

## CONTROL PANELS & MODIFICATION KITS FOR HICA, HOCA, HIRU, HICW UNITS

### Preface

The tables on the following pages contain the control panels and their modification kits for HICA, HOCA, HIRU, and HICW compressor units.

### Description of Tables

The color coded sheets contain the control panel selection tables. The following factors must be considered when selecting a table:

#### A. COMPRESSOR MOTOR VOLTAGE REQUIREMENTS.

Control panels are available for two compressor voltages:

1. 208-230/3/60. ("K" electrical type).
2. 460/3/60. ("M" electrical type). Note that in addition to the 460 volt power supply for the motor, a 208-230 volt power supply is required for these control panels to operate the pilot circuit and provide power for electric defrost. For Air Defrost Units 3 hp and below 208-230/60/1 power is required. For all other 460V units 208-230/60/3 is required.

#### B. CONDENSING UNIT TYPE. I = Indoor. O = Outdoor.

Select "IK" or "IM" panels for indoor HICA, HIRU, HICW units; select "OK" or "OM" panels for HOCA outdoor units.

#### C. DEFROST TYPE. The last table within each of the previous groups contains the air defrost control panels; all other tables are for electric defrost.

#### D. REFRIGERATOR TYPE. The tables for electric defrost are separated into three groups: those for display cases with defrost sub-breakers, those for cases requiring multiple defrost breakers installed in the panel, and those for unit coolers. Display case fans are not cycled by the defrost timer during defrost, whereas unit cooler fans are, requiring that unit coolers be interfaced with the defrost timer in the control panel. Thus, the pilot circuit of panels provided for unit cooler application is sized to handle the fan motor load up to 12 amps, which is sufficient for all Hussmann unit coolers.

After the colored sheets are tables for selecting the following control panel modifications kits:

- A. NEMA-rated motor Contactors
- B. Single Phase
- C. Specific Vendor Circuit Breakers
- D. Definite Purpose Motor and Defrost Contactors
- E. Two-tier Kits and Interconnection Kits

### Selecting a Control Panel

1. Select correct table by whether display cases or unit coolers are being used, Air or Electric Defrost, and the type of defrost termination required. Tables are also available for Indoor 208 Volt panels for display cases requiring Multiple Defrost Sub-Breakers.
2. For Electric Defrost cases first turn to Section 2, "Defrost Wiring", to obtain the defrost amperage required for the given line-up. Note that unit cooler defrost data is supplied with the corresponding table.  
For dissimilar refrigerators on the same unit, the total defrost amperage must be calculated as described in Section 2, "Defrost Wiring."  
Next return to this Section, (10), and select a control panel which has a maximum defrost amperage greater than the defrost amperage obtained in Section 2. Align the defrost amp column with the row corresponding to the condensing unit being used, and select the panel.
3. If multiple defrost sub-breakers are required, see the tables and instructions following the control panel selection tables. Note that all Electric Defrost refrigerators operating on outdoor units, and all Electric Defrost unit coolers require sub-fusing at the refrigerator, so do not apply multiple defrost breaker panels to them.
4. For Air Defrost tables, select the correct refrigerator type and defrost termination from the left most columns, then proceed horizontally across to intersection with correct condensing unit model column.

## 208-230 VOLT CONTROL PANELS FOR HICA, HIRU, HICW UNITS WITH COPELAND COMPRESSORS

### DISPLAY CASES Temperature (or Time) Terminated Electric Defrost

Maximum Defrost Amps Defrost Breaker (Amps) Defrost Contactor Size (Amps)*	12 15 30	16 20 30	24 30 30	24 30 40	32 40 40	40 50 40	48 60 50	56 70 75	50 100 50	64 80 75	72 90 75	75 100 75	100 125 112	120 150 120	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)	
Condensing Unit Model	Control Panel Nomenclature																
0051 - 0245	IK59		IK61 IK128			IK129		IK162							15	25	
0304, 0444, 0534						IK63	IK161								30	25	
0311 - 0375		IK60	IK62			IK64	IK146	IK105							20	25	
0404, 0475 - 0531, 0544 - 0621				IK149	IK145	IK64	IK146	IK105							50	30	
0623 - 0721, 0725 - 0954				IK160	IK150	IK65	IK151			IK152		IK103			50	40	
0623 - 0721, 0725 - 0954								IK66							70	40	
0724, 1015 - 1344								IK67					IK104		70	60	
0724, 1015 - 1344										IK148					80	60	
0724, 1015 - 1344											IK68				90	60	
1415 - 1544									IK69			IK70			100	75	
1415 - 1544													IK70		125	75	
1815 - 2214, 2311 - 2324														IK71	100	75	
1815 - 2214, 2311 - 2324														IK71	125	75	
1815 - 2214, 2311 - 2324														IK71	150	75	
2413 - 2714, 2215, 2225														IK73	125	120	
2413 - 2714, 2215, 2225															IK74	150	120
2813 - 3025														IK74	150	120	
Main Breaker Size (Amps)	15	20	30	50	50	50	60	70	100	80	90	100	125	150			
Pilot Breaker Size (Amps)	15	15	15	15	15	15	15	15	15	15	15	15	15	15			
Defrost Timer Model	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145			

\*Resistive

### Pressure Terminated Electric Defrost

Maximum Defrost Amps Defrost Breaker (Amps) Defrost Contactor Size (Amps)*	12 15 30	16 20 30	24 30 30	40 50 40	56 70 75	50 100 50	72 90 75	75 100 75	100 125 112	120 150 120	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Condensing Unit Model	Control Panel Nomenclature											
0051 - 0245	IK42		IK44								15	25
0304, 0444, 0534			IK130	IK131							30	30
0311 - 0375		IK43	IK45	IK46							20	25
0404, 0475 - 0531, 0544 - 0621				IK47							50	30
0623 - 0721, 0725 - 0954				IK48							50	40
0623 - 0721, 0725 - 0954					IK49						70	40
0724, 1015 - 1344					IK50						70	60
0724, 1015 - 1344							IK51				90	60
1415 - 1544						IK52		IK53			100	75
1415 - 1544								IK53		IK54	125	75
1815 - 2214, 2311 - 2324								IK53		IK54	100	75
1815 - 2214, 2311 - 2324										IK54	125	75
1815 - 2214, 2311 - 2324											150	75
2413 - 2714										IK56	125	120
2413 - 2714											150	120
2813 - 3025											150	120
Main Breaker Size (Amps)	15	20	30	50	70	100	90	100	125	150		
Pilot Breaker Size (Amps)	15	15	15	15	15	15	15	15	15	15		
Defrost Timer Model	8245	8245	8245	8245	8245	8245	8245	8245	8245	8245		

\*Resistive

**208-230 VOLT CONTROL PANELS FOR  
HICA, HIRU, HICW UNITS WITH COPELAND COMPRESSORS**  
**CONTROL PANELS WITH MULTIPLE SUB-BREAKERS**  
**(Indoor 208-230V Display Cases Only)**

The next two control panel tables permit the use of as many as six separate defrost breakers. These tables should be applied whenever display cases are utilized without sub-fusing at the case, and on indoor units. The table directly below lists all defrost sub-breakers which can be applied to the following two control panel tables. These breakers should be sized according to the defrost loads of each display case obtained from Section 2, "Defrost Wiring."

