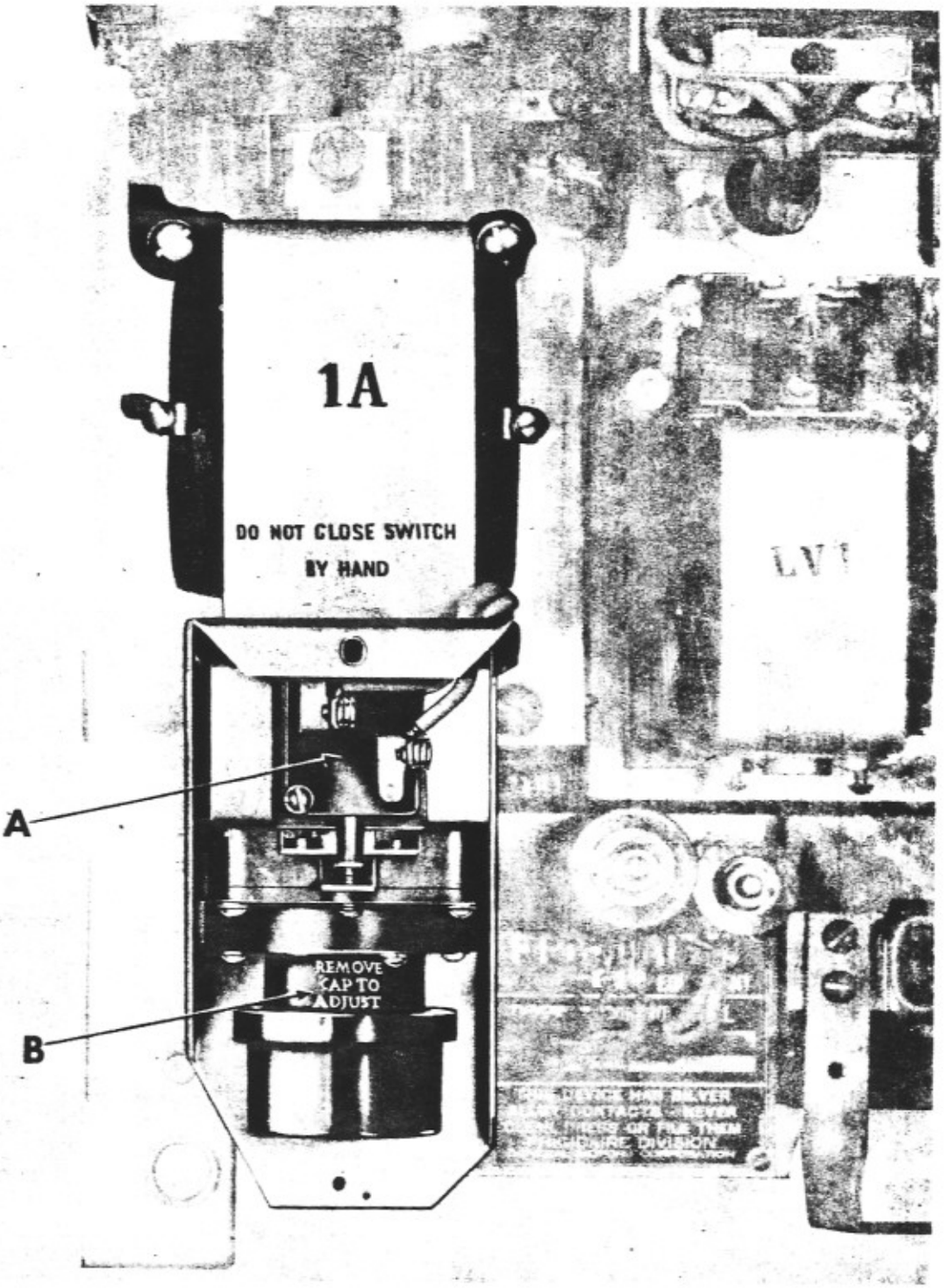
a.	External Field Resistors	g.	Resistor No. 2
b.	Edison Link	h.	Resistor No. 1
c.	Low Voltage Pilot Relay	j.	Compressor Motor Fuse
d.	Accelerating Contactor	k.	Line Contactor
e.	Low Voltage Power Relay	i.	Resistor No. 3
f.	Pneumatic Timer	m.	Armature Resistor

