1. INTRODUCTION

The Relay Output Network Interface (RONI) is an INCOM® slave node designed to control external devices by means of its output relays and monitor devices with its inputs. In its maximum configuration, RONI has four output relays and eight monitoring inputs.

In its minimum configuration the RONI has eight monitoring inputs and no output relays. In this configuration it has the functionality of an ERNI (Existing Relay Network Interface) with the added benefits of real-time tagging, programmable debounce timing and ability to monitor contact openings and closings at the same time. If you have a unit without output relays, disregard the text in the I.L. pertaining to output relays and programmable logic functions.

The inputs are used to monitor "wet" contacts directly or currents using non-invasive, Hall-effect transducers. Changes in the state of a contact or current can be captured, time-tagged, and stored in RONI's non-volatile memory for later retrieval through an INCOM master device such as IMAC or MINT.

The output relays are energized either by issuing a command from the INCOM master device or, when the programmable logic function is selected, by having the RONI inputs satisfy user-specified logic equations.

2. FEATURES

The RONI has the following features:

- Capability of using either 1200 bps or 9600 bps INCOM communications.
- A non-volatile memory for settings and target data.
- A real-time clock with battery back up to time tag target data.
- 48 Vdc version and a 120 Vac/125 to 250 Vdc version.
- Conformity to all applicable ANSI and IEC specifications.
- Programmable logic functions.
- Up to eight monitoring inputs and four outputs.
- A non-invasive current monitoring system using Hall-effect transducers.

3. DESCRIPTION

3.1. Power Requirements

Range:	48 Vdc or 120 Vac/125 to 250 Vdc
Burden:	4W @ 48 Vdc 4W @ 125 Vac 4W @ 250 Vdc

Debounce Timing

To prevent RONI from storing multiple events due to contact bounce, a user setting is included to ignore contact closures less than a specified time. Each input has its own debounce intervals that allows the RONI to interface to the widest variety of contacts. These settings are made using IMAC or RCP.

Voltage Thresholds

RONI inputs normally have a relatively high input voltage threshold to increase noise immunity - voltages greater than 38 Vdc are "high" and voltages under 10 Vdc are "low". The "gray" region between 10 and 38 Vdc is undefined – RONI may consider voltages in this range as either high or low.

– "high" input range: 38 - 250 Vdc or 120 Vac
– "low" input range: 0 - 10 Vdc
– undefined range: 11 - 37 Vdc

Alternatively, users can select a low input threshold to work with lower voltage contacts and devices like the RONI Hall-Effect Transducers. This lower voltage can be selected independently for the eight monitoring inputs by changing the appropriate internal jumper from "NORM" to "HALL"; this bypasses the 10k input resistor (see section 4.2). The voltage thresholds then become:

– "high" input range: 11 - 250 Vdc or 120 Vac
– "low" input range: 0 - 5 Vdc
– undefined range: 6 - 10 Vdc

3.2. Monitoring Input Characteristics

Depending on user-supplied software settings, RONI can be set to record either contact openings or closings, thus an event will be recorded when either voltage appears at an input, a voltage is removed, or both. These software settings are easily made using IMAC or RCP setup menus.

Monitoring Input Burden:

3.6 mA	@	48 Vdc
4.2 mA	@	125 Vdc
4.5 mA	@	250 Vdc
4.0 mA	@	120 Vdc

3.3. Temperature Range

For operation: 0 to + 50°c
For storage: -20 to + 80°c

3.4. Physical Dimensions

Height: 5.26 inches (133.6 mm)
Width: 9.125 inches (234 mm)
Depth: 5.92 inches (150.4 mm)
Weight: 4.0 lbs. (1.8 kg)

3.5. Nameplate and Front Panel Layout

The RONI front panel is shown in Figure 1. The nameplate identifies the output terminal blocks, TB2 and TB4, the LED (ACTIVE), the inputs, TB3, the address switches (A2 A1 A0), the INCOM and power connector, TB1, and the product name and manufacturer.