Select circuit breakers from the following chart:

**Defrost Sub-breakers**

Sub-Breaker Size (Amps)	Max. Loading Value (80%) (Amps)	2-Pole	3-Pole
20	16	53VA	86DV
30	24	54VA	73DT
40	32	—	74DT
50	40	—	75DT
70	56	—	50FA

If only one display case defrost is to be wired through a breaker, then a 2-pole (single phase) breaker can be selected, and loaded no more than 80 percent. If two or more display cases are wired through the same breaker, or if a G5 or G6 which requires 3-phase defrost is used, then a 3-pole (three phase) breaker must be selected also at no more than 80 percent loaded.

It is recommended that local codes be reviewed, since they may impose other restrictions which effect the breaker selection.

Note that the number of breaker positions available is limited as listed on the following two tables. All circuit breaker handles will protrude through the panel door for ease of access.

Select power distribution block 55VA for any panel which uses more than **two** sub-breakers.

**MULTIPLE DEFROST SUB-BREAKER PANEL**  
**Time or Temperature Terminated Display Cases**

Maximum Defrost Amps. Defrost Contactor Size (Amps)* Max. No. Defrost Sub-Breakers	40 3 2	40 3 2	40 3 2	40 4 3	56 6 4	56 6 4	72 6 4	72 6 4	100 6 4	75 6 4	112 6 4	112 6 4	Motor Contactor Size (Amps)
Condensing Unit Model	Control Panel Nomenclature												
0051 - 0245 0311 - 0375 0304, 0444, 0534 0404, 0475 - 0531, 0544 - 0621	IK155	IK89	IK134	IK90	IK157	IK91	IK158	IK92	IK159	IK93	IK94	IK95	25 25 25 30
0633 - 0721, 0725 - 0954 0724, 1015 - 1344 1415 - 1544 1815 - 2214, 2311 - 2324 2413 - 3015, 2215, 2225										IK93 IK93	IK94 IK94		40 60 75 75
Main Breaker (Amps) Compressor Breaker (Amps) Pilot Breaker (Amps) Defrost Timer	50 15 15 8145	50 20 15 8145	50 30 15 8145	50 50 15 8145	70 50 15 8145	70 70 15 8145	90 70 15 8145	90 90 15 8145	125 70 15 8145	100 100 15 8145	125 125 15 8145	150 150 15 8145	

\*Resistive

**Pressure Terminated Display Cases**

Maximum Defrost Amps. Defrost Contactor Size (Amps)* Max. No. Defrost Sub-Breakers	40 3 2	40 3 2	40 3 2	40 4 3	56 6 4	75 6 4	75 6 4	112 6 4	112 6 4	Motor Contactor Size (Amps)
Condensing Unit Model	Control Panel Nomenclature									
0051 - 0245 0311 - 0375 0304, 0444, 0534 0404, 0475 - 0531, 0544 - 0621	IK156	IK96	IK135	IK97	IK98	IK99	IK100	IK101	IK102	25 25 25 30
0623 - 0721, 0725 - 0954 0724, 1015 - 1344 1415 - 2214, 2311 - 2324 1415 - 2214, 2311 - 2324 2413 - 3015, 2215, 2225										40 60 75 75
Main Breaker (Amps) Compressor Breaker (Amps) Pilot Breaker (Amps) Defrost Timer	50 15 15 8245	50 20 15 8245	50 30 15 8245	50 50 15 8245	70 70 15 8245	90 90 15 8245	100 100 15 8245	125 125 15 8245	150 150 15 8245	

\*Resistive

## 208-230 VOLT CONTROL PANELS FOR HICA, HIRU, HICW UNITS WITH COPELAND COMPRESSORS UNIT COOLER DEFROST AMPS

Model - Number Of Fans	Defrost Amps 230/3/60*				Model - Number Of Fans	Defrost Amps 230/3/60*			
	Quantity of Like Unit Coolers					Quantity of Like Unit Coolers			
	1	2	3	4		1	2	3	4
SK-1	5.2	9.0	9.0	13.8	GL-1	3.5	6.1	6.1	9.3
SK-2	10.4	18.0	18.0	27.5	GL-2	7.0	12.1	12.1	18.5
SK-3	15.6	27.0	27.0	41.3	GL-3	10.4	18.0	18.0	27.5
SK-4	12.1	24.2	36.3	48.4	GL-4	13.9	24.1	24.1	36.8
SK-5	15.1	30.2	45.3	60.4	GL-5	17.4	30.1	30.1	46.0
SK-6	18.1	36.2	54.3	72.4	GL-6	20.9	36.2	36.2	55.3
SS-1	12.6	21.8	21.8	33.3	GH-1	7.0	12.1	12.1	18.5
SSX-1	16.5	28.6	28.6	43.7	GH-2	13.9	24.1	24.1	36.8
SS-2	24.3	42.1	42.1	64.3	GH-3	20.9	36.2	36.2	55.3
SSX-2	31.2	54.0	54.0	82.5	GH-4	27.8	48.6	48.6	73.9
SS-3	36.5	63.2	63.2	96.6	GH-5	34.8	60.3	60.3	92.1
SSX-3	47.8	87.8	87.8	126.5	GH-6	N/A	N/A	N/A	N/A

\*NOTE: Values given for quantity of one unit cooler are 230V single phase except the 4, 5 and 6 fan SK coils which are 230V three phase. Defrost amps are not shown for SC models because they use off-time defrost.

