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SmarTek Acoustic Sensor - Version 1 (SAS-1)

Installation and Setup Guide

Part-H
SAS Relay Interface Configuration And Connection

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Note: In all cases, do not work or position equipment over an active traffic lane. Working over active lanes presents a hazard to the installer and to travelers using the highway. Follow local authorized procedures when installing the SAS-1 unit and any associated components or subsystems.

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SAS Relay Interface Configuration and Connection

Many traffic monitoring sites in place (or planned) and traffic counters use the traditional controller interface approach of vehicle presence relay signals. The SAS Relay Interface is used with the SmarTek Acoustic Sensor (SAS-1) to provide physical vehicle presence relay signals to a cabinet controller or traffic counter . The SAS Relay Interface (SAS-RI) is available in two form factors (Figure 1). The shelf mount version and the Type 170 card version of the SAS-RI connect to the SAS-CT using a SmarTek Systems supplied cable (CAT 5E with an RJ-45 connector on both ends).

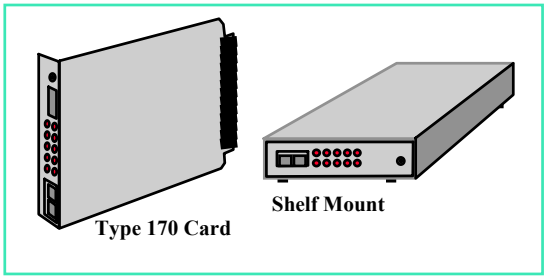

Figure 1 SAS Relay Interface

The function of the SAS-RI is to acquire the bit-serial relay message stream from the SAS-1 and convert the bit-serial relay messages into physical relay signals. These signals are open collector opto-isolated vehicle presence signals. To sense the state of the signals, pull-up resistors are required. The signals are brought out on individual conductors for the shelf mount SAS-RI and on a card edge connector for the Type 170 SAS-RI card. When using the SAS-RI to provide per lane vehicle presence relay signals, the SAS-1 default operating mode must be the **Single Relay or Dual Loop Mode.** For the Dual Loop Mode, the "Loop" spacing must also be set in the SAS-1. Before installation and connection of the SAS-RI, each SAS-RI must be configured using push-pin jumpers on the SAS-RI circuit board. Configuration of the SAS-RI is required to match the specific deployment of a single SAS-1 or multiple SAS-1 units (sharing a home run cable).

Configuration and Installation

The shelf mount version brings ten (10) relay signals out via a multi-conductor cable connected at the rear of the SAS-RI shelf mount unit. This cable is made up of ten (10) conductors (open collector) for ten (10) relay signals and one common emitter (CE) as shown in Figure 2. The two "CE" pins (Common Emitter) are common to all the relay signals. Power for the SAS-RI can range from 8 to 24 VDC since the SAS-RI has it's own DC to DC switching regulator.

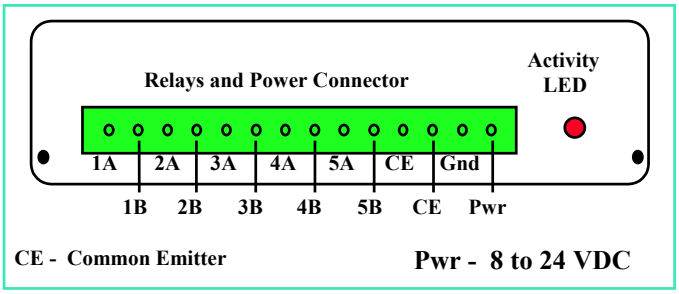

Figure 2 SAS-RI Rear Panel Connector

The SAS-RI has ten (10) LEDs (for detection indication), ten (10) channels of opto-coupled relays, a reset switch, and two RJ-45 receptacles. The ten LEDs are organized with two per channel (1A, 1B, 2A, 2B, etc.). The Reset switch resets the SAS-RI and after 6 seconds sends a reset command to the SAS-1 if no bit serial relay message activity is detected.