Figure 77



FRIGIDAIRE TYPE Q PANEL

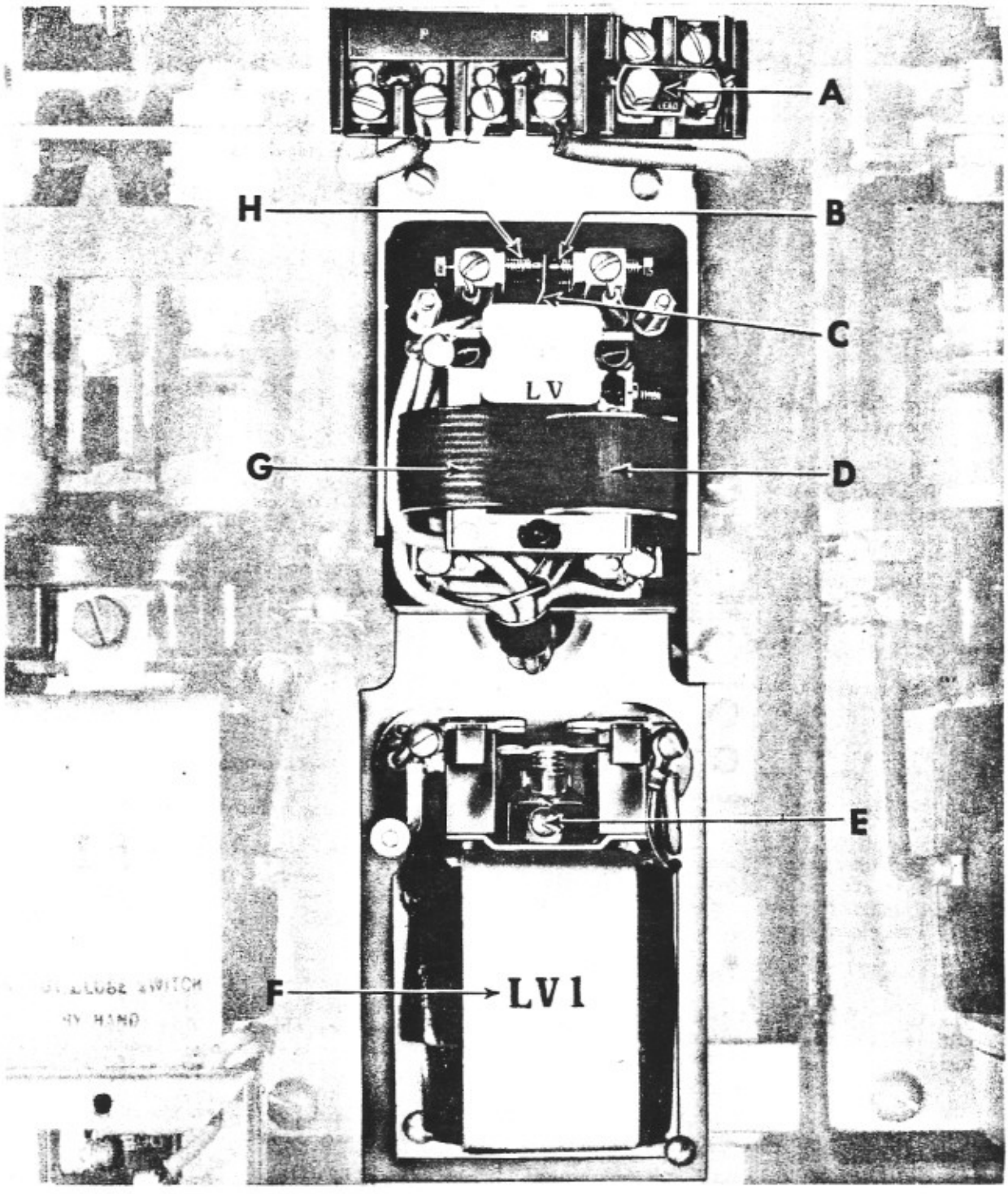
Figure 78



Pneumatic Timer "T" (Close up)

a. Timer Switch b. Timer Mechanism

Figure 79



"LV" and "LVI" Relay (close up)

a. Lead and Edison Battery Adjustment Link
b. Pick-up Contact
c. Moving Contact
d. 1/2 Voltage Coil
e. Moving Contact Assembly Retaining Screw
f. Low Voltage Power Relay
g. Current Coil Wound Over 1/2 Voltage Coil
h. Drop-out Contact

Figure 80

EC-17676 PARTS LIST
TYPE CFR RESISTOR

AMOUNT PER UNIT	DESCRIPTION
1	Resistor - W. L. Type 5" WX-100 Vitrohm 5%, with Type 229 Terminals and Bareside for Adjustment.
1	Sliding Contact Band - W. L. Dwg. 11216.2-9 (Specify Tube Type WX.
1	Mounting - W. L. Type 802 (Tube Length 5").

OPERATION OF AIR CONDITIONING CONTROL SYSTEM
(Figure 81)

1. Turn blower fan switch to the "Normal" position. This places the blower motors in operation.

2. (The LV relay circuit is closed through the normally open interlock contacts of the R.C. relay when the axle generator is operating.) Closing the LV relay energizes the operating coil of the No. 1A accelerating contactor and the compressor motor starts, armature in series with the armature resistor. Lifting the No. 1A solenoid plunger actuates the pneumatic timer T, and 2.5 to 3 seconds later the timer contacts close. Line contactor No. 2A is energized and is held closed by the No. 2A auxiliary contacts in series with the No. 3 economizer resistor. Auxiliary contact No. 2A in series with coil No. 12 opens and the accelerating contactor and timer return to their original positions.

