

# **FRONTLINE<sup>®</sup>**

## **DC Mill Auxiliary Control**

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**SQUARE D COMPANY**

Class 6530 mill auxiliary controllers are recommended for use with dc series, shunt, or compound wound motors. They are frequently used on steel mill auxiliary drives such as screwdowns, tables, sideguards, shears, and similar applications.

Five basic control types are available. The equipment supplied as standard on each of these controllers is listed below:

**REVERSING PLUGGING (RP) CONTROL**

- 1 – Two pole fused control circuit knife switch (CSW)
- 1 – Two pole unfused main line knife switch with padlock clip (LSW)
- 1 – Surge suppressor for motor shunt field protection (included on panels used with shunt or compound wound motors only)
- 4 – Type M single pole directional contactors with mechanical interlocks (1F, 2F, 1R, 2R)
- 3 or 4 – Type M single pole acceleration contactors (including one for plugging) (1A, 2A, 3A, P)
- 2 or 3 – Type ST-1 static acceleration timers (1AR, 2AR, 3AR)
- 1 – Type M single pole negative line contactor (M)
- 1 – Type KP rectifier-plugging relay (PR)
- 1 – Undervoltage relay (UV)
- 2 – Magnetic overload relays (one instantaneous and one inverse time) (10L, 20L)

**REVERSING PLUGGING DYNAMIC BRAKING (RPD) CONTROL**

Includes the same equipment as the reversing plugging (RP) controller, but with the addition of:

- 1 – Type M single pole spring-closed dynamic braking contactor (DB)

**NON-REVERSING (NR) CONTROL**

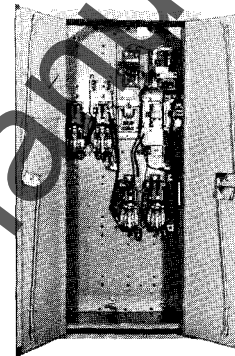
- 1 – Two pole fused control circuit knife switch (CSW)
- 1 – Two pole unfused main line knife switch with padlock clip (LSW)
- 1 – Surge suppressor for motor shunt field protection (included on panels used with shunt or compound wound motors only)
- 1 – Type M single pole positive line contactor (1M)
- 1 – Type M single pole negative line contactor (2M)
- 2 or 3 – Type M single pole acceleration contactors (1A, 2A, 3A)
- 2 or 3 – Type ST-1 static acceleration timers (1AR, 2AR, 3AR)
- 1 – Undervoltage relay (UV)
- 2 – Magnetic overload relays (one instantaneous and one inverse time) (10L, 20L)

**NON-REVERSING DYNAMIC BRAKING (NRD) CONTROL**

Includes the same equipment as the non-reversing (NR) controller, but with the addition of:

- 1 – Type M single pole spring-closed dynamic braking contactor (DB)

- MILL DUTY CLASS 7004 TYPE M LINE-ARC CONTACTORS & CLASS 7001 TYPE K RELAYS
- CLASS 7001 TYPE ST-1 STATIC ACCELERATION TIMERS



Class 6530 Type FWN-3  
Mill Auxiliary Controller

**REVERSING NON-PLUGGING DYNAMIC BRAKING (RNPD) CONTROL**

- 1 – Two pole fused control circuit knife (CSW)
- 1 – Two pole unfused main line knife switch with padlock clip (LSW)
- 1 – Surge suppressor for motor shunt field protection (included on panels used with shunt or compound wound motors only)
- 4 – Type M single pole directional contactors with mechanical interlocks (1F, 2F, 1R, 2R)
- 2 or 3 – Type M single pole acceleration contactors (including one for plugging) (1A, 2A, 3A)
- 2 or 3 – Type ST-1 static acceleration timers (1 AR, 2AR, 3AR)
- 1 – Type M single pole negative line contactor (M)
- 1 – Type M single pole spring-closed dynamic braking contactor (DB)
- 1 – Type KE non-plugging relay (NP)
- 1 – Undervoltage relay (UV)
- 2 – Magnetic overload relays (one instantaneous and one inverse time) (10L, 20L)

**DUPLEX MOTOR CONTROL  
2 MOTORS CONNECTED IN PARALLEL**

The duplex controller consists of the equipment for a single motor controller with the exception that all contactors are double pole devices and one additional main line knife switch and two overload relays are added to the controller.



