Installation and Start-Up Instructions

Part Numbers: 30GT-911---074, 30GT-911---075, 30GT-911---076, 30GT-911---077, 30GT-911---078, 30GT-911---079, 30GT-911---080, 30GT-911---081, 30GT-911---082

CONTENTS

SAFETY CONSIDERATIONS

Installation, start-up, and servicing of this equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service technicians should install, start up, and service this equipment.

When working on this equipment, observe precautions in the literature and on tags, stickers, and labels attached to the equipment and any other safety precautions that may apply.

⚠ WARNING

Open all remote disconnects before servicing this equipment. Electrical shock could result in personal injury.

INTRODUCTION

This book contains instructions for the installation and start-up of the Motormaster V (MMV) control on models 09DK (100%, 50%/50% and 67%/30% split only), 30GTN, GTR,GUN,GUR040-420, 38AH044-134, and 38AKS028-044. The 30GTN,GTR,GUN,GUR230-420 units are shipped as 2 separate modules. See Table 1 for details of modular units.

Two Motormaster Accessory Packages are required for modular units.

Table 1 — 30GTN,GTR,GUN,GUR080-210 and Associated Modular Units

UNIT 30GTN,GTR,GUN,GUR	ASSOCIATED UNIT MODULES 30GTN,GTR,GUN,GUR
080	230B
090	245B
100	255B, 270B
110	290B, 315B
130	None
150	230A-255A
170	270A, 330A/B, 360B (50 Hz)
190	290A, 360A, 360B (60 Hz), 390B
210	315A, 390A, 420A/B

The Motormaster V control is a motor speed control device that adjusts condenser fan motor speed in response to declining liquid refrigerant pressure. A properly applied Motormaster V control extends the operating range of air-conditioning systems and permits operation at lower outdoor ambient temperatures.

On 09DK units, the Motormaster V control is used in conjunction with the standard fan cycling controls. See Table 2A or 2B for the ambient temperatures at which the 09DK units operate without modification.

Motormaster V control cannot be installed with the high-static fan option.

Table 2A — Minimum Outdoor-Air Operating Temperature — 09DK (English)

UNIT 09DK	HEAD PRESSURE CONTROL	TD (F)	COMPRESSOR CAPACITY (%)*			
			100	75	50	25
			Minimum Outdoor-Air Temperature (F)			
020,024, 028	FCPSs (1 Fan)†	30	29	34	38	51
		25	38	40	42	53
		20	47	47	46	56
034,044	FCPSs (2 Fans)†	30	12	19	22	43
		25	22	25	29	47
		30	31	31	36	51
054,064	FCPSs (2 Fans)†	30	29	34	38	51
		25	38	40	42	53
		20	47	47	46	56
074-094	FCPSs (2 Fans)† ATSs (2 Fans)	30	12	19	22	43
		25	22	25	29	47
		20	31	31	36	51

NOTE: See Legend and Notes on page 2.

Table 2B — Minimum Outdoor-Air Operating Temperature — 09DK (SI)

UNIT 09DK	HEAD PRESSURE CONTROL	TD (C)	COMPRESSOR CAPACITY (%)*			
			100	75	50	25
			Minimum Outdoor-Air Temperature (C)			
020,024, 028	FCPSs (1 Fan)†	16.7	–2	1	3	11
		13.9	3	4	6	12
		11.1	8	8	8	13
034,044	FCPSs (2 Fans)†	16.7	–11	–7	–6	6
		13.9	–6	–4	–2	8
		11.1	–1	–1	2	11
054,064	FCPSs (2 Fans)†	16.7	–2	1	3	11
		13.9	3	4	6	12
		11.1	8	8	8	13
074-094	FCPSs (2 Fans)† ATSs (2 Fans)	16.7	–11	–7	–6	6
		13.9	–6	–4	–2	8
		11.1	–1	–1	2	11

LEGEND
ATS — Air Temperature Switch
FCPS — Fan Cycling Pressure Switch
TD — Temperature Difference (Saturated Condensing Temperature – Entering-Air Temperature)

*Interpolation permitted.
†Additional FCPS required for 66%/33%.

NOTES:
1. Fans on the 09DK020-094 units are controlled by ATSs and FCPSs.
2. Minimum outdoor temperatures are determined for indoor and outdoor unit combinations of the same capacity.

Table 3 shows the ambient temperature at which 30GTN, GTR,GUN,GUR, 38AH and 38AKS units operate without modification.

Table 3 — Minimum Outdoor-Air Operating Temperature — 30GTN,GTR,GUN,GUR and 38AH,AKS

UNIT/SIZE		TEMPERATURE	
		F	C
30GTN,GTR,GUN,GUR040-210		0	–18.0
30GTN,GTR,GUN,GUR Modules 230-420		0	–18.0
38AKS	028	31	–0.6
	034	30	–1.1
	044	25	–3.9
38AH	024	53	11.7
	028	50	10.0
	034	49	9.4
38AH*	044	50	10.0
	054	48	8.0
	064	39	3.9
	074	31	–0.5
	084	20	–6.7
	094	25	–3.9
	104	14	–10.0
	124	38	3.3
	134	38	3.3

*Data based on standard units operating at 100% of system capacity. Temperatures shown are for circuit A or B, whichever is higher.

To operate these units below the ambient temperatures listed, Motormaster® V controls (Fig. 1) must be added. Field-supplied and installed wind baffles are also required for all units. The Motormaster V control permits operation of the unit to an ambient temperature of –20 F (–29 C). The control regulates the speed of 3-phase fan motors that are compatible with the control. These motors are factory installed on 60 Hz models, but must be field installed on 50 Hz models.

See Tables 4 and 5 for the Motormaster V control accessory package usage and contents. Table 6 shows applicable voltages and motors. Motor or fan blade replacement is not necessary on most units since the control is compatible with the factory-installed fan motors. Only field wiring control is required.

NOTE: Two Motormaster V controls must be added for each unit (one for each circuit) with the following exceptions:
- 30GTN,GTR,GUN,GUR230-420 modular units require 4 controls (2 per modular unit)
- 38AH124,134 modular units require 4 controls (two per modular unit)
- 38AH024-034, 38AKS028-044 and 09DK020-044 require only one controller per unit
- 09DK020-044 also requires a field-supplied, 20 x 20 x 8 NEMA 3R enclosure.

⚠ WARNING

To avoid the possibility of electrical shock, open all disconnects before installing or servicing this accessory.

Pre-Installation — Inspect the contents of this accessory package before installing. File a claim with the shipper if you find shipping damage or if a part is missing.

Table 4 — Motormaster V Control Package Usage

UNIT	SIZE	VOLTAGE	PACKAGE NO.
30GTN,GTR, GUN,GUR	040-110	208/230	30GT-911---080
		380, 400, 460	30GT-911---081
		575	30GT-911---082
	130-210, 230A-315A	208/230	30GT-911---074
		380, 400, 460	30GT-911---075
		575	30GT-911---076
	230B-315B	208/230	30GT-911---080
		380, 400, 460	30GT-911---081
		575	30GT-911---082
	330A/B-420A/B*	208/230	30GT-911---074
		380, 400, 460	30GT-911---075
		575	30GT-911---076
38AH	024-034	208/230	30GT-911---077
		380, 400, 460	30GT-911---078
		575	30GT-911---079
	044-134	208/230	30GT-911---080
		380, 400, 460	30GT-911---081
		575	30GT-911---082
38AKS	028-044	208/230	30GT-911---077
		380, 400, 460	30GT-911---078
		575	30GT-911---079
09DK	020-044	208/230	30GT-911---077
		380, 400, 460	30GT-911---078
		575	30GT-911---079
	054-094	208/230	30GT-911---080
		380, 400, 460	30GT-911---081
		575	30GT-911---082

*Two accessory packages required for modular units.

Table 5 — Motormaster® V Control Package Contents

ITEM	MOTORMASTER V CONTROL PACKAGE NUMBER								
	30GT-911---074	30GT-911---075	30GT-911---076	30GT-911---077	30GT-911---078	30GT-911---079	30GT-911---080	30GT-911---081	30GT-911---082
	Item Description (Qty)								
Controller, 230 V, 2 HP	—	—	—	HR46TN001 (1)	—	—	HR46TN001 (2)	—	—
Controller, 460 V, 2 HP	—	—	—	—	HR46TN002 (1)	—	—	HR46TN002 (2)	—
Controller, 575 V, 2 HP	—	—	—	—	—	HR46TN003 (1)	—	—	HR46TN003 (2)
Controller, 230 V, 5 HP	HR46TN004 (2)	—	—	—	—	—	—	—	—
Controller, 460 V, 5 HP	—	HR46TN005 (2)	—	—	—	—	—	—	—
Controller, 575 V, 5 HP	—	—	HR46TN006 (2)	—	—	—	—	—	—
Fuse, 15 A, Class CC	—	—	HY10KB151 (6)	—	HY10LF014 (3)	HY10LF014 (3)	—	HY10LF014 (6)	HY10LF014 (6)
Fuse, 20 A, Class CC	—	HY10KB200 (6)	—	HY10LF014 (3)	—	—	HY10LF014 (6)	—	—
Fuse, 30 A, Class CC	HY10KB300 (6)	—	—	—	—	—	—	—	—
Wires	14 AWG, 8 in. long wires (6)	16 AWG, 8 in. long wires (6)		—	—	—	16 AWG, 38 in. long wires (6)		
	14 AWG, 6 in. long wires (6)	16 AWG, 6 in. long wires (6)		—	—	—	—		
	14 AWG, 10 in. long wires (6)	16 AWG, 10 in. long wires (6)		16 AWG,10 in. long wires (3)			16 AWG, 40 in. long wires (6)		
	16 AWG, 6 in. jumper wires (2)								
Wire Ties	Wire Ties (7)								
Wire Connectors	Wire Connectors (6)			—			—		
Connector	—			HW60EA001 (1)			HW60EA001 (1)		
Varnish Cloth	—			48DA510141 (1)			48DA510141 (1)		
1/4 in. Flare Tee	—			EC36SZ061 (1)			EC36SZ061 (2)		
Transducer	HK05YZ007 (2)			HK05YZ007 (1)			HK05YZ007 (2)		
Transducer Cable	30GT415784 (2)			30GT415784 (1)			30GT415784 (2)		
Fuse Block	HY11UT035 (2)			HY11UT035 (1)			HY11UT035 (2)		
10AB-16 x 1/2 in. Screw	AL78AG216 (4)			AL78AG216 (2)			AL78AG216 (4)		
8 x 3/4 in. Screw	AL56AU168 (12)			AL56AU168 (6)			AL56AU168 (12)		
Relay	HN61KK035 (2)			HN61KK035 (1)			HN61KK035 (2)		
10 x 1/2 in. Screw	(4)			(2)			(4)		

AWG — American Wire Gage

NOTE: The 09DK020 also requires a field-supplied, 20 x 20 x 8 NEMA 3R enclosure. Hoffman A-20RZ08HCLO with A-20P20 back panel.

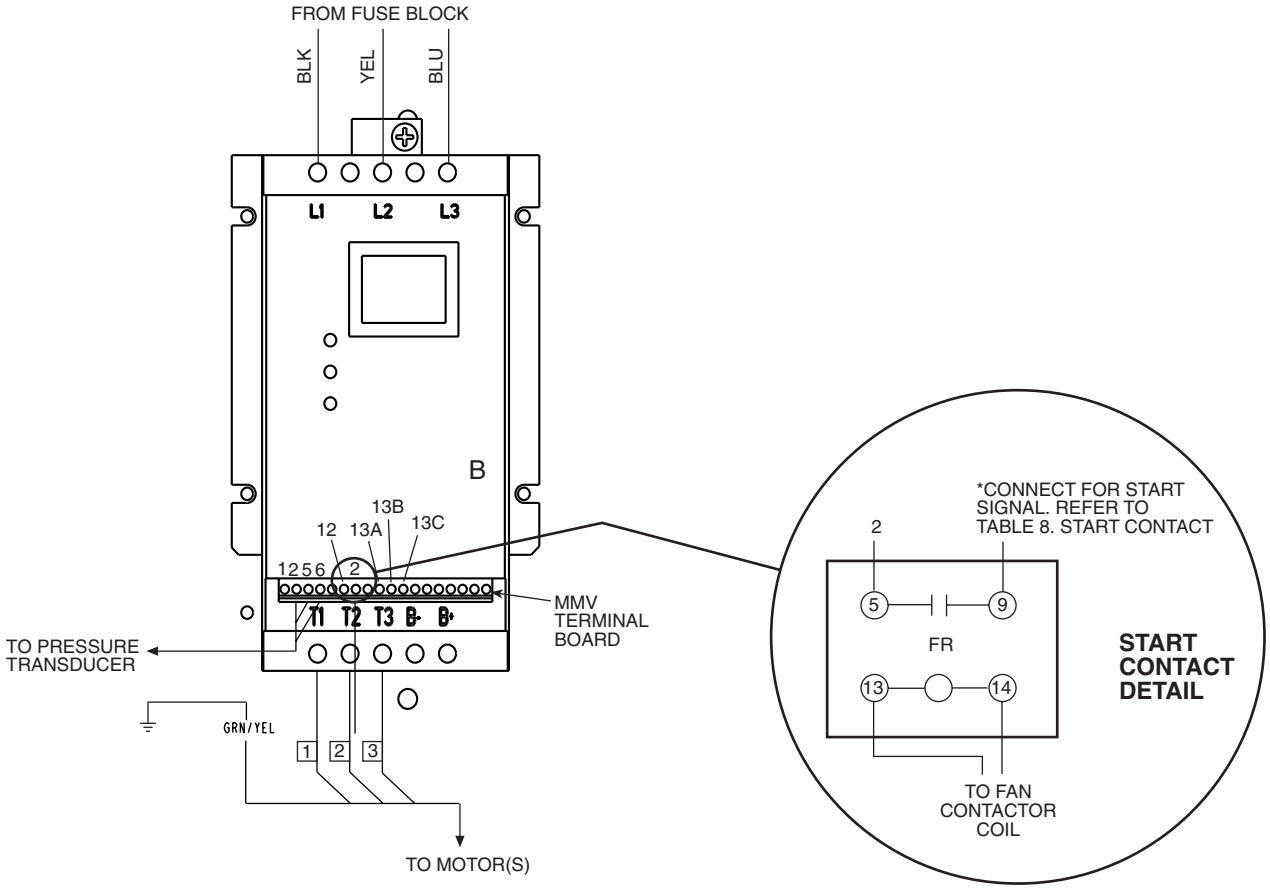


Fig. 1 — Motormaster V Control

Table 6 — Applicable Voltages and Motors

UNIT NAMEPLATE VOLTAGE*	COMPATIBLE MOTORS
208-230/3/60	HD52AK654, HD52AK002
380-3-60	HD52GE381, HD52GE382
460-3-60, 380/415-3-50	HD52AK654, HD52AK002
380/415-3-50 (Low noise fans)	HD56AK653
575-3-60	HD52GE576, HD52GE577

*Not all voltages are available for all units. See base unit installation instructions for available voltages.

APPLICATION NOTES

For the 09DK units, the information in this book is applicable when either 100%, 50/50% or 67%/33% condenser coil circuiting is used.

There are no minimum capacity step (%) tables with the 09DK condensers, because capacity steps are dependent on the compressor-bearing unit. Refer to base unit product data literature for further details.

The 09DK020-044 units require a field-supplied, 20 x 20 x 8 NEMA 3R enclosure.

Corrosion-inhibited antifreeze solution for 30GTN,GTR, GUN,GUR chiller use must be added to the cooler fluid loop to protect it to temperatures 15° F (9° C) below the lowest expected outdoor temperature.

Widely varying cooling loads are often encountered during low ambient temperature operation of the 30GTN,GTR, GUN, GUR chiller. To minimize compressor cycling as a result of these conditions, provide sufficient volume in the chiller fluid loop, adding a properly baffled storage tank to the system if necessary. At least 6 gal per ton (6.5 L per kW) of refrigeration is recommended for a moderate system load.

⚠ CAUTION

Operation at low ambient temperature is not recommended if the minimum load on the 30GTN,GTR,GUN,GUR chiller or the 38AH condensing unit is below its minimum step of capacity. Unstable operation may result. See Table 7A, 7B, 7C, or 7D.

Table 7A — Minimum Capacity Step (%) 30GTN,GTR,GUN,GUR — 60 Hz

UNIT/SIZE 30GTN,GTR,GUN,GUR	STANDARD UNIT	STANDARDUNIT WITH ACCESSORYUNLOADER(S)
040	25*	—
045	24*	21†
050	31*	20†
060	28*	18†
070	33*	16†
080; Module 230B	22	11
090; Module 245B	18	9
100; Modules 255B, 270B	16	8
110; Modules 290B, 315B	14	7
130	14	8
150; Modules 230A, 245A, 255A	11	6
170; Modules 270A, 330A/B	11	6
190; Modules 290A, 360A/B, 390B	13	9
210; Modules 315A, 390A, 420A/B	11	8

*A1 compressor with standard unloader, OR
A1 compressor with standard unloader and B1 compressor with accessory unloader.
†A1 compressor with standard unloader and accessory unloader, and B1 compressor with accessory unloader, OR
A1 compressor with standard unloader and accessory unloader, and B1 compressor with 2 accessory unloaders.