### UNIT COOLERS Temperature Terminated Electric Defrost

Maximum Defrost Amps. Main Defrost Breaker Size (Amps) Defrost Contactor Size (Amps)*	16	24	40	56	72	75	75	75	75	90	90	90	90	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Condensing Unit Model	Control Panel Nomenclature														
0051 - 0245	IK76	IK77												15	25
0311 - 0375	IK144	IK78	IK79											20	25
0304, 0444, 0534		IK132	IK133											30	25
0404, 0475 - 0531, 0544 - 0621			IK80											50	30
0623 - 0721, 0725 - 0954				IK81										70	40
0724, 1015 - 1344				IK82										70	60
0724, 1015 - 1344					IK83									90	60
1415 - 1544						IK84								100	75
1815 - 2214, 2311 - 2324							IK85							125	75
1815 - 2214, 2311 - 2324												IK86		150	75
2413 - 2714, 2215, 2225									IK87					150	120
2813 - 3025												IK88		200	120
Pilot Breaker Size (Amps)	15	15	15	15	15	15	15	15	15	15	15	15			
Unit Cooler Fan Breaker Size (Amps)	15	15	15	15	15	15	15	15	15	15	15	15			
Maximum Unit Cooler Fan Amps (2 POLE)	12	12	12	12	12	12	12	12	12	12	12	12			
Defrost Timer Model	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145	8145			

\*Resistive

### UNIT COOLERS AND DISPLAY CASES Air Defrost

Refrigerator Type Display Unit Case Cooler	Defrost Termination	Condensing Unit Model										Defrost Timer Model
		0051 - 0245	0311 - 0375	0304, 0444, 0534	0404, 0475 - 0531, 0544 - 0621	0623 - 0721 0725 - 0944	0724, 1015 - 1344	1415 - 2114, 2311 - 2324	2215, 2225 2413 - 2714	2813 - 3025		
		Control Panel Nomenclature										
Dairy, Meat, Deli Produce (33°)	SC, SK, GH, GL, S, SX	Pressure	IK10	IK11	IK124	IK12	IK13	IK14	IK15	IK16	IK17	8245
		Off-Cycle	IK18	IK19	IK125	IK20	IK21	IK22	IK23	IK24	IK25	NONE
Self Service Meat, Deli, Prod.	SC, SK, GH, GL, S, SX	Temperature (or time)	IK34	IK35	IK126	IK36	IK37	IK38	IK39	IK40	IK41	8145
		Time - Over 110 Minutes	IK26	IK27	IK127	IK28	IK29	IK30	IK31	IK32	IK33	4004
Main Breaker/Compressor Breaker Size (Amps)			15	20	30	50	50	70	100	125	150	
Standard Motor Contactor Size (Amps)			25	25	30	30	40	60	75	120	120	
Pilot Breaker Size (Amps)			15	15	15	15	15	15	15	15	15	

### REVERSE AIR ELECTRIC DEFROST CONTROL PANEL KITS

Determine the case maximum defrost amperage from Section 2, and select the appropriate kit from the table to the right. The kits are factory installed and contain circuit breakers and contactors. If the maximum defrost amperage is in between the ratings shown, select the next larger sized kit. The kits will be wired for 3 phase heater loads. If the kit selection is sized for single phase, field wiring will be to the outside terminals of the defrost contactor. NOTE: These kits do not apply to the #4004 defrost timer, or when no defrost timer is used.

Kit Nomenclature	Max. Defrost Amperage
42FE	12
43FE	16
44FE	24
45FE	40
46FE	56
47FE	75

**208-230 VOLT CONTROL PANELS FOR  
HOCA UNITS WITH COPELAND COMPRESSORS**

**DISPLAY CASES**  
**Temperature (or Time) Terminated Electric Defrost**

	12	16	24	40	56	50	72	75	100	120	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Maximum Defrost (Amps)	12	16	24	40	56	50	72	75	100	120		
Defrost Protection Breaker	15	20	30	50	70	100	90	100	125	150		
Defrost Contactor Size (Amps)*	30	30	30	40	75	50	75	75	112	120		
Condensing Unit Model	Control Panel Nomenclature											
0051 - 0245	OK34		OK36								15	25
0304, 0444, 0534			OK83	OK84	OK89						30	25
0311 - 0355		OK35	OK37	OK38							20	25
0404, 0475 - 0531, 0544 - 0621				OK39	OK40						50	30
0623 - 0721, 0725 - 0944				OK41				OK43			50	40
0623 - 0721, 0725 - 0944					OK42				OK46		70	40
0724, 1015 - 1344					OK44					OK46	70	60
0724, 1015 - 1344							OK45				90	60
1415 - 1544						OK47		OK48			100	75
1415 - 1544									OK49		125	75
1815 - 2214, 2311 - 2324								OK48			100	75
1815 - 2214, 2311 - 2324									OK49		125	75
1815 - 2214, 2311 - 2324										OK50	150	75
2413 - 2714, 2215, 2225									OK51		125	120
2413 - 2714, 2215, 2225										OK52	150	120
2813 - 3025										OK52	150	120
Main Breaker (Amps)	15	20	30	50	70	100	90	100	125	150		
Pilot Breaker (Amps)	15	15	15	15	15	15	15	15	15	15		
Defrost Timer	A633	A633	A633	A633	A633	A633	A633	A633	A633	A633		

\*Resistive

## 208-230 VOLT CONTROL PANELS FOR HOCA UNITS WITH COPELAND COMPRESSORS

### UNIT COOLER DEFROST AMPS

Model - Number Of Fans	Defrost Amps 230/3/60*				Model - Number Of Fans	Defrost Amps 230/3/60*			
	Quantity of Like Unit Coolers					Quantity of Like Unit Coolers			
	1	2	3	4		1	2	3	4
SK-1	5.2	9.0	9.0	13.8	GL-1	3.5	6.1	6.1	9.3
SK-2	10.4	18.0	18.0	27.5	GL-2	7.0	12.1	12.1	18.5
SK-3	15.6	27.0	27.0	41.3	GL-3	10.4	18.0	18.0	27.5
SK-4	12.1	24.2	36.3	48.4	GL-4	13.9	24.1	24.1	36.8
SK-5	15.1	30.2	45.3	60.4	GL-5	17.4	30.1	30.1	46.0
SK-6	18.1	36.2	54.3	72.4	GL-6	20.9	36.2	36.2	55.3
SS-1	12.6	21.8	21.8	33.3	GH-1	7.0	12.1	12.1	18.5
SSX-1	16.5	28.6	28.6	43.7	GH-2	13.9	24.1	24.1	36.8
SS-2	24.3	42.1	42.1	64.3	GH-3	20.9	36.2	36.2	55.3
SSX-2	31.2	54.0	54.0	82.5	GH-4	27.8	48.6	48.6	73.9
SS-3	36.5	63.2	63.2	96.6	GH-5	34.8	60.3	60.3	92.1
SSX-3	47.8	87.8	87.8	126.5	GH-6	N/A	N/A	N/A	N/A

\*NOTE: Values given for quantity of one unit cooler are 230V single phase except the 4, 5 and 6 fan SK coils which are 230V three phase. Defrost amps are not shown for SC models because they use off-time defrost.