3. The condenser blower motor and the condenser pump motor are connected in parallel with the compressor motor armature.

4. High or low speed operation of the compressor motor is obtained by a separate type "P" relay, controlled thermostatically. The normally open contacts on this relay close to short-circuit the field resistors during the modulated operation (low speed). The Freon solenoid valve is controlled by cooling modulating relay.

5. The economizer connection is provided for conserving the battery charge when the axle generator is not operating. The compressor motor speed is reduced purposely by shorting out a portion of the external field resistor through normally closed interlock contacts on the R.C. relay of generator control panel.

TESTING LOW VOLTAGE RELAY

The low voltage pilot relay is constructed on the design of a sturdy voltmeter. See Figure 80, 82. It has two elecgric magnet poles formed by a horse-shoe shaped laminated iron core and a laminated rotor. The rotor is spring loaded so as to hold its pole ends away from the field poles.

As there is no method of reversing the polarity of the field poles when the coils are energized, the rotor tends to pull into the magnetic field and remain there.

Attached to the rotor shaft is a contact arm, similar to a voltmeter needle which floats between two stationary adjustable contacts when the battery voltage is between the cut-in and cut-out valves. The right contact completes the circuit to the low voltage control relay (LVI), the left contact shorts-out the circuit to the coil of the low voltage control relay (LVI) through resistor No. 1, causing the LVI to drop out.

There are three coils wound on the low voltage pilot relay laminated core; two are voltage coils and are connected in series; the third is a current coil wound over the left voltage coil and connected across a calibrated portion of the compressor motor buss bar conductor (between the left compressor motor fuse clip and the rear contacts of the 1A and 2A contactors). There are two connection points on the buss bar, marked No. 1 and No. 2. The current coil lead is connected to No. 1 when lead batteries are used and to No. 2 for Edison Batteries.

N.H.

The function of the current coil is to compensate for the voltage drop during the compressor motor starting cycle. It is energized by the flow of current through the compressor motor circuit. The voltage across the current coil varies according to the current drawn by the compressor motor, and is at its peak at the closing of the compressor motor circuit.

The direction of the current flow through the current winding must be the same as the voltage coil over which it is wound otherwise instead of strengthening the field of the pilot relay and holding it in, it will neutralize the field and relay will drop out by moving the rotor contact to the left and shorting out the low voltage relay (LVI) coil.

In maintaining good operation of the low voltage pilot relay, it is imperative that the contacts of the low voltage control relay (LVI) be kept in a good state of cleanliness as one set of these contacts carries the 3 to 5 volts to the coil of the low voltage pilot relay. Any dirt on the contacts will cause the rotor of the low voltage pilot relay to pull into the short-circuiting position. The following steps are to be taken when adjusting the relays:

1. Turn cooling off.
2. Remove compressor motor fuse.
3. Disconnect "C1" and "B" terminals on compressor motor control panel.
4. Remove contact block on plunger of low voltage control (LVI) relay; clean and reapply.
5. Connect "B" terminal on motor panel
6. Apply ammeter shunt of 500-amperes capacity in compressor motor fuse clips.
7. Connect No. 2 lead from low voltage relay tester to "C1" terminal on motor control panel.
8. Connect No. 3 lead from low voltage relay tester to "C1" lead removed from motor control panel.
9. Connect No. 4 lead from low voltage relay tester to "B" terminal on motor control panel.
10. Turn dial on low voltage tester counter clockwise to full stop.
11. Turn on cooling. The LV, LVI, Timer, 1A and 2A relays will close and compressor will run.
12. Remove wire from PC terminal on panel. This puts the compressor motor external field resistors in the circuit and operates the motor at full speed. The motor armature current must be about 140 amperes to provide a good field in the current coil on the low voltage pilot relay which is necessary when setting the dropout voltage.
13. Turn the dial on the low voltage tester clockwise and observe at what voltage the low voltage pilot relay shorts out the LVI relay coil. Adjust to 54 volts. Turn adjustment on left stationary contact clockwise to raise drop-out voltage, and counter-clockwise to lower drop-out voltage.
14. Short-out reset button circuit at terminals "C3" and "B" on motor control panel (with jumper) while turning dial on low voltage tester counter-clockwise, and observe at what voltage the low voltage pilot relay completes the circuit to the LVI relay coil. Adjust to 58 volts. Turn adjustment on right stationary contact clockwise to lower cut-in voltage and counter-clockwise to raise cut-in voltage. Be sure to remove jumper wire on "C3" and "B" after the adjustment is made.
15. Disconnect tester leads, reconnect panel leads, apply relay covers, remove ammeter shunt, apply compressor motor fuse, and remove cardboard from between contacts of reverse current pilot relay and connect wire to PC terminal.