Table 7B — Minimum Capacity Step (%) — 30GTN,GTR,GUN,GUR — 50 Hz

UNIT/SIZE 30GTN,GTR,GUN,GUR	STANDARD UNIT	STANDARD UNIT WITH ACCESSORY UNLOADER(S)
040	24*	21†
045	31*	18†
050	28*	15†
060	33*	16†
070	19*	11†
080; Module 230B	22	8
090; Module 245B	14	7
100; Modules 255B, 270B	13	7
110; Modules 290B, 315B	17	8
130	10	6
150; Modules 230A, 245A, 255A	13	6
170; Modules 270A, 330A/B, 360B	9	5
190; Modules 290A, 360A, 390B	17	11
210; Modules 315A 390A, 420A/B	9	7

*A1 compressor with standard unloader, OR
A1 compressor with standard unloader and B1 compressor with accessory unloader.
†A1 compressor with standard unloader and accessory unloader, and B1 compressor with accessory unloader, OR
A1 compressor with standard unloader and accessory unloader, and B1 compressor with 2 accessory unloaders.

Table 7C — Minimum Capacity Step (%) — 38AH — 50/60 Hz

UNIT 38AH	STANDARD UNIT	OPTIONAL VAV UNIT WITH ELECTRIC UNLOADERS OR STANDARD UNIT WITH ACCESSORY UNLOADER(S) ON LEAD COMPRESSOR
024	33	17
028	33	17
034	28	14
044	25	—
054	21	22
064	32	16
074	29	14
084	33	17
094	22	22
104	18	17
Modules 124A, 124B, 134A	32	9
Module 134B	29	8

LEGEND
VAV — Variable Air Volume

Table 7D — Minimum Capacity Step (%) — 38AKS — 50/60 Hz

UNIT 38AKS	STANDARD UNIT
028	33
034	33
044	33

Winter Start — All 30GTN,GTR,GUN,GUR chillers have winter start features included in their microprocessor control logic. All 38AH and 38AKS units have winter start features included in their standard controls. The 09DK air-cooled condenser sections do not need to be directly modified, however, the total system may require winter start control. Refer to indoor base unit installation instructions. No additional provisions are necessary.

INSTALLATION

Step 1 — Install Field-Fabricated Wind Baffles and Brackets

⚠ WARNING

To avoid the possibility of electrical shock, open all disconnects before installing or servicing this accessory.

Wind baffles and brackets must be field fabricated for all units (except 38AH024-034, 38AKS028-044 and 09DK020-044) to ensure proper cooling cycle operation at low-ambient temperatures with Motormaster® V controls. See Fig. 2-10 for the number and sizes of brackets and baffles required and for bracket and baffle details. Use 20-gage (1 mm) galvanized sheet metal, or similar corrosion-resistant material for the baffles. Use 14-gage (1.85 mm) galvanized sheet metal or similar corrosion-resistant material for the brackets. Use field-supplied screws to attach baffles and brackets to unit. Screws should be $^1/_4$-in. (6.3 mm) diameter or larger. Drill required screw holes for mounting baffles and brackets.

⚠ CAUTION

To avoid damage to refrigerant coils and electrical components, use extreme care when drilling screw holes and screwing in fasteners.

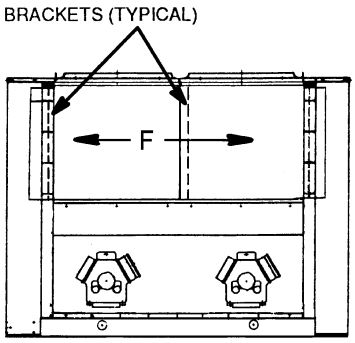
Summary of Baffles and Brackets

UNIT	BAFFLE TYPE AND QUANTITY						BRACKETS*		
	A	B	C	D	E	F	Qty	Length in.	Length mm
09DK054,064	—	—	—	—	—	2	6	$36^3/_8$	924
09DK074,084	2	—	—	—	4	—	8	$44^3/_8$	1127
09DK094	2	4	—	—	—	—	8	$44^3/_8$	1127
30GTN,GTR,GUN,GUR040-050	—	—	—	—	—	2	6	$36^3/_8$	924
30GTN,GTR,GUN,GUR060,070	2	—	—	—	4	—	8	$44^3/_8$	1127
30GTN,GTR,GUN,GUR080,090; Modules 230B, 245B	2	4	—	—	—	—	8	$44^3/_8$	1127
30GTN,GTR,GUN,GUR100,110; Modules 255B-315B	—	—	2	4	—	—	8	$44^3/_8$	1127
38AH094,104	2	4	—	—	—	—	8	$44^3/_8$	1127
38AH044-064; Modules 124A, 124B, 134A	—	—	—	—	—	2	6	$36^3/_8$	924
38AH074,084; Module 134B	2	—	—	—	4	—	8	$44^3/_8$	1127

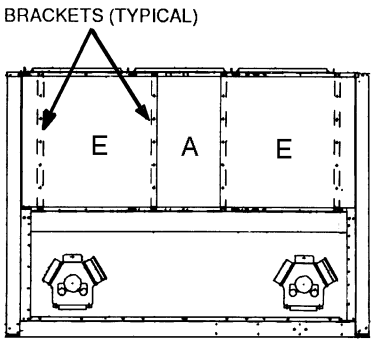
*See Fig. 7 for bracket construction.

BAFFLE	BAFFLE SIZE	
	in.	mm
A	26 x $41^{11}/_{16}$	660 x 1059
B	47 x $41^7/_8$	1194 x 1064
C	32 x $41^{11}/_{16}$	813 x 1059
D	61 x $41^7/_8$	1549 x 1064
E	42 x $41^7/_8$	1067 x 1064
F	85 x $33^{11}/_{16}$	2159 x 856

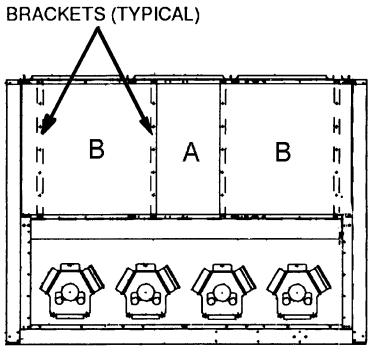
NOTES:
1. Unit 09DK condensers are not provided with compressors.
2. See Fig. 3-6 for baffle construction.



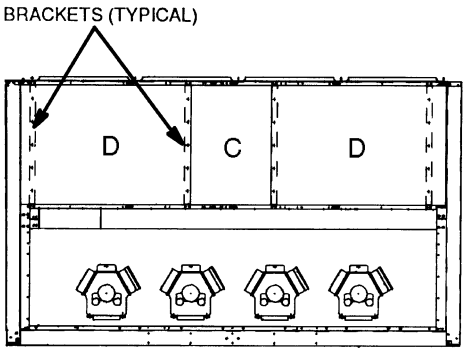
09DK054,064/30GTN,GTR,GUN,GUR040-050/
38AH044-064 AND MODULES 124A/B, 134A



09DK074,084/
30GTN,GTR,GUN,GUR060,070/
38AH074,084 AND MODULE 134B

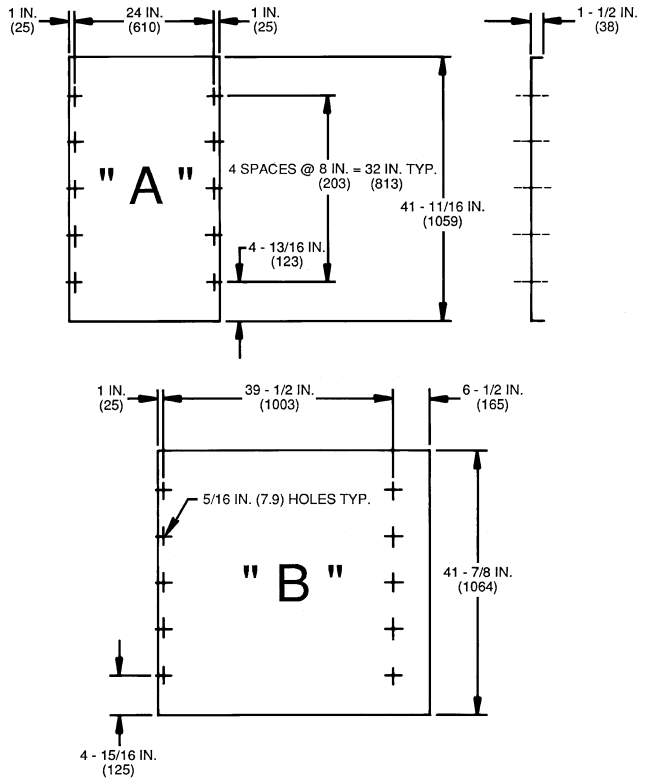


09DK094/
30GTN,GTR,GUN,GUR080,090
AND MODULES 230B, 245B/ 38AH094, 104



30GTN,GTR,GUN,GUR100,110 AND
MODULES 255B-315B

Fig. 2 — Baffle Configuration for 09DK/30GTN,GTR,GUN,GUR040-110 and Associated Modular Units (See Table 1)/38AH044-134 Low-Ambient Operation

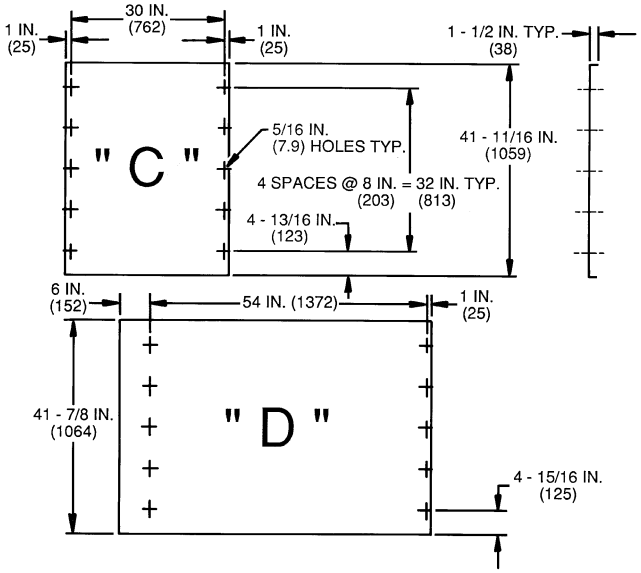


LEGEND

TYP — Typical

NOTES:
1. Dimensions in ( ) are millimeters.
2. All units listed as modules consist of one module “A” plus one module “B.”

Fig. 3 — “A” Baffle for Coil Section (09DK074-094/30GTN,GTR,GUN,GUR060-090 and Modules 230B, 245B/38AH074-104 and Module 134B); “B” Baffle for Coil Section (09DK094/30GTN,GTR,GUN,GUR080,090 and Modules 230B, 245B/38AH094,104)

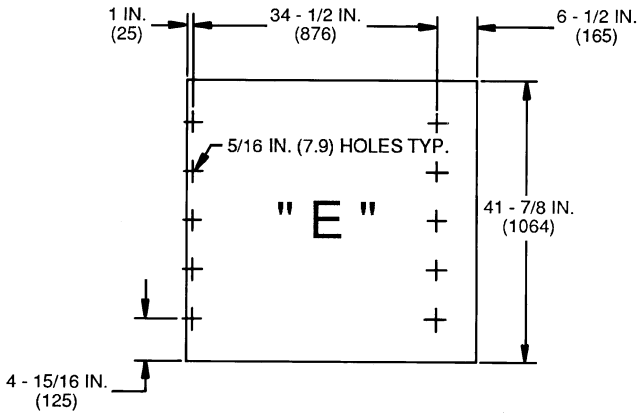


LEGEND

TYP — Typical

NOTES:
1. Dimensions in ( ) are millimeters.
2. All units listed as modules consist of one module “A” plus one module “B.”

Fig. 4 — “C” and “D” Baffles for Coil Section (30GTN,GTR,GUN,GUR100,110 and Modules 255B-315B)

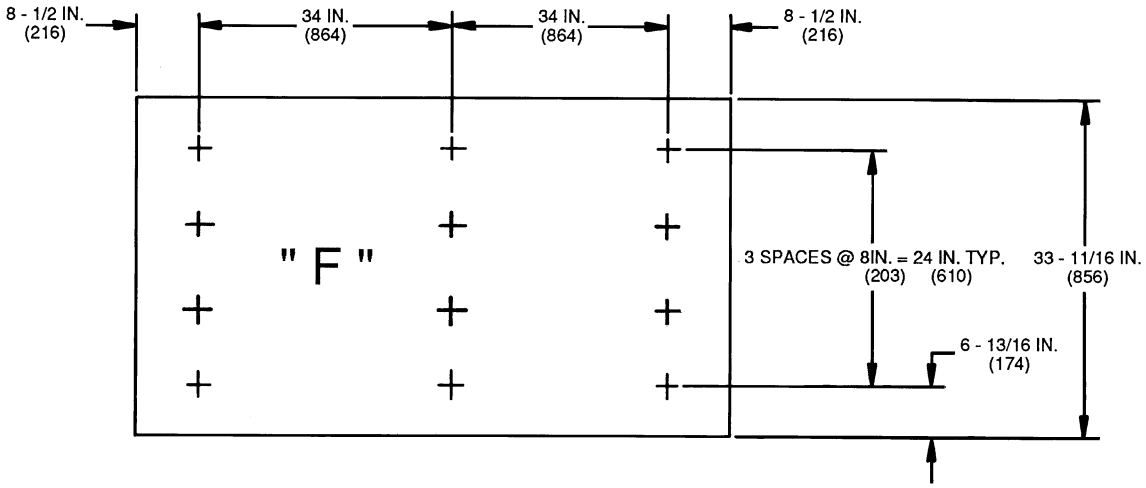


LEGEND

TYP — Typical

NOTES:
1. Dimensions in ( ) are millimeters.
2. All units listed as modules consist of one module “A” plus one module “B.”

Fig. 5 — “E” Baffles for Coil Section (09DK074,084/30GTN,GTR,GUN,GUR060,070;38AH074,084; Module 134B)

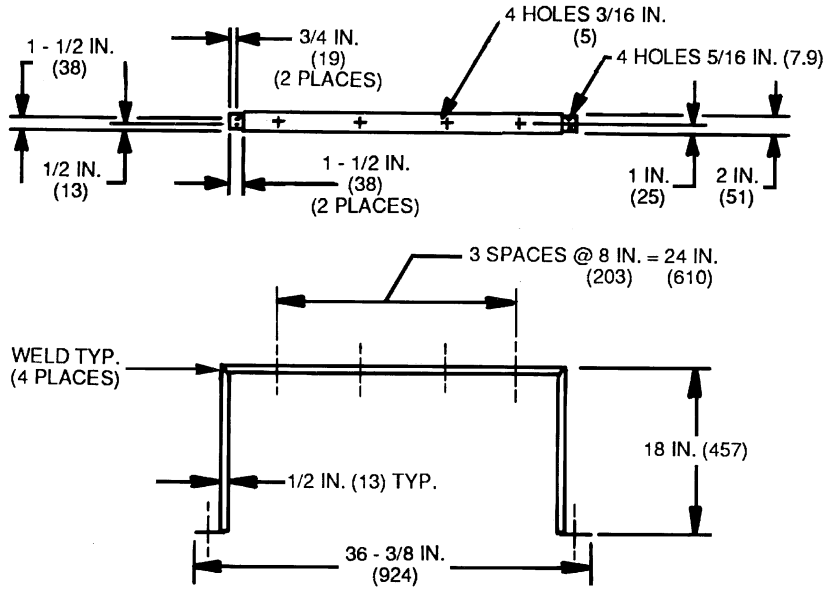


LEGEND

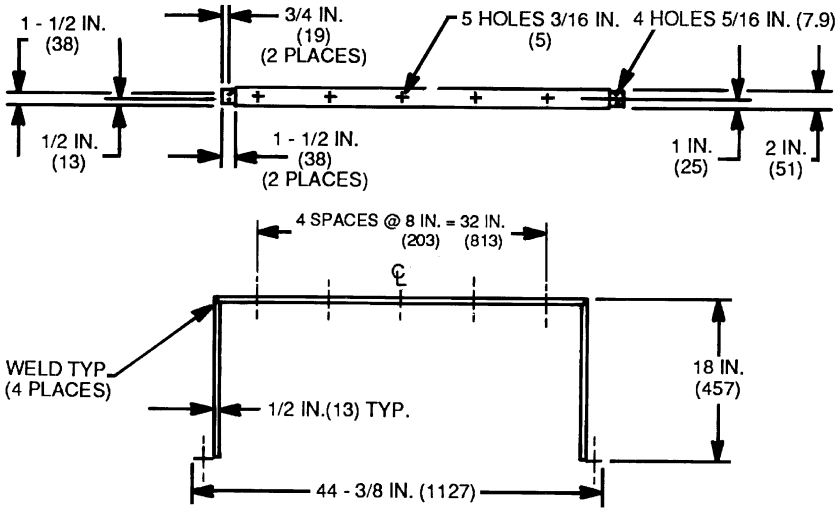
TYP — Typical

NOTES:
1. Dimensions in ( ) are millimeters.
2. All units listed as modules consist of one module “A” plus one module “B.”