# DC MILL AUXILIARY CONTROL

## PRICING INFORMATION

CLASS  
6530

### SINGLE MOTOR CONTROL

Volts	Max. HP		Contactors NEMA Size	No. of Speed Points	Open Type		General Purpose Enclosure NEMA Type 1		General Purpose Enclosure NEMA Type 1 Gasketed		Rainproof and Sleet-Resistant Enclosure NEMA Type 3R		Industrial Enclosure NEMA Type 12 $\Delta$	
	Inter- mittent	Contin- uous			Controller Type	Price	Controller Type	Price	Controller Type	Price	Controller Type	Price	Controller Type	Price
<b>REVERSING PLUGGING (RP) CONTROL</b>														
230	35	25	3	4	EOR-3	\$ 5744.	EGR-3	\$ 7744.	ESR-3	\$ 8168.	EWR-3	\$ 8648.	EAR-3	\$ 9744.
	55	40	4	4	FOR-3	6800.	FGR-3	8800.	FSR-3	9224.	FWR-3	9904.	FAR-3	10800.
	110	75	5	4	GOR-3	9296.	GGR-3	11596.	GSR-3	12020.	GWR-3	12500.	GAR-3	13896.
	225	150	6	5	HOR-3	15428.	HGR-3	18628.	HSR-3	19052.	HWR-3	19532.	HAR-3	21828.
	275	200	6A†	5	HAOR-3	20044.	HAGR-3	23244.	HASR-3	23668.	HAWR-3	24148.	HAAR-3	26444.
<b>REVERSING PLUGGING DYNAMIC BRAKING (RPD) CONTROL</b>														
230	35	25	3	4	EOB-3	\$ 5744.	EGB-3	\$ 8388.	ESB-3	\$ 8812.	EWB-3	\$ 9292.	EAB-3	\$10388.
	55	40	4	4	FOB-3	6800.	FGB-3	9532.	FSB-3	9956.	FWB-3	10436.	FAB-3	11532.
	110	75	5	4	GOB-3	9296.	GGB-3	12316.	GSB-3	12740.	GWB-3	13220.	GAB-3	14616.
	225	150	6	5	HOB-3	15428.	HGB-3	20528.	HSB-3	20952.	HWB-3	21432.	HAB-3	23728.
	275	200	6A†	5	HAOB-3	20044.	HAGB-3	25714.	HASB-3	26120.	HAWB-3	26600.	HAAB-3	28896.
<b>REVERSING NON-PLUGGING DYNAMIC BRAKING (RNPD) CONTROL</b>														
230	35	25	3	3	EOP-3	\$ 5744.	EGP-3	\$ 7744.	ESP-3	\$ 8168.	EWP-3	\$ 8648.	EAP-3	\$ 9744.
	55	40	4	3	FOP-3	6800.	FGP-3	8800.	FSP-3	9224.	FWP-3	9904.	FAP-3	10800.
	110	75	5	3	GOP-3	9296.	GGP-3	11596.	GSP-3	12020.	GWP-3	12500.	GAP-3	13896.
	225	150	6	4	HOP-3	15428.	HGP-3	18628.	HSP-3	19052.	HWP-3	19532.	HAP-3	21828.
	275	200	6A†	4	HAOP-3	20044.	HAGP-3	23244.	HASP-3	23668.	HAWP-3	24148.	HAAP-3	26444.
<b>NON-REVERSING (NR) CONTROL</b>														
230	35	25	3	3	EON-3	\$ 3692.	EGN-3	\$ 5492.	ESN-3	\$ 5916.	EWN-3	\$ 6396.	EAN-3	\$ 7292.
	55	40	4	3	FON-3	4200.	FGN-3	6000.	FSN-3	6424.	FWN-3	6904.	FAN-3	7800.
	110	75	5	3	GON-3	5544.	GN-3	7544.	GSN-3	7968.	GWN-3	8448.	GAN-3	9544.
	225	150	6	4	HON-3	9876.	HGN-3	12776.	HSN-3	13200.	HWN-3	13680.	HAN-3	15676.
	275	200	6A†	4	HAON-3	12830.	HAGN-3	15730.	HASN-3	16154.	HAWN-3	16634.	HAAN-3	18630.
<b>NON-REVERSING DYNAMIC BRAKING (NRD) CONTROL</b>														
230	35	25	3	3	EOD-3	\$ 4336.	EGD-3	\$ 6136.	ESD-3	\$ 6560.	EWD-3	\$ 7040.	EAD-3	\$ 7936.
	55	40	4	3	FOD-3	4932.	FGD-3	6732.	FSD-3	7156.	FWD-3	7636.	FAD-3	8532.
	110	75	5	3	GOD-3	6664.	GGD-3	8664.	GSD-3	9088.	GWD-3	9568.	GAD-3	10664.
	225	150	6	4	HOD-3	11776.	HGD-3	14676.	HSD-3	15100.	HWD-3	15580.	HAD-3	17576.
	275	200	6A†	4	HAOD-3	15300.	HAGD-3	18200.	HASD-3	18624.	HAWD-3	19104.	HAAD-3	21100.

