



# 1334-MOD-L

## Function Expander Card

**Description** The Function Expander Card expands the available adjustments for two standard functions of the Bulletin 1334 and 1335 Adjustable Frequency Drives. The Function Expander Card provides:

- A Wider Range of Acceleration and Deceleration Rates
- Additional Volts-per-Hertz Settings

**Each Bulletin 1334-MOD-L Option Kit includes:**

- (1) Function Expander Card, P/N 50374
- (2)  $\frac{1}{4}$ "  $\frac{1}{4}$ -turn Standoffs, P/N 201104

### Installation

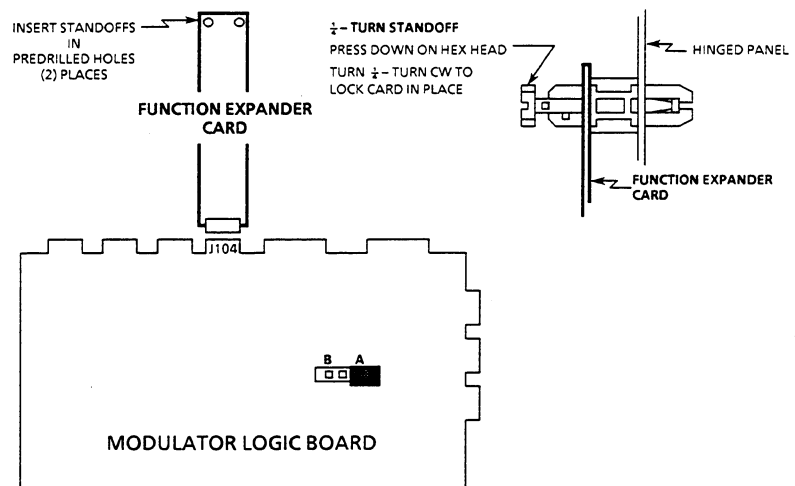


#### WARNING

Only personnel familiar with the Drive and its associated machinery should plan or implement the installation, startup, and adjustment of MOD kits. Failure to comply may result in personal injury and/or equipment damage.

To guard against personal injury, always remove & lock out power to the Drive at the main supply disconnect and all other power source disconnects. Ensure that DS1 is not lit when boards or wires are being installed or connected. Refer to the instruction manual for your Drive for LED location.

Two predrilled holes have been provided above Modulator Logic Board connector **J104**. Installation requires removing power to the Drive and installing the (2)  $\frac{1}{4}$ -turn standoffs into the predrilled holes. The card is then plugged onto the edge connector while pressing the top of the card onto the (2) installed standoffs. To secure the card in place, press down on each hex head and turn  $\frac{1}{4}$ -turn CW.



**Allen-** The Function Expander Card replaces the volts-per-hertz jumper setting on the Modulator Logic Board. After the card has been installed, remove the volts-per-hertz jumper so that neither position **A** nor **B** is selected. The jumper may be stored by placing it over only one of the pins.

**Setup ACCEL/DECEL RATES**

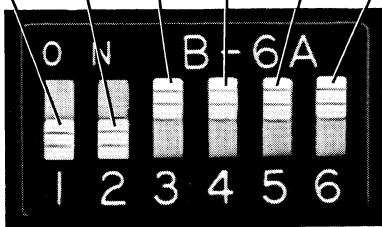
As explained in the instruction manual, the Modulator Logic Board has settings to adjust the Drive Acceleration and Deceleration rates from 1.2 to 152.4 Hz/Sec via switches **S1** and **S2**. The Function Expander Card additionally allows these settings to be reduced by one half or one fourth for greater range in setting the Drive Accel/Decel ramp.

The Function Expander Card has a blue jumper that can be placed in one of three positions.

- X1** Allows both the Accel and Decel Rates to remain as set by Modulator Logic Board switches **S1** and **S2**.
- X1/2** Will half both the Accel and Decel Rates set by switches **S1** and **S2** and allow rates of 0.6 to 76.2 Hz/Sec.
- X1/4** Will quarter both the Accel and Decel Rates set by switches **S1** and **S2** and allow rates of 0.3 to 38.1 Hz/Sec.