Fig. 6 — “F” Baffles for Coil Section (09DK054,064/30GTN,GTR,GUN,GUR040-050/38AH044-064; Modules 124A/B and 134A)



09DK054,064/30GTN,GTR,GUN,GUR040-050/
38AH044-064 AND MODULES 124A/B, 134A



09DK074-094/30GTN,GTR,GUN,GUR060-110
AND MODULES 230B-315B/38AH074-104 AND MODULE 134B

LEGEND

TYP — Typical

NOTES:
1. Dimensions in ( ) are millimeters.
2. All units listed as modules consist of one module “A” plus one module “B.”

Fig. 7 — Brackets for Coil Section (09DK/30GTN,GTR,GUN,GUR040-110 and All Associated Modular Units [See Table 1]/38AH044-134 Units)

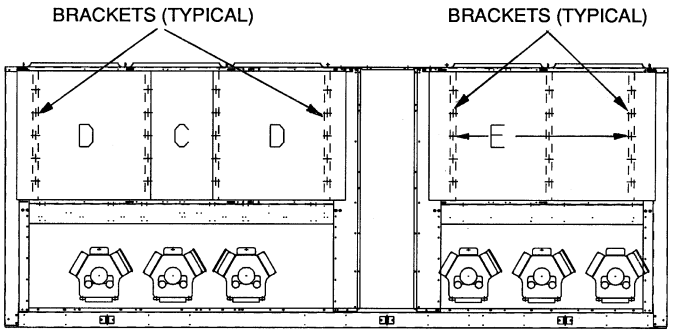
Summary of Baffles and Brackets

UNIT 30GTN,GTR,GUN,GUR	BAFFLE TYPE AND QUANTITY			BRACKETS*		
	C	D	E	Qty	Length	
					in.	mm
130-170,230A-270A	2	4	2	14	$48^{3}/_{8}$	1229
190-210,290A,315A	4	8	—	16	$48^{3}/_{8}$	1229
330A/B†	4	8	4	28	$48^{3}/_{8}$	1229
360A/B (50 Hz)†	6	12	2	30	$48^{3}/_{8}$	1229
360A/B (60 Hz)†, 390A/B†, 420A/B†	8	16	—	32	$48^{3}/_{8}$	1229

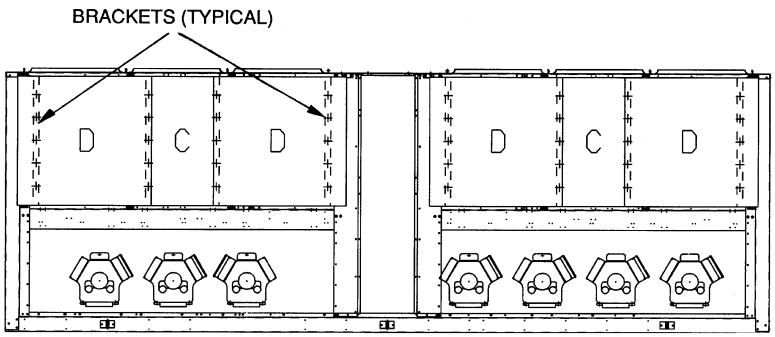
*See Fig. 10 for bracket construction.
†Total unit (includes both modules).

BAFFLE	BAFFLE SIZE	
	in.	mm
C	26 x $45^{11}/_{16}$	660 x 1160
D	47 x $45^{7}/_{8}$	1194 x 1165
E	80 x $45^{11}/_{16}$	2032 x 1160

NOTE: See Fig. 9 for baffle construction.

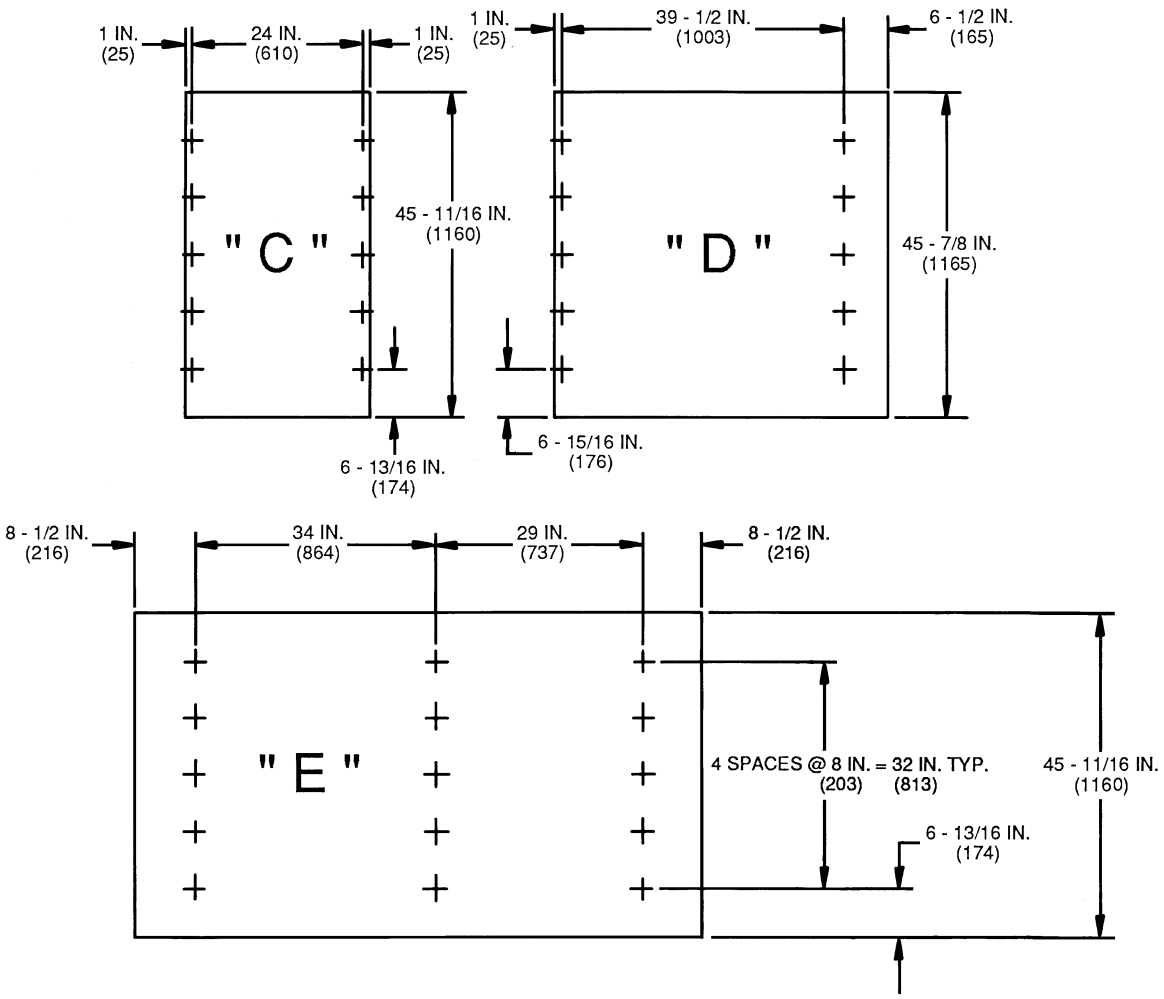


30GTN,GTR,GUN,GUR130-170 AND MODULES 230A-270A, 330A/B, 360B (50 Hz)



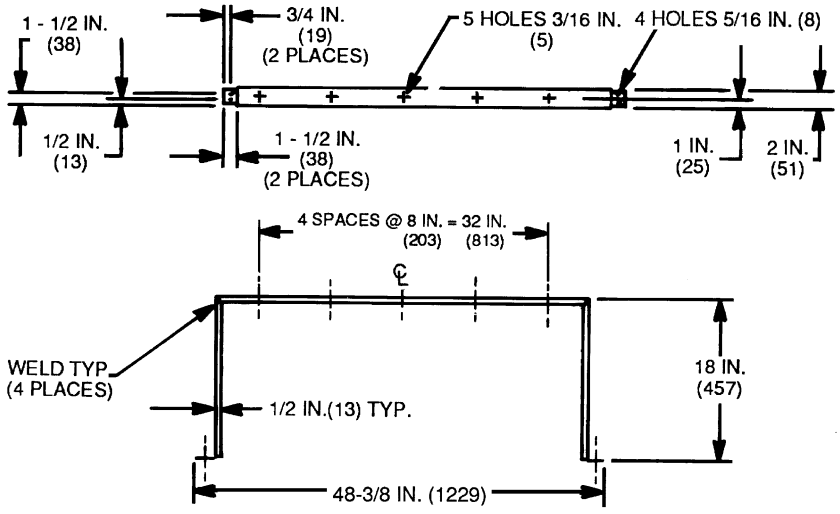
30GTN,GTR,GUN,GUR190-210 AND MODULES 290A, 315A, 360A (50 AND 60 Hz),
360B (60 Hz), 390A/B, 420A/B

Fig. 8 — Baffle Configuration for 30GTN,GTR,GUN,GUR, Sizes 130-210, 230A-315A, 330A/B-420A/B Low Ambient Operation



LEGEND
TYP — Typical
NOTE: Dimensions in ( ) are millimeters.

Fig. 9 — "C," "D," and "E" Baffles for 30GTN,GTR,GUN,GUR130-210, 230A-315A, 330A/B-420A/B



LEGEND
TYP — Typical
NOTE: Dimensions in ( ) are millimeters.

Fig. 10 — Brackets for Coil Section — 30GTN,GTR,GUN,GUR130-210, 230A-315A, 330A/B-420A/B

Step 2 — Mount Motormaster® V Controls and Accessories

⚠ WARNING

To avoid electric shock and personal injury open and tag all electrical disconnects before installing or servicing unit.

⚠ WARNING

Hazard of electric shock! Wait three minutes after disconnecting incoming power before servicing drive. Capacitors retain charge after power is removed.

NOTE: Two Motormaster V controllers, 2 fuse blocks, 2 relays and 2 pressure transducers must be added per unit (1 per refrigerant circuit) with the following exceptions:

- 38AH 124, 134 units and 30GTN,GTR,GUN,GUR 230-420 modular units will require 2 kits per unit (4 controllers, 4 fuse blocks, 4 relays, and 4 pressure transducers). Two of each item will be installed in each of the 2 control boxes.
- 38AH044-084 single circuit and 09DK054-094 100% circuiting units will require 2 controllers, 2 fuse blocks, 2 relays, and 2 pressure transducers. The pressure transducers from each control will be attached at the same point on the liquid line.
- 38AH024-034, 38AKS028-044 and 09DK020-044 units will only require one controller, fuse block, one relay and transducer.

MOTORMASTER V CONTROLLERS, RELAYS, FUSE BLOCKS AND FUSES — Refer to Fig. 11-16 for the proper mounting locations. Use the 8 x $^3/_4$-in. screws provided with kit to mount controls and fuse blocks to control box. Use 10 x $^1/_2$-in. screws to mount relays. See Table 5 for proper fuse sizes for each kit. The 09DK020-044 units require a field-supplied, 20 x 20 x 8 NEMA 3R enclosure.

PRESSURE TRANSDUCER — Install pessure transducer(s) in the proper location on the liquid line. See Fig. 17-22.

30GTN,GTR,GUN,GUR Units — Mount one pressure transducer to the Schrader service valve port near each liquid line valve as shown in Fig. 17. Identify which circuit is A and B and retain this information for use in later steps.

38AH024-104 and 09DK020-094 and 38AKS028-044 Units (Except Single Circuit or 100% Circuit) — See Fig. 18-20. Install a field-supplied Schrader port and valve into the liquid line near the liquid line valve on each circuit. Mount pressure transducer on this valve. For 09DK020-044 dual circuit units, install the pressure transducer on the lead circuit. If unit has already been piped and charged, mount pressure transducer to each circuit's liquid line valve port using tees provided. Identify which circuit is A and B and retain this information for use in later steps.

NOTE: Ensure that the liquid line valve is not backseated or the pressure transducer will not read correctly.

38AH044-084 Single Circuit, 38AH124A/B and 09DK054-094 100% Circuiting Units — Install 2 field-supplied Schrader ports with valves on the common liquid line near the liquid line valve. Mount transducers to these valve ports. If unit has already been piped and charged, mount pressure transducers to liquid-line valve port using tees provided. (See Fig. 22.)

NOTE: Ensure that the valve is not backseated or the pressure transducer will not read correctly.

38AH124A/B and 134A/B units — Install 2 Schrader ports with valves on the common liquid line near the liquid line valve for unit module A. Repeat process for unit module B. If unit has already been piped and charged, mount pressure transducers to liquid line valve ports using tees provided.

NOTE: Ensure that the valve is not backseated or the pressure transducer will not read correctly.

Step 3 — Make Electrical Connections

⚠ CAUTION

To avoid damage to the small terminals on the Motormaster V control, use care when tightening the compression terminals and use the proper size screwdriver.

⚠ CAUTION

DO NOT connect incoming AC power to Motormaster V output terminals T1, T2, and T3! Severe damage to the control will result.

The required electrical connections for the Motormaster V control are for incoming power, outgoing power, and control signals. All required wires are provided in each kit. Detailed instructions for each model are shown below:

09DK054-094 (see Fig. 23), 30GTN,GUR,GUN,GUR040-110, 230B, 245B, (refer to Fig. 24), 38AH044-104 (Except Single Circuit) (refer to Fig. 24) (P/N 30GT-911---080,081,082)

1. Mark and then disconnect shielded power cables (FM-1 and FM-2) from fan motor contactors FC-A1 and FC-B1 (FC1 and FC2 for 09DK). Retain all fasteners for later use. Disconnect power cable ground wires at the control box.
2. Cut ring terminals from black power wires only. Strip back $^1/_4$ inch. Do not cut off ring terminal on ground wire.
3. Attach newly stripped wires 1, 2, 3 from FM-1 to MM-A terminals T1, T2, T3 respectively. Re-attach ground wire to control box back wall using ground screw near Motormaster V controller. Be careful not to attach wires to B– or B+.
4. Attach newly stripped wires 1, 2, 3 from FM-2 to MM-B terminals T1, T2, T3 respectively. Re-attach ground wire to control box wall using ground screw punch near Motormaster V controller.
5. Install 40-in. BLK, YEL, BLU wires from fan circuit breaker (FCB-1) (or TB1 for 09DK units only) to fuse block MMF-A. Install 38-in. BLK, YEL, BLU wires from MMF-A to input power terminals L1, L2, L3 respectively on MM-A.
6. Install 40-in. BLK, YEL, BLU wires from fan circuit breaker FCB-2 (or FC-B1 [FC2] if FCB-2 is not used) to fuse block MMF-B. Install 38-in. BLK, YEL, BLU wires from MMF-B to input power terminals L1, L2, L3 respectively on MM-B.
7. Attach sensor cables to pressure transducers and route cable to control box. Ensure that the cable is separated from sharp edges. Route cable through knockouts in bottom of control box. Seal cable to control box using supplied varnish cloth and metal conduit connector. Wrap varnish cloth around wires to separate wires from metal connector. Trim lengths of cable as desired but ensure that shield drain wire is used.
8. Attach RED, GRN, BLK wires from sensor cables to Motormaster controls terminal block 6, 5 and 2 respectively according to Fig. 1, 23 and 24. Attach shield drain wire to control box near Motormaster control using the original ground screw. Ensure that the pressure transducer from refrigerant circuit A is attached to MM-A.
9. Attach VIO and the RED wires from FR-1 fan relay terminals 5 and 9 to Motormaster control. The RED wire connects at terminals 2, the VIO wire to the terminal listed in Table 8. Repeat for circuit B using VIO and RED wires.
10. Attach GRA and the RED wires to FR-1 terminals 13 and 14. Attach the other ends to FC-1 terminals C1 and C2. Repeat for circuit B using VIO and RED wires.