$\Delta$  Non-ventilated NEMA Type 12 enclosures are not recommended for severe service applications or for applications which have frequent jogging and inching operations because a corrosive atmosphere detrimental to the components can develop. For these applications, NEMA 1 gasketed enclosures are recommended.  
†Not a NEMA size/rating

### DUPLEX MOTOR CONTROL 2 MOTORS CONNECTED IN PARALLEL

For duplex controller pricing, double the prices shown for single motor controller.

To specify duplex controllers, modify the controller type number shown in the single motor control pricing tables by changing the suffix from "3" to "4." Example: EGR-3 becomes EGR-4.

#### ORDERING INFORMATION REQUIRED:

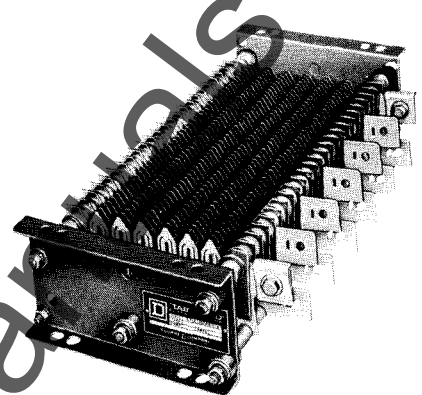
- |                      |  |  |
|----------------------|--|--|
| 1. Class             | 5. Motor Shunt Field Currents<br>(Minimum and maximum<br>operating currents) | 7. Controller Modifications: Specify<br>Form Y35 and Modification<br>Numbers |
| 2. Type              | 6. Voltage   | 8. Resistor Service Classification   |
| 3. Motor Horsepower  |  | 9. Master Switch Type and Form   |
| 4. Motor Duty Rating |  |  |

**DC MILL AUXILIARY CONTROL  
ACCESSORY PRICING INFORMATION  
AND APPLICATION DATA**

A complete set of motor control equipment consists of a controller and separately mounted TAB-WELD<sup>®</sup> resistors and master switch. The following tables are for selecting the resistors and master switches used with Class 6530 mill auxiliary control panels.