**FUNCTION EXPANDER CARD JUMPER SETTINGS — X1, X1/2, & X1/4**

MODULATOR LOGIC BOARD SWITCH SETTINGS S1 – ACCEL OR S2 – DECEL						FUNCTION EXPANDER CARD JUMPER SETTINGS X1, X1/2, & X1/4			MODULATOR LOGIC BOARD SWITCH SETTINGS S1 – ACCEL OR S2 – DECEL						FUNCTION EXPANDER CARD JUMPER SETTINGS X1, X1/2, & X1/4		
1	2	3	4	5	6	X1 Hz/Sec	X1/2 Hz/Sec	X1/4 Hz/Sec	1	2	3	4	5	6	X1 Hz/Sec	X1/2 Hz/Sec	X1/4 Hz/Sec
ON	ON	ON	ON	ON	ON	1.2	0.6	0.3	OFF	OFF	ON	OFF	OFF	ON	66.0	33.0	16.5
OFF	ON	ON	ON	ON	ON	3.6	1.8	0.9	ON	ON	OFF	OFF	OFF	ON	68.4	34.2	17.1
ON	OFF	ON	ON	ON	ON	6.0	3.0	1.5	OFF	ON	OFF	OFF	OFF	ON	70.8	35.4	17.7
OFF	OFF	ON	ON	ON	ON	8.4	4.2	2.1	ON	OFF	OFF	OFF	OFF	ON	73.2	36.6	18.3
ON	ON	ON	ON	ON	ON	10.8	5.4	2.7	OFF	OFF	OFF	OFF	OFF	ON	75.6	37.8	18.9
OFF	ON	ON	ON	ON	ON	13.2	6.6	3.3	ON	ON	ON	ON	ON	OFF	78.0	39.0	19.5
ON	OFF	ON	ON	ON	ON	15.6	7.8	3.9	OFF	ON	ON	ON	ON	OFF	80.4	40.2	20.1
OFF	OFF	ON	ON	ON	ON	18.0	9.0	4.5	ON	OFF	ON	ON	ON	OFF	82.8	41.4	20.7
ON	ON	ON	ON	ON	ON	20.4	10.2	5.1	OFF	OFF	ON	ON	ON	OFF	85.2	42.6	21.3
OFF	ON	ON	OFF	ON	ON	22.8	11.4	5.7	ON	ON	OFF	ON	ON	OFF	87.6	43.8	21.9
ON	OFF	ON	OFF	ON	ON	25.2	12.6	6.3	OFF	ON	OFF	ON	ON	OFF	90.0	45.0	22.5
OFF	OFF	ON	OFF	ON	ON	27.6	13.8	6.9	ON	OFF	OFF	ON	ON	OFF	92.4	46.2	23.1
ON	ON	OFF	OFF	ON	ON	30.0	15.0	7.5	OFF	OFF	OFF	ON	ON	OFF	94.8	47.4	23.7
OFF	ON	OFF	OFF	ON	ON	32.4	16.2	8.1	ON	ON	ON	ON	ON	OFF	97.2	48.6	24.3
ON	OFF	OFF	OFF	ON	ON	34.8	17.4	8.7	OFF	ON	ON	OFF	ON	OFF	99.6	49.8	24.9
OFF	OFF	OFF	OFF	ON	ON	37.2	18.6	9.3	ON	OFF	ON	OFF	ON	OFF	102.0	51.0	25.5
ON	ON	ON	ON	OFF	ON	39.6	19.8	9.9	OFF	OFF	ON	OFF	ON	OFF	104.4	52.2	26.1
OFF	ON	ON	ON	OFF	ON	42.0	21.0	10.5	ON	ON	OFF	OFF	ON	OFF	106.8	53.4	26.7
ON	OFF	ON	ON	OFF	ON	44.4	22.2	11.1	OFF	ON	OFF	OFF	ON	OFF	109.2	54.6	27.3
OFF	OFF	ON	ON	OFF	ON	46.8	23.4	11.7	ON	OFF	OFF	OFF	ON	OFF	111.6	55.8	27.9
ON	ON	OFF	ON	OFF	ON	49.2	24.6	12.3	OFF	OFF	OFF	OFF	ON	OFF	114.0	57.0	28.5
OFF	ON	OFF	ON	OFF	ON	51.6	25.8	12.9	ON	ON	ON	ON	OFF	OFF	116.4	58.2	29.1
ON	OFF	OFF	ON	OFF	ON	54.0	27.0	13.5	OFF	ON	ON	ON	OFF	OFF	118.8	59.4	29.7
OFF	OFF	OFF	ON	OFF	ON	56.4	28.2	14.1	ON	OFF	ON	ON	OFF	OFF	121.2	60.6	30.3
ON	ON	ON	OFF	OFF	ON	58.8	29.4	14.7	OFF	OFF	ON	ON	OFF	OFF	123.6	61.8	30.9
OFF	ON	ON	OFF	OFF	ON	61.2	30.6	15.3	ON	ON	OFF	ON	OFF	OFF	126.0	63.0	31.5
ON	OFF	ON	OFF	OFF	ON	63.6	31.8	15.9	OFF	ON	OFF	ON	OFF	OFF	128.4	64.2	32.1