N.H.

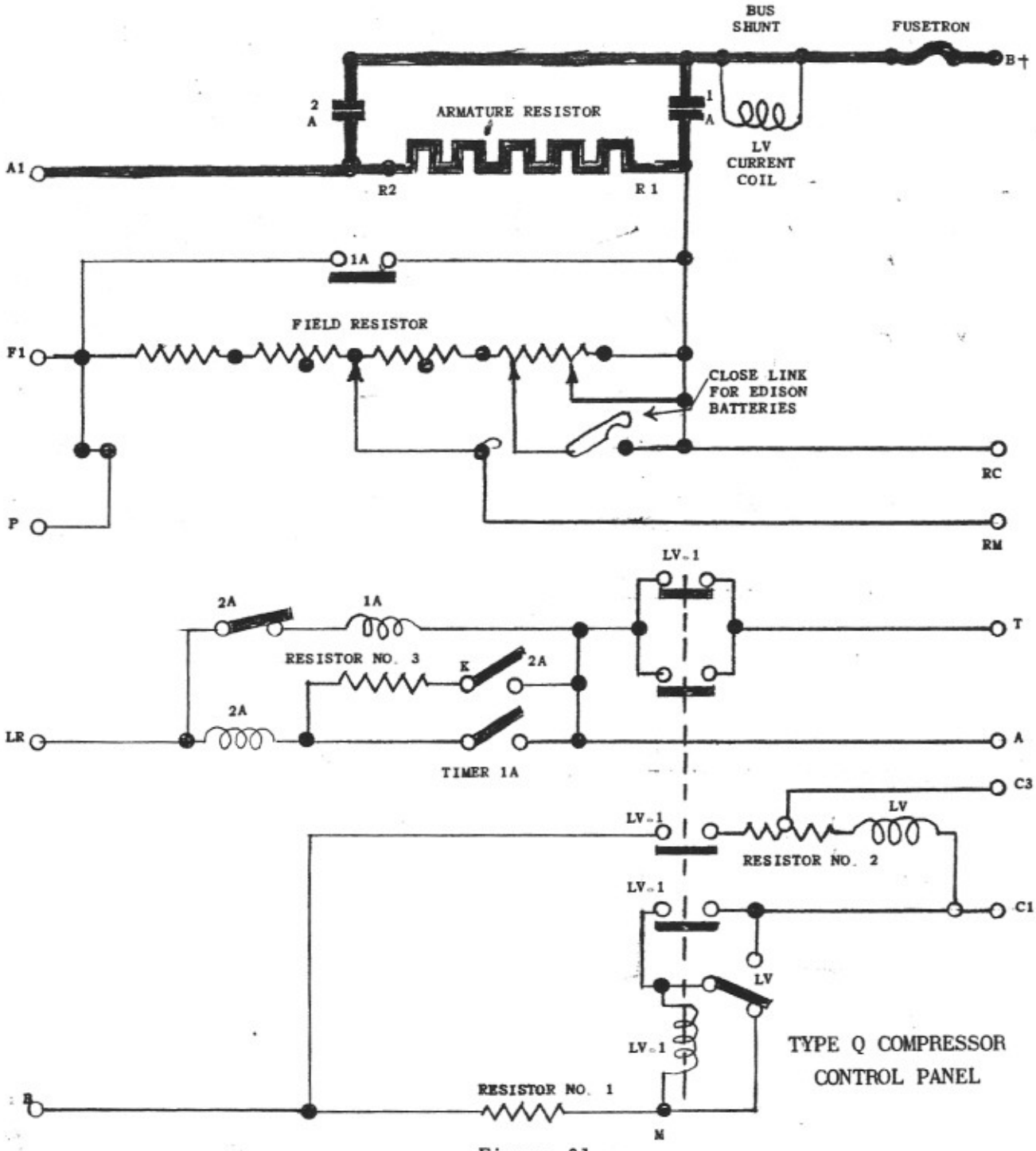


Figure 81.

RESISTANCE VALUES

NAME	PART NO.	RESISTANCE AT 25° C.
LV RELAY POTENTIAL COIL	R-4310	35.0
LV RELAY POT. & CURR. COILS	R-4311	23.0 POT. 0.016 CURR.
LV-1 RELAY COIL	RY-1909	145.0
1A CONTACTOR COIL	RH-4717	28.8
2A CONTACTOR COIL	RH-4717	28.8
RESISTOR NO. 1	X-106054	150.0
RESISTOR NO. 2	X-106060	620 TAPPED AT 540
RESISTOR NO. 3	X-106066	120.0

NOTES