**TAB-WELD RESISTOR SELECTION TABLE**

Maximum HP Rating Single Motor ■	Price											
	NEMA Class ●											
	RP			RPD RIP-AS ▲			RNPD NRD & NR-AS ▲			NR		
	152-P 153-P	162-P 163-P	172-P 173-P	152-DB 153-DB 152-AS 153-AS	162-DB 163-DB 162-AS 163-AS	172-DB 173-DB 172-AS 173-AS	155-DB 155-AS	165-DB 165-AS	175-DB 175-AS	155	165	175
5	\$1160.	\$1160.	\$1680.	\$1576.	\$1576.	\$2286.	\$ 760.	\$ 760.	\$1102.	\$ 460.	\$ 460.	\$ 666.
7½	752.	752.	1090.	1184.	1184.	1716.	760.	760.	1102.	460.	460.	666.
10	708.	708.	1026.	1184.	1184.	1716.	760.	760.	1102.	460.	460.	666.
15	752.	752.	1090.	1184.	1184.	1716.	760.	760.	1102.	460.	460.	666.
20	752.	752.	1090.	1184.	1184.	1716.	760.	964.	1398.	632.	648.	940.
25	752.	752.	1090.	1184.	1184.	1716.	956.	964.	1398.	632.	648.	940.
30	752.	872.	1264.	1184.	1184.	1716.	956.	964.	1398.	632.	648.	940.
35	760.	988.	1432.	1076.	1288.	1868.	956.	964.	1398.	632.	648.	940.
40	856.	1100.	1596.	1168.	1416.	2052.	956.	1048.	1520.	632.	744.	1076.
45	956.	1228.	1780.	1264.	1620.	2348.	956.	1068.	1548.	632.	820.	1190.
50	1048.	1320.	1916.	1356.	1764.	2556.	1006.	1168.	1694.	692.	896.	1300.
60	1220.	1596.	2316.	1588.	1976.	2864.	1068.	1392.	2018.	820.	1068.	1548.
65	1312.	1716.	2488.	1712.	2240.	3248.	1152.	1484.	2152.	860.	1152.	1670.
70	1416.	1848.	2680.	1832.	2404.	3484.	1220.	1620.	2350.	956.	1228.	1780.
75	1484.	1952.	2832.	1936.	2548.	3696.	1288.	1688.	2448.	992.	1304.	1890.
90	1772.	2328.	3376.	2300.	3016.	4372.	1536.	2020.	2930.	1184.	1560.	2262.
100	1936.	2564.	3716.	2532.	3332.	4832.	1680.	2240.	3248.	1288.	1716.	2488.
110	2140.	2820.	4088.	2780.	3664.	5312.	1852.	2464.	3572.	1424.	1884.	2732.
125	2404.	3180.	4620.	3128.	4132.	6020.	2080.	2752.	3876.	1620.	2124.	3084.
135	2576.	3424.	4960.	3364.	4448.	6440.	2240.	2964.	4304.	1716.	2268.	3278.
150	2872.	3784.	5480.	3716.	4940.	7160.	2472.	3288.	4786.	1908.	2532.	3674.
175	3308.	4388.	6320.	4304.	5716.	8300.	2872.	3808.	5538.	2192.	2924.	4250.
200	3764.	5000.	7240.	4884.	6500.	9420.	3256.	4344.	6296.	2504.	3332.	4834.
225	4216.	5624.	8150.	5228.	7308.	10620.	3664.	4884.	7074.	2820.	3748.	5440.
250	4820.	6356.	9216.	6268.	8272.	11980.	4168.	5504.	7972.	3220.	4296.	6174.
275	5280.	6968.	10104.	6856.	9064.	12630.	4560.	6040.	8740.	3512.	4644.	6770.



Class 6715 TAB-WELD<sup>®</sup> Resistor

**RESISTOR APPLICATION DATA**

- Duplex controllers require two sets of resistors, one set for each motor.
- Class 15 — is recommended for light mill duty.
- Class 16 — is recommended for standard mill duty.
- Class 17 — is recommended for severe mill duty.

For explanation of NEMA resistor classifications — refer to Class 6715 Application Data.

▲ Armature shunt resistors are intermittent rated for use with an armature shunt contractor, Panel Modification No. 5.

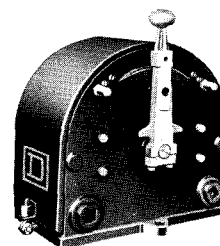
For resistors mounted in racks, unwired, refer to Class 6715.

**SPECIAL RESISTOR PRICING**

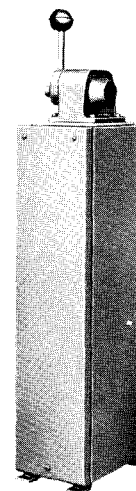
For NEMA Class	Multiply Listed Price of	By
132 or 133	152 or 153	70%
134	155	80%
135	155	70%
154	155	120%
164	165	120%
174	165	175%
95	165	190%

**MASTER SWITCH SELECTION TABLE**

CLASS 9004 VM OR CM NEMA 1 ENCLOSED					
Speed Points	Form	VM		CM	
		Type	Price	Type	Price
2	2X	VG-6	\$880.	CG-6	\$ 970.
3	3X	VG-6	880.	CG-6	970.
4	4X	VG-9	960.	CG-8	1020.
5	5X	VG-9	960.	CG-8	1020.



