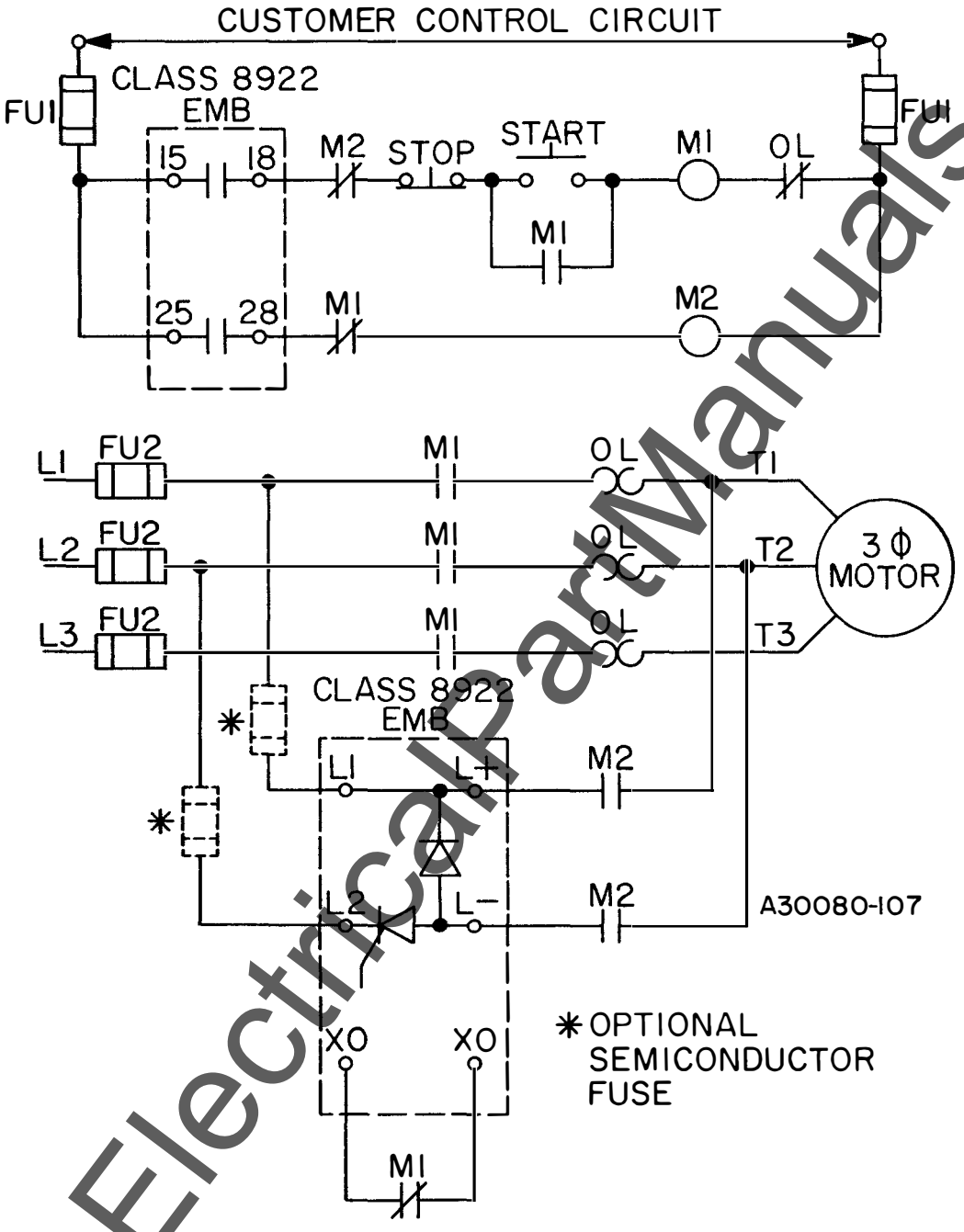
Class 8922
APRIL, 1983
Supersedes 1/81 Edition