### UNIT COOLERS Temperature Terminated Electric Defrost

Maximum Defrost Amps. Main Defrost Breaker Size (Amps) Defrost Contactor Size (Amps)*	16	24	40	56	72	75	75	75	90	90	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Condensing Unit Model	Control Panel Nomenclature											
0051 - 0245 0311 - 0375 0304, 0444, 0534 0404, 0475 - 0531, 0544 - 0621	OK54	OK55 OK56 OK85	OK57 OK86 OK58								15 20 30 50	25 25 30 30
0623 - 0721, 0725 - 0944 0623 - 0721, 0725 - 0944 0724, 1015 - 1344 0724, 1015 - 1344				OK59		OK60					70 100 70 90	40 40 60 60
1415 - 1544 1815 - 2214, 2311, 2324 1815 - 2214, 2311, 2324 2413 - 2714, 2215, 2225					OK62	OK63	OK64			OK65	100 125 150 150	75 75 75 120
2413 - 2714, 2215, 2225 2813 - 3025								OK66		OK67 OK67	200 200	120 120
Pilot Breaker Size (Amps) Unit Cooler Fan Breaker Size (Amps) Maximum Unit Cooler Fan Amps (2 POLE) Defrost Timer Model	15 15 12 A633	15 15 12 A633	15 15 12 A633	15 15 12 A633	15 15 12 A633	15 15 12 A633	15 15 12 A633	15 15 12 A633	15 15 12 A633	15 15 12 A633		

\*Resistive

### UNIT COOLERS AND DISPLAY CASES Air Defrost

Refrigerator Type Display Unit Case Cooler	Defrost Termination	Condensing Unit Model									Defrost Timer Model
		0051 - 0245	0311 - 0355	0304, 0444,0534	0404,0475-0531, 0544-0621	0623-0721 0725-0944	0724, 1015-1344	1415-2214, 2311-2324	2215-2225, 2413-2714	2813 - 3024	
Off-Cycle	Off-Cycle	OK10	OK11	OK80	OK12	OK13	OK14	OK15	OK16	OK17	None
Self Service Meat/Deli & Dairy Produce	Temperature (or time) (1)	OK18	OK19	OK81	OK20	OK21	OK22	OK23	OK24	OK25	A633
Service Meat/Deli	Time - Over 110 Minutes	OK26	OK27	OK82	OK28	OK29	OK30	OK31	OK32	OK33	4004
Main Breaker Size (Amps)		15	20	30	50	50	70	100	125	150	
Standard Motor Contactor Size (Amps)		25	25	30	30	40	60	75	120	120	
Pilot Breaker Size (Amps)		15	15	15	15	15	15	15	15	15	

### REVERSE AIR ELECTRIC DEFROST CONTROL PANEL KITS

Determine the case maximum defrost amperage from Section 2, and select the appropriate kit from the table to the right. The kits are factory installed and contain circuit breakers and contactors. If the maximum defrost amperage is in between the ratings shown, select the next larger sized kit. The kits will be wired for 3 phase heater loads. If the kit selection is sized for single phase, field wiring will be to the outside terminals of the defrost contactor. NOTE: These kits do not apply to the #4004 defrost timer, or when no defrost timer is used.

Kit Nomenclature	Max. Defrost Amperage
42FE	12
43FE	16
44FE	24
45FE	40
46FE	56
47FE	75

## 460 VOLT CONTROL PANELS FOR HICA, HIRU, HICW UNITS WITH COPELAND COMPRESSORS

### DISPLAY CASES Temperature (or Time) Terminated Electric Defrost

									460 Volt Components		
208-230 Volt Maximum Defrost Amps Defrost Breaker Size (Amps)		16	24	40	40	56	75	100	120	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Components		20	30	50	50	70	100	125	150		
Condensing Unit Model		Control Panel Nomenclature									
0091 - 0245, 0311 - 0375		IM49	IM50	IM51						15	25
0304, 0444			IM88	IM95						15	25
0404, 0475 - 0521, 0544 - 0621					IM52	IM53				15	25
0524, 0623 - 0954, 1064					IM54	IM55	IM56	IM100		30	30
1015 - 1054, 1311 - 1344						IM57	IM58	IM59		50	30
1415 - 1534						IM60	IM61	IM62		50	40
1815 - 2204, 2311, 2314							IM61	IM62	IM63	50	40
2215, 2413 - 3015								IM64	IM65	70	60
Pilot Breaker Size (Amps)		15	15	15	15	15	15	15	15	208-230 Volt Components	
Fan Contactor Size (Amps)		—	25	—	25	25	25	25	25		
Defrost Contactor Size (Amps)*		30	30	40	40	75	75	112	120		
Defrost Timer		8145	8145	8145	8145	8145	8145	8145	8145		

\*Resistive

### Pressure Terminated Electric Defrost

									460 Volt Components		
208-230 Volt Maximum Defrost Amps Defrost Breaker Size (Amps)		16	24	40	40	56	75	100	120	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Components		20	30	50	50	70	100	125	150		
Condensing Unit Model		Control Panel Nomenclature									
0091 - 0245, 0311 - 0375		IM34	IM35	IM36						15	25
0304, 0444			IM87	IM94						15	25
0404, 0475 - 0521, 0544 - 0621					IM37					15	25
0524, 0623 - 0954, 1064					IM38	IM39	IM99			30	30
1015 - 1054, 1311 - 1344						IM40	IM41			50	30
1415 - 1534						IM42	IM43	IM44		50	40
1815 - 2204, 2311, 2314							IM43	IM44	IM45	50	40
2215, 2413 - 3015								IM46	IM47	70	60
Pilot Breaker Size (Amps)		15	15	15	15	15	15	15	15	208-230 Volt Components	
Fan Contactor Size (Amps)		—	25	—	25	25	25	25	25		
Defrost Contactor Size (Amps)*		30	30	40	40	75	75	112	120		
Defrost Timer		8245	8245	8245	8245	8245	8245	8245	8245		