Connecting and Routing Relay Signals For The SAS-RI Type 170 Card

The type 170 card version is comprised of a SAS-RI Main Card and up to two SAS-RI Daughter Cards (D1 and D2) as shown in Figure 3. Each SAS-RI Main and Daughter Card has a ribbon cable header for relay distribution and a **Relay Routing Matrix**. The Relay Routing Matrix on each SAS-RI Card provides complete flexibility for connecting any of the ten relay signals from each SAS-1 unit to any of the four standard card edge contacts (F, W, S, and Y) as specified for a type 170 Card File. For Type 170 compatible detector cards, there may be up to four relay signals brought out to the card edge connector as shown in figure 4. Note that for the Type 170 Card File, the relay signals at **S** and **Y** are actually routed to the **F** and **W** positions in the next lower slot. Therefore, the Type 170 Card File provides only 2 relay signals per slot.

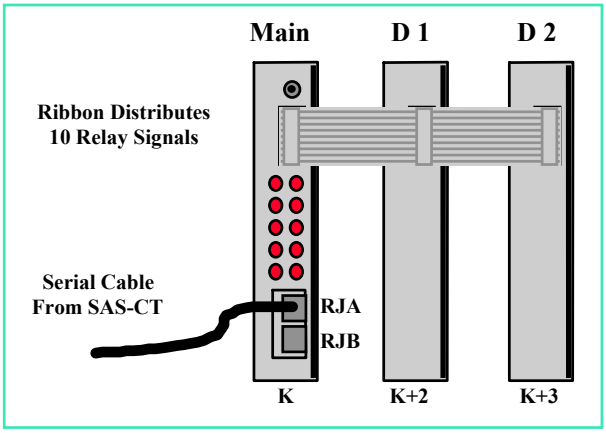

Figure 3 SAS-RI Main and Daughter Cards

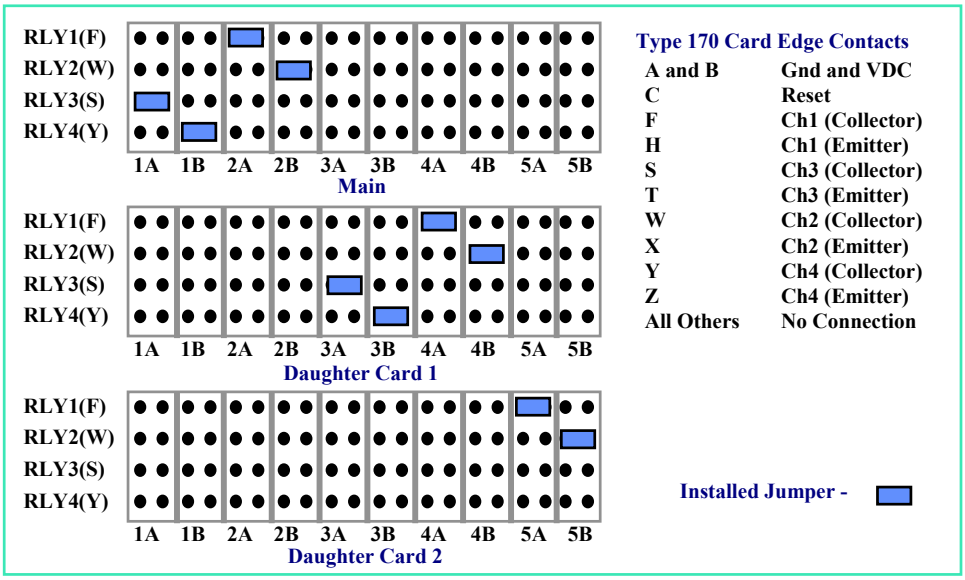

Figure 4 Routing Relay Signals to the SAS-RI Card Edge

The following example shows how to connect and configure a SAS-RI Main Card and Two SAS-RI Daughter Cards. Each of ten relay signals from a SAS-1 (bit serial message) are routed to appropriate card edge connector contacts (physical relay signals) in a Type 170 Card File. Since there are ten relay signals to be routed, three SAS-RI Cards (4 relays per card) are required (1 SAS-RI Main Card, 2 SAS-RI Daughter Cards).