Class 9004 Type CG-6 Master Switch



Class 9004 Type VG-9 Master Switch

**ACCESSORIES**

- Brakes.....see Class 5010
- Manual & Magnetic Disconnect Switch.....see Class 6140



# DC MILL AUXILIARY CONTROL

## MODIFICATION PRICING INFORMATION AND APPLICATION DATA

CLASS  
6530

### CONTROLLER MODIFICATIONS (FORM Y35)

Modification No.	Description	Price				
		Max. HP. Rating-Single Motor				
		35	55	110	225	275
1	Substitute Fused Main Line Knife Switch for Unfused Main Line Knife Switch	\$660.	\$660.	\$880.	\$1780.	\$1780.
2	Substitute Circuit Breakers for Main Line and Control Circuit Knife Switches	400.	400.	600.	600.	900.
3	Additional Accel. Point	776.	912.	1216.	1852.	2160.
5	Armature Shunt Contactor	468.	604.	908.	1544.	1898.
6	Jam Relay	368.	368.	368.	368.	368.
7	Series Brake Transfer Knife Switches	1424.	2312.	3264.	6016.	6630.
8	Power Terminal Board	560.	720.	900.	1620.	1992.
12	Shunt Brake Relay	368.	368.	368.	368.	368.
13	Voltage Relay	440.	440.	440.	440.	440.
14	Ammeter Shunt, 50 MV	136.	184.	336.	508.	508.
15	Ammeter Shunt, 100 MV	208.	280.	672.	1080.	1080.
16	Miniature Ammeter, Panel Mounted	200.	200.	200.	200.	200.
18	Cabinet Space Heater Controlled By Interlock From M Contactor	440.	440.	440.	440.	440.
20	Field Loss Relay	440.	440.	440.	440.	440.
21	Field Acceleration Relay	440.	440.	440.	440.	440.
22	Field Economy Relay Including Resistor	440.	440.	440.	440.	440.
23	Field Decelerating Relay	440.	440.	440.	440.	440.
24	Substitute Type SSI Time-Current Acceleration Module for Type ST Static Acceleration Timers.	700.	700.	700.	700.	700.

### APPLICATION DATA

#### MULTI-MOTOR DRIVES

**Two motors connected in series** – The armatures and fields of each motor are connected in series and treated as a single motor. If the voltage rating of each motor is 230 vdc and the supply voltage is 230 vdc, the horsepower rating is equal to the rating of one motor. If the voltage rating of each motor is 115 vdc and the supply voltage is 230 vdc, the horsepower rating is equal to the sum of the ratings of both motors. Controller and resistor pricing is based on the horsepower rating. A single set of motor power resistors is required.

**Two motors connected in parallel** – One set of control equipment and power resistors is required for each motor. Controller prices and modification prices are double those shown for a single motor scheme.

#### CONTROLLERS

Standard controllers come equipped with the components listed. Special features to be added to standard controllers are identified by Form Y35 and a modification number. Most of these modifications are self-explanatory. Others, however, require some additional explanation.

MODIFICATION NO. 6 lists a jam relay. It is used for protecting the motor against excessive stalled currents on

drives such as sideguards, stripper cane screws or coke oven pusher rams. The relay operating coil is connected in series with the motor armature. The relay is used to insert additional resistance into the motor armature circuit by controlling the acceleration contactors. It can also be used to de-energize the motor.

MODIFICATION NO. 7 lists series brake transfer knife switches for use on duplex controllers. For single motor operation, these knife switches connect the series brakes in series with one motor to permit operating the drive without having to manually release one brake.

MODIFICATION NO. 12 a shunt brake relay is primarily intended for use on mill drives using shunt brakes. The brake relay is commonly arranged for operation from a separate push button station to allow manual control of the brake.

MODIFICATION NO. 13 covers a voltage sensitive relay. This relay is used for sensing motor armature voltage which is an indication of motor speed.