\*Resistive

# 460 VOLT CONTROL PANELS FOR HICA, HIRU, HICW UNITS WITH COPELAND COMPRESSORS

## UNIT COOLERS Temperature Terminated Electric Defrost

							460 Volt Components		
208-230 Volt Components	16	24	40	56	80	100	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)	
							15	25	
Maximum Defrost Amps	20	30	50	70	100	125			
Main Breaker Size (Amps)									
Condensing Unit Model	Control Panel Nomenclature								
0091 - 0375	IM67	IM68	IM69				15	25	
0304, 0444		IM89	IM97				15	25	
0404, 0475 - 0521, 0544 - 0621			IM70				15	25	
0524, 0623 - 0954, 1064				IM71	IM101		30	30	
1015 - 1054, 1311 - 1344				IM72	IM73		50	30	
1415 - 1534					IM74		50	40	
1815 - 2204, 2311 - 2314					IM74	IM75	50	40	
2215, 2413 - 3015					IM76	IM77	70	60	
Pilot Breaker Size (Amps)	15	15	15	15	15	15	208-230 Volt Components		
Unit Cooler Fan Breaker Size (Amps)	15	15	15	15	15	15			
Maximum Unit Cooler Fan Amps	12	12	12	12	12	12			
Defrost Contactor Size (Amps)*	30	30	40	75	75	90			
Defrost Timer	8145	8145	8145	8145	8145	8145			

\*Resistive

## UNIT COOLERS & DISPLAY CASES Air Defrost

Defrost Termination	Condensing Unit Model								Defrost Timer Model
	0091-0245, 0311-0375	0304, 0444	0404, 0475-0521, 0544-0621	0524, 0623-0954, 1064	1015-1054, 1311-1344	1415-2204, 2311-2314	2215, 2413-3015	3504, 3513	
	Control Panel Nomenclature								
Pressure	IM10	IM90	IM11	IM12	IM13	IM14	IM15	IM102	8245
Off Cycle	IM16	IM91	IM17	IM18	IM19	IM20	IM21	IM103	None
Time or Temp	IM28	IM93	IM29	IM30	IM31	IM32	IM33	IM104	8145
Time Over 110 Min.	IM22	IM92	IM23	IM24	IM25	IM26	IM27	IM105	4004
Motor Breaker Size (Amps)	15	15	15	30	50	50	70	100	460 Volt
Motor Contactor Size (Amps)	25	25	25	30	30	40	60	75	
Pilot Breaker Size (Amps)	15	15	15	15	15	15	15	15	208-230 Volt
Unit Cooler Fan Contactor Size (Amps)	—	—	25	25	25	25	25	25	

### REVERSE AIR ELECTRIC DEFROST CONTROL PANEL KITS

Determine the case maximum defrost amperage from Section 2, and select the appropriate kit from the table to the right. The kits are factory installed and contain circuit breakers and contactors. If the maximum defrost amperage is in between the ratings shown, select the next larger sized kit. The kits will be wired for 3 phase heater loads. If the kit selection is sized for single phase, field wiring will be to the outside terminals of the defrost contactor. NOTE: These kits do not apply to the #4004 defrost timer, or when no defrost timer is used.

Kit Nomenclature	Max. Defrost Amperage
42FE	12
43FE	16
44FE	24
45FE	40
46FE	56
47FE	75



**HUSSMANN®**  
 A Whitman Company

**460 VOLT CONTROL PANELS FOR  
 HOCA UNITS WITH COPELAND COMPRESSORS**

**DISPLAY CASES  
 Temperature (or Time) Terminated Electric Defrost**

									460 Volt Components		
Maximum Defrost Amps Defrost Breaker Defrost Contactor Size (Amps)*	208-230 Volt Components	16	24	40	40	56	75	100	120	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Condensing Unit Model	Control Panel Nomenclature										
0091 - 0245, 0311 - 0355	OM28	OM29	OM30							15	25
0304, 0444		OM63	OM68							15	25
0404, 0475 - 0521, 0544 - 0621				OM31	OM32					15	25
0524, 0623 - 0944, 1064				OM33	OM34	OM35				30	30
1015 - 1054, 1311 - 1344					OM36	OM37	OM38			50	30
1425 - 1544					OM39	OM40	OM41			50	40
1825 - 2214, 2321, 2324						OM40	OM41			50	40
1825 - 2214, 2321, 2324									OM42	50	40
2225, 2423 - 2714							OM43			70	60
2823 - 3025									OM44 OM44	70 70	60 60
Pilot Breaker Size Defrost Timer Model	15 A633	15 A633	15 A633	15 A633	15 A633	15 A633	15 A633	15 A633	15 A633	208-230 Volt Components	

\*Resistive

## 460 VOLT CONTROL PANELS FOR HOCA UNITS WITH COPELAND COMPRESSORS

### UNIT COOLERS Temperature Terminated Electric Defrost

							460 Volt Components		
Maximum Defrost Amps	208-230 Volt Components	16	24	40	56	75	90	Motor Breaker Size (Amps)	Motor Contactor Size (Amps)
Main Defrost Breaker		20	30	50	70	100	125		
Defrost Contactor Size (Amps)*		30	30	40	75	75	90		
Condensing Unit Model	Control Panel Nomenclature								
0091 - 0245, 0311 - 0355	OM46	OM47	OM48					15	25
0304, 0444		OM64	OM69					15	25
0404, 0475 - 0521, 0544 - 0621			OM49					15	25
0524, 0623 - 0944, 1064				OM50				30	30
1015 - 1054, 1311 - 1344				OM51	OM52			50	30
1425 - 1544					OM53			50	40
1825 - 2214, 2321, 2324					OM53	OM54		50	40
2225, 2423 - 2714					OM55	OM56		70	60
2823 - 3025						OM56		70	60
Pilot Breaker Size (Amps)	15	15	15	15	15	15	15	208-230 Volt Components	
Defrost Timer Model	A633	A633	A633	A633	A633	A633	A633		

\*Resistive

### UNIT COOLERS & DISPLAY CASES Air Defrost

Defrost Termination	Condensing Unit Model							Defrost Timer Model
	0091 - 0245, 0311 - 0355	0304, 0444	0404, 0475 - 0521, 0544 - 0621	0524, 0623 - 0944, 1064	1015 - 1054, 1311 - 1344	1425 - 2214, 2321 - 2324	2225 - 2423, 3025	
Off Cycle Temp or Time Time Over 110 Min.	Control Panel Nomenclature							None A633 4004
	OM10	OM65	OM11	OM12	OM13	OM14	OM15	
	OM16	OM66	OM17	OM18	OM19	OM20	OM21	
Main Breaker Size (Amps)	15	15	15	30	50	50	70	460
Motor Contactor Size (Amps)	25	25	25	30	30	40	60	Volt
Pilot Breaker Size (Amps)	15	15	15	15	15	15	15	208-230
Unit Cooler Fan Contactor Size (Amps)	—	—	25	25	25	25	25	Volt

### REVERSE AIR ELECTRIC DEFROST CONTROL PANEL KITS

Determine the case maximum defrost amperage from Section 2, and select the appropriate kit from the table to the right. The kits are factory installed and contain circuit breakers and contactors. If the maximum defrost amperage is in between the ratings shown, select the next larger sized kit. The kits will be wired for 3 phase heater loads. If the kit selection is sized for single phase, field wiring will be to the outside terminals of the defrost contactor. NOTE: These kits do not apply to the #4004 defrost timer, or when no defrost timer is used.