38AH024-034, 38AKS028-044 and 09DK020-044 (See Fig. 25)

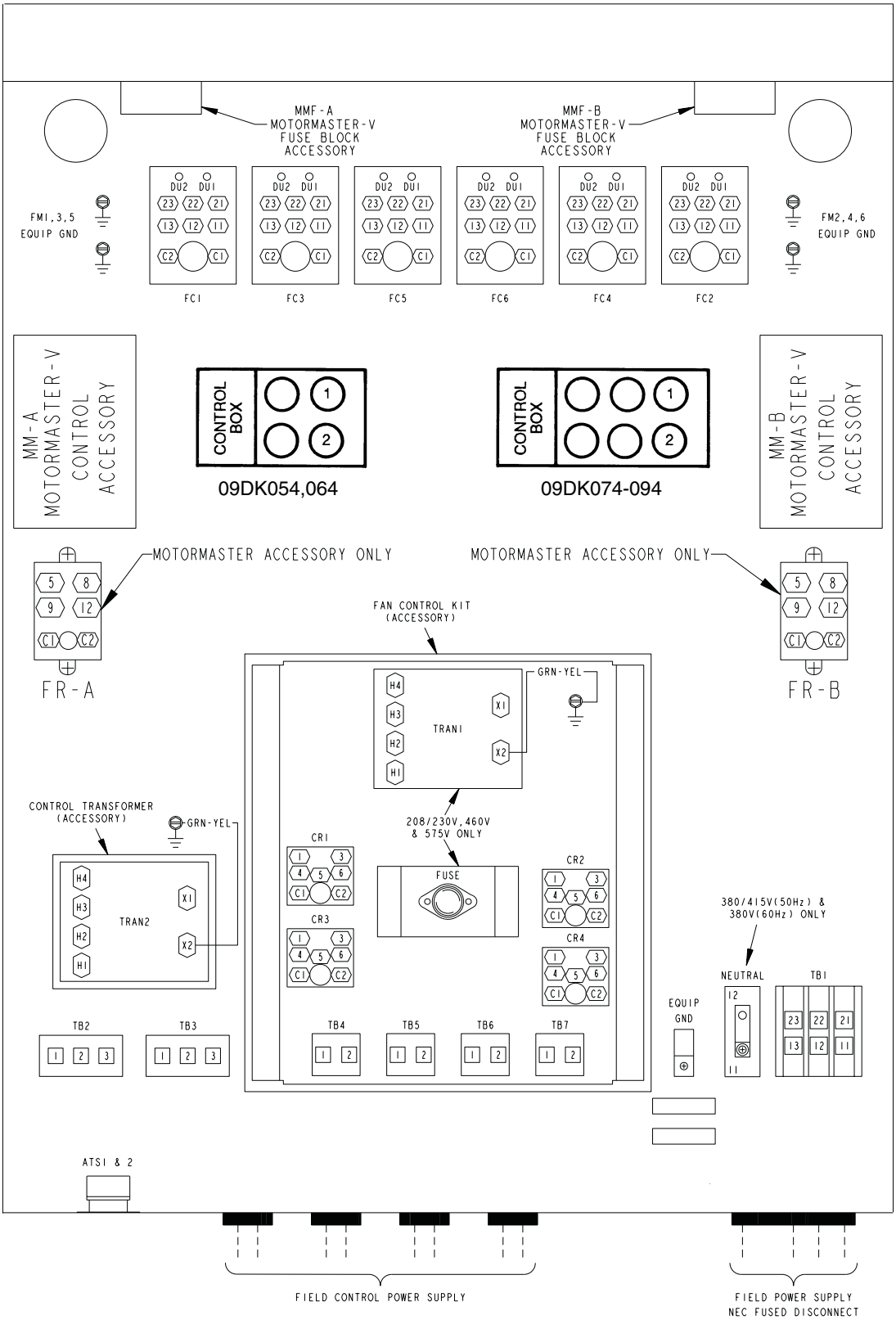
1. Mark the shielded cable from FM1 to FC1 at Motormaster® V controller location. The cable will be cut at this point, so be sure to allow enough slack to reach the Motormaster V controller and fuse block.
2. In the area marked, cut the cover off of the cable. Cut each individual wire and mark both ends for identification. Mark wires 1, 2 and 3.
3. Strip the ends of the wires coming from FC-1, and attach them to one side of the fuse block.
4. Install the 10-in. black, yellow and blue wires from the fuse block to the Motormaster V terminal block (L1, L2 and L3). The BLK, YEL, and BLU wires are on the same fuse as wires 1, 2 and 3, and are on Motormaster V terminals L1, L2 and L3, respectively.
5. Install the other end of the cut wires (on the FM side) into the Motormaster V terminal block T1, T2 and T3 terminals.
6. Ground shield with the ground wire from each side of the cut shielded cable.
7. Remove wires from FC-1, T1/T2/T3 and connect at FU1 (or TB1 if FU1 not used).
8. Attach the sensor cable to the pressure transducer and route it to the controller. Ensure that the cable is separated from all sharp edges. Trim the lengths of the cable as desired, but ensure that shield drain wire is used.
9. Attach the RED, GRN and BLK wires from the sensor cables to the Motormaster V control terminal block positions 6, 5 and 2, respectively. Attach shield drain wire to the panel where the Motomaster V is mounted.
10. Attach VIO and the RED wires from FR-1 fan relay terminals 5 and 9 to Motormaster control. The RED wire connects at terminals 2, the VIO wire to the terminal listed in Table 8. Repeat for circuit B using VIO and RED wires.
11. Attach GRA and the RED wires to FR-1 terminals 13 and 14. Attach the other ends to FC-1 terminals C1 and C2. Repeat for circuit B using VIO and RED wires.

38AH044-084 SINGLE CIRCUIT AND 124A/B, 134A/B (refer to Fig. 26): (P/N 30GT-911---080,081,082)

1. Mark and then disconnect shielded power cables (FM-1 and FM-2) from fan motor contactor FC-A1. Retain all fasteners for later use. Remove ground wires from control box back wall.
2. Cut ring terminals from black power wires only. Strip back $^1/_4$ inch. Do not cut off ring terminal on ground wire.
3. Attach newly stripped wires 1, 2, 3 from FM-1 to MM-A terminals T1, T2, T3 respectively. Re-attach ground wire to control box back wall using ground screw near Motormaster V controller.
4. Attach newly stripped wires 1, 2, 3 from FM-2 to MM-B terminals T1, T2, T3 respectively. Re-attach ground wire to control box back wall using ground screw punch near Motormaster V controller.
5. Install 40-in. BLK, YEL, BLU wires from fan circuit breaker FCB-1 to fuse block MMF-A. Install 38-in. BLK, YEL, BLU wires from MMF-A to input power terminals L1, L2, L3 respectively on MM-A.
6. Install 40-in. BLK, YEL, BLU wires from fan circuit breaker FCB-2 (or FCB-1 is 2 is not used) FC-A1 to fuse block MMF-B. Install 38-in. BLK, YEL, BLU wires from MMF-B to input power terminals L1, L2, L3 respectively on MM-B.
7. Attach sensor cables to pressure transducers and route cable to control box. Ensure that the cable is separated from sharp edges. Route cable through knockouts in bottom of control box. Seal cable to control box using supplied varnish cloth and metal conduit connector. Wrap varnish cloth around wires to separate wires from metal connector. Trim lengths of cable as desired but ensure that shield drain wire is used.
8. Attach RED, GRN, BLK wires from sensor cables to Motormaster controls terminal block 6, 5 and 2 respectively, see Fig. 1 and 26. Attach shield drain wire to control box near Motormaster control using the original ground screw.
9. Attach VIO and the RED wires from FR-1 fan relay terminals 5 and 9 to Motormaster control. The RED wire connects at terminals 2, the VIO wire to the terminal listed in Table 8. Repeat for circuit B using VIO and RED wires.
10. Attach GRA and the RED wires to FR-1 terminals 13 and 14. Attach the other ends to FC-1 terminals C1 and C2. Repeat for circuit B using VIO and RED wires.

30GTN,GUR,GUN,GUR130-210, 230A-315A, 330A/B-420A/B (refer to Fig. 27): (P/N 30GT-911---074,075,076)

1. Mark and then disconnect shielded power cables FM-5, 7 from fan motor contactors FC-A1 and cables FM-6, 8 from FC-B1. Retain all fasteners for later use. Disconnect ground wires from control box back wall.
2. Cut ring terminals from black power wires on each cable labeled 1, 2, 3 only. Strip back $^1/_2$ inch. Do not cut off ring terminal on ground wire.
3. Use the crimp connectors supplied to splice the black wire (marked #1), from cables FM-5 and FM-7 along with one of the 6-in. black wires in the kit. Connect the other end of the 6-in. black wire to lug T1 on the bottom of the control MM-A. Make similar connections for black wires marked #2 and #3 from each cable and connect them to lugs T2 and T3 of the MM-A control.
4. Use the crimp connectors supplied to splice the black wire (marked #1), from cables FM-6 and FM-8 along with one of the 6-in. black wires in the kit. Connect the other end of the 6-in. black wire to lug T1 on the bottom of the control MM-B. Make similar connections for black wires marked #2 and #3 from each cable and connect them to lugs T2 and T3 of the MM-B control.
5. Reconnect ground wires to control box back wall near Motormaster controllers using original ground screws.
6. Install 30-in. BLK, YEL, BLU wires from fan circuit breaker FCB-1 to fuse block MMF-A. Install 8-in. BLK, YEL, BLU wires from MMF-A to input power terminals L1, L2, L3 respectively on MM-A.
7. Install 30-in. BLK, YEL, BLU wires from fan circuit breaker FCB-2 (or FCB-1 if 2 is not used) to fuse block MMF-B. Install 8-in. BLK, YEL, BLU wires from MMF-A to input power terminals L1, L2, L3 respectively on MM-B.
8. Attach sensor cables to pressure transducers and route cable to control box. Ensure that the cable is separated from sharp edges. Route cable through grommet on left side of control box. Trim lengths of cable as desired but ensure that shield drain wire is used.
9. Attach RED, GRN, BLK wires from sensor cables to Motormaster controls terminal block 6, 5 and 2 respectively according to Fig. 1 and 27. Attach shield drain wire to control box near Motormaster control using the original ground screw. Ensure that the pressure transducer from refrigerant circuit A is attached to MM-A.
10. Attach VIO and the RED wires from FR-1 fan relay terminals 5 and 9 to Motormaster control. The RED wire connects at terminals 2, the VIO wire to the terminal listed in Table 8. Repeat for circuit B using VIO and RED wires.
11. Attach GRA and the RED wires to FR-1 terminals 13 and 14. Attach the other ends to FC-1 terminals C1 and C2. Repeat for circuit B using VIO and RED wires.



LEGEND

ATS — Air Temperature Switch
CR — Control Relay
DU — Dummy Terminal
EQUIP — Equipment
FC — Fan Contactor
FR — Fan Relay
GND — Ground
MM — Motormaster Control
MMF — Motormaster Relay
NEC — National Electrical Code
TB — Terminal Block
TRAN — Transformer

Terminal Block Connection
Marked Terminal
Unmarked Terminal
Factory Wiring
Field Wiring

Fig. 11 — Motormaster® V Control Location; 09DK054-094 Units (074-094 Units Shown)

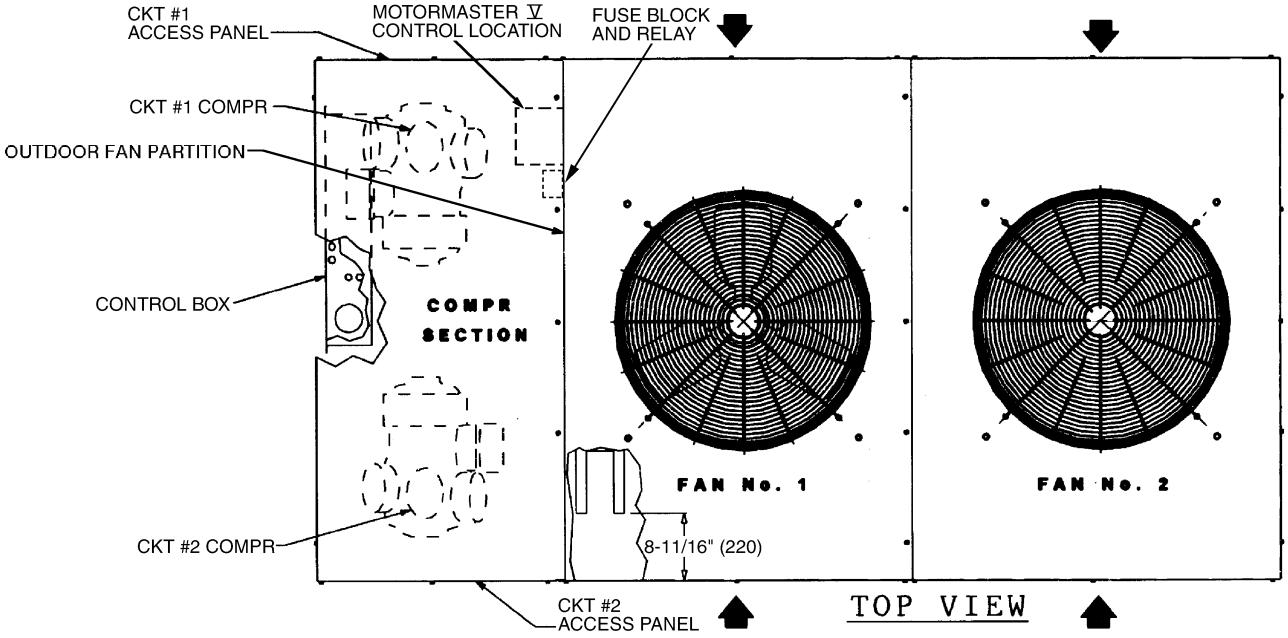


Fig. 12 — Motormaster® V Control Location; 38AH024-034, 38AKS028-044

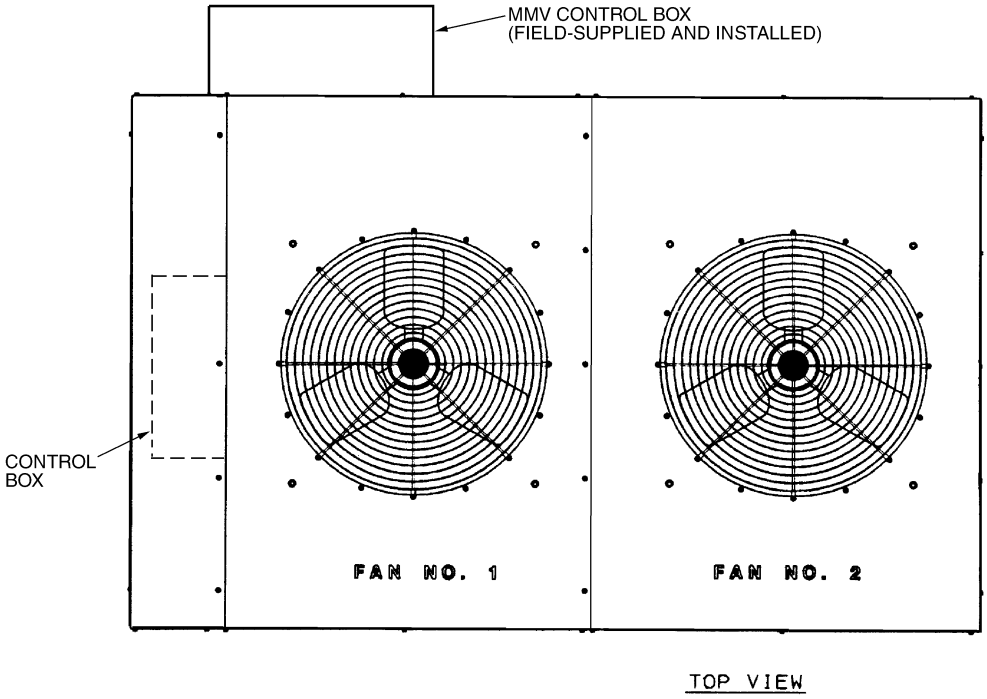
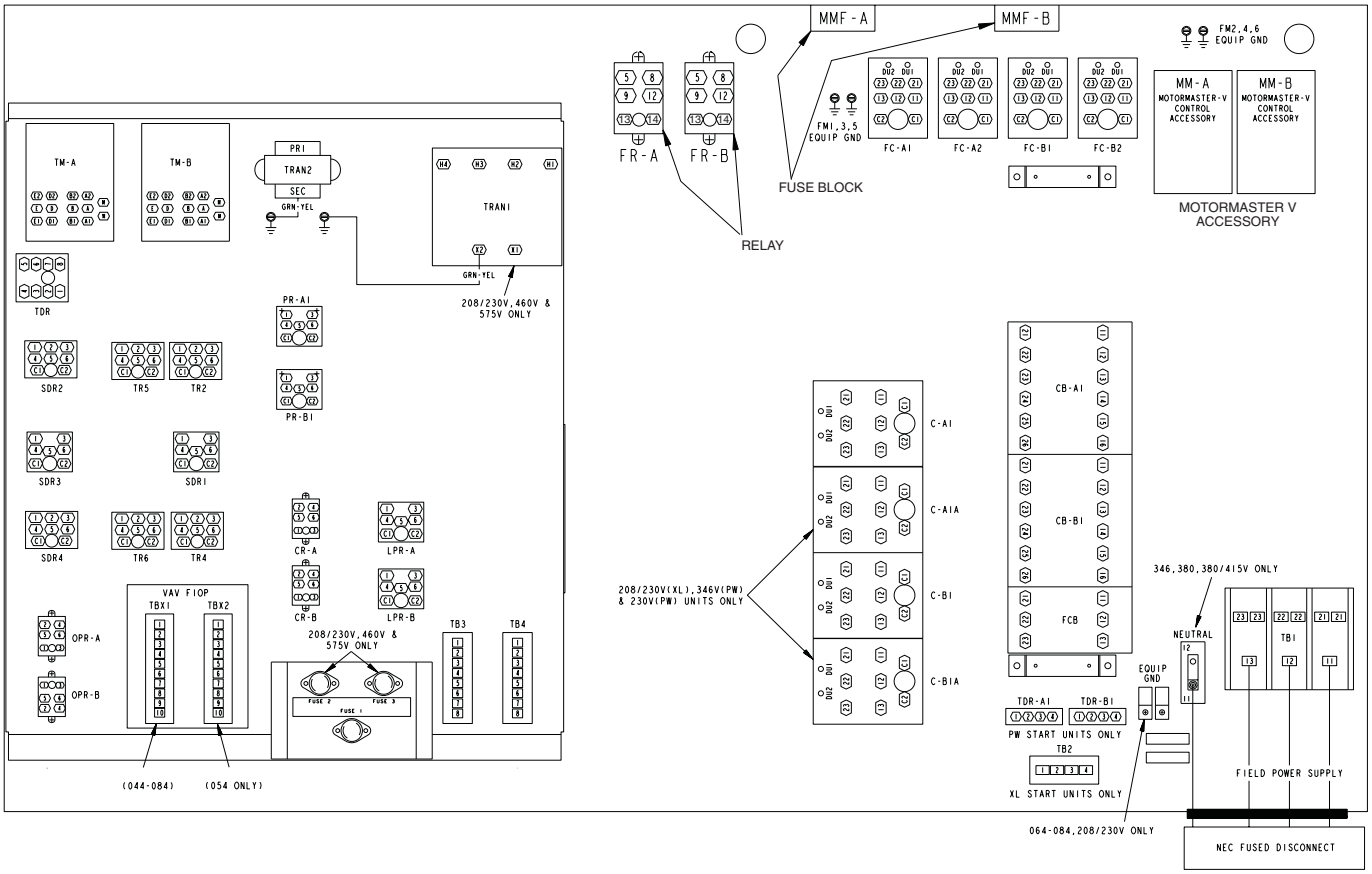
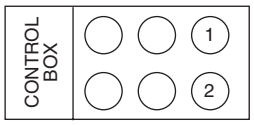
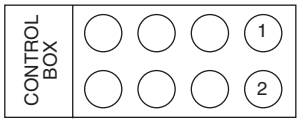


