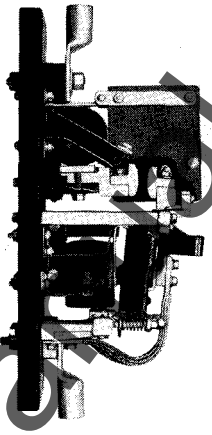
OCTOBER, 1964

AC Resistance Welder Control

Catalog Listing — The contactors, timers and accessories described in this section are listed in detail in a separate catalog entitled "Resistance Welder Control", copies of which are available upon request. This catalog contains complete descriptive and price data. Contact your Square D field office for additional information.



Cutaway profile of magnetic contactor

WELDER CONTACTORS-CLASS 8990

Resistance Welding Contactors

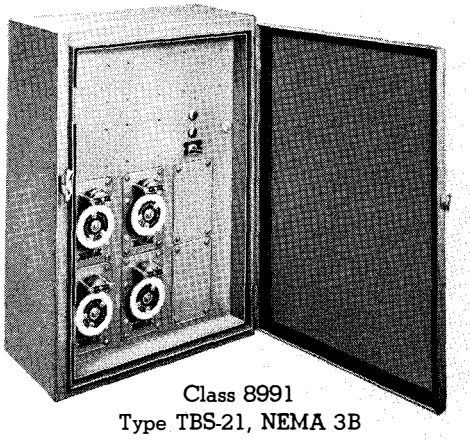
Application — Class 8990 welder contactors are used with resistance welding machines to make and break the heavy current required by the primary circuit of the welder transformer. The frequent operation, short timing periods and heavy loads characteristic of welder service, require a contractor having many special design features.

Magnetic contactors, single or two pole, provide the greatest economy on small or medium sized welders where the duty cycle is relatively light.

Electronic contactors are recommended for jobs involving heat control, very short weld periods and heavy currents, or high speed operation. Tubes are available in five sizes identified as A, B, C, Jumbo C and D. The contactor rating depends on the size tube installed. Electronic contactor rating curves are given in the Class 8990 Descriptive Sheet, Pages 21-22. Maintenance requirements are minimized because there are no moving parts.

Arc Welding Contactors

Application — Class 8990 magnetic welder contactors are also used for arc welding applications. These contactors are especially designed to control the high dc current encountered in arc welding service.



Class 8991
Type TBS-21, NEMA 3B

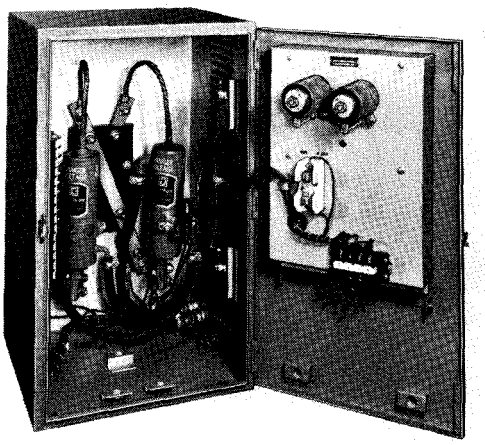
WELD AND SEQUENCE-WELD TIMERS CLASS 8991

Application — **Weld timers** for foot or motor operated welding machines, control only the duration of welding current through the work. The pressure function associated with the electrode motion must be controlled by some other means.

Sequence-Weld timers provide completely automatic control of spot or projection welding machines.

1. By governing energization of a separate welder contactor which switches the heavy current to the welding transformer, and
2. By controlling the operation of the valve solenoid on air or hydraulically operated machines.

Sequence-weld timers control not only the duration of welding current through the work, but also the order and duration of events in the pressure cycle.

