



MARC70

Installation Manual

SA 3

SA 15

SA 24

SR 263

SR 342

SR 623

SRU 1

SRU 5

SRU 10

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Record of Revisions

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Section 1 General Description

1.1 Introduction

This manual describes the installation of the SANDIA aerospace MARC70 line of interface modules. It is intended for use by FAA certified repair stations to install the MARC70 modules. It includes both the mechanical and electrical installation information for all MARC70 components, including the individual modules and enclosures. Where applicable, alignment and checkout procedures are included. In many instances, such as with switching relays, the checkout procedure will be performed as part of the major system installation check out and no specific check out procedure is provided for in this manual. In any case, the installer should insure that all functions are operating according to their intended purpose in their particular installation.

1.1.1 Interface Modules

All interface modules have the same mechanical dimensions and are inserted into the card enclosures in the same manner. An identification tag accompanies each interface module which should be attached to the card enclosure directly above the interface module to identify it. Each interface module connector is keyed to prevent the inadvertent installation of the connector into the wrong module. Keying of the module has been accomplished at the factory by the removal of one of the pins on the module's connector. The installing agency MUST insert a keying plug into the appropriate pin location on the harness connector to complete the keying process.

Each MARC70 interface module is FAA-PMA approved and has been tested to meet the requirements necessary to allow it to be mounted outside the aircraft's pressure vessel. Each interface module has been tested to 70,000 feet and has passed the vibration requirements for helicopter installations. See section 1-2 for complete technical specification on each of the MARC70 modules.

1.1.2 Card Enclosures

Several different card enclosures are available depending on the application and installation space available. If an enclosure is not filled, the unused card slots are covered with blank panels. These extra card slots can be used in future installations or system upgrades, eliminating the need to re-engineer the mechanical installation. Interface modules are secured to the enclosures with captive stainless steel screws. In installations where the enclosure is difficult to reach, the harness connector can first be attached then the module inserted into the appropriate card slot and secured with the captive hold down screws.

1.1.3 SRU-1

The SRU1 is a single card enclosure which accepts any MARC70 interface module. The SRU 1 is ideally suited for installations where only one MARC70 card is required or where there is limited real estate for mounting the larger enclosures. The SRU 1 can be mounted in any axis and either inside or outside the pressure vessel.

1.1.4 SRU 5

The SRU 5 is a multi-card enclosure that accepts up to five MARC70 interface modules. The SRU 5 can be mounted either inside or outside the pressure vessel. When less than five interface modules are used with the SRU 5, cover plates are placed over the unused card slots. If additional cards are required at a later date, the cover plates can be removed and the appropriate interface card installed. When installing the SRU 5 ample room should be allowed for both connector clearance and for inserting and removing the interface modules. The SRU 5 as well as the interface modules can be mounted in any axis.

1.1.5 SRU 10

The SRU 10 is multi-card enclosure that accepts up to ten MARC70 interface modules. It is ideally suited for installations that will require more than five interface modules. As with the SRU 5, unused slots are covered with cover plates included in the installation kit. These extra slots can be used on future installations, eliminating the need for additional mechanical engineering and approval. The SRU 10 can be installed either inside or outside the aircraft's pressure vessel. For installation flexibility, the SRU 10 and the installed interface modules can be mounted in any axis. Ample room should be allowed for both the connector and for inserting and removing the interface modules.

1.2 TECHNICAL CHARACTERISTICS

The conditions and tests performed for FAA-PMA approval of these articles are minimum performance standards. It is the responsibility of the installing agency to determine that the aircraft operating conditions are within these FAA-PMA parameters.

1.2.1 Physical Characteristics

Unit	Part Number	Width	Height	Depth	Weight
SA 3	305005-01	3.92 in.	3.5 in.	.82 in.	.20 lb
SA 15	305004-01	3.92 in.	3.5 in.	.82 in.	.15 lb
SA 24	305003-01	3.92 in.	3.5 in.	.82 in.	.18 lb
SR 263	305001-01	3.92 in.	3.5 in.	.82 in.	.16 lb
SR 343	305000-01	3.92 in.	3.5 in.	.82 in.	.18 lb
SR 623	305002-01	3.92 in.	3.5 in.	.82 in.	.24 lb
SRU 1	305146-00	5.2 in.	1.0 in.	3.9 in. *	.37 lb
SRU 5	305018-00	5.4 in.	4.0 in.	3.65 in. *	.80 lb
SRU 10	305014-00	9.55 in.	4.0 in.	3.65 in. *	1.32 lb

* With Module Installed

1.2.2 Operational Characteristics

Unit	Part Number	Operating Temp	Altitude	Voltage	Current Req.
SA 3	305005-01	-55° C to +70° C	70,000 Ft.	28 Vdc	N/A
SA 15	305004-01	-55° C to +70° C	70,000 Ft	N/A	N/A
SA 24	305003-01	-55° C to +70° C	70,000 Ft	N/A	.003 Amp in Test Mode
SR 263	305001-01	-55° C to +70° C	70,000 Ft	28 Vdc	.15 Amp
SR 343	305000-01	-55° C to +70° C	70,000 Ft	28 Vdc	.22 Amps
SR 623	305002-01	-55° C to +70° C	70,000 Ft	28 Vdc	.25 Amps
SRU 1	305146-00	-55° C to +70° C	70,000 Ft	N/A	N/A
SRU 5	305018-00	-55° C to +70° C	70,000 Ft	N/A	N/A
SRU 10	305014-00	-55° C to +70° C	70,000 Ft	N/A	N/A

1.2.3 Certification

Unit	Part Number	PMA	STC	Aircraft
SA 3	305005-01	Yes *	ST09475 SC	Embraer EMB120
SA 15	305004-01	Pending	Pending	
SA 24	305003-01	Yes **	ST09475 SC	Embraer EMB120
SR 263	305001-01	Yes	ST00318 DE-D	Learjet 55
SR 343	305000-01	Yes	ST00318 DE-D	Learjet 55
SR 623	305002-01	Pending	Pending	
SRU 1	305146-00	Yes*/**	ST09475 SC	Embraer EMB120
SRU 5	305018-00	Pending	Pending	
SRU 10	305014-00	Yes	ST00318 DE-D	Learjet 55

* SA3 PMA'd with SRU1 as SAS 1-3

** SA 24 PMA'd with SRU 1 as SAS 1-24

NOMENCLATURE: MARC70 RELAY, DIODE ISOLATOR, INVERTER AND REGULATOR UNIT
TYPE/MODEL/PART NO: MARC70/SA 3, SA 15, SA 24, SR263, SR 343, SR 623
TSO NUMBER: DO-160 Env. Cat. E1-BBA[(SBL)(U)] XXXXXXZZAZZULXXX
MANUFACTURER'S SPECIFICATION AN/OR OTHER APPLICABLE SPECIFICATION:
MARC70 INSTALLATION MANUAL 305147-00
ENVIRONMENTAL TEST PLAN SR 343, SR 263, SR 623, SA 24, SA 15, SA 3 Doc. #
MK700020