3.6. Test Conformity

– Insulation Test Voltage 2.8 kVdc, 1 minute (ANSI C37.90, IEC-255-5).

– Impulse Voltage Withstand 5 kV Peak, 1.2/50 microseconds, 0.5 Joule (IEC-255-5).

– Surge Withstand Voltage 2.5 kV, 1 MHz (ANSI C37.90.1, IEC-255-6).

– Fast Transient voltage 5 kV, 10/100 nsec Withstand (ANSI C37.90.1).

– EMI Volts/Meter Withstand 25 MHz-GHz, 10V/M (ANSI C37.90.2).

4. INSTALLATION

Installation of the RONI involves the following four steps:

- Setting switches
- Setting jumpers
- Making the software settings
- Physically mounting the RONI and connecting the cables.

4.1. Setting Switches

RONI has two types of switch settings: INCOM communication parameters and the INCOM address.

4.1.1. INCOM Address Switches

Three hexadecimal switches on the RONI front panel specify the INCOM address. These are set so that each device has a unique network address. The switches are designated A0, A1, and A2. Each switch has a small arrow in the center that points to a single digit.

To set the switches, use a small screwdriver and turn the arrow on each switch to the appropriate setting. When selecting an address, start with a lower address and increase addresses as you add network devices. Numbering the addresses this way will speed up the IMAC substation controller when it is learning the network configuration.

The hex address is read A2 A1 A0. To set the hex address 123, for example, set A2 to “1”, A1 to “2”, and A0 to “3”.

4.1.2. INCOM Parameters Switch

INCOM networks come in two varieties: the standard or original INCOM network is 1200 bps, ASK (amplitude shift keying) modulation, and the high speed INCOM network is 9600 bps, FSK (frequency shift keying) modulation. Table 1 shows switch SW4 settings for both network types.

Table 1:

	INCOM NETWORK TYPE	
SW4	1200 bps, ASK	9600 bps, FSK
1	closed (down)	open (up)
2	closed (down)	closed (down)
3	closed (down)	open (up)
4	open (up)	open (up)

Switch 4 settings for INCOM network parameters.

4.2. Setting Jumpers

The RONI contains two position jumpers for each contact input, J1 - J8. Normally the jumpers would not be installed to give the maximum noise immunity, however the Hall-effect tranducers only switch between about 0Vdc when monitored current is flowing and 12 Vdc when the current is off, so RONI inputs must be set to interpret 12Vdc as active when Hall-effect tranducers are used.

Jumpers for all inputs that will be connected to a RONI Hall-effect transducer must be installed. Each jumper number corresponds to the input it controls: J1 controls input 1, J2 controls input 2, and so on.

4.3. Software Settings

In most cases, several settings will have to be made using the network master. These include:

- Pick-up Delay - the time between the RONI receiving a valid request to energize a relay and actually energizing it
- Drop-out delay - the time each relay will remain energized
- Current time and date
- Logic equations for each output relay.

Some settings are optional and make communicating with the RONI more convenient. They Include:

- Input/Output Descriptions – each input and output can be tagged with a 30 character description. These descriptions will be displayed automatically by the INCOM network master (IMAC or your computer) when reviewing targets.
- RONI Identification —You can set a 38 character description which identifies a particular RONI. This identifier is displayed automatically by the network master when communicating with a specific RONI.

The INCOM master menus will assist you in making these settings. Settings will vary depending on the options of your RONI and your requirements.

Settings are stored in non-volatile memory, keeping this information intact even when RONI power is removed.

4.4. Mounting and Connecting The RONI

The location should be clean and dry, and free from excessive vibration, corrosive fumes, and heat.

Connect the RONI:

1. RONI “GND” (silver stud on front panel) to ground,
2. Seven pin male connector, TB1:
   a. Hall-effect power, pins 1-2:
   b. INCOM, pins 5-6: Connect to the INCOM network twisted pair.
   c. POWER AC/DC, pins 3-4: Connect to battery or 120 Vac.
   d. GND, spare ground connection - no connection needed.
3. The incoming twisted pair shield should be connected to the outgoing twisted pair shield; ***DO NOT*** connect these shields to the RONI case or earth ground.