Fig. 13 — Motormaster V Control Location; 09DK020-044





30GTN,GTR,GUN,GUR080,090; MODULES 230B,245B/ 38AH094,104

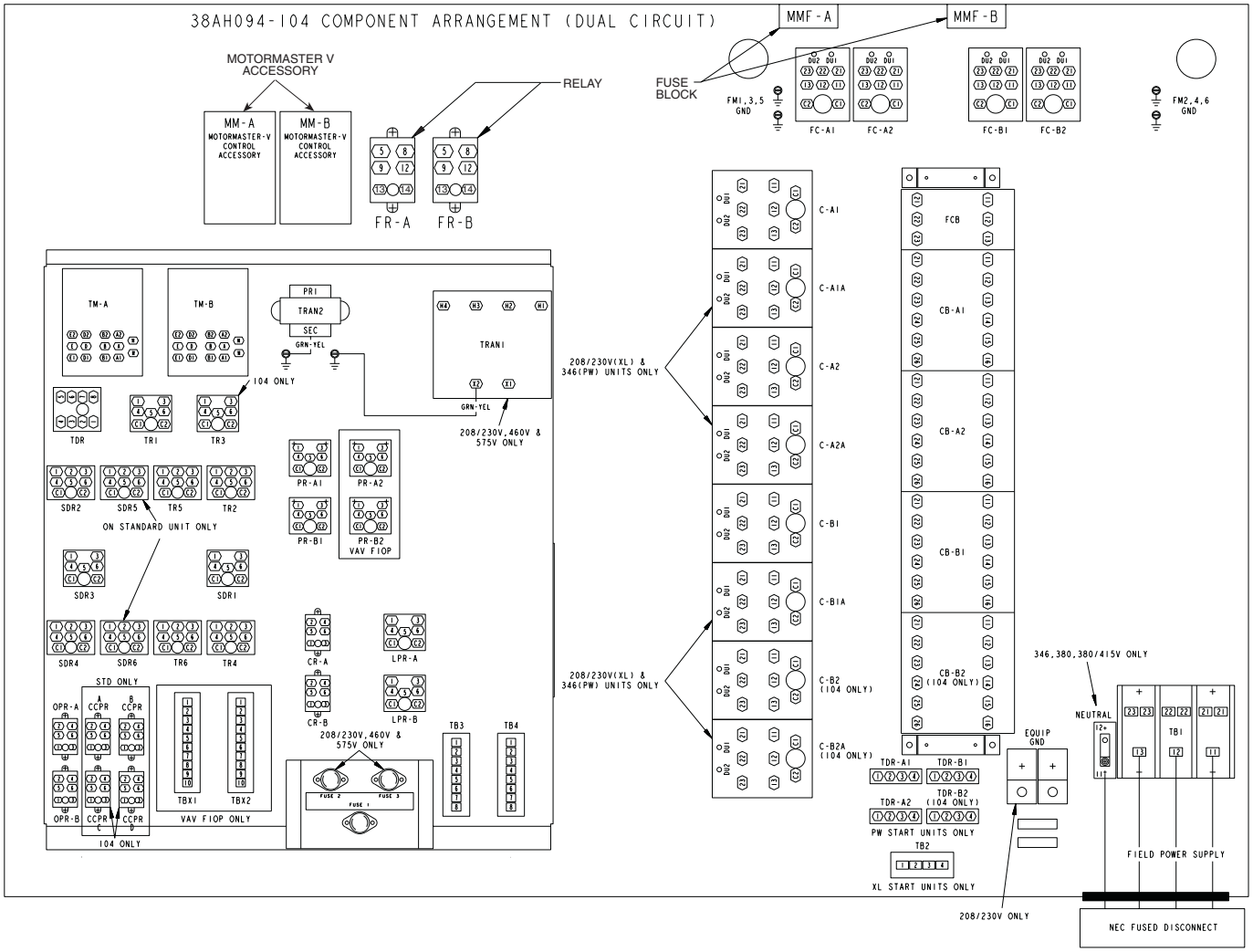


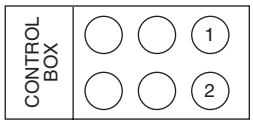
30GTN,GTR,GUN,GUR100,110; MODULES 255B,315B

LEGEND

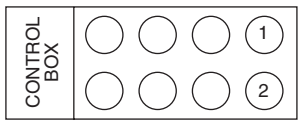
CB	—	Circuit Breaker
CCPR	—	Capacity Control Pressure Relay
CR	—	Control Relay
DU	—	Dummy Terminal
EQUIP	—	Equipment
FC	—	Fan Contactor
FCB	—	Fan Circuit Breaker
FR	—	Fan Relay
GND	—	Ground
LPR	—	Low Pressure Relay
MMF	—	Motormaster® Fuse
NEC	—	National Electrical Code
OPR	—	Oil Pressure Relay
PR	—	Power Relay
PRI	—	Primary
PW	—	Part Wind
SDR	—	Solenoid Drop Relay
SEC	—	Secondary
TB	—	Terminal Block
TDR	—	Time-Delay Relay
TM	—	Timer Motor
TR	—	Timer Relay
VAV FIOP	—	Variable Air Volume Factory-Installed Option
XL	—	Across-the-Line

Fig. 14 — 38AH044-084,124,134; 30GTN,GTR,GUN,GUR040-070 Component Arrangement





30GTN,GTR,GUN,GUR080,090; MODULES 230B,245B/ 38AH094,104

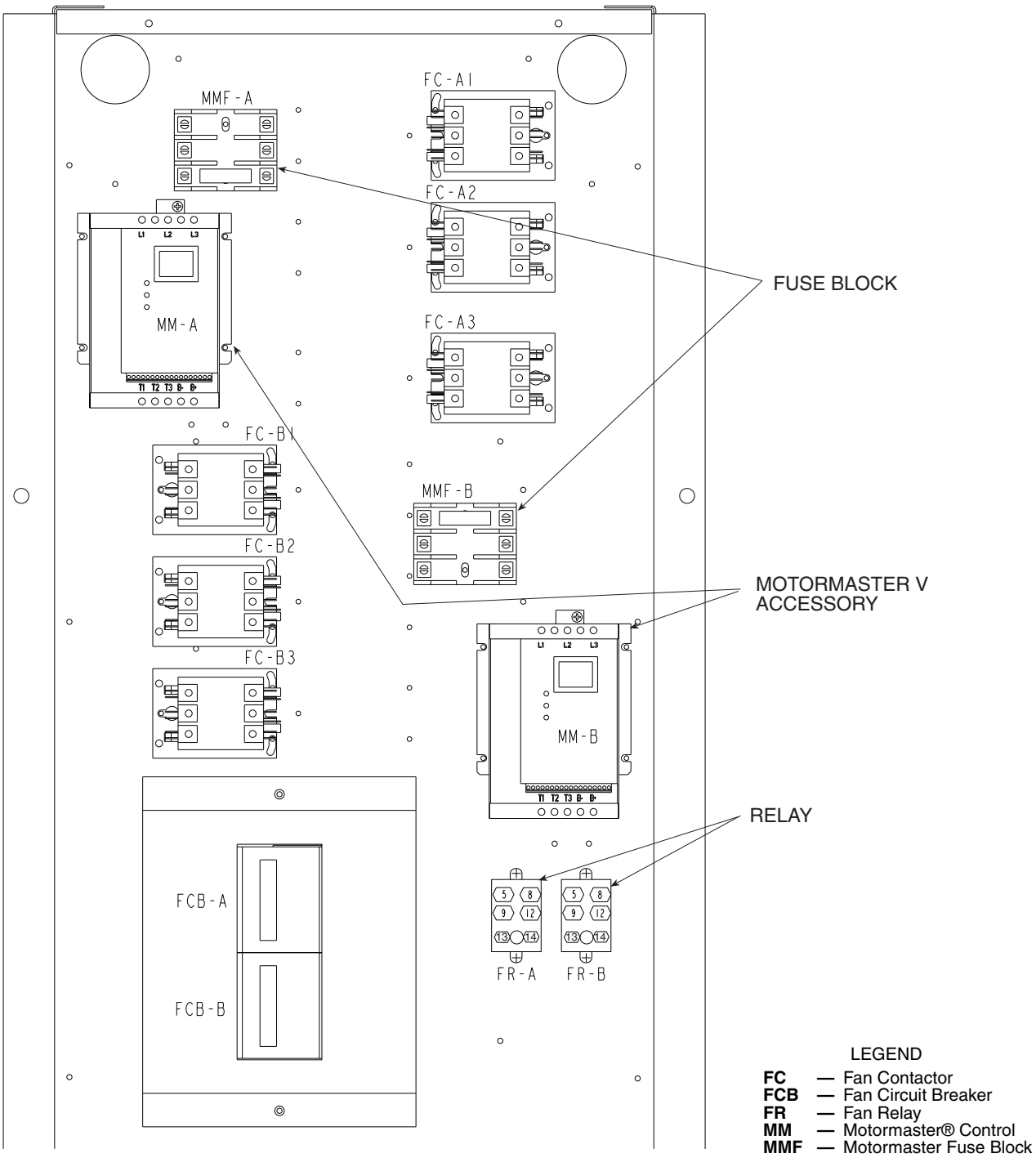


30GTN,GTR,GUN,GUR100,110; MODULES 255B,315B

LEGEND

CB	—	Circuit Breaker
CCPR	—	Capacity Control Pressure Relay
CR	—	Control Relay
DU	—	Dummy Terminal
EQUIP	—	Equipment
FC	—	Fan Contactor
FCB	—	Fan Circuit Breaker
FR	—	Fan Relay
GND	—	Ground
LPR	—	Low Pressure Relay
MMF	—	Motormaster® Fuse
NEC	—	National Electrical Code
OPR	—	Oil Pressure Relay
PR	—	Power Relay
PRI	—	Primary
PW	—	Part Wind
SDR	—	Solenoid Drop Relay
SEC	—	Secondary
TB	—	Terminal Block
TDR	—	Time-Delay Relay
TM	—	Timer Motor
TR	—	Timer Relay
VAV FIOP	—	Variable Air Volume Factory-Installed Option
XL	—	Across-the-Line

Fig. 15 — 38AH094-104; 30GTN,GTR,GUN,GUR080-110 (and Associated Modular Units) Component Arrangement (Typical) (38AH094-104 Shown)



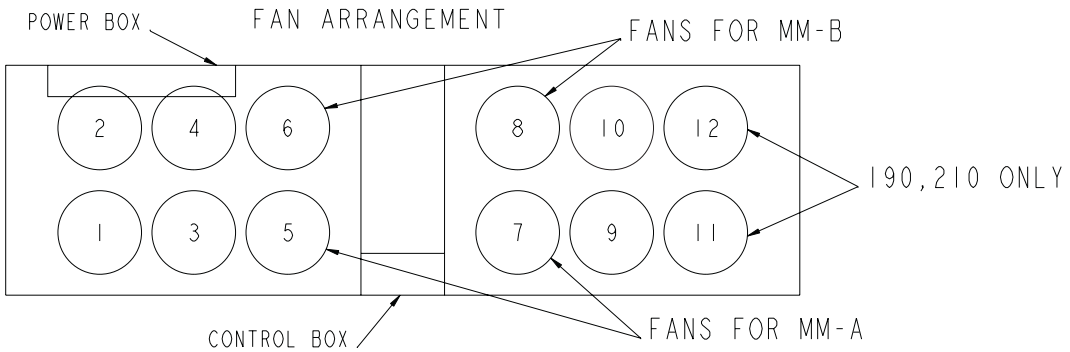
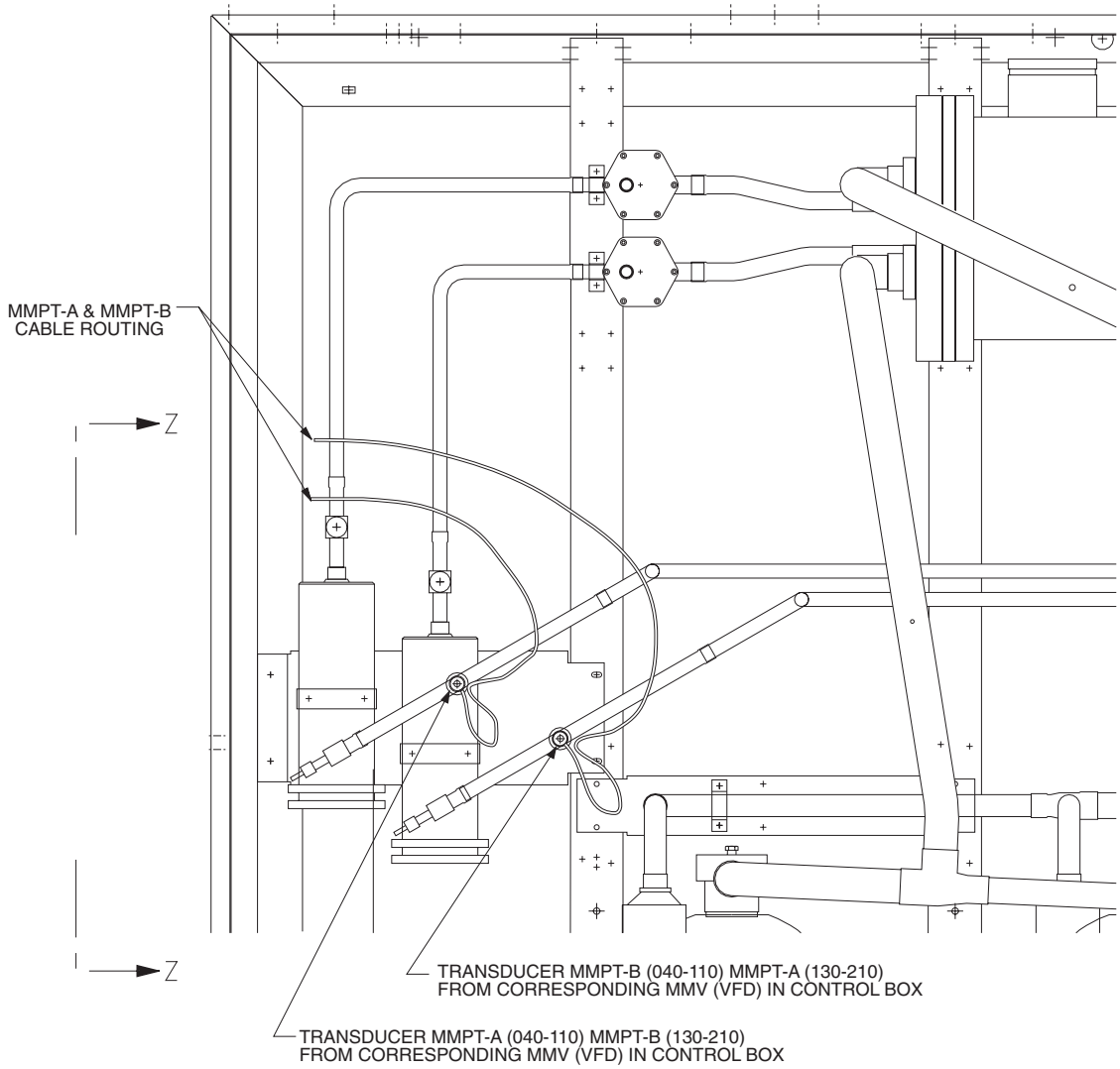
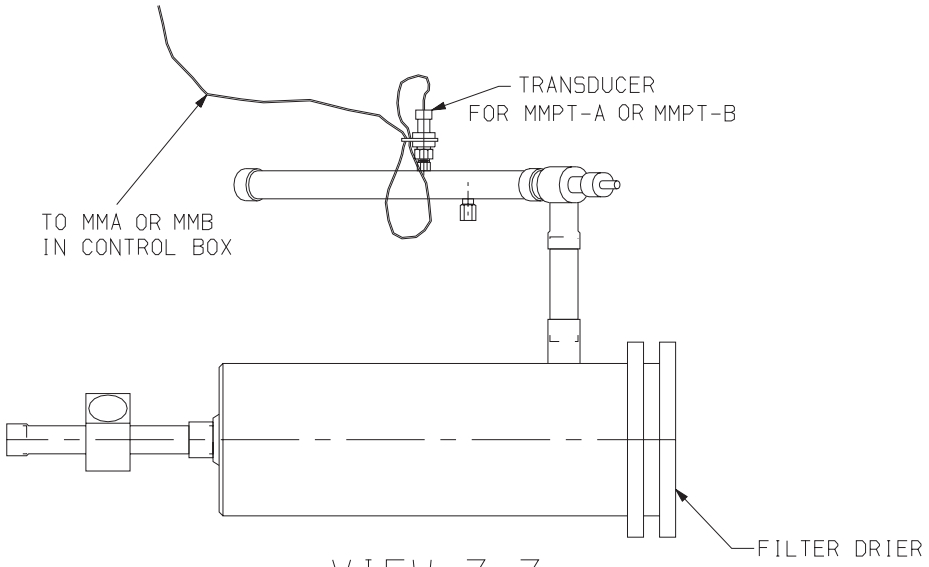