MANUFACTURER: SANDIA AEROSPACE
ADDRESS: 5445 EDITH BLVD. NE, SUITE I ALBUQUERQUE, NM 87107

REVISION & CHANGE NUMBER OF DO-160: REV D, DATED JULY 27 1997

CONDITIONS	SECTION	DESCRIPTION OF TESTS CONDUCTED
Temperature and Altitude	4.0	Equipment Tested to Category E1
Low Temperature	4.5.1	Tested to +70°C Operating High Temp Tested to +85°C Ground Survival Test not Applicable
High Temperature	4.5.2 & 4.5.3	
In-Flight Loss of Cooling	4.5.4	
Altitude	4.6.1	70,000 feet
Decompression	4.6.2	Test not Applicable
Overpressure	4.6.3	Test not Applicable
Temperature Variation	5.0	Tested to Category B
Humidity	6.0	Tested to Category B
Operational Shock and Crash Safety	7.0	Tested to Category A, Aircraft Type 5. Random Orientation
Vibration	8.0	Tested to Category S, Aircraft Zone 2 using vibration curves B and M. Tested to Category U, Helicopter Zone 2 using vibration curves F and F1.
Explosion	9.0	Equipment identified as Category X, no test performed
Waterproofness	10.0	Tested to Category X, no test performed
Fluids Susceptibility	11.0	Equipment identified as Category X, no test performed
Sand and Dust	12.0	Equipment identified as Category X, no test performed
Fungus	13.0	Equipment identified as Category X, no test performed
Salt Spray	14.0	Equipment identified as Category X, no test performed
Magnetic Effect	15.0	Equipment is category Z
Power Input	16.0	Tested to Category Z
Voltage Spike	17.0	Tested to Category A
Audio Frequency Susceptibility	18.0	Tested to Category Z
Induced Signal Susceptibility	19.0	Tested to Category Z
Radio Frequency Susceptibility	20.0	Tested to Category U
Radio Frequency Emission	21.0	Tested to Category L
Lightning Induced Transient Susceptibility	22.0	Tested to Category X, no test performed
Lightning Direct Effects	23.0	Equipment identified as Category X, no test performed
Icing	24.0	Equipment identified as Category X, no test performed
Electrostatic Discharge	25.0	Equipment identified as Category X, no test performed

Environmental Qualification Form

Section 2 Installation

2.1 Introduction

The MARC70 family of enclosures and interface modules has been designed to simplify and standardize installation of avionics systems. SANDIA aerospace supplies each mounting enclosure and interface module separately. The installer can mix and match the modules in the enclosures to meet specific requirements. Each of the module's connectors is keyed to prevent inadvertently attaching the wrong connector. It is important that the installer insert the supplied plug in the proper location in the mating connector for the keying to be complete.

2.2 Mounting Considerations

The MARC70 family of interface modules and their associated mounting enclosures can be mounted in any attitude and either inside or outside the pressure vessel. Each card is installed in the desired mounting enclosure by inserting it into a vacant location and securing it with the two stainless steel fasteners attached to the modules front plate. The interface modules can only be inserted and secured in one direction. While the modules are relatively easy to install and remove in the enclosures, considerations should be given to service access. At least six inches of clearance should be provided at the front of the enclosures for removal and reinsertion of MARC70 modules. It is also recommended that enough cable be supplied so that the interface modules can be inserted and removed with the cable harness and connector attached to the module. This will aid in any calibration that may be required and will also simplify attaching the connector to the interface module.

2.3 Cooling

Cooling for the MARC70 is not required. However if several higher current modules, such as annunciator drivers are installed, adequate space should be allowed for convection cooling.

Section 3 Installation Procedures

3.1 General

Each MARC70 module is supplied with a mating connector, crimp style pins and an identification tag. The identification tag is to be placed on the top of the enclosure directly over the slot in which the module is installed. The enclosures are supplied with enough blank plates and screws to cover any unused slots. Extra blank plates and screws can be discarded or retained in case a module is ever removed.

3.2 Mounting Instructions

The SRU 1 is attached to an aircraft structure by using four #10-32 screws as shown in the outline drawing.