4.5. Hall-Effect Transducers

Hall-effect transducers sense the magnetic field produced by a current carrying conductor and switch low when a current is detected. RONI’s transducers can reliably detect currents as low as 880 mA, and cannot be damaged by excessive current. These tranducers are non-invasive: the conductor to be monitored passes through a hole in the device without making an electrical connection.

The transducer must be supplied with a dc voltage between 6 and 16 V; RONI Hall Effect output terminals, pins 1 and 2 of TB1 provide an isolated 12V dc source which will power up to eight tranducers.

To install the Hall Effect Tranducers, run the wire to be monitored through the hole in the device. If you are attempting to monitor a small wire with less than 880 mA of current when active, you can loop the wire through the conductor more than once. The transducer detects “Loop-turns” of current, thus it could reliably detect a wire with 300 mA of current if it were looped and passed through the detector three times; each pass increases sensitivity:

Table 2:
Hall Effect Transducer Sensitivity

No. Of Loop-turns	Minimum Sensitivity (MA)
1	880
2	440
3	243
4	220
5	176
6	147

Some transducers are much more sensitive than 880 mA. If a wire carries a small “OFF” current you must make sure that this current won’t be interpreted as “ON”, so only loop the minimum number of turns.

For example, to detect a wire that carries 700 mA when “ON” and 150 mA when “OFF” you should loop the wire so that it makes two passes through the transducer (2 loop-turns); this will allow the transducer to detect currents as low as 440 mA. With this arrangement, the transducer will detect the 700 mA “ON” current but will ignore the 150 mA “OFF” current.

Hall-effect transducers connectors should be connected: as follows:

Table 3:
Connections

Connector Wire	Description	Connect to:
White wire	output	Contact input, either terminal
Black wire	ground	TB1, Pin 1 & remaining input terminal
Gray wire	+ supply	TB1, Pin 2

5. ACCEPTANCE TESTS AND OPERATION

CAUTION

We recommend that users perform specified Acceptance Tests on RONI prior to installing it on the network in order to verify it is working properly. Before performing the Acceptance Tests, users should be familiar with IMAC or WRELCOM software packages.

5.1. RONI Self Test

Apply station battery to RONI “POWER AC/DC” terminals, either polarity is acceptable. Within about five seconds the “ACTIVE” LED should begin to slowly flash green for about one second on and one second off; this indicates RONI is passing all internal self tests. If the LED begins to rapidly flash amber, the RONI clock may need to be set or there may be an internal hardware fault. First attempt to set the clock using IMAC or RCP software. If the LED continues to flash amber, power the unit off, check power supply connections and voltages, and apply power again; if the amber flash persists, contact an ABB representative.

NOTE: If the LED does not light at all, it is likely that the RONI is not receiving power.

5.2. Network Test

Normally the RONI LED slowly flashes green, however the LED flashes red whenever RONI transmits data on the network, and remains red for the duration of the transmission. When this transmission is lengthy, the LED may remain red for several seconds.

Before testing communications:

– Set the RONI to a unique network address by setting the hex switches on the front panel (see 4.2, Setting the INCOM Address).

– Set internal DIP switch, S4, to the proper INCOM parameters (see 4.1.2, INCOM Parameters Switch)

– Connect the RONI “INCOM” terminals to the INCOM shielded, twisted-pair wire.

5.2.1. IMAC as Controller

Place the IMAC controller in Learn Mode and observe if the RONI is detected. If the controller does not recognize the RONI, recheck the RONI address hex switches, and try again.

After the IMAC has recognized the RONI, place the IMAC in Interactive Mode and execute several commands to ensure the RONI is working properly.

5.2.2. BIRT or MINT as Controller

The BIRT or MINT’s RS-232C serial port can be connected to a modem or PC; refer to the WRELCOM Software Manual for the correct cable configurations.