Fig. 16 — 30GTN,GTR,GUN,GUR130-210 (and Associated Modular Units) Component Arrangement





VIEW Z-Z

ROTATED 90° COUNTER-CLOCKWISE
TRANSDUCER WIRING FROM VFD
MMPT-A & MMPT-B
SCALE: 1:4

LEGEND

MM — Motormaster® Control
MMPT — Motormaster Pressure Transducer
VFD — Variable Frequency Drive

Fig. 17 — 30GTN,GTR,GUN,GUR Pressure Transducer Location

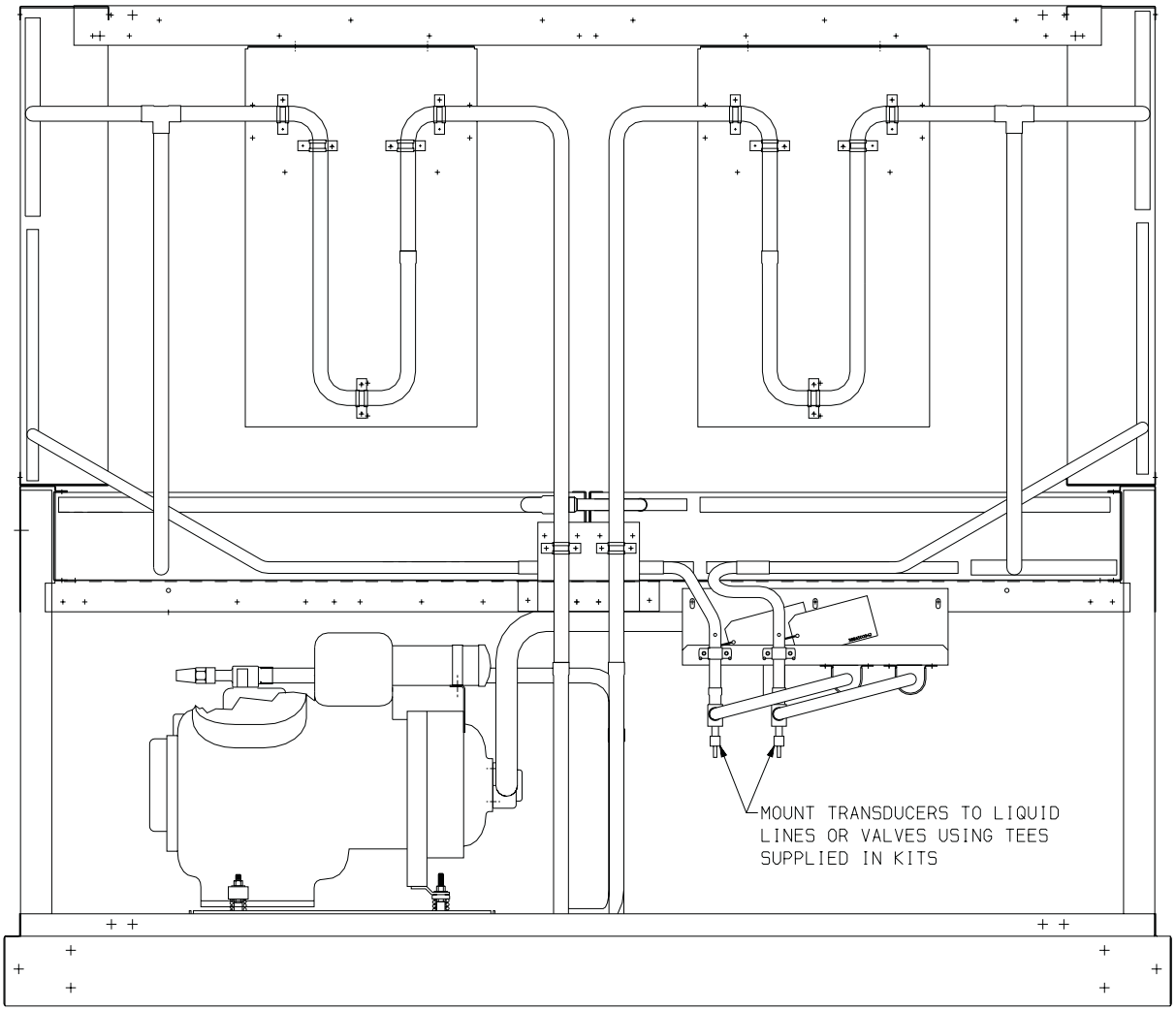
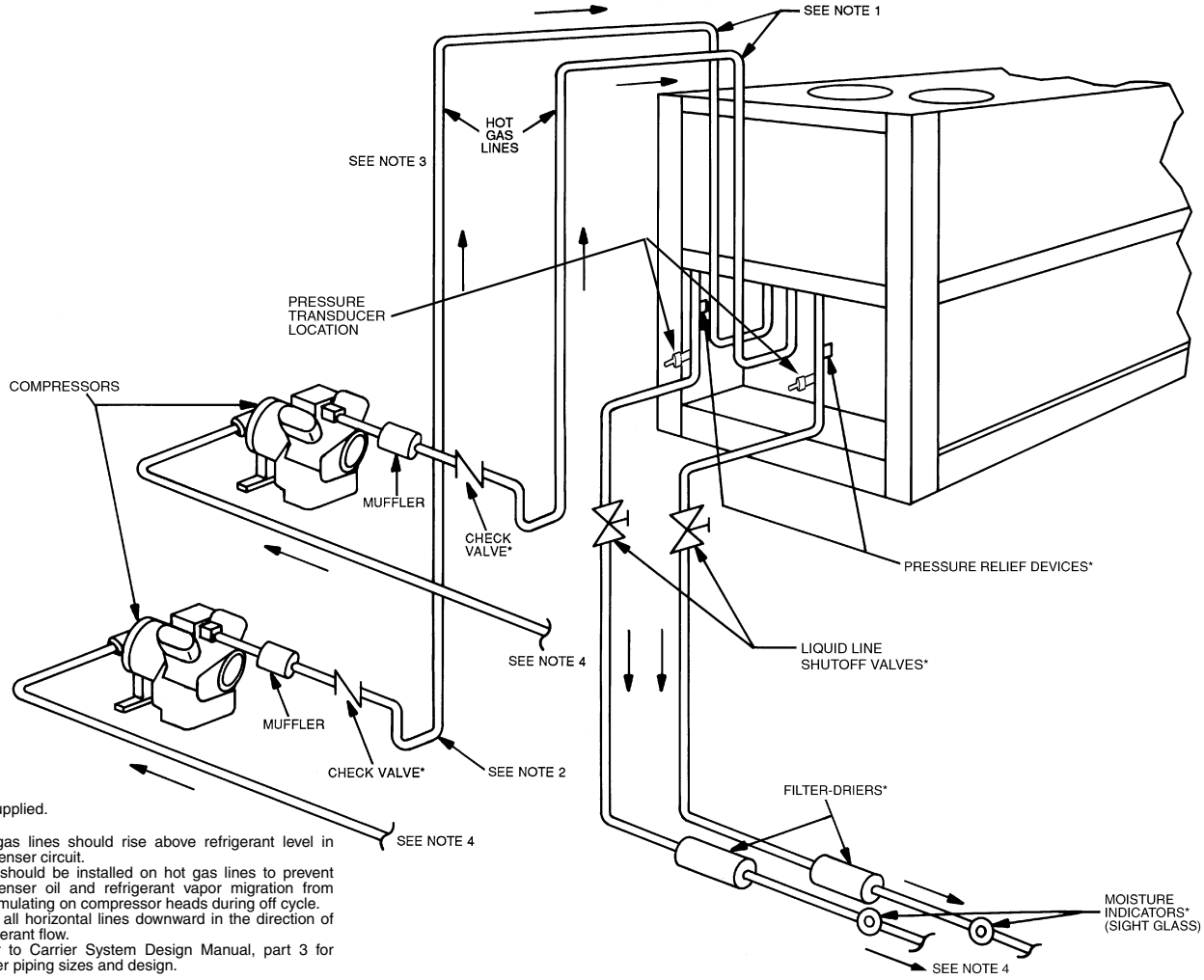


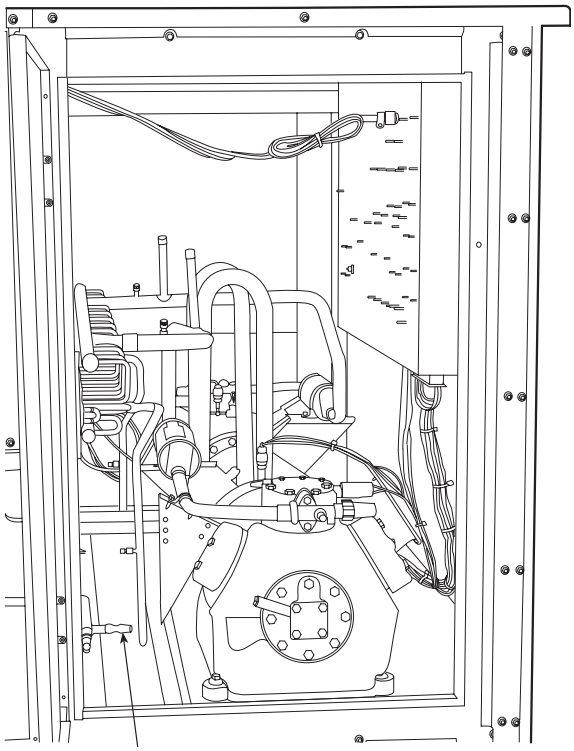
Fig. 18 — 38AH Dual-Circuit Pressure Transducer Location



*Field supplied.

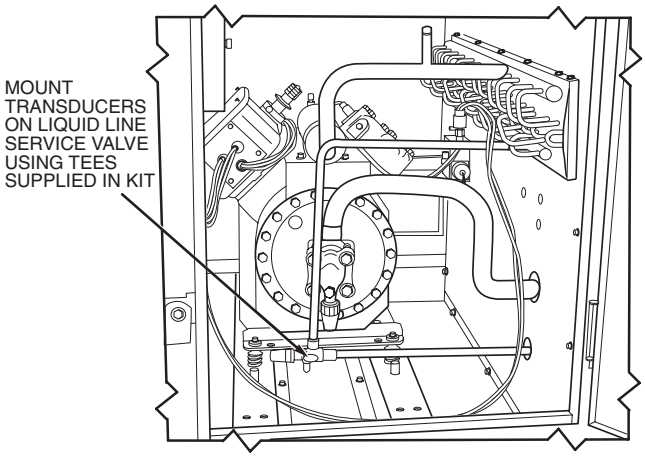
NOTES:
1. Hot gas lines should rise above refrigerant level in condenser circuit.
2. Trap should be installed on hot gas lines to prevent condenser oil and refrigerant vapor migration from accumulating on compressor heads during off cycle.
3. Pitch all horizontal lines downward in the direction of refrigerant flow.
4. Refer to Carrier System Design Manual, part 3 for proper piping sizes and design.

