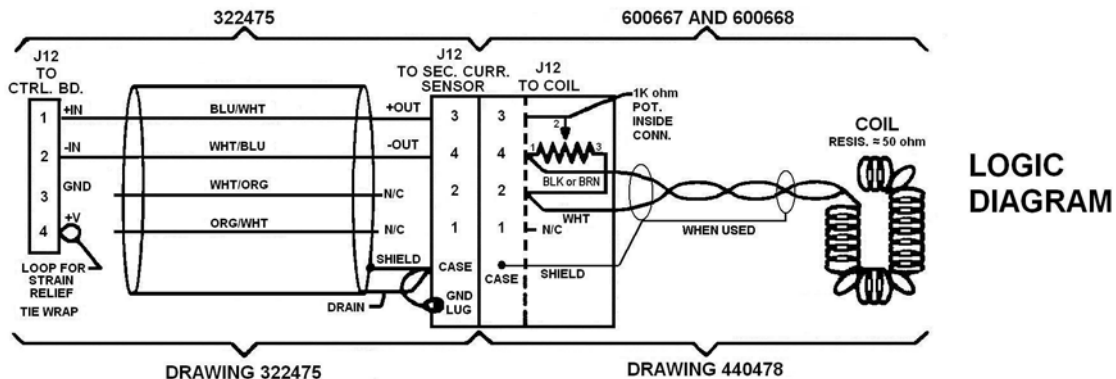


## APPLICATION NOTE 700224A USING MULTIPLE SECONDARY TOROIDS EN1001 CASCADE/MULTI-VALVE CONTROLS

### Using Secondary Constant Current or Current Monitoring Independent Secondaries when using multiple SCRs

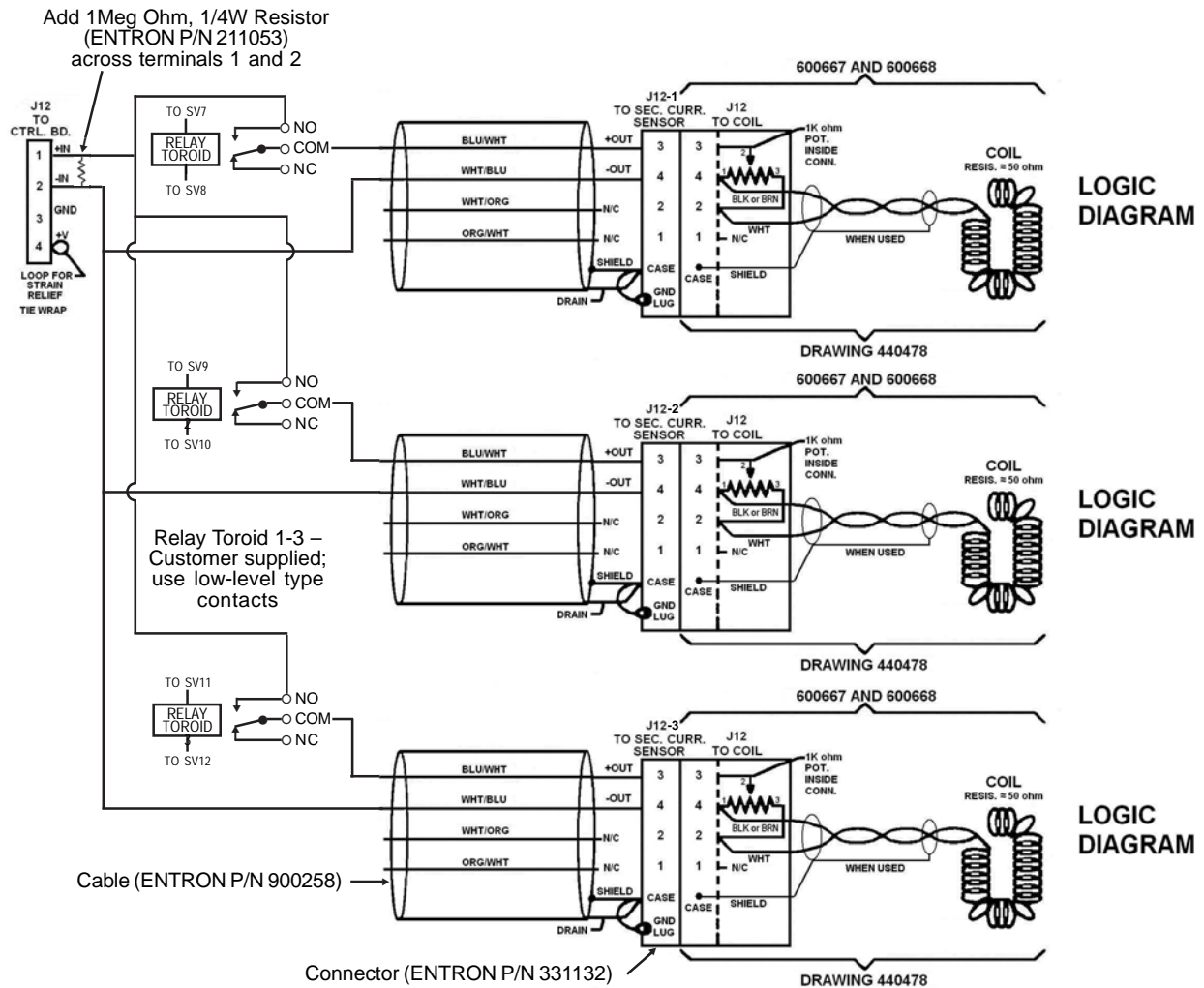
The EN1001 Cascade/Multi-Valve Control can fire up to 8 SCRs. If Secondary current monitoring or regulation is necessary and one leg of each secondary cannot pass through one toroid, it will be necessary to **connect** all the toroids and **multiplex** them in such a way that only **one** toroid's signal is presented to the control input at any time during a weld. This toroid must correspond to the SCR being fired. In addition, it must come on a few cycles before weld time begins and turn off at least 1 or 2 cycles after the weld interval ends. In order to achieve this, it is necessary to change the Single Toroid circuit to accommodate subsequent toroids.