ON	ON	ON	ON	ON	ON	66.0	33.0	16.5	ON	OFF	OFF	ON	OFF	OFF	130.8	65.4	32.7
OFF	ON	ON	ON	ON	ON	68.4	34.2	17.1	OFF	OFF	OFF	ON	OFF	OFF	133.2	66.6	33.3
ON	OFF	ON	ON	ON	ON	70.8	35.4	17.7	ON	ON	ON	ON	ON	ON	135.6	67.8	33.9
ON	ON	ON	ON	ON	ON	73.2	36.6	18.3	OFF	ON	ON	OFF	OFF	OFF	138.0	69.0	34.5
OFF	OFF	ON	ON	ON	ON	75.6	37.8	18.9	ON	OFF	ON	OFF	OFF	OFF	140.4	70.2	35.1
ON	ON	ON	ON	ON	ON	78.0	39.0	19.5	OFF	OFF	ON	OFF	OFF	OFF	142.8	71.4	35.7
OFF	ON	ON	ON	ON	ON	80.4	40.2	20.1	ON	ON	OFF	ON	OFF	OFF	145.2	72.6	36.3
ON	OFF	ON	ON	ON	ON	82.8	41.4	20.7	OFF	ON	OFF	OFF	OFF	OFF	147.6	73.8	36.9
OFF	OFF	ON	ON	ON	ON	85.2	42.6	21.3	ON	OFF	OFF	OFF	OFF	OFF	150.0	75.0	37.5
ON	ON	OFF	ON	ON	ON	87.6	43.8	21.9	OFF	OFF	OFF	OFF	OFF	OFF	152.4	76.2	38.1
OFF	ON	OFF	ON	ON	ON	90.0	45.0	22.5	ON	ON	ON	ON	ON	ON			
ON	OFF	ON	ON	ON	ON	92.4	46.2	23.1	OFF	OFF	ON	ON	ON	ON			
OFF	OFF	ON	ON	ON	ON	94.8	47.4	23.7	ON	ON	ON	ON	ON	ON			
ON	ON	ON	ON	ON	ON	97.2	48.6	24.3	OFF	ON	ON	OFF	ON	OFF			
OFF	ON	ON	OFF	ON	ON	99.6	49.8	24.9	ON	OFF	ON	ON	ON	OFF			
ON	OFF	ON	OFF	ON	ON	102.0	51.0	25.5	OFF	OFF	ON	ON	ON	OFF			
OFF	OFF	ON	OFF	ON	ON	104.4	52.2	26.1	ON	ON	ON	ON	ON	ON			
ON	ON	OFF	ON	ON	ON	106.8	53.4	26.7	OFF	ON	ON	ON	ON	ON			
OFF	ON	ON	OFF	ON	ON	109.2	54.6	27.3	ON	OFF	OFF	ON	ON	ON			
ON	OFF	OFF	OFF	ON	ON	111.6	55.8	27.9	OFF	OFF	OFF	OFF	ON	OFF			
OFF	OFF	OFF	OFF	ON	ON	114.0	57.0	28.5	ON	ON	ON	ON	ON	ON			
ON	ON	ON	ON	ON	ON	116.4	58.2	29.1	OFF	ON	ON	ON	ON	ON			
OFF	ON	ON	ON	ON	ON	118.8	59.4	29.7	ON	OFF	ON	ON	ON	ON			
ON	OFF	ON	ON	ON	ON	121.2	60.6	30.3	OFF	OFF	ON	ON	ON	ON			
OFF	OFF	ON	ON	ON	ON	123.6	61.8	30.9	ON	ON	ON	ON	ON	ON			
ON	ON	OFF	ON	ON	ON	126.0	63.0	31.5	OFF	ON	ON	ON	ON	ON			
OFF	ON	OFF	ON	ON	ON	128.4	64.2	32.1	ON	OFF	ON	ON	ON	ON			
ON	OFF	OFF	ON	ON	ON	130.8	65.4	32.7	OFF	OFF	ON	ON	ON	ON			
OFF	OFF	OFF	ON	ON	ON	133.2	66.6	33.3	ON	ON	ON	ON	ON	ON			
ON	ON	ON	ON	ON	ON	135.6	67.8	33.9	OFF	ON	ON	ON	ON	ON			
OFF	ON	ON	ON	ON	ON	138.0	69.0	34.5	ON	OFF	ON	ON	ON	ON			
ON	OFF	ON	ON	ON	ON	140.4	70.2	35.1	OFF	OFF	ON	ON	ON	ON			
OFF	OFF	ON	ON	ON	ON	142.8	71.4	35.7	ON	ON	ON	ON	ON	ON			
ON	ON	OFF	ON	ON	ON	145.2	72.6	36.3	OFF	ON	ON	ON	ON	ON			
OFF	ON	OFF	ON	ON	ON	147.6	73.8	36.9	ON	ON	ON	ON	ON	ON			
ON	OFF	OFF	ON	ON	ON	150.0	75.0	37.5	OFF	OFF	ON	ON	ON	ON			
OFF	OFF	OFF	ON	ON	ON	152.4	76.2	38.1	ON	ON	ON	ON	ON	ON			