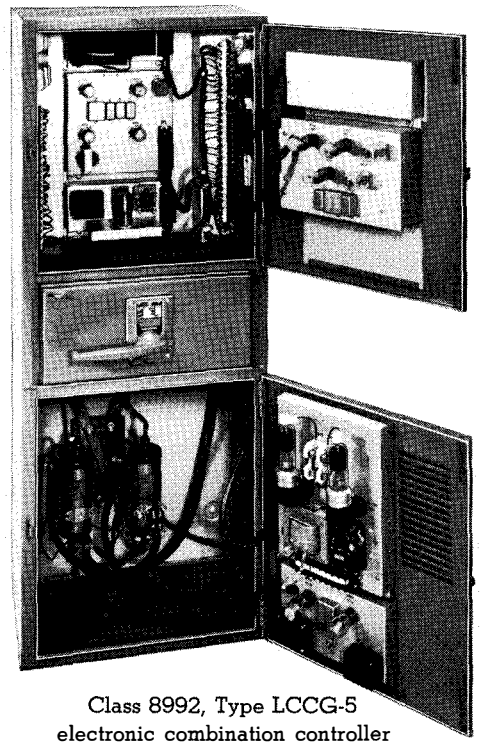


Class 8990 Type CCG-1
electronic contactor
with tubes in place

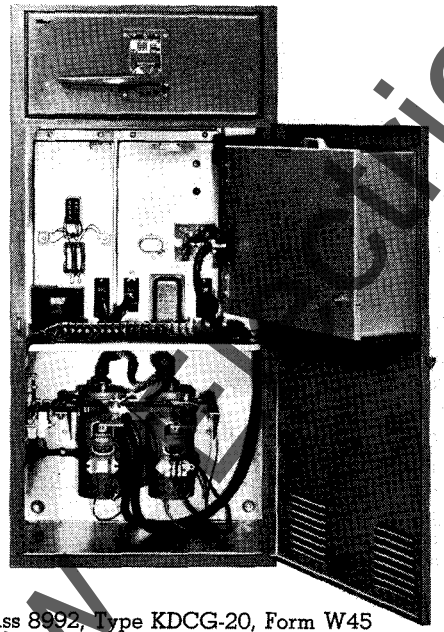
Sofront:

Sofront weld and sequence-weld timers are an improved, simplified version of a time tested device. These timers are assembled from individually mounted pneumatic timing relays

AC Resistance Welder Control



Class 8992, Type LCCG-5
electronic combination controller
NEMA N2UD-600



Class 8992, Type KDCG-20, Form W45
solid state combination controller
NEMA N2HX-600

and control relays electrically interconnected to provide control of the various current and pressure events in the welding cycle. Any of the units can be easily removed or replaced with only a screwdriver and pliers. Simple circuits using dependable magnetic units make servicing an easy matter.

Safety — Initiating switch, pressure switch, no-weld switch and timer control circuits are 24 volts, and are isolated from the power supply to meet NEMA and RWMA Standards. Dead front construction of the *Safront* timer protects the operator while making adjustments.

ELECTRONIC:

Square D electronic sequence-weld timers have been carefully designed to include many features considered important to industrial users.

Electronic timers consist of several plug-in panels, each performing a specific function. The plug-in panels are identical to the panels used in the electronic combination controllers. NEMA 3B and 5B timer panels are interchangeable, as are the power panels for standard voltages and special voltages, and the tube and relay valve panels. The use of plug-in panels makes the job of servicing a matter of a few seconds.

Accuracy and Consistency — Tap switch adjustments of the weld time and expanded dials for low ranges on the other timing periods, contribute to a high accuracy on all timing periods. DC timing circuits are used to maintain accuracy regardless of line voltage variations as great as $\pm 10\%$.

Compatibility — This timer cabinet matches the width and depth dimensions of Square D electronic contactors. However, it may be used satisfactorily with magnetic contactors, or other designs of electronic contactors.

NON-SYNCHRONOUS COMBINATION WELDER CONTROLLERS CLASS 8992

Class 8992 combination welder controllers are designed to provide fully automatic control for an air or hydraulically operated resistance welding machine, complete in a single enclosure. The combination controller cabinet houses the sequence-weld timer and ignitron welder contactor, together with all necessary interwiring and user terminals.

Electrode motion is governed by the sequence-weld timer which controls energization of the air (or hydraulic) valve solenoid. It also governs weld duration by "firing" the ignitron contactor which switches the welding transformer primary current.

An automatic or non-automatic circuit interrupter may be included in the same enclosure to provide a convenient means for disconnecting the welding machine and control from the incoming power line.