Qwik-Stop® Electronic Motor Brake

CONTENTS

SQUARE D COMPANY

QWIK-STOP® ELECTRONIC MOTOR BRAKE
WIRING DIAGRAM



QWIK-STOP® ELECTRIC BRAKING CONTROL
100% AVERAGE BRAKING TORQUE

3 PHASE — **NEMA 1 — GENERAL PURPOSE ENCLOSURE** — **60 CYCLES◐**

Horse-power	220 VOLTS			440 VOLTS			550 VOLTS		
	Load Factor †	Type	Price	Load Factor †	Type	Price	Load Factor †	Type•	Price
½	670	CG-201	**$ 547.**	840	CG-401	**$ 543.**	640	CG-601	**$ 550.**
¾	310 630	CG-201 CG-214	**547.** **569.**	660	CG-402	**543.**	270 560	CG-601 CG-602	**550.** **565.**
1	280 580 810	CG-202 CG-222 CG-223	**541.** **560.** **565.**	380 740	CG-402 CG-422	**543.** **571.**	270 570 870	CG-603 CG-604 CG-623	**546.** **556.** **575.**
1½	260 430 690	CG-222 CG-223 CG-224	**560.** **565.** **572.**	150 350 670	CG-421 CG-422 CG-423	**560.** **571.** **585.**	110 240 510 760	CG-621 CG-622 CG-623 CG-636	**559.** **569.** **575.** **601.**
2	160 270 510	CG-222 CG-223 CG-224	**560.** **565.** **572.**	100 220 460 690	CG-421 CG-422 CG-423 CG-436	**560.** **571.** **585.** **602.**	80 150 320 570	CG-621 CG-622 CG-623 CG-636	**559.** **569.** **575.** **601.**
3	120 190 330 550	CG-225 CG-226 CG-227 CG-241	**560.** **565.** **572.** **590.**	80 170 360 590	CG-424 CG-425 CG-426 CG-442	**556.** **565.** **576.** **591.**	90 150 290 510	CG-624 CG-625 CG-641 CG-642	**567.** **578.** **598.** **612.**
5	120 200 430 710	CG-227 CG-241 CG-242 CG-253	**572.** **590.** **600.** **647.**	130 220 400 610	CG-426 CG-442 CG-443 CG-453	**576.** **591.** **604.** **635.**	100 170 400 730	CG-641 CG-642 CG-653 CG-663	**598.** **612.** **644.** **724.**
7½	90 150 270 600	CG-241 CG-242 CG-253 CG-263	**590.** **600.** **647.** **748.**	90 150 230 500	CG-442 CG-443 CG-453 CG-465	**591.** **604.** **635.** **699.**	100 220 460 720	CG-643 CG-654 CG-664 CG-665	**612.** **644.** **724.** **770.**
10	90 140 240 550	DG-243 DG-244 DG-254 DG-264	**782.** **798.** **840.** **982.**	120 200 400 690	CG-444 CG-454 CG-466 CG-473	**604.** **635.** **699.** **771.**	90 190 330 510	CG-654 CG-664 CG-665 CG-675	**644.** **724.** **770.** **846.**
15	110 250 460 770	DG-254 DG-264 DG-275 DG-283	**840.** **982.** **1117.** **1323.**	100 180 330 710	DG-454 DG-466 DG-473 DG-483	**834.** **892.** **1001.** **1191.**	90 220 400 740	DG-664 DG-675 DG-676 DG-686	**916.** **1081.** **1254.** **1575.**
20	100 220 400 720	EG-254 EG-264 EG-275 EG-283	**975.** **1072.** **1213.** **1463.**	90 170 310 690	DG-454 DG-466 DG-473 DG-483	**834.** **892.** **1001.** **1191.**	90 190 350 690	DG-664 DG-675 DG-676 DG-686	**916.** **1081.** **1254.** **1575.**
25	110 220 460 790	EG-264 EG-275 EG-283 EG-293	**1072.** **1213.** **1463.** **1601.**	100 160 390 670	DG-466 DG-473 DG-483 DG-494	**892.** **1001.** **1191.** **1476.**	80 180 360 670	DG-666 DG-677 DG-678 DG-687	**896.** **999.** **1200.** **1443.**
30	140 270 580	EG-275 EG-283 EG-293	**1213.** **1463.** **1601.**	100 240 450 730	EG-473 EG-483 EG-494 EG-497	**1099.** **1284.** **1564.** **1925.**	100 210 400 770	EG-677 EG-678 EG-687 EG-693	**1135.** **1288.** **1593.** **1769.**
40	120 260	FG-283 FG-293	**1762.** **1900.**	110 190 370	EG-483 EG-494 EG-497	**1284.** **1564.** **1925.**	90 170 400	EG-678 EG-687 EG-693	**1288.** **1593.** **1769.**
50	100 210	FG-283 FG-293	**1762.** **1900.**	90 150 310	EG-483 EG-494 EG-497	**1284.** **1564.** **1925.**	80 130 290	EG-678 EG-687 EG-693	**1288.** **1593.** **1769.**