For each of the SAS-RI cards used, set the Relay Routing Matrix (header **JP1**) jumpers as shown in Figure 4. These jumpers connect each relay signal (1A, 1B, 2A, 2B, etc.) from the SAS-RI to

a card edge contact (**F, W, S, Y**). From Figure 4 it can be seen that the SAS-RI Main card routes relay signals 1A, 1B, 2A, and 2B to four card edge contacts. The SAS-RI Daughter Card 1 routes relays signals 3A, 3B, 4A, and 4B to four card edge contacts. And finally, the SAS-RI Daughter Card 2 routes relay signal 5A and 5B to two card edge contacts. For Type 170 card files, contacts **S** and **Y** are routed to contacts **F** and **W** respectively in the adjacent lower numbered slot (i.e. contacts **S** and **Y** in slot 2 are routed to **F** and **W** in slot 1). Plug each SAS-RI Card into the appropriate **slots** in the Type 170 card file to avoid relay signal conflict (Figure 3). Note the use of slot K+3 instead of slot K+4 for SAS-RI Daughter Card 2. Since SAS-RI Daughter Card 2 routes only two relay signals to card edge contacts **F** and **W**, slot K+3 can be used without conflict. For the jumper configuration shown in figure 4, the relay signals are routed to the following Type 170 Card File positions:

Signals 1A and 1B	**to**	**Slot K-1, contacts F and W**
Signals 2A and 2B	**to**	**Slot K, contacts F and W**
Signals 3A and 3B	**to**	**Slot K+1, contacts F and W**
Signals 4A and 4B	**to**	**Slot K+2, contacts F and W**
Signals 5A and 5B	**to**	**Slot K+3, contacts F and W.**

Connecting SAS-RIs For Up To Six SAS-1 Units

For a single SAS-1 connected to the home run cable and the SAS-CT, remove all jumpers from the **JP2 Header** on the SAS-RI. Make sure that the SAS-1 Default Operating Mode is setup for either **Single Relay** or **Dual Loop Relay Mode** and **Periodic** communication.

Connect the ribbon cable to each header on the main SAS-RI card and on each of the daughter cards as shown in Figure 3. This ribbon cable is used to distribute all ten relay signals from the SAS-RI Main Card to each of the Daughter Cards. If the shelf mount SAS-RI is being used, make sure that the relay and power conductors are securely connected to the correct terminal (Figure 2). Connect the serial cable (straight thru Cat 5E) to the SAS-CT (RJ-45) and to the SAS-RI Main Card (RJ-45 receptacle marked **RJA**).

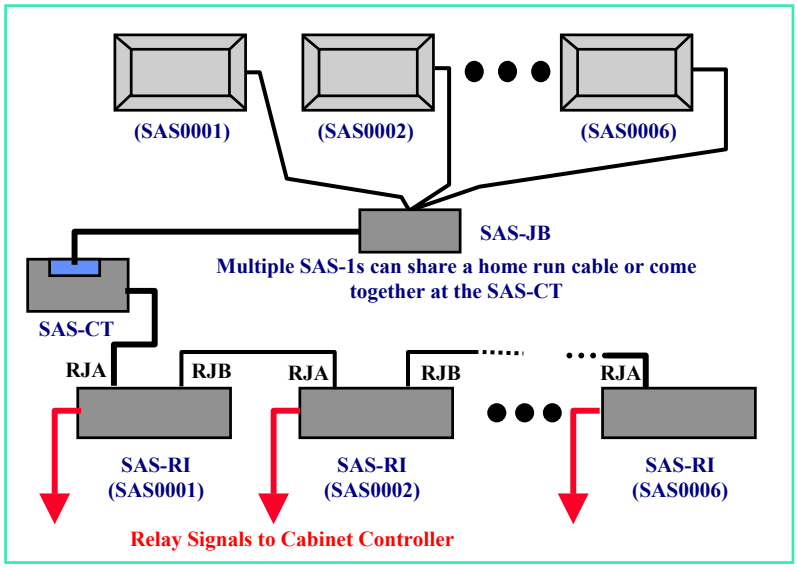

Figure 5 Connecting Multiple SAS-1s and SAS-RIs

Apply power to the card file (or the shelf mount SAS-RI) and to the SAS-1 unit (SAS-CT). The system should now be operating. Observe the Activity LED (inside on the Type 170 SAS-RI card or on the back of the shelf mount SAS-RI) and the detection indicator LEDs to verify proper operation. The activity LED should blink with a nearly constant period. The detection LEDs

should light based on detections by the SAS-1. To setup SAS-1 or to repeat the SAS-1 setup using the SAS Monitor and Setup software, connect the supplied serial cable from the PC running SAS Monitor and Setup directly to the SAS-CT (in place of the cable connecting the SAS-RI). After setup of the SAS-1 is complete, replace the cable from the SAS-RI (RJA) to the SAS-CT. Press the SAS-RI Reset switch on the SAS-RI front panel. The Activity LED should begin to blink after approximately 6 seconds.