Setup  
(continued)

**VOLTS-PER-HERTZ SETTINGS**

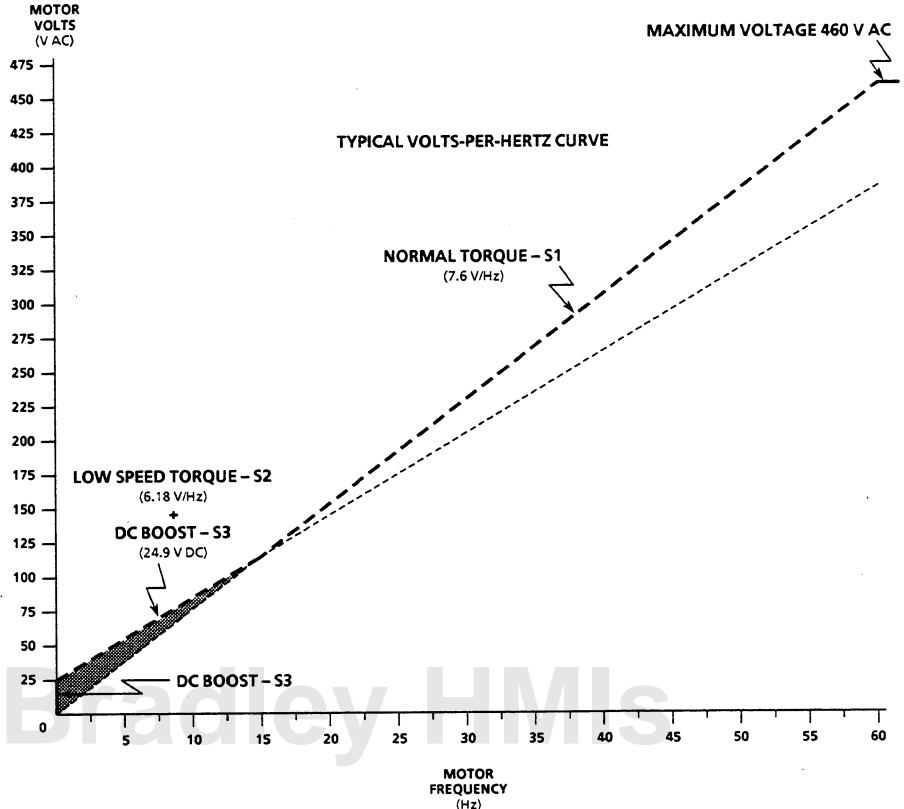
Without the Function Expander Card, the Modulator Logic Board sets the Drive output volts-per-hertz. The Modulator Logic Board has a limited range of adjustment permitting only two settings. The board settings permit only a linear volts-per-hertz ramp where an output equal to the nominal input voltage is reached at either:

- 120 Hz — 3.83 V/Hz with a 460V Input
- 60 Hz — 7.6 V/Hz with a 460V Input

With the Function Expander Card installed, the following volts-per-hertz ranges are available.

INPUT VOLTAGE	OUTPUT V/Hz ADJUSTMENT RANGE
380V AC	0.13 to 8.46 V/Hz
415V AC	0.15 to 9.24 V/Hz
460V AC	0.16 to 10.24 V/Hz
575V AC	0.20 to 12.80 V/Hz

The Function Expander Card adjustments allow the setup of two independent volts-per-hertz slopes for the Drive. One slope is set by switch **S1** (normal torque), the other by **S2** (low speed torque). The resultant output volts-per-hertz set by switch **S2** is further modified by the Modulator Logic Board DC Boost setting. The logic within the Drive reads both settings and uses the setting that will produce the higher volts-per-hertz for the present operating frequency, either **S1** or **S2 + DC Boost**. This logic allows the setting of a higher output voltage or "boost" at lower frequencies to increase starting and low speed torque than could be obtained by a single adjustment. At higher frequencies where boost is no longer required, the setting becomes the normal or rated volts-per-hertz.



Setup  
(continued)

Use the following guidelines to determine **S1** and **S2** settings, then use the **FUNCTION EXPANDER CARD SWITCH SETTING** chart on **page 5** to determine the closest output V/Hz value.

### S1 — NORMAL TORQUE

$$S1 = \text{MOTOR NAMEPLATE DATA} = \frac{\text{NAMEPLATE VOLTAGE}}{\text{NAMEPLATE FREQUENCY}}$$

#### EXAMPLE 1

Standard motor with nameplate data of 460V AC at 60 Hz

$$S1 = \text{MOTOR NAMEPLATE DATA} = \frac{460}{60} = 7.67 \text{ V/Hz}$$

SET SWITCH **S1** TO 7.64 V/Hz

#### EXAMPLE 2

Custom motor with 460V AC at 90 Hz for special high speed operation

$$S1 = \text{MOTOR NAMEPLATE DATA} = \frac{460}{90} = 5.11 \text{ V/Hz}$$

SET SWITCH **S1** TO 5.04 V/Hz

### S2 — LOW SPEED TORQUE

The initial setting of **S2** is best determined by the type of load connected to the Drive. The load should be evaluated to determine which of the following categories it best fits.

#### CATEGORY 1

High Starting Torque [ > 100% ]

High Accelerating and Running Torque [ > 100% ]

SET DC BOOST ON THE MODULATOR LOGIC BOARD AS REQUIRED

$$\text{SET } S2 \text{ [V/Hz]} = \frac{\text{MOTOR NAMEPLATE VOLTAGE} - \text{DC BOOST}}{\text{MOTOR NAMEPLATE FREQUENCY}}$$

#### CATEGORY 2

High Starting Torque [ > 100% ]

Normal Accelerating and Running Torque [ 50 – 100% ]

SET DC BOOST ON THE MODULATOR LOGIC BOARD AS REQUIRED

$$\text{SET } S2 \text{ [V/Hz]} = S1 \times .9$$

#### CATEGORY 3

Low Starting Torque [ < 50% ]

Low Accelerating and Running Torque [ < 50% ]

SET DC BOOST ON THE MODULATOR LOGIC BOARD AS REQUIRED

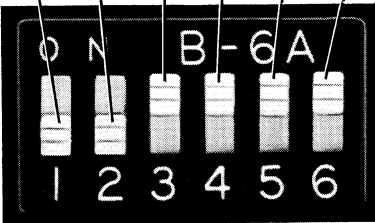
$$\text{SET } S2 \text{ [V/Hz]} = S1 \times .7$$

For best motor and inverter efficiency, it is recommended to use the lowest setting of **DC Boost** and **S2** that will satisfactorily operate the load. **DC Boost** has the most effect at low frequencies of 0 to 10 Hz. Low speed torque switch **S2** has the most effect between 10 and 30 Hz.