†Load factor indicates maximum allowable braking time (seconds) per hour of operation. Refer to Class 8922 Descriptive Sheets for selection information. Load factors shown apply for average 1800 rpm NEMA design B motors.

◐For frequencies other than 60 cycles, consult factory.
®Qwik-Stop is a registered trademark of Square D Company.

•Overload Relay Selection — Refer to Tab "Overload Relay Selection"
Additions and Special Features — Refer to Tab "Additions and Special Features"

ORDERING INSTRUCTIONS

1—Specify Class and Type number, also Form designation when used. Give horsepower, voltage, phase, cycles and full load current rating of motor.

2—For motors larger than 15 hp indicate load factor required and give stator dc resistance in ohms. (Load factors listed are based on resistance of average 1800 rpm, NEMA design B motors. Any variation in resistance from design values will affect the load factor rating, particularly when large motors are involved.)

3—Describe clearly any modifications desired which cannot be covered by Form designation.

4—If desired controller cannot be selected from the standard listing, submit (1) complete motor nameplate data, (2) controller features desired, (3) type of machine, (4) accelerating time of motor connected to load or total WK^2 referred to motor shaft, (5) desired braking time, and (6) description of duty cycle.

•Revised

NOVEMBER, 1963
Supersedes Supplementary Price Sheet 8922 Pages 1-4
(Minor Correction — 3/67)