Follow the procedures in the WRELCOM Software Manual to establish communications between the PC (or MODEM) and RONI. Execute several commands to ensure the RONI is working properly.

5.3. Setting the Password

The first time a new RONI is powered up, you will probably want to set the password to alter settings. In addition to a user specified password, a default password, “PASSWORD”, is active during the first fifteen minutes each time the RONI is powered up. This password only gives permission to enter a new password and cannot by itself be used to update RONI settings.

Use IMAC or RCP menus and the default password to set the user password in RONI. Once a user password is entered, it can be used to change RONI settings or change the password. Unlike the default

password, the user password has the authority to make changes at all times.

If you ever forget your password, power the RONI off, then on, and use the default password to enter a new password.

5.4. Monitoring Input Test

Depending on RONI's last-stored settings, RONI may not generate an event record no matter what voltage is applied to its Monitoring Inputs, so it is important to set RONI before testing these inputs.

For this test RONI should be set to generate an event when voltage is applied to each input, or, alternatively RONI can be set to generate an event when either a voltage is applied or removed from a Monitoring Input. This user setting can be made using IMAC or RCP software.

After entering the settings, clear all RONI targets using IMAC or RCP, then apply a voltage (between 38 and 250 Vdc, using either polarity) between each contact input pair on TB3:

Table 4:
Monitoring Input Pins

Input	TB3 pins	Input	TB3 pins
1	1 & 2	5	9 & 10
2	3 & 4	6	11 & 12
3	5 & 6	7	13 & 14
4	7 & 8	8	15 & 16

This action simulates relay activity. Use the network controller to request the contents of buffer 1, and observe any targets. Each of the eight inputs should have generated at least one target (at least sixteen targets if RONI is set to record events for each input when voltage is applied or removed).

5.5. Output Relay Control

Each output relay has two times that can be set by the user: a pick-up delay and a drop-out delay. These times can be set between 0-120 seconds in 4 msec increments, or "infinite" for drop-out delay. When a relay is "activated", it will energize after the pick-up delay and will remain energized until the drop-out delay, or indefinitely if "infinite" delay is specified.

5.5.1. Logic Relay Control

When the RONI Logic Control function is selected, its eight contact inputs are used as variables in logic equations set by the user. For example, relay 2 could be programmed to energize when inputs 1, 2, and 4 were active and input 8 was inactive, or when 2 and 3 were active. In equation form:

relay 2 = 1 2 4 8' + 2 3

Unique logic equations can be entered for each output relay using virtually any combination of terms.

When a relay's logic equation is satisfied by the proper input combination, the relay will activate using the user-specified pick-up delay for that relay - if the pick-up delay is set for two seconds, then two seconds after the relay logic equation becomes true, the relay will energize.

The relay will remain energized indefinitely until its equation becomes false; at that point, the relay will begin counting down the user-specified drop-out delay. If the equation becomes true again before the relay is de-energized, this countdown is aborted and the relay will remain energized indefinitely until the equation becomes false.

If the equation does not become true before the drop-out delay has expired, the relay will de-energize.

In general Logic Control of relays takes precedence over INCOM Master commands to activate or deactivate relays. If a relay is energized or has started a pick-up delay, Master commands to energize that relay will not affect it: it will still energize after the original pick-up delay. Likewise, requests to de-energize a relay that is energized due to Logic Control will be ignored by the relay.

The INCOM Master does, however, always have the authority to disable Logic Control of any relay which will cause the specified relays to immediately de-energize.

Users create logic equations using IMAC or RCP software. These equations are then transmitted to the RONI on the INCOM network which updates its non-volatile memory with new equations.

5.5.2. Master Command Control

As mentioned, the INCOM Master can directly control output relays using commands in IMAC or RCP software. Any combination of relays can be instructed to activate. To change a relay, users must supply proper passwords, and IMAC verifies which RONI the user is planning to change. RONI will activate the proper relays after receiving the relay control command, however, any relay currently servicing a Logic Control function will ignore the master's relay control command since Logic Control has a higher

priority than Command Control.