3.2.1 SRU 1 Outline Dimensions

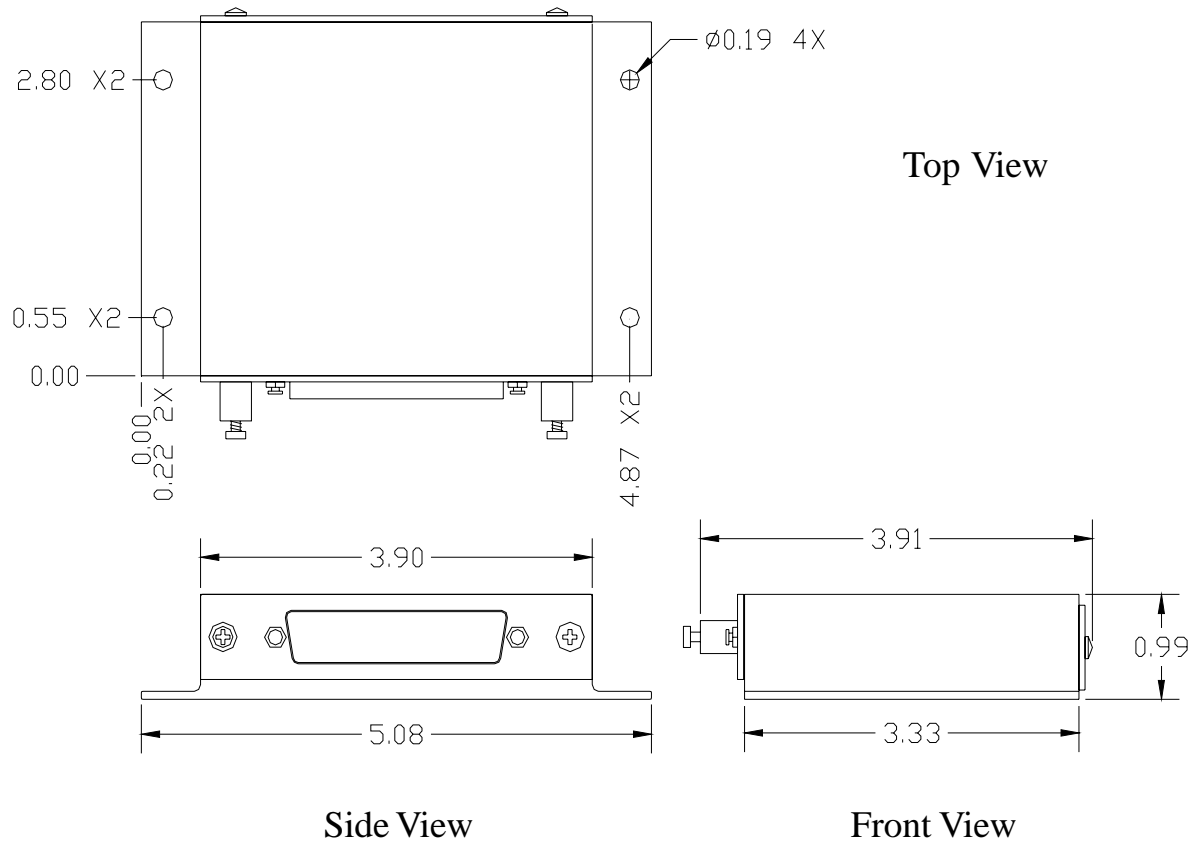


Figure 3-1
SRU 1 Outline Dimensions

3.2.2 SRU 5 Mounting Instructions

The SRU 5 is attached to an aircraft structure by using four #10-32 screws as shown in the outline drawing.

3.2.2.1 SRU 5 Outline Dimensions

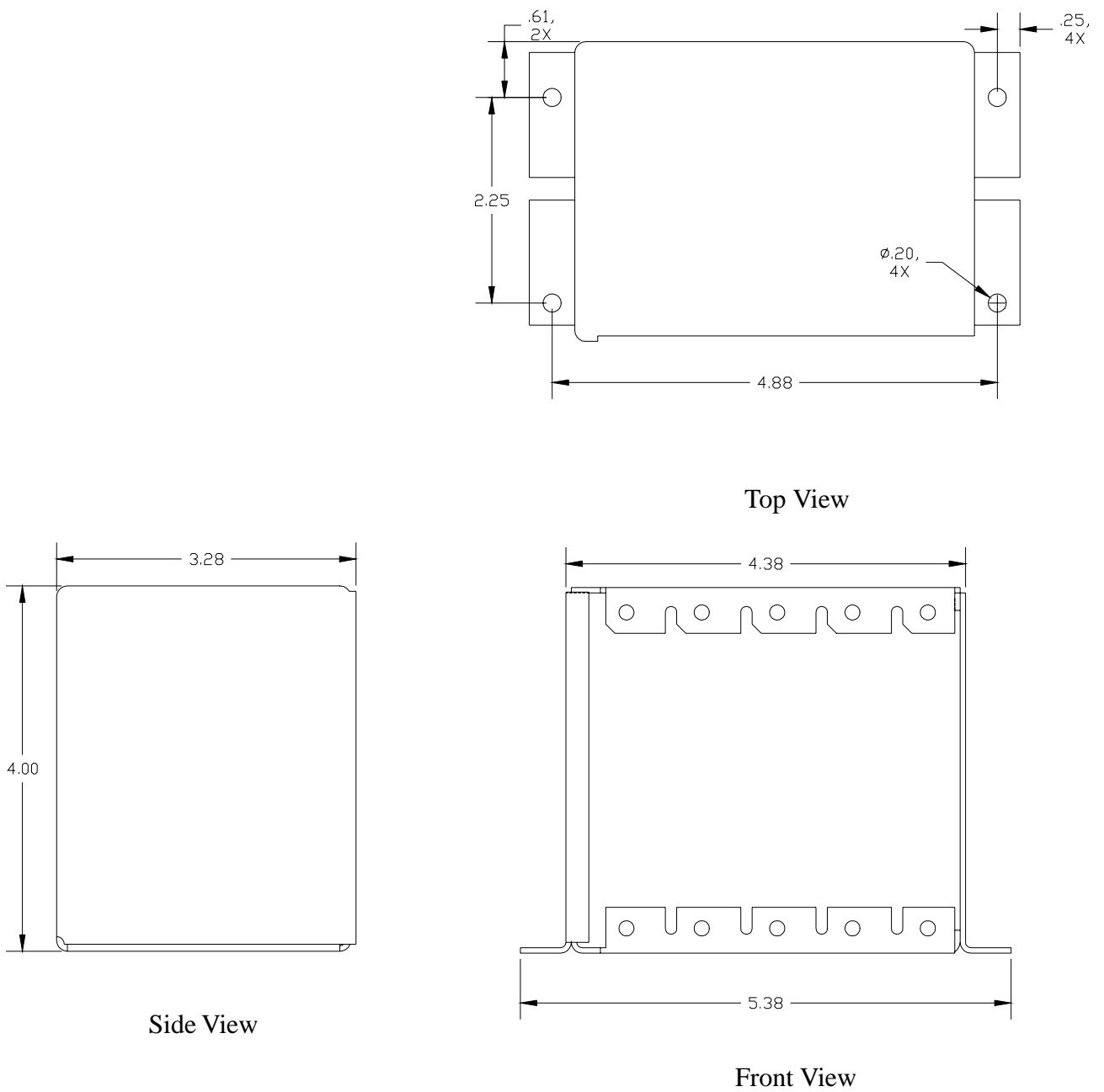
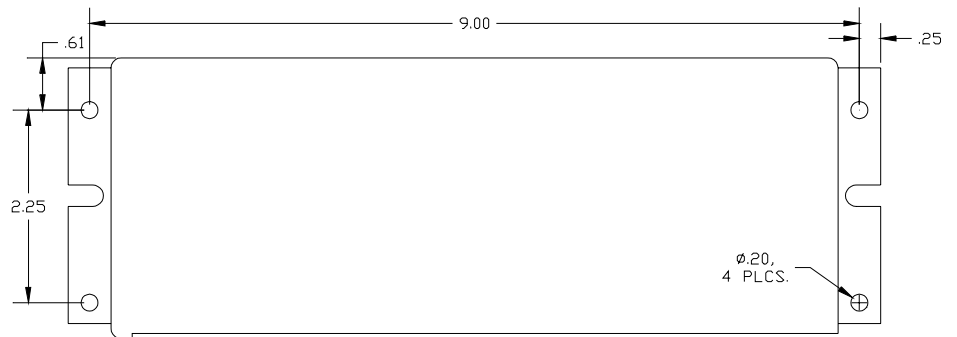


Figure 3-2
SRU 5 Outline Dimensions

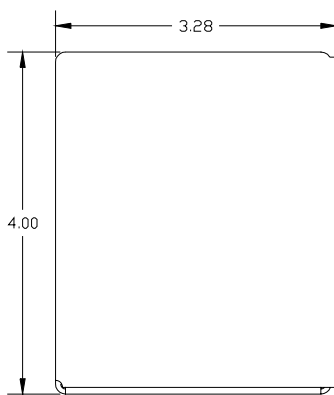
3.2.3 SRU 10 Mounting Instructions

The SRU 10 is attached to an aircraft structure by using four #10-32 screws as shown in the outline drawing.