Kit Nomenclature	Max. Defrost Amperage
42FE	12
43FE	16
44FE	24
45FE	40
46FE	56
47FE	75



## CONTROL PANEL MODIFICATIONS

### NEMA — RATED MOTOR CONTACTORS

The following table modifies the standard control panel to provide NEMA motor contactors. Each NEMA contactor has both a horsepower and an amperage rating. We normally use the horsepower rating to match the contactor to the compressor model, but a customer may prefer to use the amperage rating.

Sizing by the amperage rating of the contactor will cause the contactors for the 7-1/2 and 10 hp units to be the next size larger than our normal (nominal horsepower) NEMA sizing. These kit numbers can be found in the amp-rated columns of the table.

**When a specific brand of NEMA contactor is needed, the Any Brand NEMA Kit must be called out along with the Specific Brand NEMA Kit.**

Compressor Unit Model (Copeland)	Control Panel Nomenclature	Any Brand				Telemecanique				G.E.				Allen-Bradley			
		Hp-Rated		Amp-Rated		Hp-Rated		Amp-Rated		Hp-Rated		Amp-Rated		Hp-Rated		Amp-Rated	
		NEMA Size	Kit No.	NEMA Size	Kit No.	NEMA Size	Kit No.	NEMA Size	Kit No.	NEMA Size	Kit No.	NEMA Size	Kit No.	NEMA Size	Kit No.	NEMA Size	Kit No.

### ALL 208-230 VOLT UNITS

0051-0444, 0534	IK 10-11, 18-19, 26-27, 34-35, 42-46, 59-63, 76-79, 89, 96, 106, 108, 112, 124-135, 144, 155-156, 161-162	1	27EC	1	27EC	1	09FC	1	09FC	1	12FC	1	12FC	1	28EC	1	28EC
	OK 10-11, 18-19, 26-27, 34-38, 54-57, 68, 70, 72, 80-86, 89																
0475-0621	IK 12, 20, 28, 36, 47, 64, 80, 90, 97, 105, 107, 109, 113-114, 116, 120, 138-139, 145-146, 149, 157	1	62FE	1	62FE	1	09FC	1	09FC	1	12FC	1	12FC	1	28EC	1	28EC
	OK 12, 20, 28, 39-40, 58, 69, 71, 73-74, 76, 78																
0623-0721, 0725-0954	IK 13, 21, 29, 37, 48-49, 65-66, 81, 91, 98, 103, 115, 117, 119, 121, 150-151, 158, 160	1	82DT	—	—	1	09FC	—	—	1	12FC	—	—	1	28EC	—	—
	OK 13, 21, 29, 41-43, 59-60, 75, 77, 79																
	IK 13, 21, 29, 37, 48, 65, 115, 117, 119, 121	—	—	2	73DV	—	—	2	08FC	—	—	2	11FC	—	—	2	86FC
	OK 13, 21, 29, 41, 75, 77, 79	—	—	2	27EO	—	—	2	08FC	—	—	2	11FC	—	—	2	86FC
	IK 49, 66, 81, 91, 98, 103, 150-151	—	—	2	63FE	—	—	2	08FC	—	—	2	11FC	—	—	2	86FC
OK 42-43, 59-60																	
0724, 1015-1344	IK 14, 22, 30, 38, 50-51, 67-68, 82-83, 92, 99, 104, 148, 159	2	84DT	—	—	2	08FC	—	—	2	11FC	—	—	2	86FC	—	—
	OK 14, 22, 30, 44-46, 61-62																
	IK 14, 22, 30, 38, 50-51, 67-68, 148	—	—	3	74DV	—	—	3	07FC	—	—	3	10FC	—	—	3	87FC
	IK 82-83	—	—	3	96EJ	—	—	3	07FC	—	—	3	10FC	—	—	3	87FC
	OK 14, 22, 30, 44-45	—	—	3	28EO	—	—	3	07FC	—	—	3	10FC	—	—	3	87FC
	OK 61-62	—	—	3	29EO	—	—	3	07FC	—	—	3	10FC	—	—	3	87FC
	IK 92, 99, 104	—	—	3	64FE	—	—	3	07FC	—	—	3	10FC	—	—	3	87FC
OK 46																	
1415-2213, 2311-2324	IK 15, 23, 31, 39, 52-53, 69-70	3	75DV	3	75DV	3	07FC	3	07FC	3	10FC	3	10FC	3	87FC	3	87FC
	OK 15, 23, 31, 47-48	3	30EO	3	30EO	3	07FC	3	07FC	3	10FC	3	10FC	3	87FC	3	87FC
	IK 84	3	98EJ	3	98EJ	3	07FC	3	07FC	3	10FC	3	10FC	3	87FC	3	87FC
	OK 63	3	31EO	3	31EO	3	07FC	3	07FC	3	10FC	3	10FC	3	87FC	3	87FC
	IK 54-55, 71-72, 85-86, 93-94, 100-101	3	65FE	3	65FE	3	07FC	3	07FC	3	10FC	3	10FC	3	87FC	3	87FC
OK 49-50, 64-65																	
2215, 2225, 2413-3025	IK 16-17, 24-25, 32-33, 40-41, 56-57, 73-74, 87-88, 95, 102	3	82FE	3	82FE	3	07FC	3	07FC	3	10FC	3	10FC	3	87FC	3	87FC
	OK 16-17, 24-25, 32-33, 51-52, 66-67																