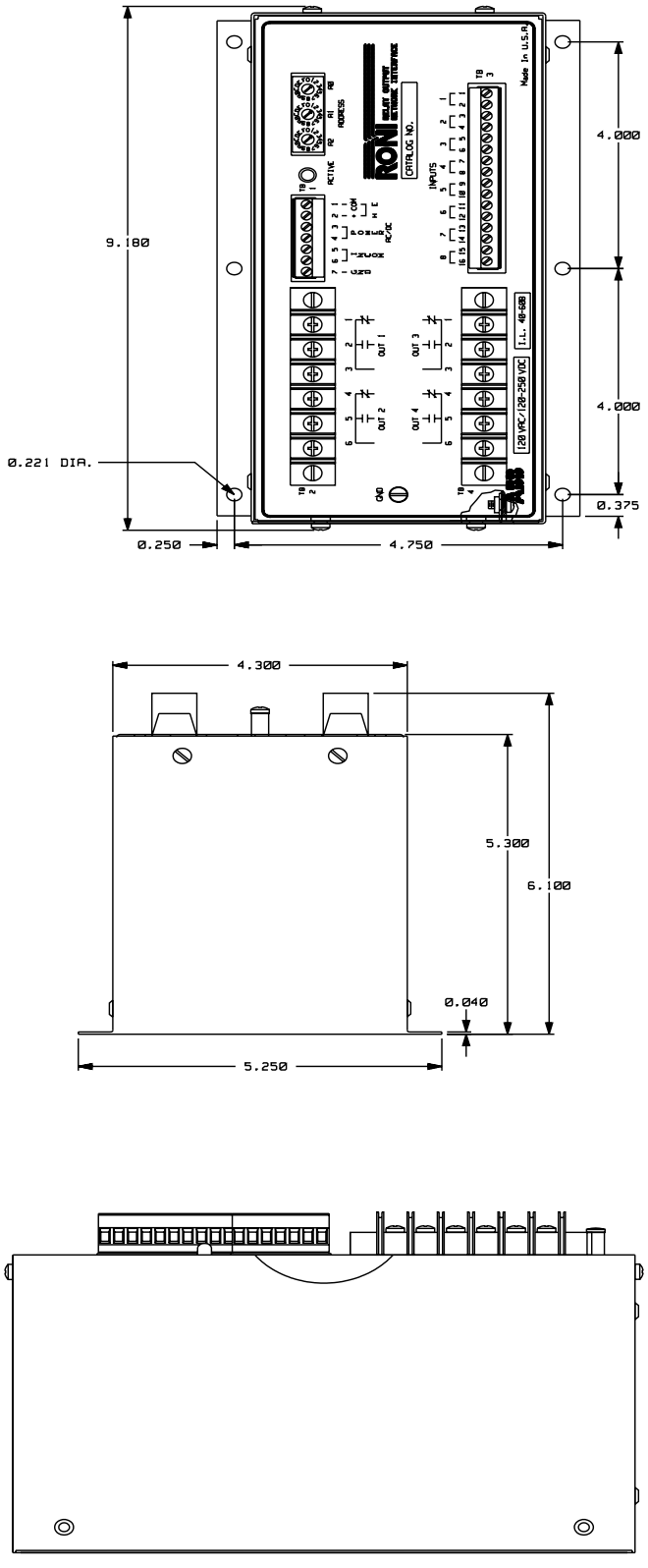
5.6. ABB Bulletin Board

The ABB Power Automation and Protection Division Bulletin Board (BBS) is now on line. To obtain the latest version of IMAC or RCP software, please call the ABB BBS via modem at:

(800) 338-0581 or (954) 755-2350

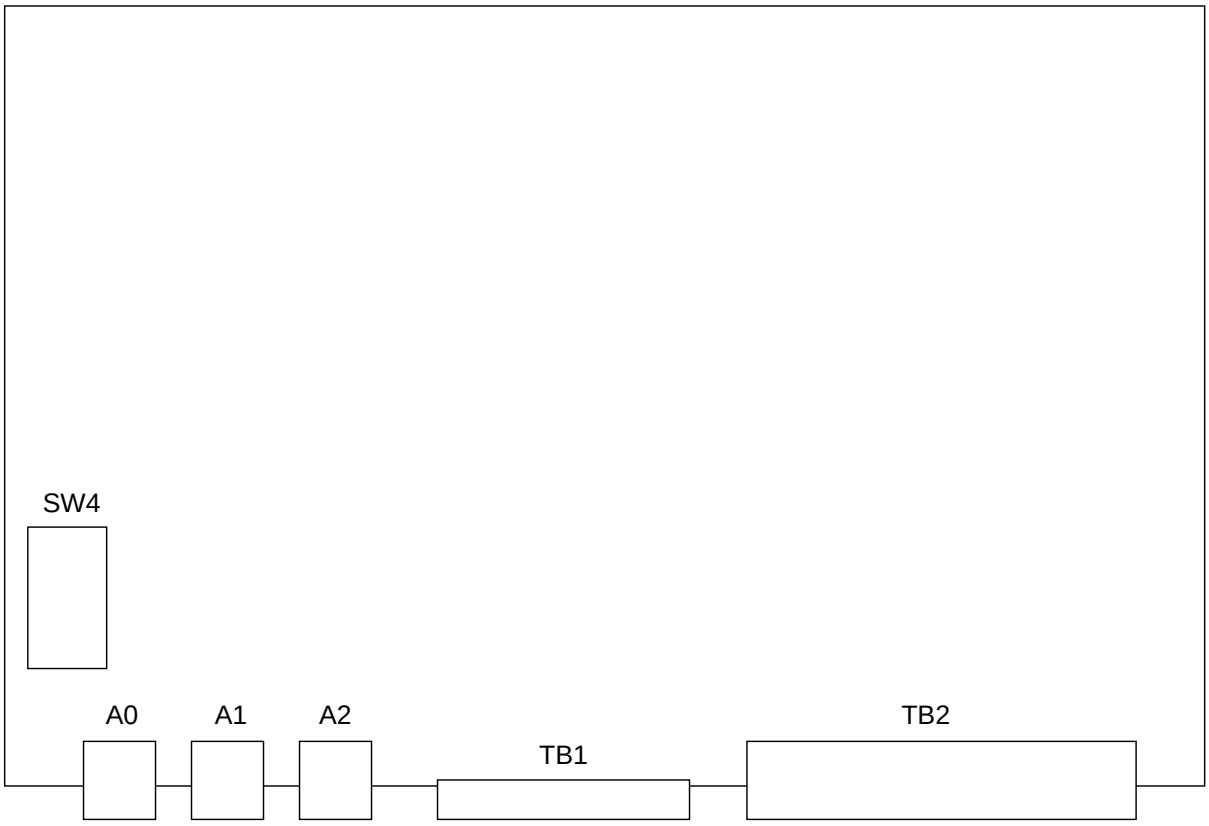
Using configuration settings 300- 14,400 bits/second, 8 data bits, 1 stop bit, no parity and full duplex. Once the connection is established and login is completed, choose L - Library of Files from the TOP menu. Next, select D -Down Load File, from the Library of Files, RCPxxx.EXE (where xxx is the most recent version number e.g., 180 for version 1.80). RCPxxx.EXE is a compressed, self extracting file which is expanded and installed by simply typing RCPxxx and following the instructions.