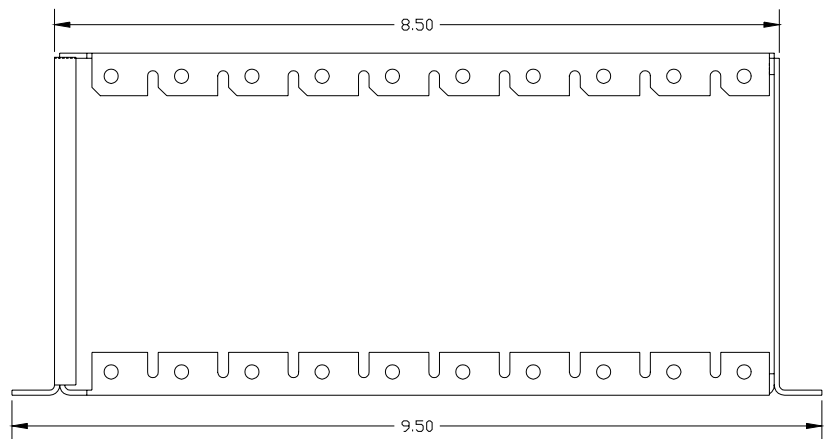
3.2.3.1 SRU 10 Outline Dimensions



Top View



Side View



Front View

Figure 3-3
SRU 10 Outline Dimensions

3.3.1 SA 3 Regulator/ Dimming Module

The SA 3 Regulator/ Dimming Module provides a source of power to drive up to .5 amps of continuous current for aircraft annunciators. The SA 3 will provide 1 amp short term for testing of annunciators. Aircraft power is supplied to 7 pins on the SA 3 for installation flexibility. Adjustments are available allowing the maximum and minimum intensity of the annunciators to be adjusted to match the existing aircraft annunciators. The SA3 is dimmed using the aircraft's annunciator dimmer switch.

Pin 2 on the SA 3 is the keying pin and has been removed at the factory. A plug which is supplied with the installation kit must be inserted into Pin 2 of the mating connector.

See figure 3-3 for a schematic and pin out of the SA 3

3.3.2 SA 15 Inverter Module

The SA 15 module allows equipment with +5Vdc or +28Vdc lamp outputs to drive panel annunciator lamps that require grounded inputs. The SA 15 inverts up to 14 high level lamp-driver inputs providing independent low outputs for each line. The 14 inverters are arranged in two banks of 7 inverters for installation flexibility. A single line on each inverter bank allows simultaneous testing of all 7 outputs. The inverters may also be cascaded, providing consistent drive polarity and simplifying press to test wiring of panel annunciators.

Pin 36 on the SA 15 is the keying pin and has been removed at the factory. A plug which is supplied with the installation kit must be inserted into Pin 36 of the mating connector.

See figure 3-4 for a schematic and pin out of the SA 15

3.3.3 SA 24 Diode Isolation/Test Module

The SA 24 provides 23 lines of diode isolation. The SA 24 also provides a test input for testing annunciators. The test input can be either a high or a low.

Pin 48 on the SA 24 is the keying pin and has been removed at the factory. A plug which is supplied with the installation kit must be inserted into Pin 48 of the mating connector.

See figure 3-5 for a schematic and pin out of the SA 24

3.3.4 SR 263 12 Pole Switching Module

The SR 263 provides 12 poles of switching through two MIL Qualified, hermetically sealed, and nitrogen filled relays. The relays contacts are gold plated hardened silver alloy with a 2 amp resistive load capacity at 28Vdc. Coil power is 2.6 watts max. at 25 degrees C.

Each relay can be activated independently by supplying the switching logic to their coil through pins 38 & 40 for K1 and 43 & 44 for K2. Or they can be switched as a pair by supplying the switching logic to pins 39 & 45.

Pin 46 on the SR 263 is the keying pin and has been removed at the factory. A plug which is supplied with the installation kit must be inserted into Pin 46 of the mating connector.

See figure 3-6 for a schematic and pin out of the SR 263

3.3.5 SR 343 12 Pole Switching Module

The SR 343 provides 12 poles of relay switching through 3 MIL Qualified, hermetically sealed, and nitrogen filled relays. The relays contacts are gold plated hardened silver alloy with a 2 amp resistive load capacity at 28Vdc. Each of the three relays can be activated independently by supplying switching logic to their coils through pins 38 & 40 for K1, pins 43 & 44 for K2 and pins 48 & 49 for K3. They can also be switched as group by supplying the switching logic to pins 39 & 45.

Pin 42 on the SR 343 is the keying pin and has been removed at the factory. A plug which is supplied with the installation kit must be inserted into Pin 42 of the mating connector.

See figure 3-7 for a schematic and pin out of the SR 343

3.3.6 SR 623 12 Pole Switching Module

The SR 623 provides 12 poles of switching through 6 MIL Qualified, hermetically sealed, and nitrogen filled relays. The relays contacts are gold plated hardened silver alloy with a 2 amp resistive load capacity at 28Vdc. Each of the 6 relays are switched independently or can be switched in any combination by supplying common switching logic to their respective coils.

Pin 39 on the SR 623 is the keying pin and has been removed at the factory. A plug which is supplied with the installation kit must be inserted into Pin 39 of the mating connector.