MODIFICATION NO. 16 lists a miniature ammeter. This is a 3½" square meter.

**CONTROLLER MODIFICATIONS (CONT'D)**

MODIFICATION NO. 20 lists a field loss relay. It is used to prevent the motor from reaching excessive speeds if current through the motor shunt field is interrupted. When this condition exists, the relay opens the main contactor, removing power from the motor. The field loss relay is required for motors having 60% or more shunt field strength.

MODIFICATION NO. 21 lists a field acceleration relay. This relay automatically provides full field excitation during acceleration to base speed and weakened field excitation for speeds above base speed. The relay has both a series coil, connected in series with the motor armature, and a shunt coil, connected across the control power source.

MODIFICATION NO. 22 lists a field economy relay. This relay provides motor shunt field protection against overheating on applications where the shunt field must be energized when motor is at rest. When the motor is not running, the relay is de-energized and the resistor is inserted

in the shunt field circuit. This additional resistance reduces the field current and prevents overheating. During starting and running conditions, the relay coil is energized, thereby shorting out the economizing resistor.

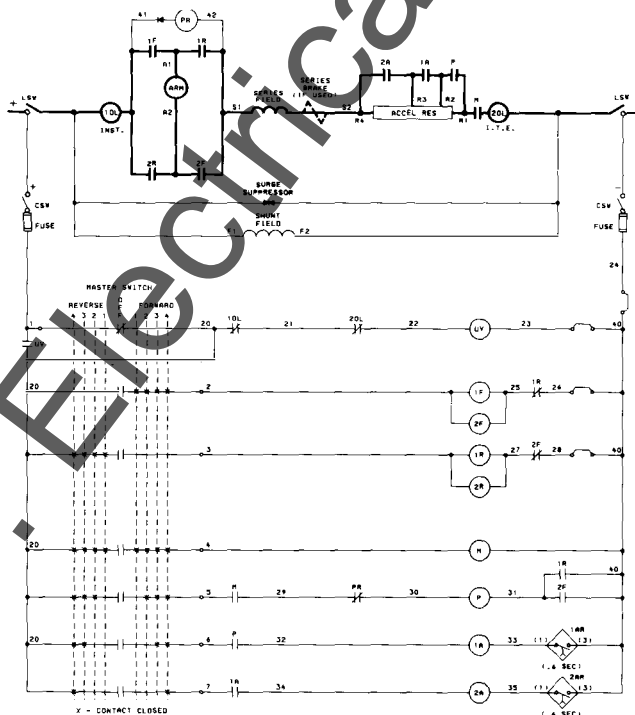
MODIFICATION NO. 23 lists a field deceleration relay. It is used to prevent excessive currents during deceleration. High currents may result while stopping from high speed on full low value or resistance. This relay has both shunt and series operating coils which sense motor armature voltage and current, respectively. The relay operates to insert additional resistance in the shunt field circuit, thereby, reducing motor armature current during deceleration.

MODIFICATION NO. 24 provides time delay acceleration in proportion to motor current.

**SPECIAL CONTROLLER CONSTRUCTION**

Several types of factory assembled and unitized constructions are available. Consult your local Square D field office for details.

**ELEMENTARY DIAGRAM  
FOR REVERSING PLUGGING (RP) CONTROL**



		REVERSE				FORWARD			
		4	3	2	1	1	2	3	4
1F						X	X	X	X
2F						X	X	X	X
1R		X	X	X	X				
2R		X	X	X	X				
M		X	X	X	X	X	X	X	X
P		X	X	X	X	X	X	X	X
1A		X	X	X	X				
2A		X	X	X	X				