When using multiple SAS-1 sensors connected to multiple SAS-RIs as shown in Figure 5, the default mode for each SAS-1 must be set for **Single Relay or Dual Loop with Polled Communication.** Using Polled communication prevents message collision that would occur if each SAS-1 sent its messages out periodically.

When multiple SAS-1 units are connected to a single SAS-CT with one home run cable or multiple home run cables (Figure 5), each SAS-1 must have a corresponding SAS-RI. Each SAS-RI must be configured to identify the bit serial relay "message packet" (from a specific SAS-1 sensor) that it will acquire and route to it's relay signal cable or card edge. The SAS-RI corresponding to SAS0001 is the Master and provides the polling messages to all SAS-1 units in order of the SAS ID. To configure each SAS-RI, the **JP2** header (inside the SAS-RI) should be jumpered as follows (**Yes-jumper present, No-jumper absent**):

JP2	**SAS-RI #1 (SAS0001) (Master)**	**SAS-RI #2 (SAS0002)**	**SAS-RI #3 .... SAS-RI #6 (SAS0003)**	**(SAS0006)**	**SAS-RI #1 (SAS0001) (Master, Dual Loop)**
A0	Yes	No	Yes	No	Yes
A1	No	Yes	Yes	Yes	Yes
A2	No	No	No	Yes	Yes

As seen in the table above, the **JP2** header for the SAS-RI corresponding to SAS0001 (Master SAS-RI) can be jumpered in one of two ways. Placing a jumper on the **A0** pins only of **JP2** (leftmost column) sets the SAS-RI as the Master (corresponds to SAS0001) and programs the SAS-RI to send **Single Relay Presence** polling commands to all of the SAS-1 units (SAS0001 thru SAS0006). For this mode, only half of the 10 vehicle presence relay signals will be active (Signals 1A, 2A, 3A, 4A, and 5A). Placing a jumper on the **A0, A1, and A2** pins of **JP2** (rightmost column) sets the SAS-RI as the Master (corresponds to SAS0001) and programs the SAS-RI to send **Dual Loop Relay** polling commands to all of the SAS-1 units (SAS0001 thru SAS0006). For this mode, all 10 vehicle presence relays are active with each pair (i.e. 1A and 1B) emulating the detector output of a "Dual Loop" Speed Trap configuration. Note that the "A" signals (1A, 2A, etc) are the upload detector relays and the "B" signals (1B, 2B, etc.) are the downroad detector relays.

Figure 6 shows the cabling for multiple SAS-RI cards connected to a single SAS-CT. The cable used for the interconnects is standard straight thru CAT 5E cable with RJ-45 connectors on both ends. The cable is connected from the RJ-45 jack on the SAS-CT to the **RJA** jack on the first SAS-RI (Master corresponding to SAS0001). The next cable is routed from the **RJB** jack on the first SAS-RI to the **RJA** jack on the second SAS-RI. The next cable is routed from the **RJB** jack

on the second SAS-RI to the **RJA** jack on the third SAS-RI. This pattern continues for up to 6 SAS-RI cards.

Note: ***Each SAS-RI used as slaves (SAS0002 thru SAS0006) in Figure 6 must be factory modified for receive only capability. They are not interchangable with the SAS-RI used as the Master (corresponding to SAS0001).***