### ALL 460 VOLT UNITS

0095-0621	IM 10-11, 16-17, 22-23, 28-29, 34-37, 49-53, 67-70, 78, 80, 82, 84, 87-95, 97	1	27EC	1	27EC	1	09FC	1	09FC	1	12FC	1	12FC	1	28EC	1	28EC
	OM 10-11, 16-17, 22-23, 28-32, 46-49, 57, 59, 61, 63-69																
0623-1344	IM 12-13, 18-19, 24-25, 30-31, 38-39, 40-41, 54-59, 71-73, 79, 81, 83, 85, 99-101	1	62FE	1	62FE	1	09FC	1	09FC	1	12FC	1	12FC	1	28EC	1	28EC
	OM 12-13, 18-19, 24-25, 33-38, 50-52, 58, 60, 62, 73, 74																
1415-2213, 2311-2324	IM 14, 20, 26, 32, 42-45, 60-63, 74-75	2	63FE	2	63FE	2	08FC	2	08FC	2	11FC	2	11FC	2	86FC	2	86FC
	OM 14, 20, 26, 39-42, 53-54																
2215, 2225, 2413-3025	IM 15, 21, 27, 33, 46-47, 64-65, 76-77	2	84DT	2	84DT	2	08FC	2	08FC	2	11FC	2	11FC	2	86FC	2	86FC
	OM 15, 21, 27, 43-44, 55-56																

### SINGLE — PHASE CONTROL PANELS

The standard 208-volt, three phase control panels for compressor unit models 51-245 and 311-355 can be modified for single-phase application as follows:

First select a standard three-phase control panel — be sure to select a control panel with a maximum defrost amperage equal to or greater than the single-phase amperage requirement. Then, to the panel selected, add the single-phase modification kit as shown in the table below.

For hermetic units see Section 9.

Unit Model	Single-Phase Kit	Applicable Control Panels	
		Indoor	Outdoor
0051-0245	11DV	IK10, IK18, IK26, IK34, IK42, IK44, IK59, IK61, IK76, IK77	OK10, OK18, OK26, OK34, OK36, OK54, OK55
0311-0355	12DV	IK11, IK19, IK27, IK35, IK43, IK45, IK46, IK155, IK156 IK60, IK62, IK63, IK78, IK79, IK89, IK96, IK144	OK11, OK19, OK27, OK35, OK37, OK38, OK56, OK57

### SPECIFIC VENDOR CIRCUIT BREAKERS (Any Brand is standard.)

COMP. RELAY MAX. AMPS	CONTROL CB SIZE	G.E.		TELEMECANIQUE		SQ D	
		240	460	240	460	240	460
AUX (when req'd.)	15A 2 POLE	15WC	*	16WC	*	—	*
12	15A 3 POLE	81ES	40WC	87ES	39WC	93ES	41WC
16	20A 3 POLE	82ES	42WC	88ES	43WC	94ES	44WC
24	30A 3 POLE	83ES	46WC	89ES	45WC	95ES	47WC
40	50A 3 POLE	84ES	49WC	90ES	48WC	96ES	50WC
56	70A 3 POLE	85ES	52WC	91ES	51WC	N/A	53WC
75	100A 3 POLE	86ES	55WC	92ES	54WC	N/A	56WC
100	125A 3 POLE	33WC	—	34WC	—	35WC	—
120	150A 3 POLE	37WC	—	36WC	—	38WC	—
150	200A 3 POLE	58WC	—	57WC	—	59WC	—

\*Since pilot (AUX) circuits on 460 volt units are 208-230, there's a blank in the 460 volt column. Select 208-230 volt.

N/A - 70 and 100 amp square D circuit breakers are not available.

### SPECIFIC VENDOR DEFINITE PURPOSE CONTACTORS

To select a specific vendor definite purpose contactor:

1. select the control panel
2. find the size (amp rating) of the defrost contactor
3. select the appropriate kit from the table below.

### MOTOR

MOTOR CONTACTOR SIZE (AMPS)	GE	TELEMECANIQUE	FURNAS
25A	15FC	—	16FC
30A	88FE	94FE	17FC
40A	89FE	95FE	18FC
60A	90FE	96FE	19FC
75A	91FE	97FE	20FC
120A	93FE	99FE	22FC

### DEFROST

MAXIMUM DEFROST SIZE (AMPS)*	GE	TELEMECANIQUE	FURNAS
30	15FC	—	16FC
40	88FE	94FE	17FC
50	89FE	95FE	18FC
75	90FE	96FE	19FC
90	91FE	97FE	20FC
112	98FE	92FE	21FC
120	93FE	99FE	22FC

\*Resistive

## TWO-TIER UNITS — FRAME KITS AND SHIPPING CRATES

When tiering units of different sizes, the larger unit should always be on the bottom. The overall height of the two-tier assembly will vary according to the height of the condenser or control panel on the upper tier. The width and depth of the two-tier assembly will be the same as the standard width and depth of the larger unit.

### COPELAND COMPRESSORS HICA UNITS

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HICA Compressor Unit Models		Base Dimensions (Depth & Width) Lower/Upper	Two Tier Frame and Base Kits (1)	Shipping Crates (3)	
Lower Tier	Upper Tier			HICA	HIRU
0051 - 0165	0051 - 0165	29 x 29 / 29 x 29	17EG - 9	25EG	25EG
0211 - 0252, 0311 - 0355	0051 - 0165	29 x 38 / 29 x 38	16EG - 15	25EG	25EG
0211 - 0252, 0311 - 0355	0211 - 0252, 0311 - 0355	29 x 38 / 29 x 38	15EG - 116	25EG	25EG
0304, 0404, 0444, 0484 - 1344	0051 - 0165	37 x 47 / 29 x 47	14EG - 16	27EG	27EG
0304, 0404, 0444, 0484 - 1344	0211 - 0252, 0311 - 0355	37 x 47 / 29 x 47	13EG - 85	27EG	27EG
0304, 0404, 0444, 0484 - 1344	0304, 0404, 0444, 0484 - 1344	37 x 47 / 37 x 47	12EG - 232	28EG	27EG

### HIRU UNITS

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0071 - 0165	0071 - 0165	29 x 29 / 29 x 29	17EG	25EG	25EG
0211 - 0915	0071 - 0165	29 x 38 / 29 x 38	16EG	25EG	25EG
0211 - 0915	0211 - 0915	29 x 38 / 29 x 38	15EG	25EG	25EG
0934 - 3017	0071 - 0165	37 x 47 / 29 x 47	14EG	27EG	27EG
0934 - 3017	0211 - 0915	37 x 47 / 29 x 47	13EG	27EG	27EG
0934 - 3017	0934 - 3017	37 x 47 / 37 x 47	12EG	28EG	27EG