See figure 3-8 for a schematic and pin out of the SR 623

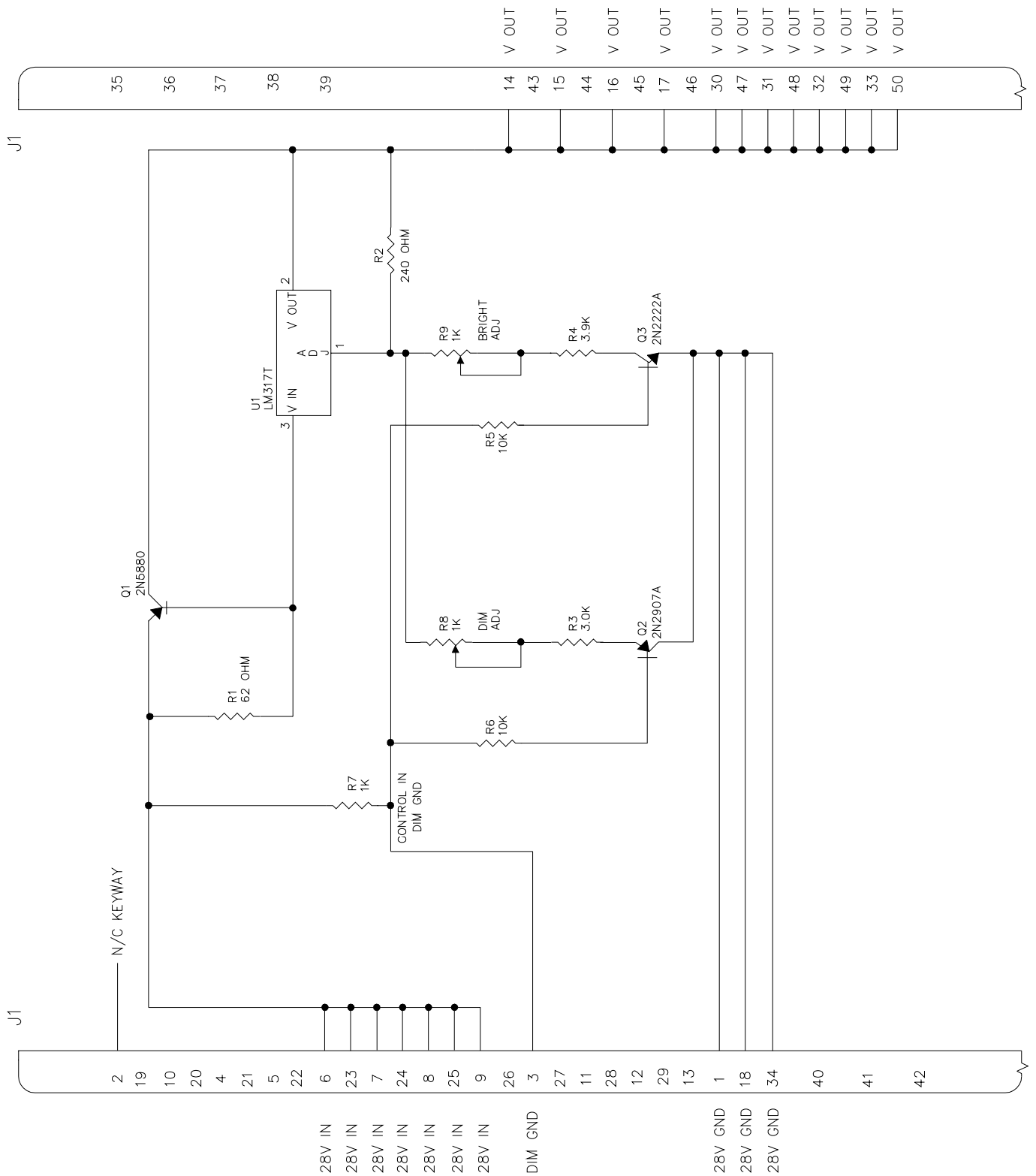


Figure 3-4
SA 3 Schematic and Pinout

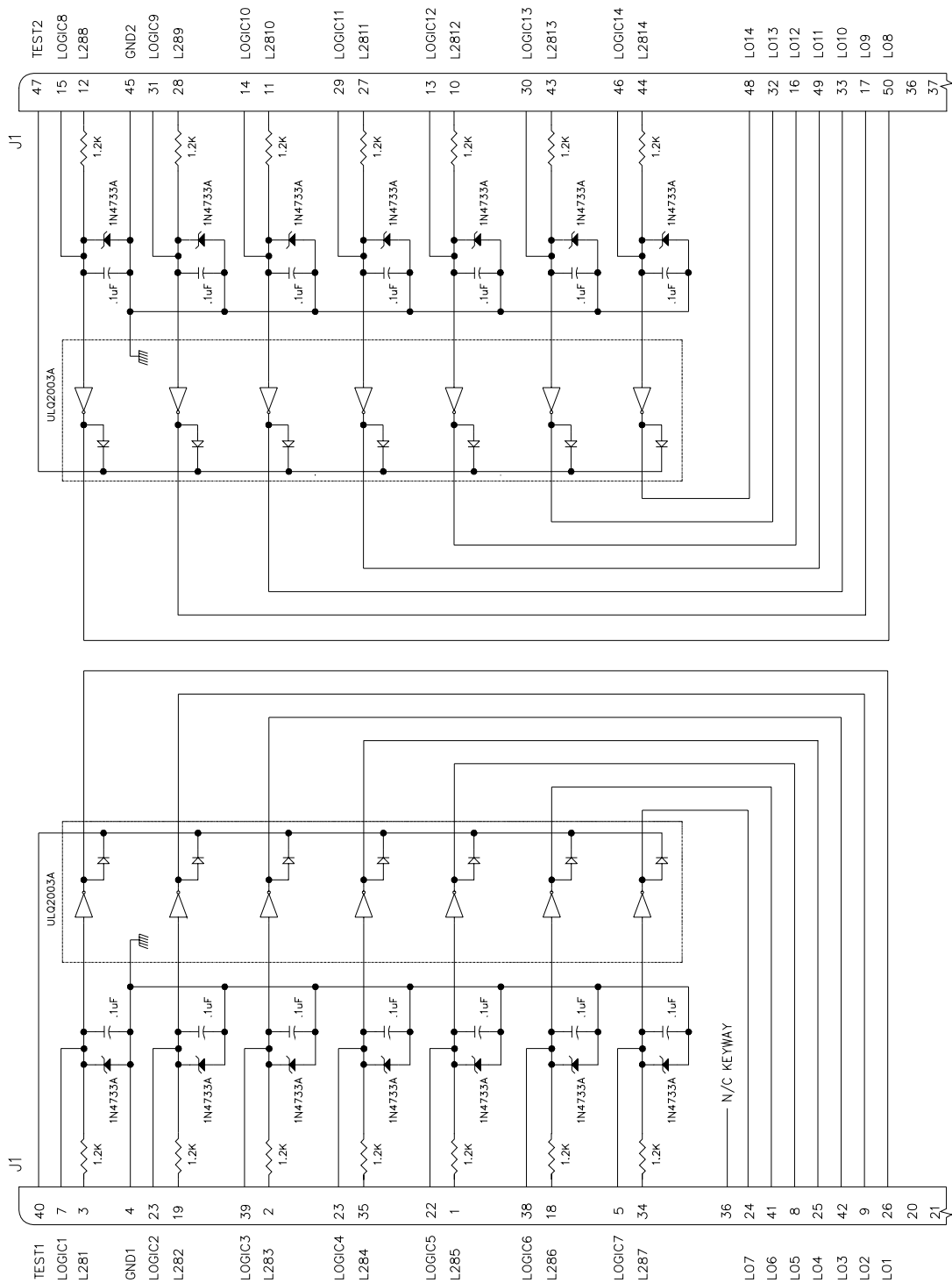


Figure 3-5
SA 15 Inverter Module

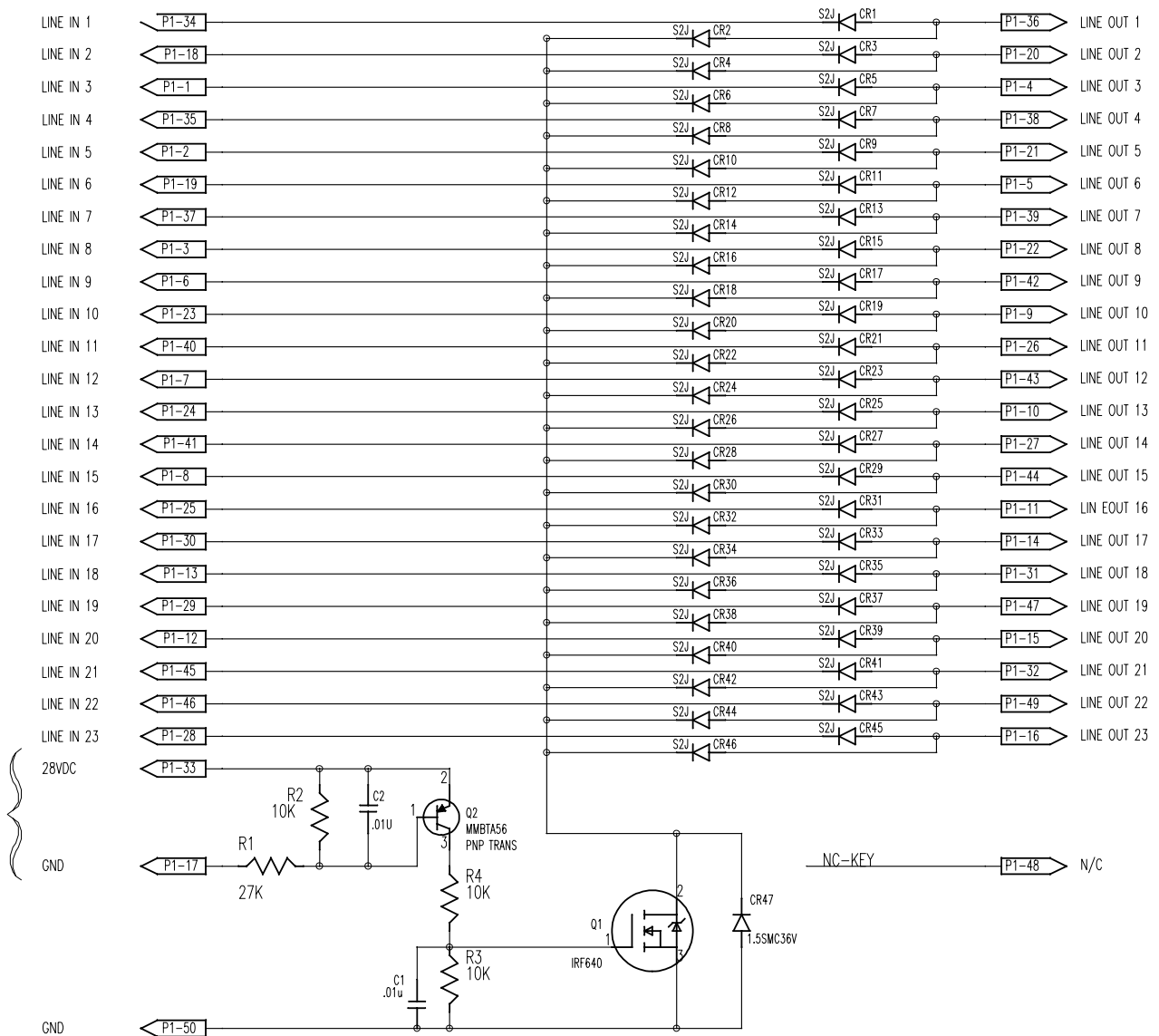


Figure 3-6
SA 24 Diode Isolation/Test Module