The objective of this Application Note is to explain in the simplest terms a method to connect the one or more additional toroids necessary to monitor all the secondaries existing in the machine. Since most OEMs have preferences in connection methods, this Application Note is meant to stay simple and generic. Figure 1 shows the **original** circuit as shipped from the factory. A complete drawing is included at end of this Note so spare parts may be ordered to assist in implementing connection modification.



**Figure 1.** Single Secondary Toroid Circuit – Original Connection

As can be seen, the Toroid Assembly is connected to J12 on the Control Board. J12, in turn, presents two input connections to the Board and one shield.



**Figure 2. Multiple Secondary Toroid Circuit – Modified Connection**

Each secondary toroid will require its own relay contact and means of switching each relay ON during the corresponding weld. Add one relay to each of the secondary toroids and connect as shown in Figure 2.

If using a PLC to control cylinders, this Application Note cannot provide more information other than what is covered in this paragraph. Additional signals must be added to energize the proper relay and “switch-in” **one** toroid corresponding to each SCR/Welding Transformer before each weld occurs and remain ON until the end of the weld period. Synchronizing events timed in Cycles may require signals from events times within the weld control, such as “dummy” Valve outputs programmed in, to ensure full relay closure just before and just after each weld. Also, switch on the next relay as necessary.

If using the weld control, a number of the 8 Solenoid Valve outputs can be used to turn toroid signals ON. The weld control automatically turns ON each relay as it is needed during each SCR firing.

For example, a spot weld sequence using 2 SCRs can be programmed using Schedules 1 and 2 in a chained sequence. Schedule 1 will sequence SQUEEZE1, WELD1, HOLD1 chained to Schedule 2 SQUEEZE2, WELD2, HOLD2. The standard EN1001 Cascade/Multi-Valve weld sequence will normally require 1 Solenoid Valve output for the entire weld sequence chain.

Assuming the application requires 2 weld cylinders, the 2 cylinders can be energized by one solenoid output. In this case, SV1-SV2 (Valve 1) will be ON during SQUEEZE, WELD and HOLD times of Schedules 1 and 2. The operator then must add 1 additional valve output per SCR. (In a 2 Cascade, add V4 to Schedule 1 and V5 to Schedule 2). This way, V4 will switch Relay Toroid 1 and V5 will switch Relay Toroid 2. See Figure 3.