Fig. 19 — Typical Piping for 09DK Condenser With a Dual Split System



CIRCUIT NO. 1

Fig. 20 — 38AH024-034 Unit Pressure Transducer Location



COMPRESSOR END, RIGHT-SIDE ACCESS DOOR

Fig. 21 — 38AKS028-044 Pressure Transducer Location

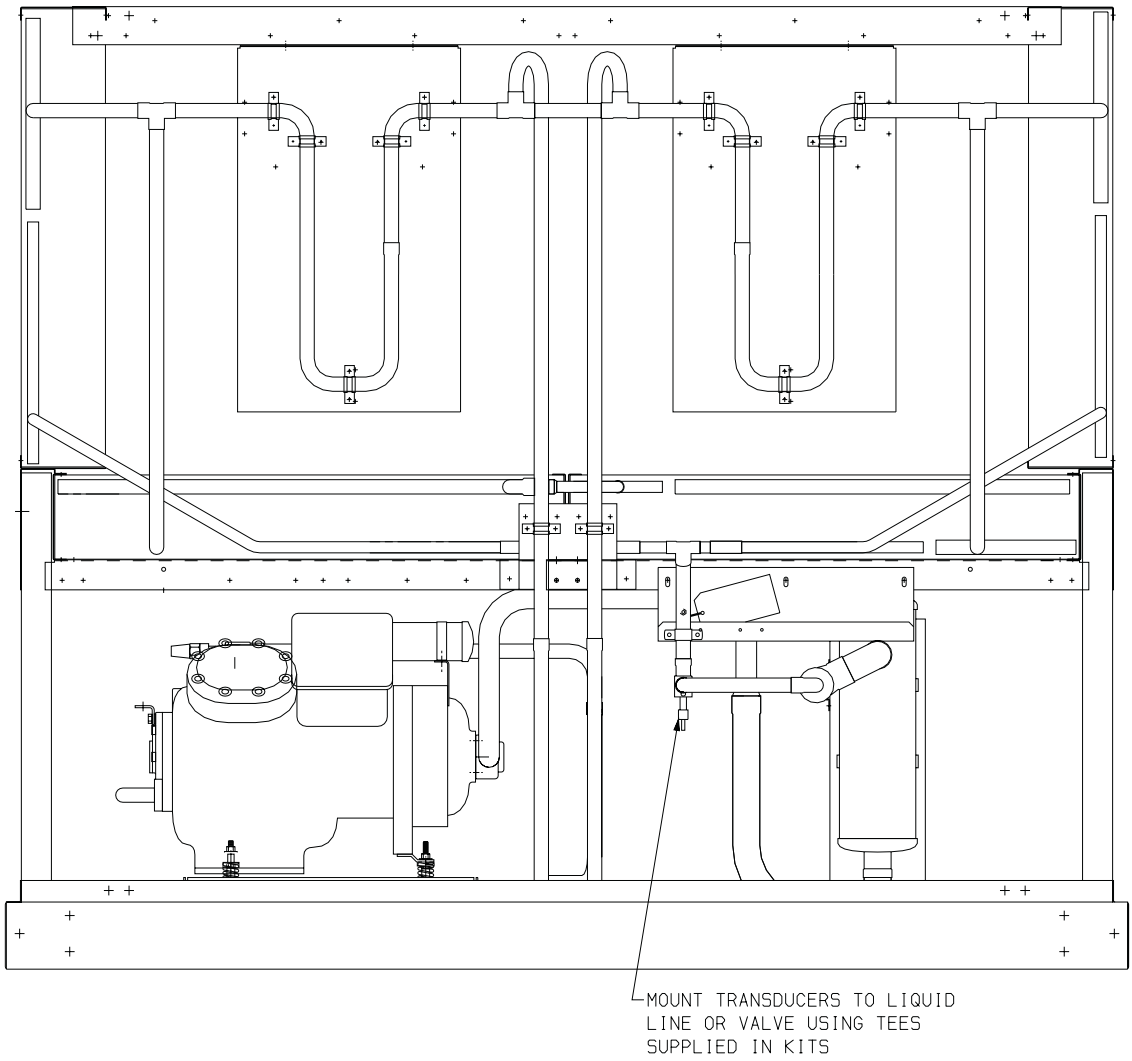


Fig. 22 — 38AH Single-Circuit Pressure Transducer Location

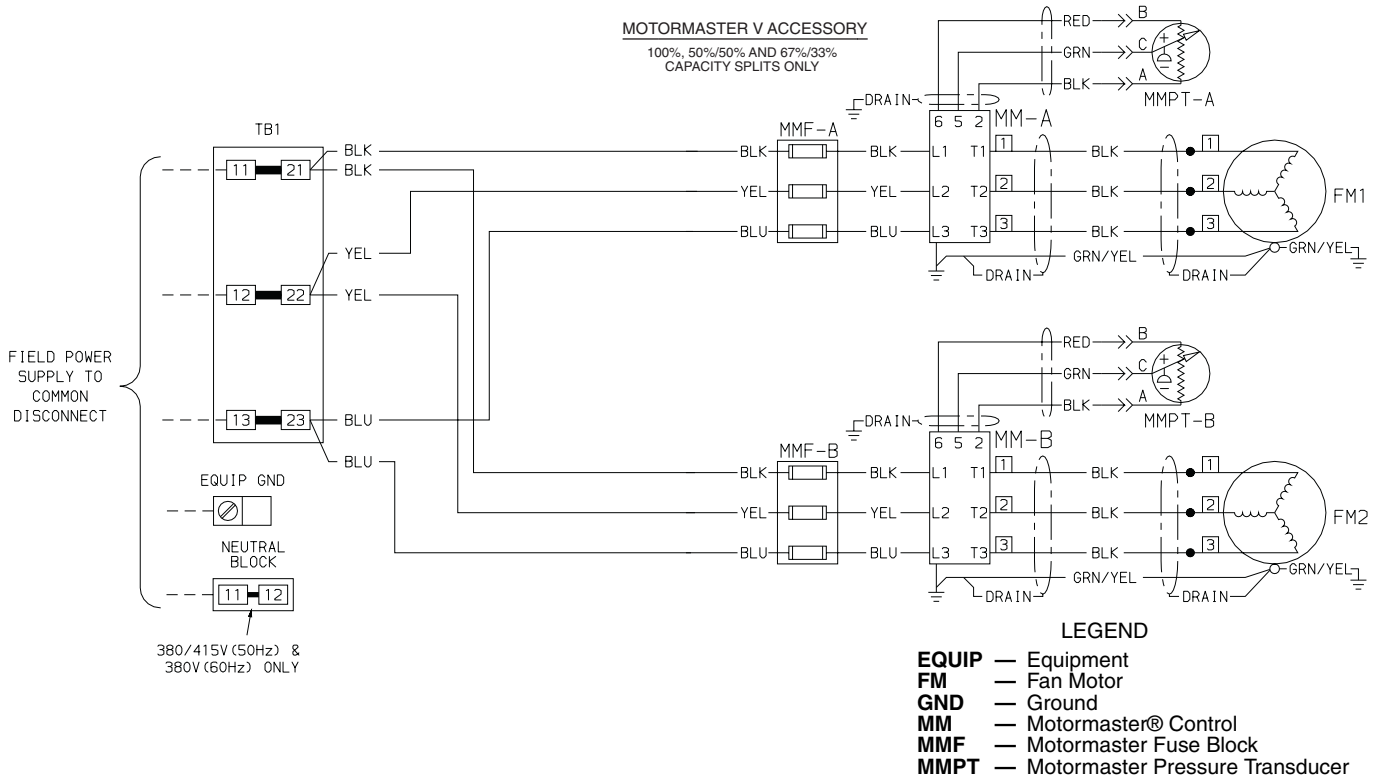


Fig. 23 — 09DK054-094 Schematic Diagram

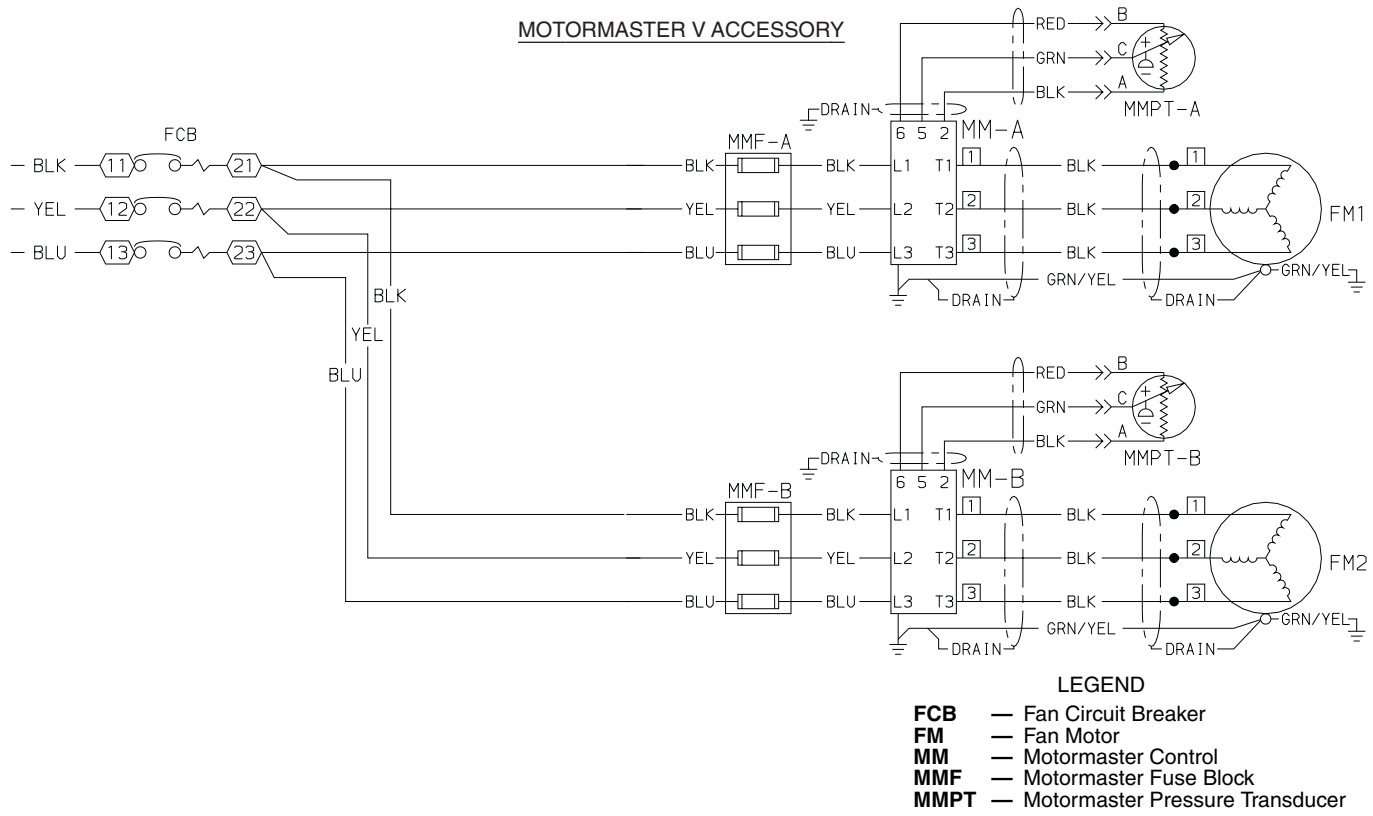


Fig. 24 — 38AH044-104 (Dual Circuit), 30GTN,GTR,GUN,GUR040-110 (and Associated Modular Units) Schematic Diagram

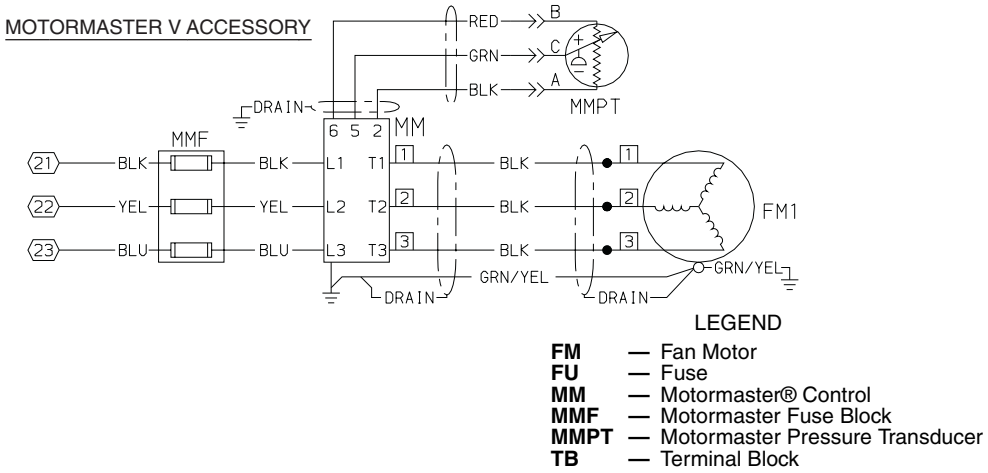


Fig. 25 — 38AH024-034, 38AKS028-044 and 09DK020-044 Schematic Diagram

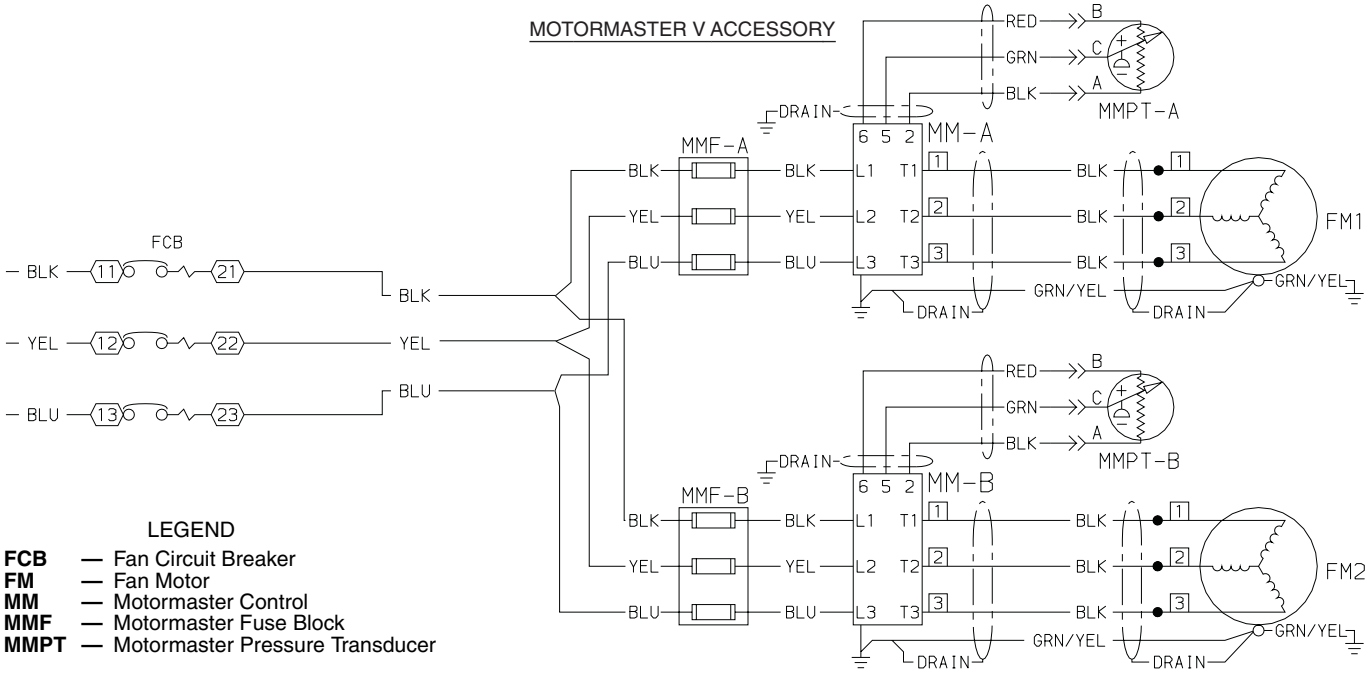


Fig. 26 — 38AH Single Circuit 044-084, 124A/B, 134A/B Schematic Diagram

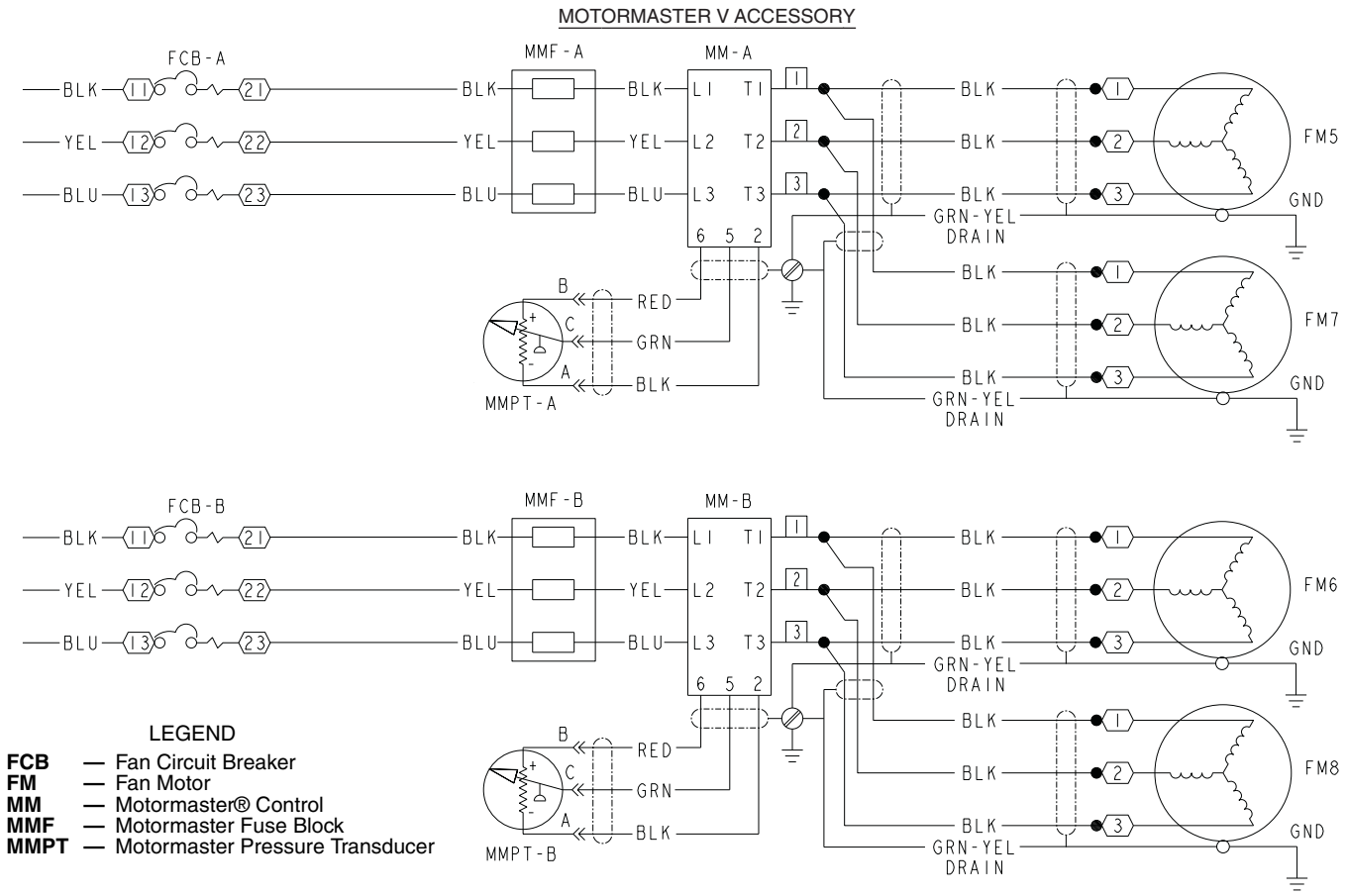


Fig. 27 — 30GTN,GTR,GUN,GUR130-210 (and Associated Modular Units) Schematic Diagram

Step 4 — Configure Motormaster® V Control — The Motormaster V control is configured for 1 of 12 operation modes based on the inputs to the small terminal block on the face of the control. 30GTN,GTR, 38AH and 38AKS units use operating modes 1-4 and 30GUN,GUR units use modes 9-12. 09DK units may use any of these modes according to unit voltage and refrigerant. In these configurations, the MMV modulates the fan speed based on a 0 to 5V feedback signal on pin 5.

To configure the Motormaster V control, install a jumper into the control terminal block according to Table 8 below. The start contact is required to configure the drive for 50/60 Hz operation and input voltage. A jumper is used to enable the R-134a set point rather than the default R-22 set point. Once the control is powered in Step 6 below, it will change to the mode selected according to the inputs. No additional programming is required. Note that the pressure transducer must be attached for proper configuration.