### OVERALL HEIGHT (2)

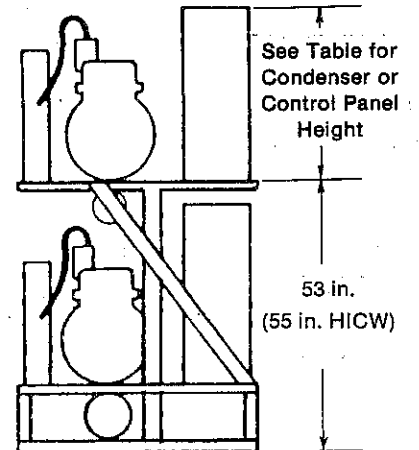
Unit on Upper Tier	HICA Condenser Height (In.)	HICA Overall Height (In.) (2)	HIRU Maximum Overall Height (In.)
0051 - 0165	21	73	82
0151, 0213, 0215	26	79	82
0211, 0221 - 0355, 0437, 0457, 0467	28	81	82
0304, 0404, 0444, 0484 - 0621, 0667, 0715, 0721	32	85	82
0623 - 1344	38	91	87

We recommend that units with the 37 x 47-inch base be used for the lower tier whenever possible so the racks will have a uniform depth from the back wall of the machine room.

If units with smaller bases must be used for the lower tier, plan to position those racks with the front of their base flush with the fronts of the larger bases to simplify wiring and piping.

Field-installed Two-tier Frame Kit	
92EJ Frame	
93EJ	29 x 38 base
94EJ	29 x 47 base
95EJ	37 x 47 base

HICW Factory-installed Two-tier Frame	
97ES	29 x 38 base
98ES	37 x 47 base
99ES	29 x 47 base



TWO TIER FRAME

#### NOTES:

- (1) HICA units 15 hp and above cannot be double tiered because they are equipped with twin condenser coils on a two tier frame as standard.
- (2) The overall heights listed for HICA units reflect the height of the condenser on the upper tier; in some instances, however, **the control panel may be taller than the condenser.** The maximum height of HIRU units reflects the height of the tallest possible control panel. For specific control panel dimension, refer to "Compressor Unit Reference."
- (3) Shipping crates are only needed at customer request.
- (4) HICW units 15 hp and above cannot be two-tiered because they are equipped with a double condenser. See Catalog 926.2.

## TWO TIER UNITS — INTERCONNECTION KITS

The following interconnection kits are available for two tier units to provide single point electrical connection. Find the lower panel in one of the 3 tables, then locate the upper panel in the same table, and finally select the appropriate interconnection kit. When the upper control panel is equipped with NEMA contactors select the interconnection kit appearing under the headline "Nema Contactors". If no kit is listed in the NEMA column, select the standard contactor interconnection kit.

### SINGLE CONDUIT

Lower Panels	Upper Panels	Standard Contactors	Nema Contactors	
		Interconnection Kit	Upper Panel Nema Motor Contactor Kit	Interconnection Kit
IK 10-50, 52-57, 59-67 76-83, 89-91 96-98, 103, 105, 124-133, 144-146, 149-152, 157-158  IM 10-42, 49-58, 60, 67-73, 87-89	IK 10-13, 18-21, 26-29, 34-37, 42- 49, 59-66, 76, 77, 124-128, 130, 144-146, 149-150	76EG	—	—
	IK 13, 21, 29, 37, 48, 49, 65, 66	—	73DV/76DV	77EG
	IK 14, 15, 22, 23, 30, 31, 38, 39, 50- 53, 67-70, 78-84, 103, 105, 129, 131-133, 148	77EG	—	—
	IM 10-33	—	74DV/77DV	78EG
	IK 14, 22, 30, 38, 50, 51, 67, 68	—	96EJ/97EJ	78EG
	IK 82, 83	—	75DV/78DV	78EG
	IK 15, 23, 31, 39, 52, 53, 69, 70	—	98EJ/99EJ	78EG
	IK 84	—	—	—
	IK 16, 17, 24, 25, 32, 33, 40, 41, 54-57 71-74, 85-88, 89, 90, 96, 97 104, 134, 135, 157	78EG	—	—
	IM 34-47, 49-74, 76, 87-89	—	—	—
IK 91-95, 98-102, 158	84EG	—	—	
IM 75, 77	—	—	—	

### DOUBLE CONDUIT

IK 51-54, 56 68-71, 73 84-88, 92 93, 99, 100, 104, 148, 159	IK 10-13, 18-21, 26-29, 34-37, 42- 49, 59-66, 76, 77, 124-128, 130, 144-146, 149-150	79EG	—	—
	IK 13, 21, 29, 37, 48, 49, 65, 66	—	73DV/76DV	80EG
	IK 14, 15, 22, 23, 30, 31, 38, 39, 50- 53, 67-70, 78-84, 103, 105, 129, 131-133, 148	80EG	—	—
	IM 10-33	—	74DV/77DV	81EG
	IK 14, 22, 30, 38, 50, 51, 67, 68	—	96EJ/97EJ	81EG
	IK 82, 83	—	75DV/78DV	81EG
	IK 15, 23, 31, 39, 52, 53, 67, 70	—	98EJ/99EJ	81EG
	IK 84	—	—	—
	IK 16, 17, 24, 25, 32, 33, 40, 41, 54-57 71-74, 85-88, 89, 90, 96, 97, 104, 134, 135, 157	81EG	—	—
	IM 34-47, 49-74, 76, 87-89	—	—	—
IK 91-95, 98-102, 158-159	85EG	—	—	
IM 75, 77	—	—	—	

### TRIPLE CONDUIT

IK 55, 57, 72 74, 94, 95, 101, 102	IK 10-13, 18-21, 26-29, 34-37, 42- 49, 59-66, 76, 77, 124-128, 130, 144-146, 149-150	48EG	—	—
	IK 13, 21, 29, 37, 48, 49, 65, 66	—	73DV/76DV	49EG
	IK 14, 15, 22, 23, 30, 31, 38, 39, 50- 53, 67-70, 78-84, 103, 105, 129, 131-133, 148	49EG	—	—
	IM 10-33	—	74DV/77DV	82EG
	IK 14, 22, 30, 38, 50, 51, 67, 68	—	96EJ/97EJ	82EG
	IK 82, 83	—	75DV/78DV	82EG
	IK 15, 23, 31, 39, 52, 53, 69, 70	—	98EJ/99EJ	82EG
	IK 84	—	—	—
	IK 16, 17, 24, 25, 32, 33, 40, 41, 54-57 71-74, 85-88, 89, 90, 96, 97, 104, 134, 135, 157	82EG	—	—
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