If poor operation occurs in either of these frequency ranges, the value for either **DC Boost** or switch **S2** should be increased, whichever is appropriate — however — the setting of **S2** should never be greater than **S1**.

FUNCTION EXPANDER CARD SWITCH SETTINGS — S1 & S2

	1	2	3	4	5	6	OUTPUT V/HZ FOR AC LINE VOLTAGE OF			
							380V	415V	460V	575V
ON	ON	ON	ON	ON	ON	ON	0	0	0	0
OFF	ON	ON	ON	ON	ON	ON	.13	.15	.16	.20
ON	OFF	ON	ON	ON	ON	ON	.27	.29	.33	.41
OFF	OFF	ON	ON	ON	ON	ON	.40	.44	.49	.61



ON	ON	OFF	ON	ON	ON	.54	.59	.65	.81
OFF	ON	OFF	ON	ON	ON	.67	.73	.81	1.02
ON	OFF	OFF	ON	ON	ON	.81	.88	.98	1.22
OFF	OFF	OFF	ON	ON	ON	.94	1.03	1.14	1.42
ON	ON	ON	OFF	ON	ON	1.07	1.17	1.30	1.63
OFF	ON	ON	OFF	ON	ON	1.21	1.32	1.46	1.83
ON	OFF	ON	OFF	ON	ON	1.34	1.47	1.63	2.03
OFF	OFF	ON	OFF	ON	ON	1.48	1.61	1.79	2.23
ON	ON	OFF	OFF	ON	ON	1.61	1.76	1.95	2.44
OFF	ON	OFF	OFF	ON	ON	1.75	1.91	2.11	2.64
ON	OFF	OFF	OFF	ON	ON	1.88	2.05	2.28	2.84
OFF	OFF	OFF	OFF	ON	ON	2.01	2.20	2.44	3.05
ON	ON	ON	ON	OFF	ON	2.15	2.35	2.60	3.25
OFF	ON	ON	ON	OFF	ON	2.28	2.49	2.76	3.45
ON	OFF	ON	ON	OFF	ON	2.42	2.64	2.93	3.66
OFF	OFF	ON	ON	OFF	ON	2.55	2.79	3.09	3.86
ON	ON	OFF	ON	OFF	ON	2.68	2.93	3.25	4.06
OFF	ON	OFF	ON	OFF	ON	2.82	3.08	3.41	4.27
ON	OFF	OFF	ON	OFF	ON	2.95	3.23	3.58	4.47
OFF	OFF	OFF	ON	OFF	ON	3.09	3.37	3.74	4.67
ON	ON	ON	ON	OFF	ON	3.22	3.52	3.90	4.88
OFF	ON	ON	OFF	OFF	ON	3.36	3.67	4.06	5.08
ON	OFF	ON	OFF	OFF	ON	3.49	3.81	4.23	5.28