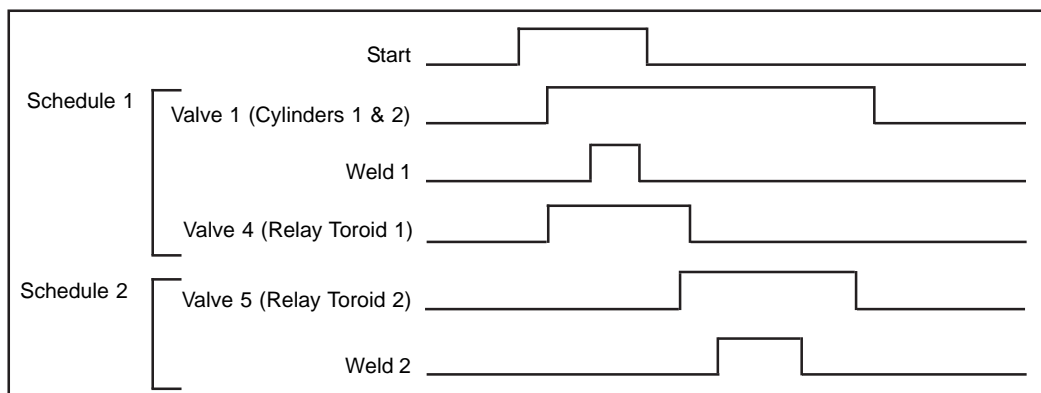
In summary, the entire weld sequence will contain:

SCHEDULE	SQUEEZE	WELD/HEAT	PERCENT CURRENT	HOLD	OFF	IMPULSES	COOL	VALVE MODE	CYCLE MODE	SLOPE MODE	SLOPE COUNT
01	>=2	*	*	>=1	*	*	*	90	02	00	00
02	>=2	*	*	>=1	*	*	*	11	00	00	00

\* As required

**Table 1. VALVE codes**

VALVE code right digit	VALVE LED 1 2 3 4	Description	VALVE code left digit	VALVE LED 5 6 7 8	Description
0	0 0 0 0	Four valves off	0	0 0 0 0	Four valves off
1	1 0 0 0	Valve 1	1	1 0 0 0	Valve 5
2	0 1 0 0	Valve 2	2	0 1 0 0	Valve 6
3	1 1 0 0	Valves 1 & 2	3	1 1 0 0	Valves 5 & 6
4	0 0 1 0	Valve 3	4	0 0 1 0	Valve 7
5	1 0 1 0	Valves 1 & 3	5	1 0 1 0	Valves 5 & 7
6	0 1 1 0	Valves 2 & 3	6	0 1 1 0	Valves 6 & 7
7	1 1 1 0	Valves 1, 2 & 3	7	1 1 1 0	Valves 5, 6 & 7
8	0 0 0 1	Valve 4	8	0 0 0 1	Valve 8
9	1 0 0 1	Valves 1 & 4	9	1 0 0 1	Valves 5 & 8
a	0 1 0 1	Valves 2 & 4	a	0 1 0 1	Valves 6 & 8
b	1 1 0 1	Valves 1, 2 & 4	b	1 1 0 1	Valves 5, 6 & 8
c	0 0 1 1	Valves 3 & 4	c	0 0 1 1	Valves 7 & 8
d	1 0 1 1	Valves 1, 3 & 4	d	1 0 1 1	Valves 5, 7 & 8
e	0 1 1 1	Valves 2, 3 & 4	e	0 1 1 1	Valves 6, 7 & 8
f	1 1 1 1	Valves 1, 2, 3 & 4	f	1 1 1 1	Valves 5, 6, 7 & 8



**Figure 3. Timing Chart**

DRAWING NUMBER **322475** - REV **E**

**ASSEMBLY NOTES:**

- On the Cable, (Item 3) strip cable insulation back 1" at one end. Cut Foil Shield Orange/White and White/Orange wires even with end of insulation. Twist Braided Wire Shield and Drain Wire together and slide 1 piece of Shrink Tubing (Item 4) over them, shrink tubing in place leaving enough wire protruding to solder to the ground lug. Slide 1 piece of Shrink Tubing (Item 7) over cable and shrink in place as indicated.
- Place Green 22 ga. Wire (Item 8) next to the braided shield/drain wire with the Shrink Tubing (Item 6) over the green wire and the drain wire and solder the braided shield/drain wire and Green 22 ga. Wire to the ground lug as indicated. Slide the Shrink Tubing over the ground lug and shrink in place.
- Slide one piece of Locking Solder Lug (Item 9) to the Green 22 ga. Wire as indicated.
- Shrink one piece of Shrink Tubing (Item 5) over each of the Blue/White and White/Blue wires and solder them to their respective terminals on Item 1 as indicated. Slide the Shrink Tubing over the terminals and solder them as indicated.
- Shrink Tubing over of Cable (Item 11) on One White, White/Orange and Foil Shield even with the end of the insulation. Gather Braided Drain and solder to 1 Luf. Capacitor (Item 13) solder other end of Capacitor to strap Orange/White wire. Add one Ferrule (Item 12) on other end of scrap Orange/White wire. Insulate Capacitor wire, and shield with Shrink Tubing (Item 14). Slide piece of Shrink Tubing (Item 15) over insulation. Strip the ends of the Blue/White and White/Blue wires and crimp Ferrules (Item 12) to the ends of the wires, insert the wires into their respective terminals in Item 2 as indicated.
- Shrink the tubing in place as indicated and use the Cable Tie (Item 11) as indicated to act as a strain relief. **(E)**
- Label using Labeling Detail. **(E)**