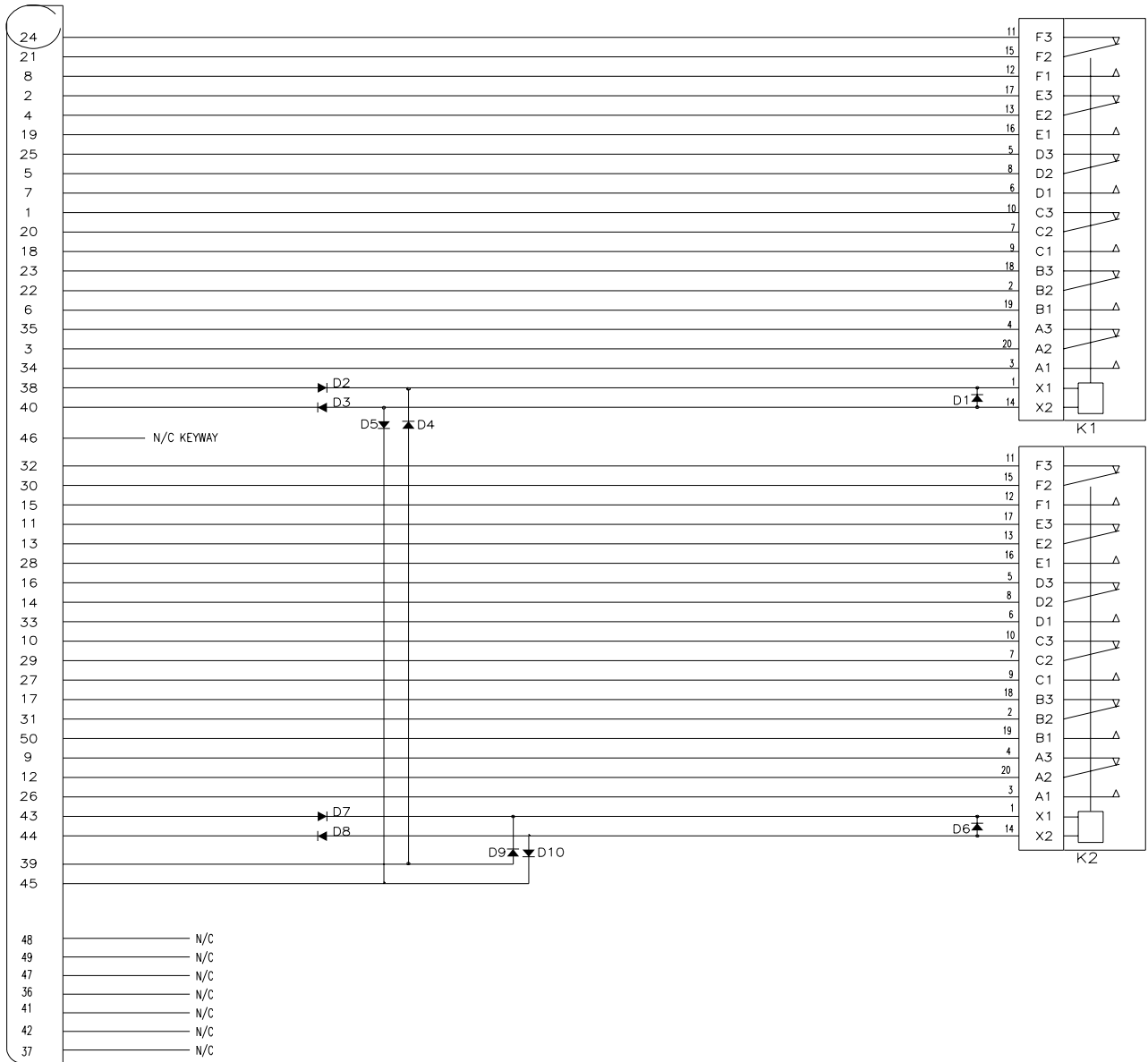


Figure 3-7
SR 263 12 Pole Switching Module

K1-D-N.C.
 K1-D-WIPER
 K1-D-N.O.
 K1-C-N.C.
 K1-C-WIPER
 K1-C-N.O.
 K1-B-N.C.
 K1-B-WIPER
 K1-B-N.O.
 K1-A-N.C.
 K1-A-WIPER
 K1-A-N.O.
 K1-KEY HIGH
 K1-KEY LOW
 K1, K2, K3-GANGED KEY HIGH
 K1, K2, K3-GANGED KEY LOW

K2-D-N.C.
 K2-D-WIPER
 K2-D-N.O.
 K2-C-N.C.
 K2-C-WIPER
 K2-C-N.O.
 K2-B-N.C.
 K2-B-WIPER
 K2-B-N.O.
 K2-A-N.C.
 K2-A-WIPER
 K2-A-N.O.
 K2-KEY HIGH
 K2-KEY LOW

KEYWAY

K3-D-N.C.
 K3-D-WIPER
 K3-D-N.O.
 K3-C-N.C.
 K3-C-WIPER
 K3-C-N.O.
 K3-B-N.C.
 K3-B-WIPER
 K3-B-N.O.
 K3-A-N.C.
 K3-A-WIPER
 K3-A-N.O.
 K3-KEY HIGH
 K3-KEY LOW