OCTOBER, 1964

AC Resistance Welder Control

Reduced Maintenance — NORPAK solid state welder controllers require less maintenance due to the use of transistorized, encapsulated circuitry. All control tubes have been eliminated. The only maintenance that should be necessary is the occasional replacement of an ignitron tube or power thyratron tube. Thyratron tube replacement can be eliminated by substitution of solid state firing, Form W45.

ABSOLUTE ACCURACY COMBINATION WELDER CONTROLLERS CLASS 8993

Application — Class 8993 absolute accuracy combination controllers are recommended for resistance welding applications requiring the highest quality and most consistent results possible. This includes the welding of steel, stainless steel, aluminum, magnesium, titanium and other nonferrous metals with a narrow plastic range.

Description — NORPAK absolute accuracy combination controllers are similar to the NORPAK non-synchronous type mentioned above. In most cases, the difference between the two classes of NORPAK controls exists in the sequence panel. Absolute accuracy timing, adjustable from 1 to 99 cycles, insures that timing accuracy and repeat accuracy are absolute (± 0 cycles error) regardless of the length of the timing period.

Sequences are provided for NEMA S2H, S3H (pulsation welding) and S5H (seam welding) controllers. Special sequences can be designed to meet a user's special needs.

ELECTRONIC:

The basic electronic combination controller includes a **cross-bus** ignitron contactor, along with a plug-in power panel, sequence timer panel, valve panel, adjuster panel, and a weld firing panel. The power panel may be for the standard voltages of 230 volts and 460 volts or for the special voltages of 208 volts, 380 volts and 575 volts. The timer and adjuster may provide NEMA 3B or 5B sequences.

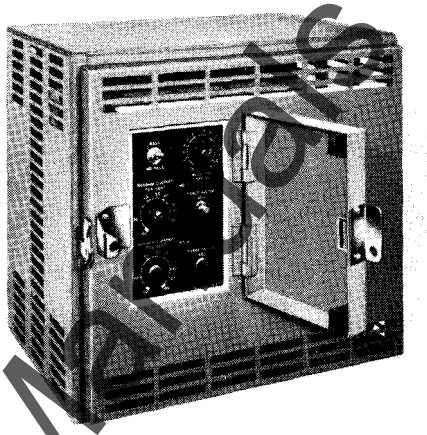
Additional Functions — The basic control may be expanded by adding one or a combination of additional auxiliary plug-in panels. Such functions as two stage initiation, phase shift heat control, slope control, current regulation, dual weld and/or dual heat, forge delay and dual gun can be included in the same combination enclosure. These functions can be included initially or added at a later date as requirements occur.

Special Features — The control includes lead-trail firing, delayed firing, safety relay and emergency stop circuits.

SOLID STATE:

The NORPAK solid state combination controller includes a **coaxial** ignitron contactor, and three plug-in panels. The sequence panel provides the timing-sequencing and auxiliary functions. The firing panel provides the firing means for the ignitron tubes.

•NORPAK welder controllers can be applied on welding supply voltages of 208V to 600V. The control power voltage input to the power panel is 480V, which can be supplied directly from the welder power supply on 480V systems or through a control power transformer.



Class 8993 Type DAG-1 bench welder control

Basic Control Functions include phase shift heat control, delayed firing, and lead-trail firing.

Additional Control Functions provided in the sequence panel can include upslope control, up-down slope control, or other standard welder functions.

BENCH WELDER CONTROL CLASS 8993

Application — Bench mounted, low capacity resistance welders require a special type of control combining a single period timer and a low capacity contactor output. The timing period usually must be highly accurate and must have a low minimum value. The current control must also be very accurate. The contactor capacity must be in the range below ignitron tubes. Bench welder controls have been designed specifically for this application.

Description — The Square D solid state bench welder combination control includes a thyratron tube contactor, a single period timer and a phase shift heat control, all in one enclosure.

The solid state, cycle counting, absolute accuracy timer has a range of ½ to 15 cycles in one cycle steps. The ½ cycle setting is one of the 16 positions on the tap switch selector. This prevents the possibility of saturating the transformer by getting a series of ½ cycle pulses, of the same polarity.

The solid state, phase shift type of heat control has a stepless adjustment range of 20% to 100% for welding voltages of 240 to 600 volts. The heat control provides synchronous firing with Lead-Trail action, except when the timer is set for ½ cycle.