**FOR S & E CABINETS**

**FOR D/T/C CABINETS**

**NOTE:**  
Leave access to screw hole

**LABELING DETAIL (E)**

**PARTS LIST**

QTY	ITEM NO.	PART NO.	DESCRIPTION
1	1	331132	CONN. RECEPTACLE, CHASSIS MT., 4 PIN
1	2	331087	CONN. PLUG, SCREW TERM., 4 PIN
1	3	900258	CABLE, 4 COND. 24 GA. STRANDED W/SHIELD 27-12 LG.
1	4	900013	TUBING, SHRINK, .332 (.09) x 1"
2	5	900013	TUBING, SHRINK, .332 (.09) x 1/2"
1	6	900261	TUBING, SHRINK, 3/16 (.19) x 1/2"
1	7	900261	TUBING, SHRINK, 1/4 x 1"
1	8	324181	WIRE, SING. COND. GRN. 22GA. 21LG.
1	9	345009	LUG, #6 SOLDER, LOCKING, 30° BEND
1	11	342002	CABLE TIE, 1/2 DIAM. WRAP
3	12	345043	LUG, FERRULE, INSULATED, 22-24 AWG
1	13	271040	CAPACITOR GLASS, MULTILAYER, 1.0uf, 50V
1	14	900013	TUBING, SHRINK, .332 (.09) x 2"
1	15	900087	TUBING, SHRINK, .38 x 2"
1	16	460444	LABEL "322475"
1	17	460237	LABEL, TEST TAG

**NOTE:** Make Harness so it can be dressed the best way in the cabinet in which it will be installed.

**REVISIONS**

REV	DATE	DESCRIPTION	BY	DATE
D	2/11/14	ADDED ITEMS 16 & 17. ADDED LABELING DETAIL.	DCS	2/11/14
C	12/10/12	ADDED VIEW FOR D/T/C CABINETS. MODIFIED LOGIC DIAGRAM FOR CLARIFICATION.	DCS	12/10/12
B	5/7/12	ADDED ITEMS 13, 14, & 15.	DCS	5/7/12
A	2/11/14	MODIFIED LOGIC DIAGRAM	DCS	2/11/14
		REMOVED ITEM 10 AND 13. USE TIE WRAP AS STRAIN RELIEF	DCS	7/29/08
		ECN CHGD ITEM 12 FERRULE WAS 345032 IS 345043. DPD	DCS	6/24/07
		2308. ADDED ITEM 13 DUAL FERRULE.	DCS	6/24/07
		ORIGINAL RELEASE		
		DESCRIPTION		
		DRWN	CHD	
		BY	BY	
		DATE	DATE	

**SCALE:** DATE: DRAWN BY: CHKD BY: APPROVED BY:

**FULL:** 1/21/00 **RHL**

**TOLERANCE UNLESS SPECIFIED:** REV LTR: APPROVED BY

ANGLES: ± 1/2°

DECIMALS: ± .010

FRACTIONS: ± 1/64

DATE: 2/11/14 **DCS**

**HARNES ASSEM, J12-J12, SECONDARY CURRENT SENSING COIL TO SEQ. CTRL. BD. EN1001 CONTROLS**

NEXT ASSUMED ON: DRAWING NUMBER: **322475**

USE: **W/600667 & 600668**

ENTRON

6 5 4 3 2 1

6 5 4 3 2 1

**LOGIC DIAGRAM (B, D)**

6 5 4 3 2 1

DRAWING 322475

11 x 17

DRAWING 440478