N/C
 N/C
 N/C
 N/C
 N/C
 N/C

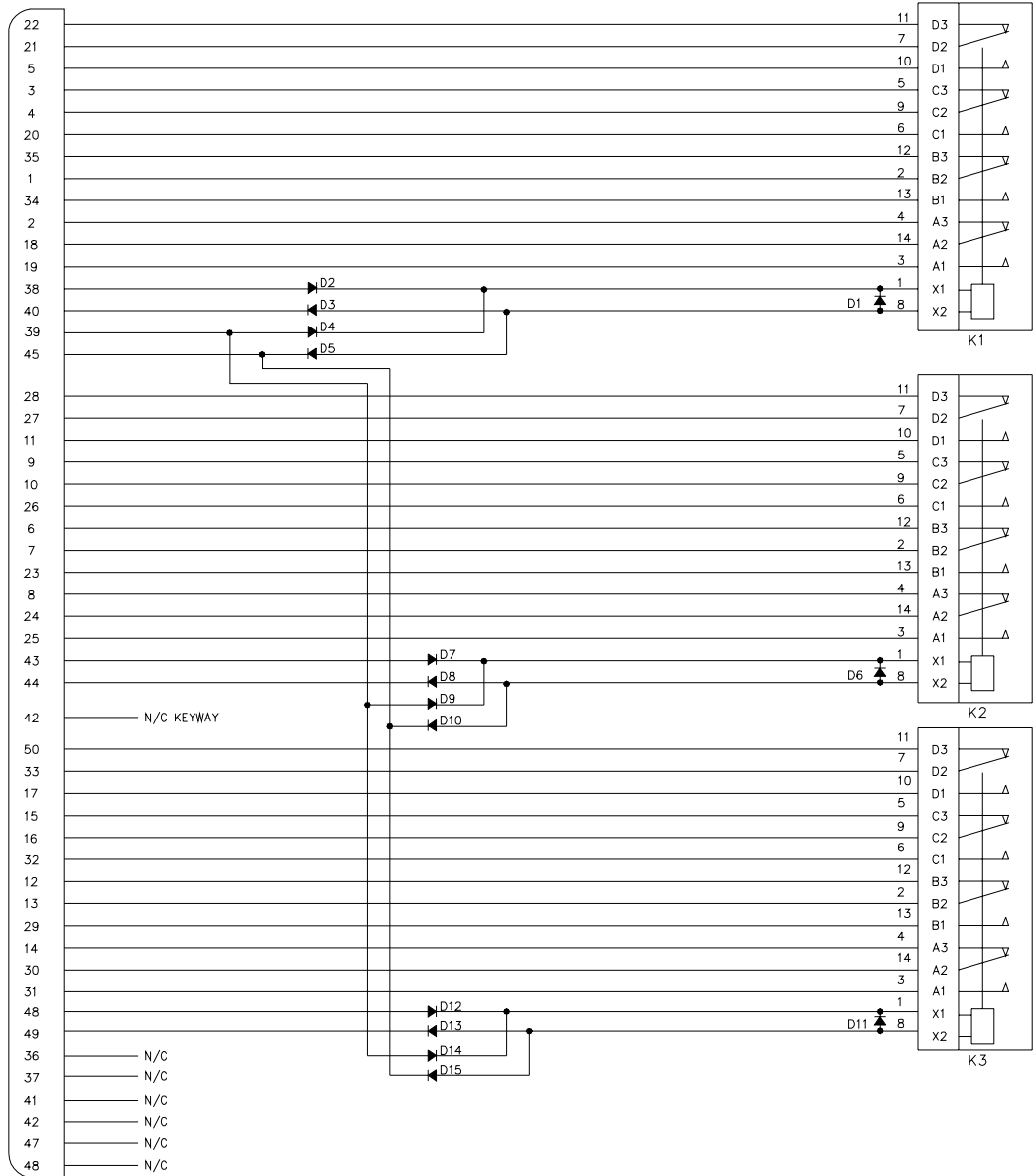


Figure 3-8
SR 343 12 Pole Switching Module

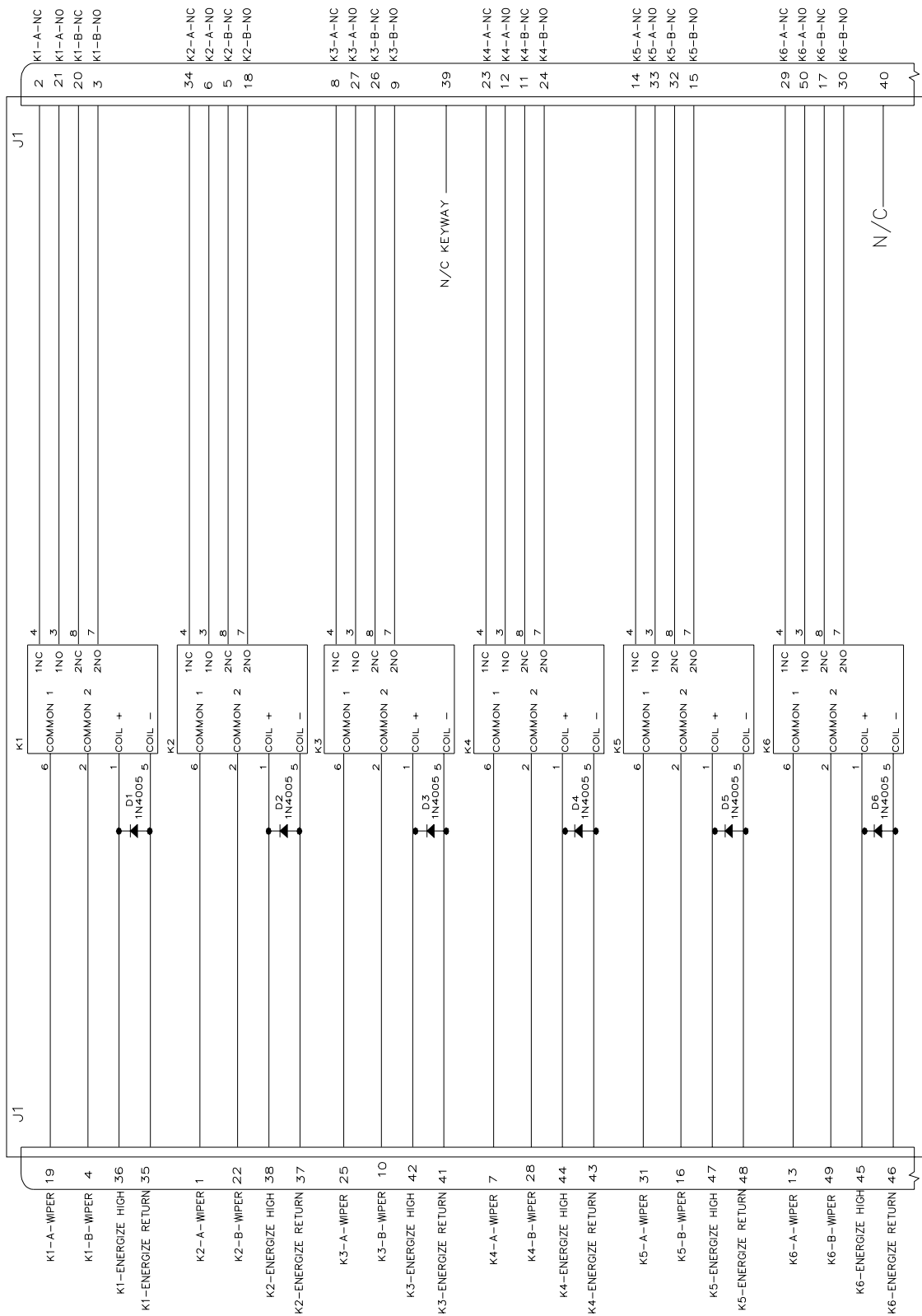


Figure 3-9
SR 623 12 Switching Module

3.4 Calibration Procedures

3.4.1 SA 3

1. With the SA 3 removed from the enclosure, connect the mating connector.
2. Apply power to the SA 3 by activating the system which is being annunciated by the SA 3.
- 3.. With the annunciator dimming switch in the bright position, adjust R9 to the desired brightness.
4. Place the annunciator dimming switch in the dim or low position, and adjust R8 to the desired brightness.
5. Press the annunciator test button and ensure that all annunciators illuminate to their maximum adjusted brightness.

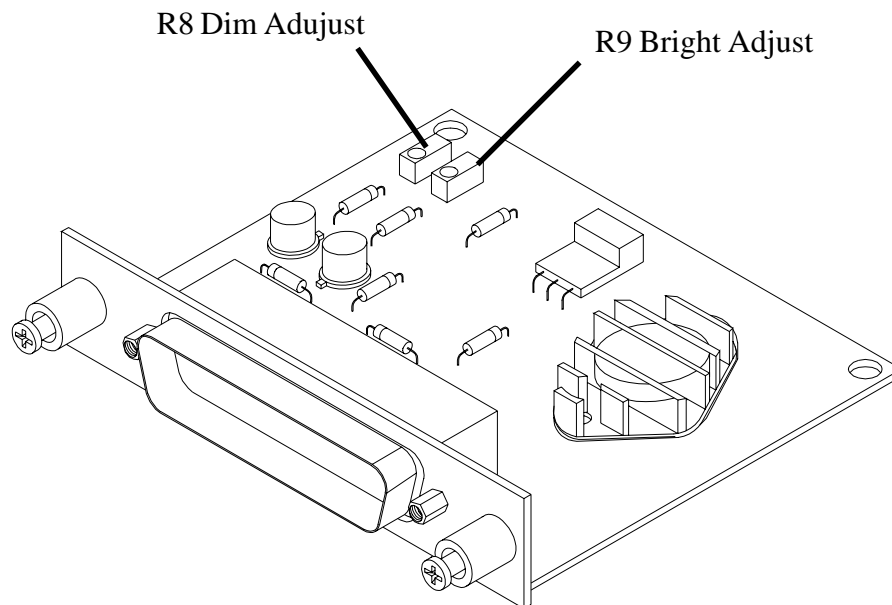


Figure 3-10
SA 3 Adjustment Locations