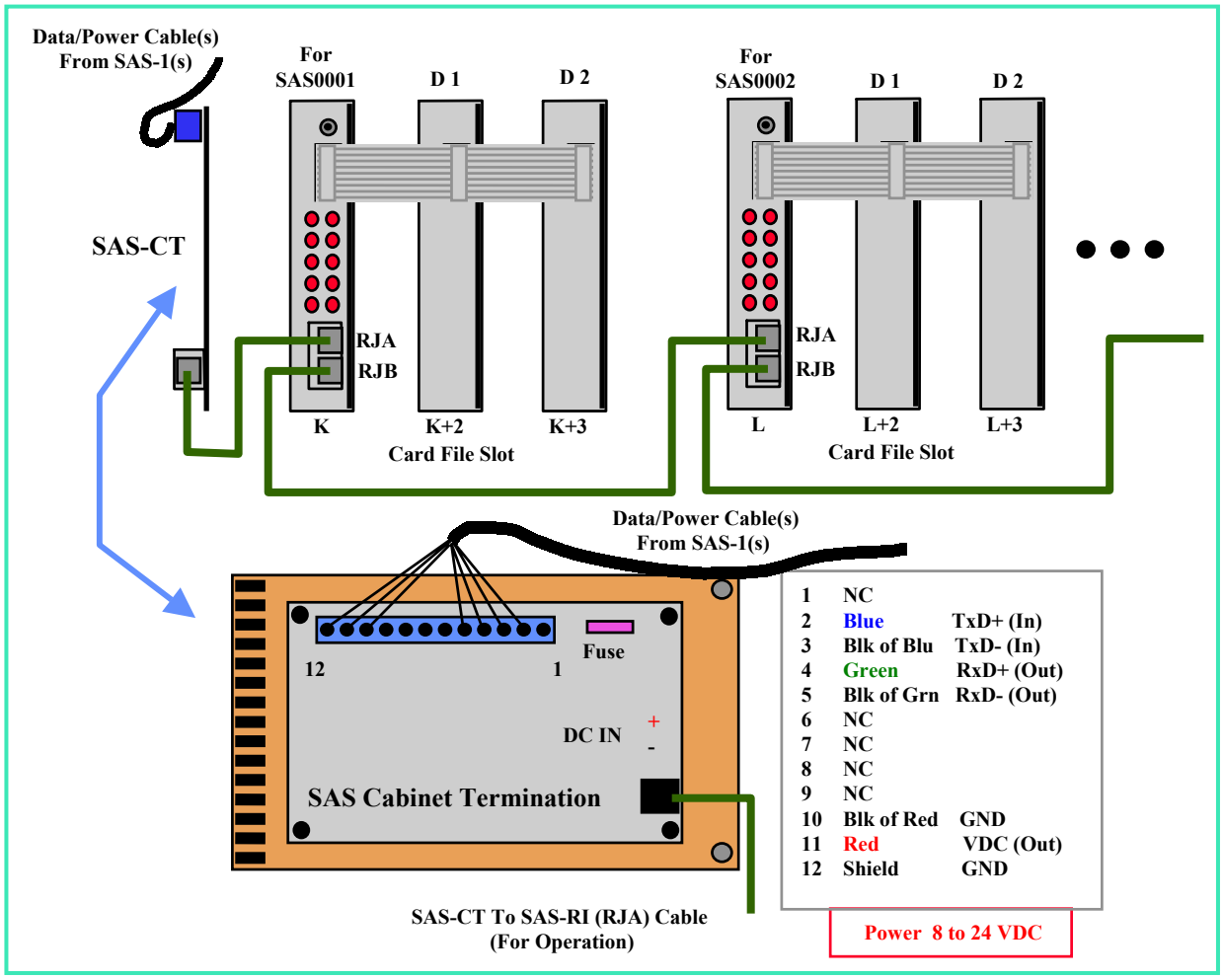

Figure 6 Connecting Multiple Type 170 SAS-RI Cards to a Single SAS-CT

Figure 7 shows the cabling for multiple shelf mount SAS-RIs connected to a single SAS-CT. The cable used for the interconnects is standard straight thru CAT 5E cable with RJ-45 connectors on both ends. The cable is connected from the RJ-45 jack on the SAS-CT to the **RJA** jack on the first SAS-RI (Master corresponding to SAS0001). The next cable is routed from the **RJB** jack on the first SAS-RI to the **RJA** jack on the second SAS-RI. The next cable is routed from the **RJB** jack on the second SAS-RI to the **RJA** jack on the third SAS-RI. This pattern continues for up to 6 SAS-RI shelf mount units.