Table 8 — Motormaster V Configuration Table

MODE	NOM VOLTAGE	Hz	CONTROL INPUT (PIN 5)	START CONTACT	SETPOINT JUMPER	REFRIGERANT
1	208*/230/460/575	60	Internal PI control, 0-5V feedback	TB1-TB2	None	R-22
2	208*/380	60	Internal PI control, 0-5V feedback	TB13A-TB2	None	
3	230	50	Internal PI control, 0-5V feedback	TB13B-TB2	None	
4	380/415	50	Internal PI control, 0-5V feedback	TB13C-TB2	None	
9	208*/230/460/575	60	Internal PI control, 0-5V feedback	TB1-TB2	TB12-TB2	R-134a
10	208*/380	60	Internal PI control, 0-5V feedback	TB13A-TB2	TB12-TB2	
11	230	50	Internal PI control, 0-5V feedback	TB13B-TB2	TB12-TB2	
12	380/415	50	Internal PI control, 0-5V feedback	TB13C-TB2	TB12-TB2	

*At 208 v, the drive can run in either mode.

Step 5 — Configure Unit for Motormaster V Operation, 30GTN,GTR,GUN,GUR Only — The unit must be configured for the Motormaster V electronic control operation. Use the *Comfort*Link™ scrolling marquee display to configure the system as following:

1. Inspect all wiring and verify that it matches the appropriate schematic and that all connections are tight
2. Apply main power and control power to unit.
3. Set the Enable/Off/Remote switch to OFF position.
4. Press the ESCAPE Escape key until the screen is blank and use the arrow key to select the Configuration mode LED.
5. Press ENTER key, then use arrow key to select the submode 'OPT1', then press ENTER key.
6. Press the down arrow key until 'MMR.S' displayed.
7. Press ENTER key twice. The word 'PASS' and 'WORD' will flash.
8. Press ENTER key and 1111 will be displayed. Enter the correct password and 'NO' will flash.
9. Use arrow keys to change to 'YES' and press ENTER key.
10. Return the Enable/Off/Remote switch to the proper position.
11. The chiller is now configured for Motormaster control.

Step 6 — Test Motormaster V Control — To test the control and motor, in the Test mode, run any compressor in either circuit. The Motormaster V electronic control adjusts the fan speed based on the liquid pressure input. Ensure that fans are rotating clockwise (as viewed from above). If rotation is backward, lockout all power then swap 2 leads **AFTER** the Motormaster control.

START-UP

When the system calls for the fan, the fan relay will be energized to start the Motormaster® V electronic control. The LED will display the speed of the motor. The display range will be 8 to 50 Hz for 50 Hz units and 8 to 60 Hz for 60 Hz units. The Motormaster V control will start the condenser fan when the compressor engages. The control will adjust the fan speed to maintain approximately 135 psig liquid line pressure for R-22 operation (85 psig for R-134a operation). Above that pressure, the fan should operate at full speed.

The Motormaster V control uses a 0 to 5 vdc signal input from a pressure transducer attached to the liquid line service valve gage port on each circuit. The pressure transducer is connected to terminals 2, 5 and 6 on the controller. The controller is configured by jumper wires and sensor input types. No field programming is required. If drive does not function properly, the information provided below can be used to program and troubleshoot the drive.

Drive Programming — Refer to Table 9 for Motormaster V program parameters for each of the operating modes. Refer to troubleshooting section below before attempting to change programming in the Motormaster V control.

⚠ CAUTION

It is strongly recommended that the user NOT change any programming without consulting Carrier service personnel. Unit damage may occur from improper programming.

To enter password and change program values:

1. Press the MODE button on the Motormaster V controller. The upper right decimal point will flash and the display will read "00".
2. To enter the programming mode to access the parameters, press the MODE button. This will activate the PASSWORD prompt (if the password has not been disabled). The display will read "00" and the upper right-hand decimal point will be flashing.
3. Use the DOWN and UP buttons to scroll to the password value (the factory default password is "111") then press the MODE button. Once the correct password value is entered, the display will read "P01", indicating that the programming mode has been accessed at the beginning of the parameter menu (P01 is the first parameter).

NOTE: If the display flashes "Er", then the password was incorrect, and the process to enter the password must be repeated.

4. Press MODE to display present parameter setting. The upper right decimal point will flash. Use DOWN arrow button and the UP arrow button to scroll to the desired parameter number.
5. Once the desired parameter number is found, press the MODE button to display the present parameter setting. The upper right-hand decimal point will begin flashing, indicating that the present parameter setting is being displayed, and that it can be changed by using the UP and DOWN buttons.
6. Use the DOWN arrow and UP arrow buttons to change setting then press Mode to store the new setting. Pressing the Mode button will store the new setting and also exit the Programming mode.
7. To change another parameter, press the MODE button again to re-enter the programming mode (the parameter menu will be accessed at the parameter that was last viewed or changed before exiting). If the MODE button is pressed within two minutes of exiting the programming mode, the password is not required access the parameters. After two minutes, the password must be entered in order to access the parameters again.

To change password:

1. Enter the current password.
2. Change parameter P44 to the desired password.

To reset factory defaults:

To recognize a factory reset, the VFD (variable frequency drive) must see a change in P48 while start contact is removed. See Table 8.

1. Remove power from the Motormaster V control.
2. Remove start contact and then apply power to Motormaster V control.
3. Enter Programming mode by entering password (see above).
4. Scroll to P48 by using UP and DOWN arrow buttons and then press MODE. One of the 12 mode numbers will appear.
5. Restore factory defaults by changing the value in P48 using UP and DOWN arrow buttons and then storing the value by pressing MODE.
6. Press MODE again to re-display the value of P48. Change the value of P48 to the desired factory default mode using the UP and DOWN arrow buttons then press MODE.
7. Motormaster V control is now restored to factory settings.
8. Remove power from Motormaster V control.
9. Reinstall start contact matching the mode selected in the above steps and reapply power to drive.

Table 9 — Motormaster® V Program Parameters for Operating Modes

PARAMETERS	DESCRIPTION	MODE 1	MODE 2	MODE 3	MODE 4	MODE 9	MODE 10	MODE 11	MODE 12
P01	Line Voltage: 01 = low line, 02 = high line	01	02	01	02	01	02	01	02
P02	Carrier Freq: 01 = 4 kHz, 02 = 6 kHz, 03=8 kHz	01	01	01	01	01	01	01	01
P03	Startup mode: flying restart	06	06	06	06	06	06	06	06
P04	Stop mode: coast to stop	01	01	01	01	01	01	01	01
P05	Standard Speed source: 01= keypad, 04=4-20mA (NO PI), 05= R22, 06=R134a	05	05	05	05	06	06	06	06
P06	TB-14 output: 01 = none	01	01	01	01	01	01	01	01
P08	TB-30 output: 01 = none	01	01	01	01	01	01	01	01
P09	TB-31 Output: 01 = none	01	01	01	01	01	01	01	01
P10	TB-13A function sel: 01 = none	01	01	01	01	01	01	01	01
P11	TB-13B function sel: 01 = none	01	01	01	01	01	01	01	01
P12	TB-13C function sel: 01 = none	01	01	01	01	01	01	01	01
P13	TB-15 output: 01 = none	01	01	01	01	01	01	01	01
P14	Control: 01 = Terminal strip	01	01	01	01	01	01	01	01
P15	Serial link: 02 = enabled 9600,8,N,2 with timer	02	02	02	02	02	02	02	02
P16	Units editing: 02 = whole units	02	02	02	02	02	02	02	02
P17	Rotation: 01 = forward only, 03 = reverse only	01	01	01	01	01	01	01	01
P19	Acceleration time: 10 sec	10	10	10	10	10	10	10	10
P20	Deceleration time: 10 sec	10	10	10	10	10	10	10	10
P21	DC brake time: 0	0	0	0	0	0	0	0	0
P22	DC BRAKE VOLTAGE 0%	0	0	0	0	0	0	0	0
P23	Min freq = 8 Hz ~ 100 – 160 rpm	8	8	8	8	8	8	8	8
P24	Max freq	60	60	50	50	60	60	50	50
P25	Current limit: (%)	125	110	125	110	125	110	125	110
P26	Motor overload: 100	100	100	100	100	100	100	100	100
P27	Base freq: 60 or 50 Hz	60	60	50	50	60	60	50	50
P28	Fixed boost: 0.5% at low frequencies	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
P29	Accel boost: 0%	0	0	0	0	0	0	0	0
P30	Slip compensation: 0%	0	0	0	0	0	0	0	0
P31	Preset spd #1: speed if loss of control signal	57	57	47	47	57	57	47	47
P32	Preset spd #2: 0	0	0	0	0	0	0	0	0
P33	Preset spd #3: 0	0	0	0	0	0	0	0	0
P34	Preset spd 4 default — R22 setpoint. TB12-2 open	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
P35	Preset spd 5 default — R134a setpoint. TB12-2 closed	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
P36	Preset spd 6 default	0	0	0	0	0	0	0	0
P37	Preset spd 7 default	0	0	0	0	0	0	0	0
P38	Skip bandwidth	0	0	0	0	0	0	0	0
P39	Speed scaling	0	0	0	0	0	0	0	0
P40	Frequency scaling 50 or 60 Hz	60	60	50	50	60	60	50	50
P41	Load scaling: default (not used so NA)	200	200	200	200	200	200	200	200
P42	Accel/decel #2: default (not used so NA)	60	60	60	60	60	60	60	60
P43	Serial address	1	1	1	1	1	1	1	1
P44	Password:111	111	111	111	111	111	111	111	111
P45	Speed at min signal: 8 Hz; used when PID mode is disabled and 4-20mA input is at 4 mA	8	8	8	8	8	8	8	8
P46	Speed at max feedback: 60 or 50 Hz. Used when PID disabled and 4-20mA input is at 20 mA	60	60	50	50	60	60	50	50
P47	Clear history? 01 = maintain. (set to 02 to clear)	01	01	01	01	01	01	01	01
P48	Program selection: Program 1 – 12	01	02	03	04	09	10	11	12
P61	PI Mode: 05= reverse, 0-5V, 01 = no PID	05	05	05	05	05	05	05	05
P62	Min feedback = 0 (0V *10)	0	0	0	0	0	0	0	0
P63	Max feedback = 50 (5V * 10)	50	50	50	50	50	50	50	50
P64	Proportional gain = 4%	4	4	4	4	4	4	4	4
P65	Integral gain = .2	.2	.2	.2	.2	.2	.2	.2	.2
P66	PI acell/decel (setpoint change filter) = 5	5	5	5	5	5	5	5	5
P67	Min alarm	0	0	0	0	0	0	0	0
P68	Max alarm	0	0	0	0	0	0	0	0

LEGEND

NA — Not Applicable
PID — Proportional Integral Derivative
TB — Terminal Block

TROUBLESHOOTING

Troubleshooting the Motormaster® V control requires a combination of observing system operation and VFD display information. Refer to Table 10 for status indicators and Table 11 for fault codes.

If the liquid line pressure is above the set point and the VFD is running at full speed (60 or 50 Hz), this is a normal condition. The fan can not go any faster to maintain set point.

The MMV also provides real time monitoring of key inputs and outputs. The collective group is displayed through parameters 50-56 and all values are read only. These values can be accessed without entering a password.

1. Press MODE twice and P50 will appear.
2. Press MODE again to display value.

Use UP and DOWN keys to scroll through parameters P51-P56 then press MODE to display the value.

- P50: FAULT HISTORY — Last 8 faults
- P51: SOFTWARE version
- P52: DC BUS VOLTAGE — in percent of nominal. Usually rated input voltage x 1.4
- P53: MOTOR VOLAGE — in percent of rated output voltage
- P54: LOAD — in percent of drives rated output current rating
- P55: VDC INPUT — in percent of maximum input: 100% will indicate full scale which is 5 v
- P56: 4-20 mA INPUT — in percent of maximum input. 20% = 4 mA, 100% = 20 mA

If a fault lockout (LC) has occurred, view the fault history in P50 to find the last fault. Once P50 is displayed, use the arrow keys to scroll through the last 8 faults. Any current faults or fault codes from the fault history can be analyzed using Table 11.

The drive is programmed to automatically restart after a fault and will attempt to restart three times after a fault (the drive will not restart after CF, cF, GF, F1, F2-F9, or Fo faults). If all three restart attempts are unsuccessful, the drive will trip into FAULT LOCKOUT (LC), which requires a manual reset.

To disable automatic control mode and enter manual speed control mode:

1. Change P05 to '01- keypad'.
2. Push UP and DOWN arrow key to set manual speed.
3. Set P05 to proper value to restore automatic control according to Table 9.

To provide manual start/stop control:

With power removed from VFD, remove start command contact and install a switch between the appropriate start terminals as required in Table 8.

EPM Chip — The drive uses a electronic programming module (EPM) chip to store the program parameters. This is an EEPROM memory chip and is accessible from the front of the VFD. It should not be removed with power applied to the VFD.

Liquid Line Pressure Set Point Adjustment — Adjusting the set point is not recommended due to possible interaction with other head pressure software algorithms or controls. In situations where the set point must be changed, the set points for R-22 and R-134a operation are found in P34 and P35. A higher value will result in a higher liquid line set point. Example: increasing the R-22 set point from 24.0 to 25.0 will increase the liquid line pressure by approximately 10 psi.

Loss of CCN Communications — Carrier Comfort Network (CCN) communications with external control systems can be affected by high frequency electrical noise generated by the Motormaster V control. Ensure unit is well grounded to eliminate ground currents along communication lines.

If communications are lost only while Motormaster V control is in operation, order a signal isolator (CEAS420876-2) and power supplies (CEAS221045-01, 2 required) for the CCN communication line.

Table 10 — Status Indication

FAULT	FAULT NAME	DESCRIPTION
CL	CURRENT LIMIT	The output has exceeded the CURRENT LIMIT setting (Parameter 25) and the drive is reducing the output frequency to reduce the output current. If the drive remains in CURRENT LIMIT for too long, it can trip into a CURRENT OVERLOAD fault (PF).
Er	ERROR	Invalid data has been entered.
GE	GE	"GE" will be displayed if an attempt is made to change the OEM default settings when the drive is operating in the OEM mode (see Parameter 48).
LC	FAULT LOCKOUT	Failed three restart attempts. Requires a manual reset.
SP	START PENDING	This is displayed during the first 15 second interval between restart attempts.

Table 11 — Fault Codes

FAULT CODE	DESCRIPTION	SOLUTION
AF	High Temperature Fault: Ambient temperature is too high; Cooling fan has failed (if equipped).	Check cooling fan operation.
CF	Control Fault: A blank EPM, or an EPM with corrupted data has been installed.	Perform a factory reset using Parameter 48 – PROGRAM SELECTION. See Drive Programming section, page 25.
cF	Incompatibility Fault: An EPM with an incompatible parameter version has been installed.	Either remove the EPM or perform a factory reset (Parameter 48) to change the parameter version of the EPM to match the parameter version of the drive.
GF	Data Fault: User data and Carrier defaults in the EPM are corrupted.	Restore factory defaults by toggling P48 to another mode. Then set P48 to desired mode to restore all defaults for that mode. See Drive Programming section, page 25. If that does not work, replace EPM.
HF	High DC Bus Voltage Fault: Line voltage is too high; Deceleration rate is too fast; Overhauling load.	Check line voltage — set P01 appropriately.
JF	Serial Fault: The watchdog timer has timed out, indicating that the serial link has been lost.	Check serial connection (computer). Check settings for P15. Check settings in communication software to match P15.
LF	Low DC Bus Voltage Fault: Line voltage is too low.	Check line voltage — set P01 appropriately.
OF	Output Transistor Fault: Phase to phase or phase to ground short circuit on the output; Failed output transistor; Boost settings are too high; Acceleration rate is too fast.	Reduce boost or increase acceleration values. If unsuccessful, replace drive.
PF	Current Overload Fault: VFD is undersized for the application; Mechanical problem with the driven equipment.	Check line voltage – set P01 appropriately. Check for dirty coils. Check for motor bearing failure.
SF	Single-phase Fault: Single-phase input power has been applied to a three-phase drive.	Check input power phasing.
F1	EPM Fault: The EPM is missing or damaged.	Install EPM or replace with new EPM.
F2 - F9, Fo	Internal Faults: The control board has sensed a problem.	Consult factory.
Drive display = '---' even though drive should be running	Start contact is missing or not functioning.	Check the fan relay for proper operation. See Drive Programming section, page 25.
VFD not slowing down even though liquid line pressure is below setpoint.	Faulty pressure transducer output VFD set for manual control.	Check VDC signal between TB5 and TB2. Should be in range of 0.5 V to 4.5 V. Restore VFD to automatic control. Change Parameter P05 back to correct value shown in Table 8.
VFD flashes "---" and LCS	No start contact in place.	Refer to Table 7 for proper jumper location. Check fan relay contact.
VFD flashes 57 (or 47) and LCS	Speed signal lost. Drive will operate at 57 (or 47) Hz until reset or loss of start command. Resetting requires cycling start command (or power).	Transducer signal lost. Check VDC signal between TB5 and TB2. Should be in range of 0.5V to 4.5V. 5VDC output should be present between TB6 and TB2.

LEGEND

EPM — Electronic Programming Module
LCS — Loss of Control Signal
VFD — Variable Frequency Drive