The contactor which energizes the welding transformer, is a pair of thyratron power tubes, connected in inverse parallel. Two sizes of enclosures are available. The smaller size handles the 10 and 25 frame contactors. The larger handles the 25 and 75 frame contactors.

•Revised

AC Resistance Welder Control

NORPAK WELDER PRESS CONTROL CLASS 8994

Application — Resistance welding of parts requiring high production at the lowest possible cost is usually done on specialized welding machines. The specialized machine often loads, clamps, welds and ejects automatically, or with a minimum of manual operation. Typical machines make as many as 30 to 60 separate spot welds during a sequence. Such specialized welding machines are generally called "Multi-Spot Welding Presses".

A multi-spot welding press requires a large amount of electrical power. Consideration must be given to the disturbance that such a machine will make on the power distribution system. This disturbance can be minimized by using load distribution welder control.

Description — NORPAK load distribution controls consist of a NORPAK sequence panel, a power panel, two or more ignitron contactors and a firing panel for each contactor, all mounted in one enclosure.

Single phase controls include from two to six contactors with a timing sequence of SQUEEZE, WELD NO. 1, WELD NO. 2, WELD NO. 3, etc., and HOLD Times. Each timing period has individual adjusters allowing different weld times for each contactor.

Three phase controllers include three contactors connected with one on each phase. The timing sequence includes SQUEEZE, WELD L1-L2, WELD L2-L3, WELD L3-L1, and HOLD times.

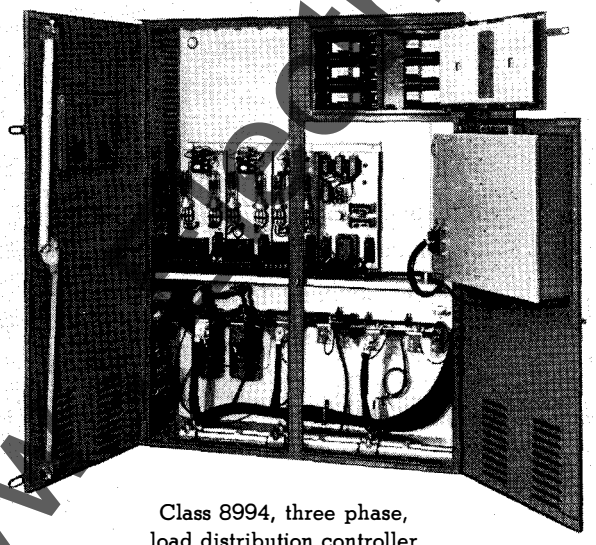
NOR/matic CONTROL CLASS 8995

Application—Class 8995 NOR/matic control is recommended for resistance welding applications where a non-synchronous combination controller might normally be used, but where it is necessary or desirable to cancel the effect of welding variables such as line voltage drops, shunting welds, and changes in material thickness. These changes might otherwise result in inferior welds. Weld nugget strength can be maintained under varying welding conditions if:

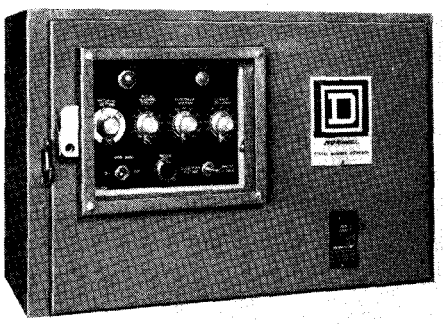
1. A good manual welding schedule is first established that will produce welds of the required strength when welding conditions are constant, and
2. An increase or decrease in the weld time will cancel the effect of changes in these welding conditions.

Description — NOR/matic combination controllers are basically NORPAK non-synchronous combination controllers incorporating a weld feedback system. The weld nugget is continually inspected **as it is formed** and welding current is terminated when the desired weld strength is reached, within a preset maximum weld time. If the required weld strength is not obtained, a "Check Weld" light is turned on.

A NOR/matic converter control makes it possible to convert an existing welding installation from the usual manual control operation to NOR/matic operation. The converter control works in conjunction with an existing combination controller on either stationary welding machines or portable welding gun installations. The converter can be applied to any non-synchronous combination controller that has provision for an external Weld-No Weld switch.



Class 8994, three phase, load distribution controller



NOR/matic converter control