	1	2	3	4	5	6	OUTPUT V/HZ FOR AC LINE VOLTAGE OF			
							380V	415V	460V	575V
OFF	OFF	ON	OFF	OFF	ON	ON	3.62	3.96	4.39	5.48
ON	ON	OFF	OFF	OFF	ON	ON	3.76	4.10	4.55	5.69
OFF	ON	OFF	OFF	OFF	ON	ON	3.89	4.25	4.71	5.89
ON	OFF	OFF	OFF	OFF	ON	ON	4.03	4.40	4.88	6.09
OFF	OFF	OFF	OFF	OFF	ON	ON	4.16	4.54	5.04	6.30
ON	ON	ON	ON	ON	OFF	ON	4.29	4.69	5.20	6.50
OFF	ON	ON	ON	ON	OFF	ON	4.43	4.84	5.36	6.70
ON	OFF	ON	ON	ON	OFF	ON	4.56	4.98	5.53	6.91
OFF	OFF	ON	ON	ON	OFF	ON	4.70	5.13	5.69	7.11
ON	ON	OFF	ON	ON	OFF	ON	4.83	5.28	5.85	7.31
OFF	ON	OFF	ON	ON	OFF	ON	4.97	5.42	6.01	7.52
ON	OFF	OFF	ON	ON	OFF	ON	5.10	5.57	6.18	7.72
OFF	OFF	OFF	ON	ON	OFF	ON	5.24	5.72	6.34	7.92
ON	ON	ON	OFF	ON	OFF	ON	5.37	5.86	6.50	8.13
OFF	ON	ON	OFF	ON	OFF	ON	5.50	6.01	6.66	8.33
ON	OFF	ON	OFF	ON	OFF	ON	5.64	6.16	6.83	8.53
OFF	OFF	ON	OFF	ON	OFF	ON	5.77	6.30	6.99	8.73
ON	ON	OFF	OFF	ON	OFF	ON	5.91	6.45	7.15	8.94
OFF	ON	OFF	OFF	ON	OFF	ON	6.04	6.60	7.31	9.14
ON	OFF	OFF	OFF	ON	OFF	ON	6.18	6.74	7.48	9.34
OFF	OFF	OFF	OFF	ON	OFF	ON	6.31	6.89	7.64	9.55
ON	ON	ON	ON	OFF	OFF	ON	6.44	7.04	7.80	9.75
OFF	ON	ON	ON	OFF	OFF	ON	6.58	7.18	7.96	9.95
ON	OFF	ON	ON	OFF	OFF	ON	6.71	7.33	8.13	10.16
OFF	OFF	ON	ON	OFF	OFF	ON	6.85	7.48	8.29	10.36
ON	ON	OFF	ON	OFF	OFF	ON	6.98	7.62	8.45	10.56
OFF	ON	OFF	ON	OFF	OFF	ON	7.11	7.77	8.61	10.77
ON	OFF	OFF	ON	OFF	OFF	ON	7.25	7.92	8.78	10.97
OFF	OFF	OFF	ON	OFF	OFF	ON	7.38	8.06	8.94	11.17
ON	ON	ON	OFF	OFF	OFF	ON	7.52	8.21	9.10	11.38
OFF	ON	ON	OFF	OFF	OFF	ON	7.65	8.36	9.26	11.58
ON	OFF	ON	OFF	OFF	OFF	ON	7.79	8.50	9.43	11.78
OFF	OFF	ON	OFF	OFF	OFF	ON	7.92	8.65	9.59	11.98
ON	ON	OFF	OFF	OFF	OFF	ON	8.05	8.80	9.75	12.19
OFF	ON	OFF	OFF	OFF	OFF	ON	8.18	8.94	9.91	12.39
ON	OFF	OFF	OFF	OFF	OFF	ON	8.32	9.08	10.08	12.59
OFF	OFF	OFF	OFF	OFF	OFF	ON	8.46	9.24	10.24	12.80

RECORD SELECTED V/HZ VALUES BELOW

LINE = \_\_\_\_\_ V      POSITION  
  1   2   3   4   5   6

S1 = \_\_\_\_\_ V/HZ      — — — — — ON  
  — — — — — OFF

S2 = \_\_\_\_\_ V/HZ      — — — — — ON  
  — — — — — OFF

EXAMPLE      — USING EXAMPLE 1 FROM PAGE 4 —

LINE = 460 V      POSITION  
  1   2   3   4   5   6

— SET SWITCH S1 TO 7.64 V/Hz —

S1 = 7.64 V/HZ      — — — — — X — — — — — ON  
  X X X X — X — — — — — OFF

— THEN EITHER CALCULATE OR MULTIPLY 7.64 BY .9 OR .7 TO SET SWITCH S2 —

S2 = 5.36 V/HZ      — X — X — X — X — — — — — ON  
  X — — — — — — — X — — — — — OFF

— WHICHEVER APPLIES —



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