QWIK-STOP® ELECTRIC BRAKING CONTROL
200% AVERAGE BRAKING TORQUE

3 PHASE — **NEMA 1 — GENERAL PURPOSE ENCLOSURE** — **60 CYCLES◐**

Horsepower	220 VOLTS			440 VOLTS			550 VOLTS		
	Load Factor †	Type	Price	Load Factor †	Type	Price	Load Factor †	Type	Price
½	310	CG-211	$ 560.	610	CG-411	$ 564.	300	CG-611	$ 563.
	550	CG-212	569.				660	CG-612	578.
¾	120	CG-211	560.	240	CG-411	564.	130	CG-611	563.
	220	CG-212	569.	550	CG-431	587.	290	CG-612	578.
	500	CG-231	584.				570	CG-631	600.
1	160	CG-213	560.	180	CG-412	564.	110	CG-613	563.
	350	CG-214	569.	400	CG-433	587.	220	CG-614	578.
	730	CG-232	584.	770	CG-434	604.	460	CG-633	600.
							770	CG-634	612.
1½	140	CG-214	569.	80	CG-432	574.	100	CG-632	593.
	360	CG-232	584.	170	CG-433	587.	200	CG-633	600.
	460	CG-233	593.	310	CG-434	604.	350	CG-634	612.
	710	CG-251	621.	600	CG-451	628.	610	CG-651	646.
2	160	CG-232	584.	110	CG-433	587.	110	CG-633	600.
	290	CG-233	593.	220	CG-434	604.	220	CG-634	612.
	500	CG-251	621.	400	CG-451	628.	400	CG-651	646.
	830	CG-261	681.	680	CG-461	690.	780	CG-661	706.
3	130	CG-234	582.	120	CG-435	595.	90	CG-635	590.
	220	CG-252	603.	200	CG-452	618.	140	CG-636	601.
	480	CG-262	662.	380	CG-462	679.	250	CG-652	632.
	770	CG-271	717.	620	CG-463	698.	560	CG-662	689.
5	90	CG-252	603.	80	CG-452	618.	90	CG-652	632.
	160	CG-262	662.	130	CG-462	679.	190	CG-662	689.
	320	CG-271	717.	220	CG-463	698.	500	CG-671	764.
	580	CG-272	777.	490	CG-471	747.	670	CG-672	807.
7½	110	CG-271	717.	90	CG-463	698.	130	CG-671	764.
	190	CG-272	777.	170	CG-471	747.	220	CG-672	807.
	420	CG-281	998.	410	CG-481	893.	370	CG-681	944.
	830	CG-291	1252.	730	CG-491	1098.	510	CG-682	1175.
10	120	DG-273	910.	100	CG-464	682.	120	CG-673	758.
	280	DG-274	1011.	210	CG-472	728.	200	CG-674	799.
	540	DG-282	1228.	410	CG-482	865.	310	CG-683	934.
	840	DG-292	1496.	790	CG-492	1052.	570	CG-684	1159.
15	120	DG-274	1011.	100	DG-472	921.	130	DG-683	1169.
	230	DG-282	1228.	170	DG-482	1099.	270	DG-684	1347.
	480	DG-292	1496.	410	DG-492	1282.	550	DG-691	1676.
	830	DG-296	1644.	710	DG-493	1476.	870	DG-696	1876.
20	110	EG-274	1101.	90	DG-472	921.	120	DG-683	1169.
	200	EG-282	1321.	150	DG-482	1099.	240	DG-684	1347.
	420	EG-292	1584.	400	DG-492	1282.	480	DG-691	1676.
	770	EG-296	1732.	690	DG-493	1476.	830	DG-696	1876.
25	110	EG-282	1321.	90	DG-482	1099.	120	DG-684	1347.
	230	EG-292	1584.	200	DG-492	1282.	250	DG-691	1676.
	520	EG-296	1732.	370	DG-493	1476.	570	DG-696	1876.
				710	DG-496	1825.			
30	80	EG-282	1321.	110	EG-492	1375.	120	EG-685	1441.
	140	EG-292	1584.	220	EG-493	1564.	230	EG-692	1784.
	310	EG-296	1732.	460	EG-496	1925.	530	EG-697	1984.
40	70	FG-292	1883.	100	EG-493	1564.	100	EG-692	1784.
	130	FG-296	2031.	200	EG-496	1925.	220	EG-697	1984.
50	100	FG-296	2031.	90	EG-493	1564.	80	EG-692	1784.
				160	EG-496	1925.	170	EG-697	1984.

†Load factor indicates maximum allowable braking time (seconds) per hour of operation. Refer to Class 8922 Descriptive Sheets for selection information. Load factors shown apply for average 1800 rpm NEMA design B motors.

◐For frequencies other than 60 cycles, consult factory.
®Qwik-Stop is a registered trademark of Square D Company.

•Overload Relay Selection — Refer to Tab "Overload Relay Selection"
Additions and Special Features — Refer to Tab "Additions and Special Features"

ORDERING INSTRUCTIONS

1—Specify Class and Type number, also Form designation when used. Give horsepower, voltage, phase, cycles and full load current rating of motor.

2—For motors larger than 15 hp indicate load factor required and give stator dc resistance in ohms. (Load factors listed are based on resistance of average 1800 rpm, NEMA design B motors. Any variation in resistance from design values will affect the load factor rating, particularly when large motors are involved.)

3—Describe clearly any modifications desired which cannot be covered by Form designation.

4—If desired controller cannot be selected from the standard listing, submit (1) complete motor nameplate data, (2) controller features desired, (3) type of machine, (4) accelerating time of motor connected to load or total WK^2 referred to motor shaft, (5) desired braking time, and (6) description of duty cycle.

•Revised

General Revision.

NOVEMBER, 1963

QWIK-STOP® BRAKING CONTROL

APPLICATION

Class 8922 "Qwik-Stop" controllers provide a simple, effective means of braking any ac squirrel cage motor. They are used to advantage on machine tools, power saws, conveyors, textile spinning frames and many other machines in varied industries.

"Qwik-Stop" electric braking units have several advantages over mechanical brakes or electrical plugging schemes:

1. Greatly reduced maintenance, since there are no parts subject to heavy wear and no periodic adjustments to make.
2. Braking torque is applied gradually, imposes less shock on machinery.
3. No special motor shaft required.
4. No extra space required at motor location.
5. Produces less motor heating than plugging, with no danger of motor reversal.
6. Can be added easily to existing machines.