CONTACTOR 1F & 1R, 1R & 2F,  
2F & 2R ARE MECHANICALLY INTERLOCKED

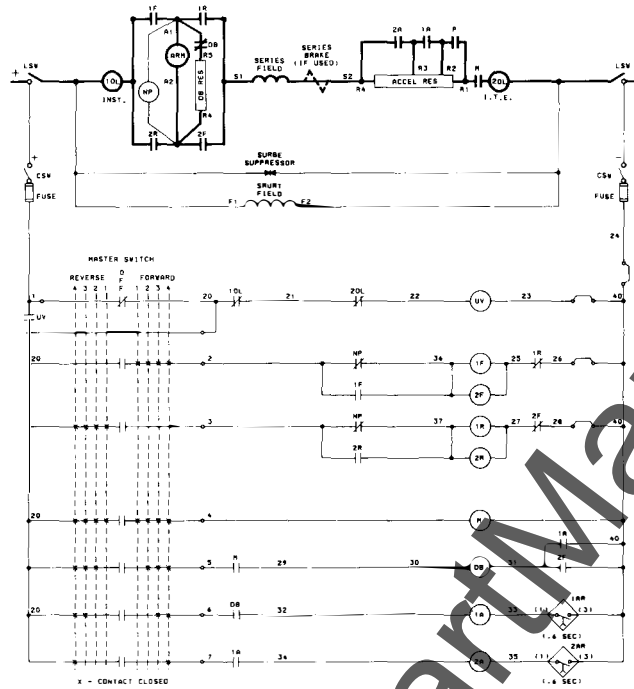


# DC MILL AUXILIARY CONTROL

## ELEMENTARY WIRING DIAGRAMS

CLASS  
6530

### FOR REVERSING NON-PLUGGING DYNAMIC BRAKING (RNPB) CONTROL

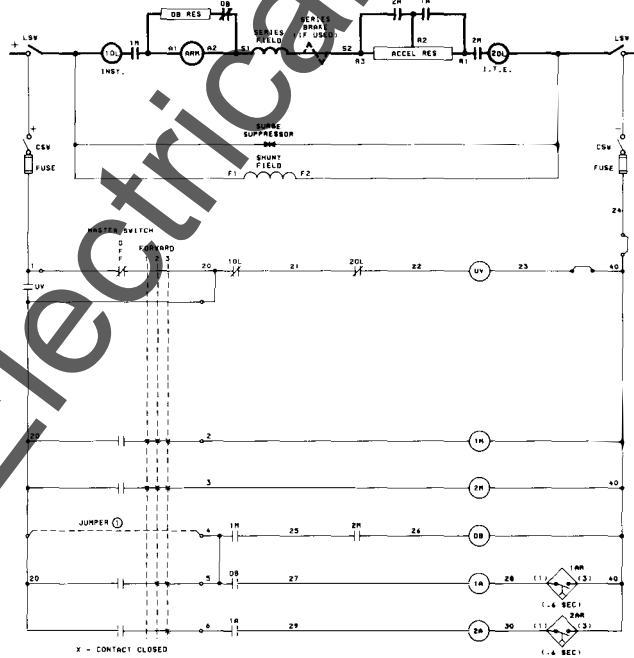


CONTACTOR SEQUENCE  
X - POWER TIPS CLOSED

	REVERSE	DB	FORWARD
1F	4	3	2
2F	1	2	3
1R	X	X	X
2R	X	X	X
M	X	X	X
DB	X	X	X
1A	X	X	X
2A	X	X	X

CONTACTOR 1F & 1R, 1R & 2F,  
2F & 2R ARE MECHANICALLY INTERLOCKED

### FOR NON-REVERSING DYNAMIC BRAKING (NRD) CONTROL

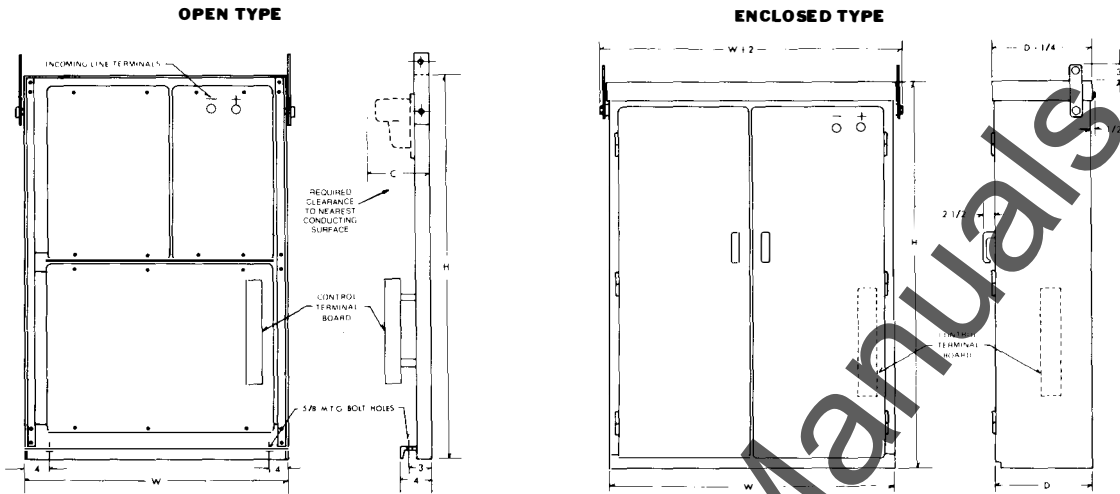


CONTACTOR SEQUENCE  
X - POWER TIPS CLOSED

	FORWARD
1M	1
2M	2
DB	3
1A	X
2A	X

① IF FIRST POINT ARMATURE SHUNT IS NOT DESIRED CONNECT JUMPER 4 TO 20 AND REMOVE CONNECTION 4 TO 5.

**SINGLE MOTOR CONTROL  
STANDARD CONTROLLERS - ALL CONTROL TYPES**



Max. HP (230V)		Open Type				Enclosed Type			
Intermittent	Continuous	H	W	C	Net Weight (Lbs.)	H	W	D	Net Weight (Lbs.)
35	25	68	33	12	500	68	33	15	700
55	40	68	33	12	500	68	33	15	700
110	75	78	38	15	700	78	38	17	900
225	150	72	72	21	1300	72	72	23	1800
275	200	72	72	21	1300	72	72	23	1800

**APPROXIMATE NUMBER OF SEPARATELY MOUNTED STANDARD  
CLASS 6715 TAB-WELD® RESISTOR SECTIONS**