Note: ***Each SAS-RI used as slaves (SAS0002 thru SAS0006) in Figure 7 must be factory modified for receive only capability. They are not interchangable with the SAS-RI used as the Master (corresponding to SAS0001).***

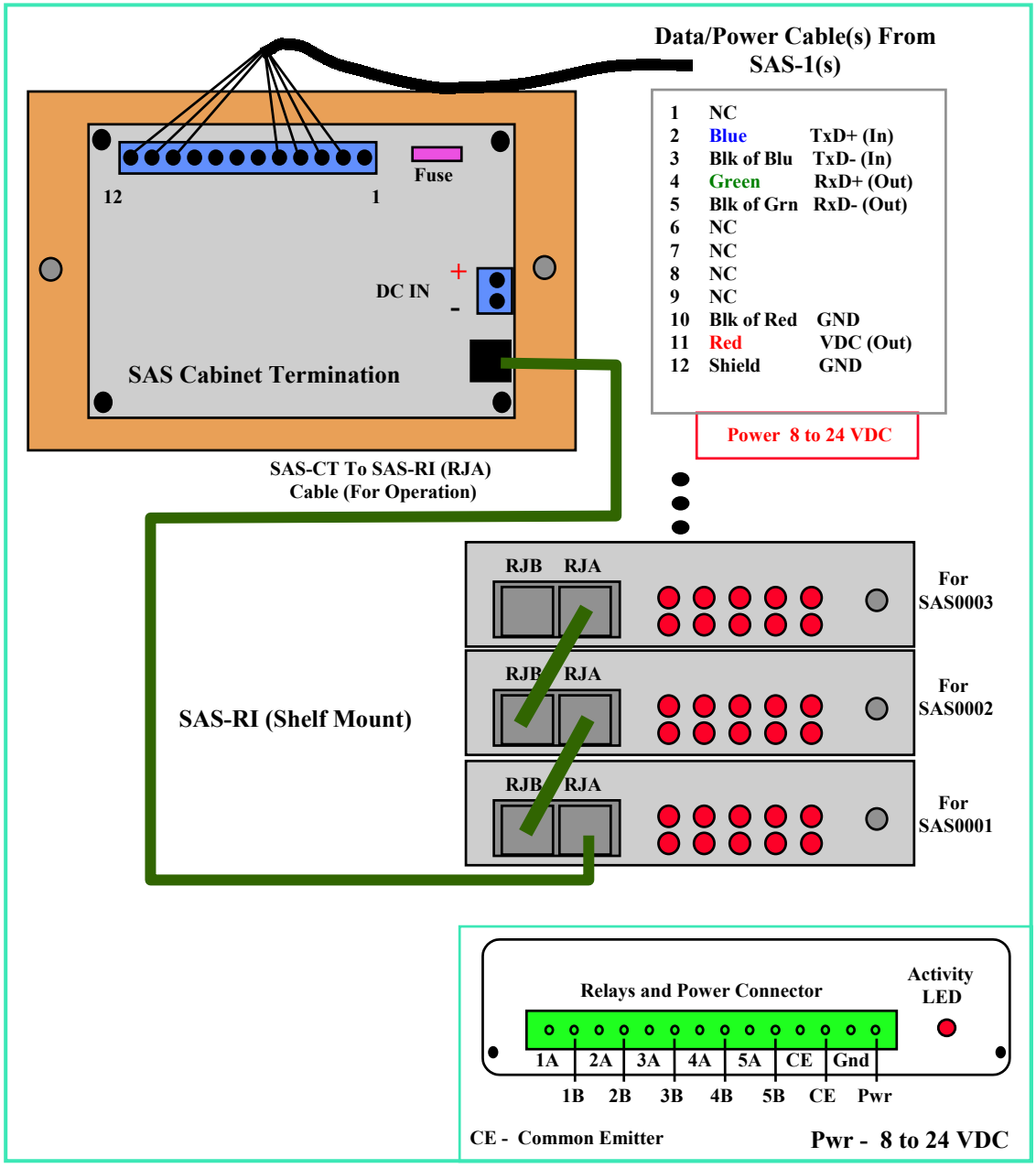

Figure 7 Connecting Multiple SAS-RI Shelf Mount Units to a Single SAS-CT