OPERATION

"Qwik-Stop" operates similar to dynamic braking, except that the principle is applied to a standard three phase induction motor. When the motor is disconnected from its ac source, dc is automatically applied to the stator windings, and the motor is braked quickly and smoothly to a stop. Initial braking torque is usually 100% or less of motor full load torque; it increases gradually to a maximum at 10 to 20% full load speed, then decreases rapidly to essentially zero torque when the motor stops. The fact that electric braking produces no holding torque at standstill is often an extra advantage.

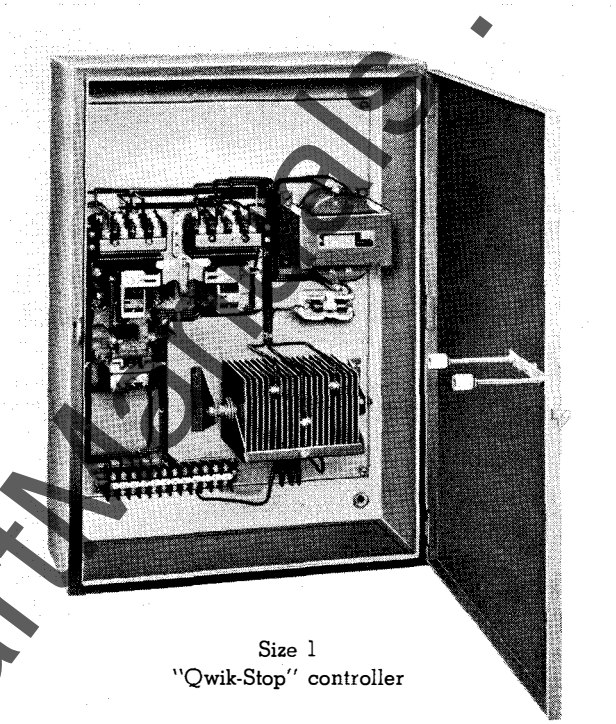
These controllers are unique in that dc is applied to all three phases of the motor. Three lead braking allows better heat distribution than conventional two lead braking, extends insulation life.

CONSTRUCTION

A self-contained transformer and full wave selenium rectifier stack provide the dc required for braking. Taps on the transformer allow adjustment of braking torque over a wide range in six steps. A reversing magnetic starter is used to connect power to the motor — ac during normal operation and dc during braking. An accurate pneumatic timer removes dc excitation when the motor stops and also acts as a rectifier protective relay, delaying application of dc until the motor back emf has decayed to a predetermined value. Melting alloy overload relays with reliable one-piece thermal units are supplied as standard. Terminal blocks are provided to simplify wiring.

When electric braking is to be added to an existing machine equipped with a line voltage type magnetic starter, the "Qwik-Stop" controller can be ordered without a main line starter (Form Y108). The existing starter must be provided with one extra normally closed control contact for proper interlocking with the braking unit. Standard controllers, however, are usually preferred since they include mechanical interlocking as well as electrical interlocking to prevent application of ac and dc at the same time.

In addition to the standard "Qwik-Stop" units listed, controllers can be furnished for reversing service, multi-speed motors, single phase motors and other special purpose applications. Single controllers for group braking of two or more individual motors are also available.



Size 1
"Qwik-Stop" controller

SELECTION

Selection of the proper "Qwik-Stop" unit is based on (1) the amount of braking torque desired, and (2) maximum duty cycle.

BRAKING TORQUE

Controllers are available for either 100% or 200% average braking torque. That is, the braking torque will average 100% or 200% of motor full load torque during the decelerating period (with transformer adjusted for maximum output voltage).

During acceleration a standard NEMA design B motor develops an average torque equal to 165% of full load torque, acting against the inertia and friction imposed by the load. When decelerating, the inertia component of the load tends to resist braking, but the friction component aids in braking. Therefore, for a load which is largely friction (low inertia), the 100% average braking torque controller will stop the motor in about the same time it took to accelerate. If a 200% braking torque unit were used, braking time would approach half the accelerating time.

For high inertia loads, the 200% average braking torque unit is required to stop the motor in the same time as it accelerates. Braking time using a 100% braking torque controller would be approximately twice the accelerating time.