This tabulation is based on Square D resistor designs for use with Class 6530 controllers only. This tabulation is for typical drive loading and may vary for any specific application. Each resistor section is 26.5" in length, 11" in width, 6" in depth and weighs 35 pounds.

Maximum H.P.	NEMA Class											
	152-P	153-P	162-P	163-P	152-DB 152-AS	153-DB 153-AS	162-DB 162-AS	163-DB 163-AS	155-DB 155-AS	165-DB 165-AS	155	165
5	3	2	3	2	4	3	4	3	2	2	1	1
7½	2	1	2	2	3	3	3	3	2	2	1	1
10	2	1	2	2	3	2	3	2	2	2	1	1
15	1	2	2	2	2	3	3	3	2	2	1	1
20	2	2	2	2	3	3	3	3	2	3	1	2
25	2	2	2	2	3	3	3	3	3	3	2	2
30	2	2	2	2	3	3	3	4	3	3	2	2
35	2	2	2	3	3	3	3	4	3	3	2	2
40	2	3	3	4	3	4	4	5	3	3	2	2
45	3	3	3	4	4	4	4	5	3	4	2	3
50	3	3	3	4	4	4	4	5	3	4	2	3
60	3	4	4	5	4	5	5	6	4	4	3	3
65	3	4	5	6	5	6	7	8	5	6	3	4
70	3	4	5	6	6	6	7	8	5	6	3	4
75	4	5	5	7	6	7	7	8	5	6	3	4
90	5	5	6	7	7	7	8	9	6	7	4	5
100	5	6	6	7	7	8	8	9	6	7	4	5
110	5	6	7	8	8	9	10	11	7	9	4	6
125	5	8	8	11	9	11	11	14	7	9	4	6
135	6	8	9	12	9	11	12	15	8	9	5	6
150	7	9	9	12	10	12	12	15	8	9	5	6
175	8	10	10	13	12	13	13	16	9	14	6	11
200	9	11	13	16	13	15	17	20	10	15	6	11
225	10	12	14	17	15	17	18	23	11	17	7	12
250	12	14	16	19	17	19	21	26	13	19	8	13
275	14	15	18	21	19	21	23	28	15	21	9	15