QWIK-STOP® BRAKING CONTROL

NOVEMBER, 1963

LOAD FACTOR (DUTY CYCLE)

"Qwik-Stop" units are given a load factor rating which is based on the size of the rectifier and transformer furnished. The load factor indicates maximum duty cycle, expressed as braking time (seconds) per hour of operation. To determine the load factor required for a particular application:

1. **Estimate braking time in seconds for one stop.**
2. **Multiply this braking time by the maximum number of operations expected in one hour.**
3. **Select a controller with a load factor equal to or greater than that calculated in step 2.**

NOTE: The above procedure applies when time between braking periods is fairly constant. When irregular duty cycles are involved, a higher load factor may be required — consult Square D for load factor recommendation in these cases.

When electric braking is used, one stop produces about the same motor temperature rise as a normal start. To avoid overheating, the number of starts in a given time should be limited to half that recommended by the motor manufacturer for standard applications.

"Qwik-Stop" controllers listed are generally limited to five braking operations per minute. Larger contactors may be required for more frequent operation in accordance with NEMA Standard IC 1-21.25.

USEFUL FORMULAS

The following information may be helpful in applying "Qwik-Stop" control:

A. Total Inertia = WR^2 of motor + WK^2 of load referred to motor shaft. If there is gearing between motor and load:

WK^2 of load referred to motor shaft =

$$WK^2 \text{ of load} \times \left(\frac{\text{Speed of Load}}{\text{Speed of Motor}}\right)^2$$

B. Average Braking Torque Required, lb-ft. =

$$\frac{0.9 \times \text{Total Inertia, lb-ft.}^2 \times \text{Full Load Motor Speed, rpm}}{307 \times \text{Desired Braking Time, seconds}}$$

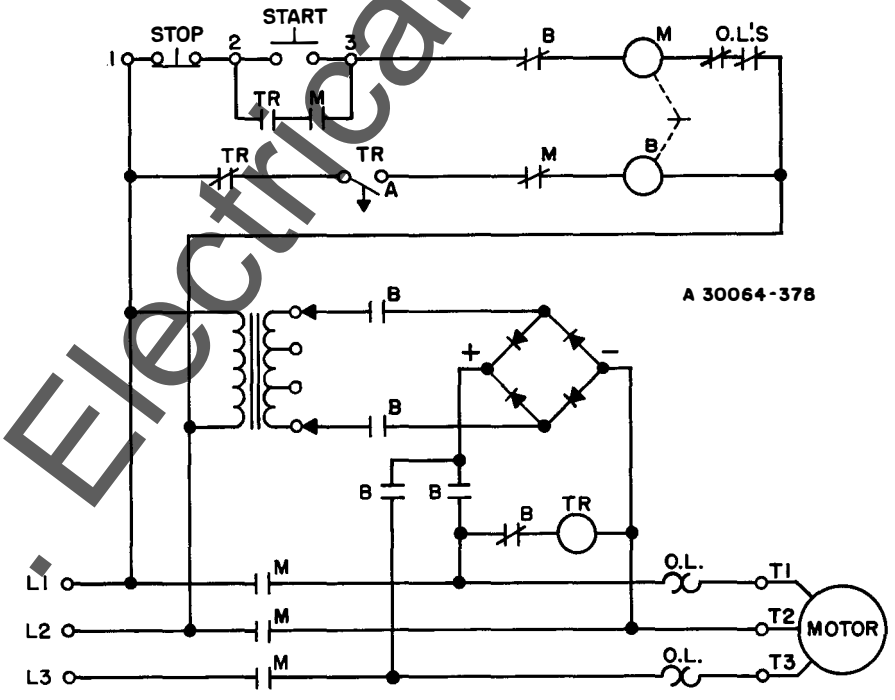
(0.9 compensates for the effect of friction in average applications.)

C. Full Load Torque, lb-ft $= \dfrac{5250 \times \text{Horsepower}}{\text{Full Load Motor Speed, rpm}}$

D. Average Braking Torque Required As % of Full Load Torque $= \dfrac{B}{C} \times 100$

If answer in D is 100 or less, use 100% "Qwik-Stop" unit; if more than 100 use 200% "Qwik-Stop" unit.

NOTE: "Qwik-Stop" controllers are designed to provide listed braking torque when used with 1800 rpm NEMA design B motors. When used with high slip motors, higher braking torques will be obtained.



Elementary Diagram for Standard "Qwik-Stop"