NOTES



Sub 1
1358D64

Figure 1. The RONI Front Panel and Physical Dimensions



Sub 2
ESK-0319

Figure 2. DIP Switch Location

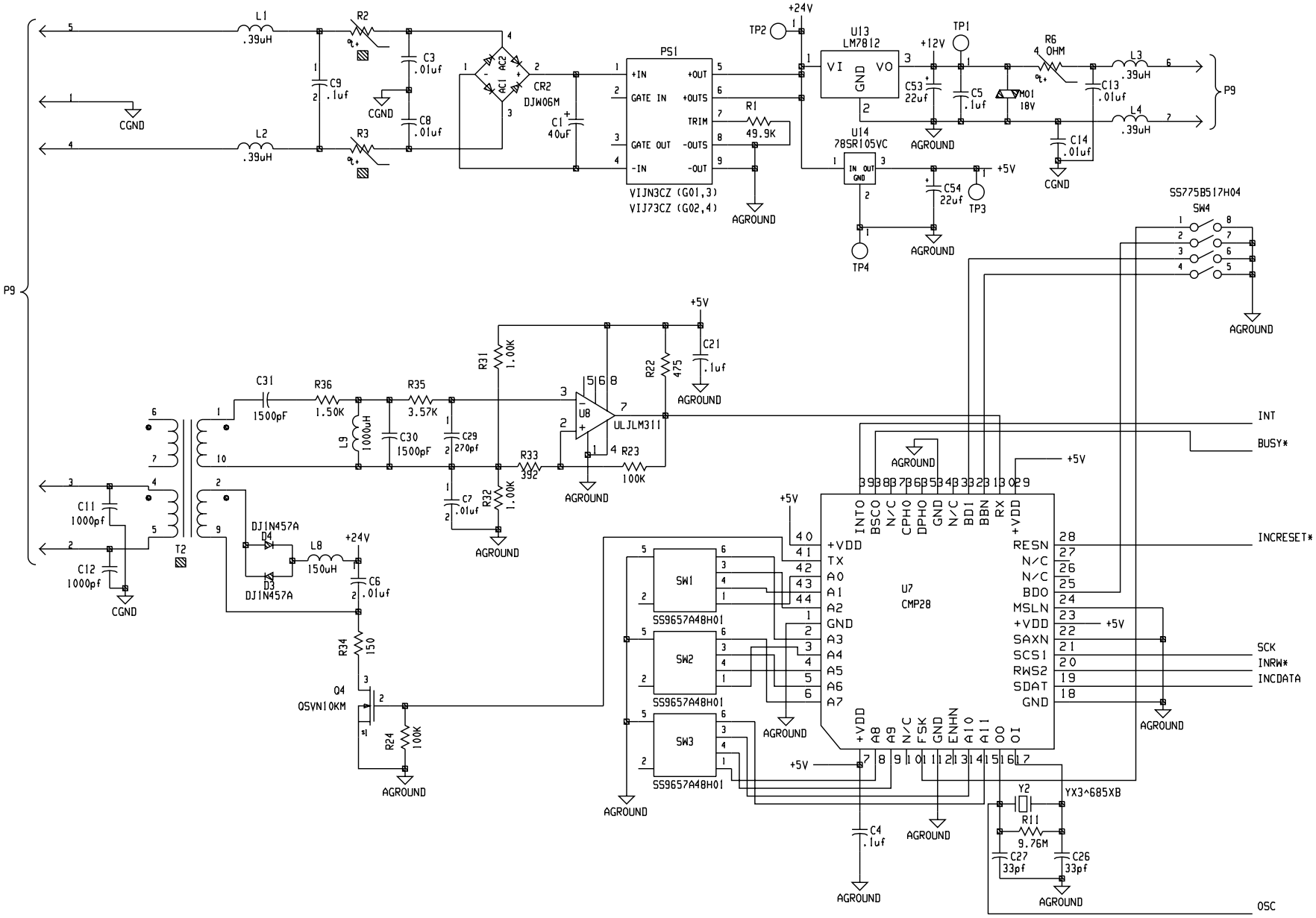
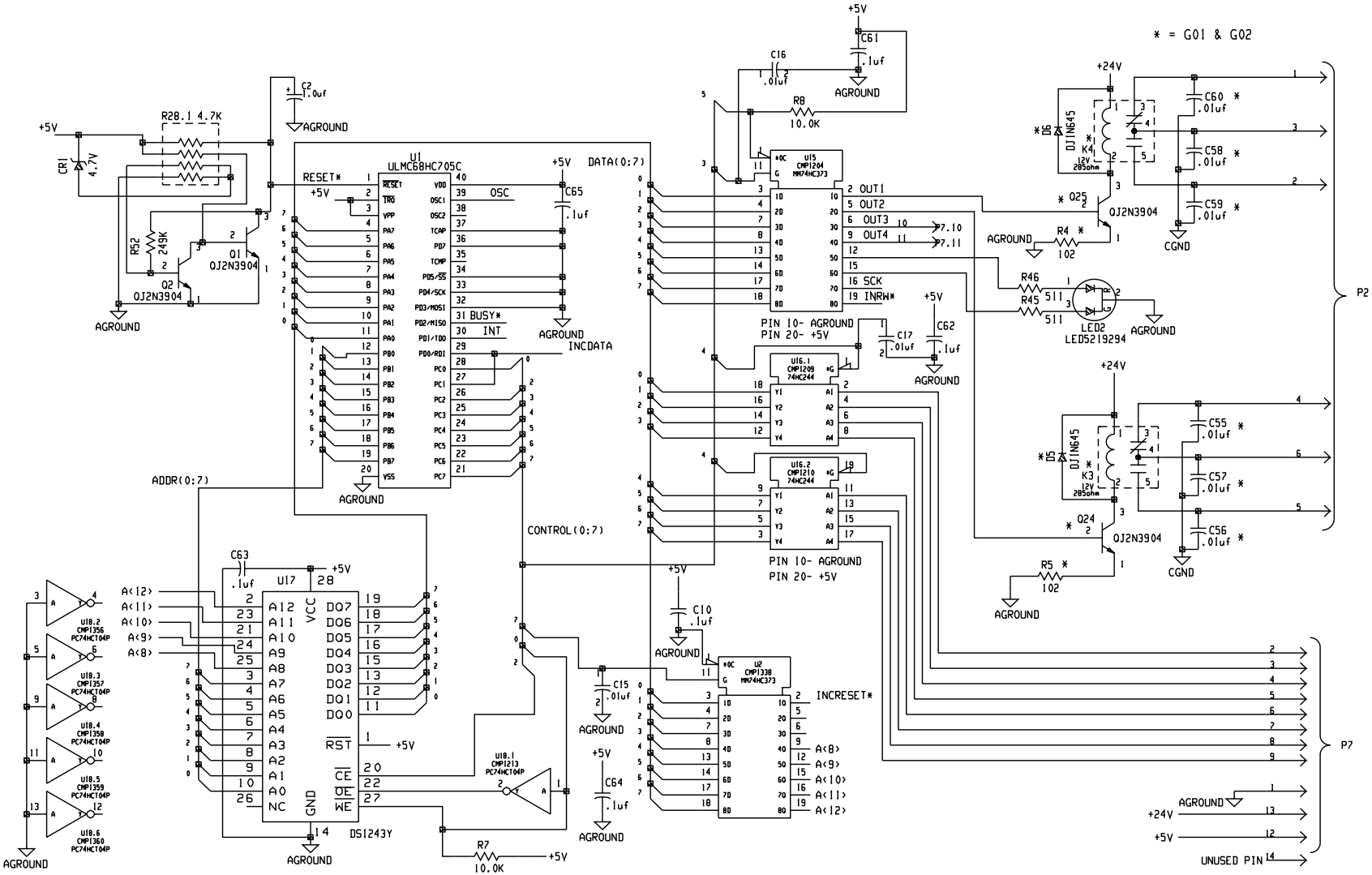


Figure 3. RONI Main Module Circuit Board Schematic

Sub 1
1612C45
page 1 of 2

I.L. 40-608A



Sub 1
1612C45
Page 2 of 2

Figure 3b. RONI Main Module Circuit Board Schematic

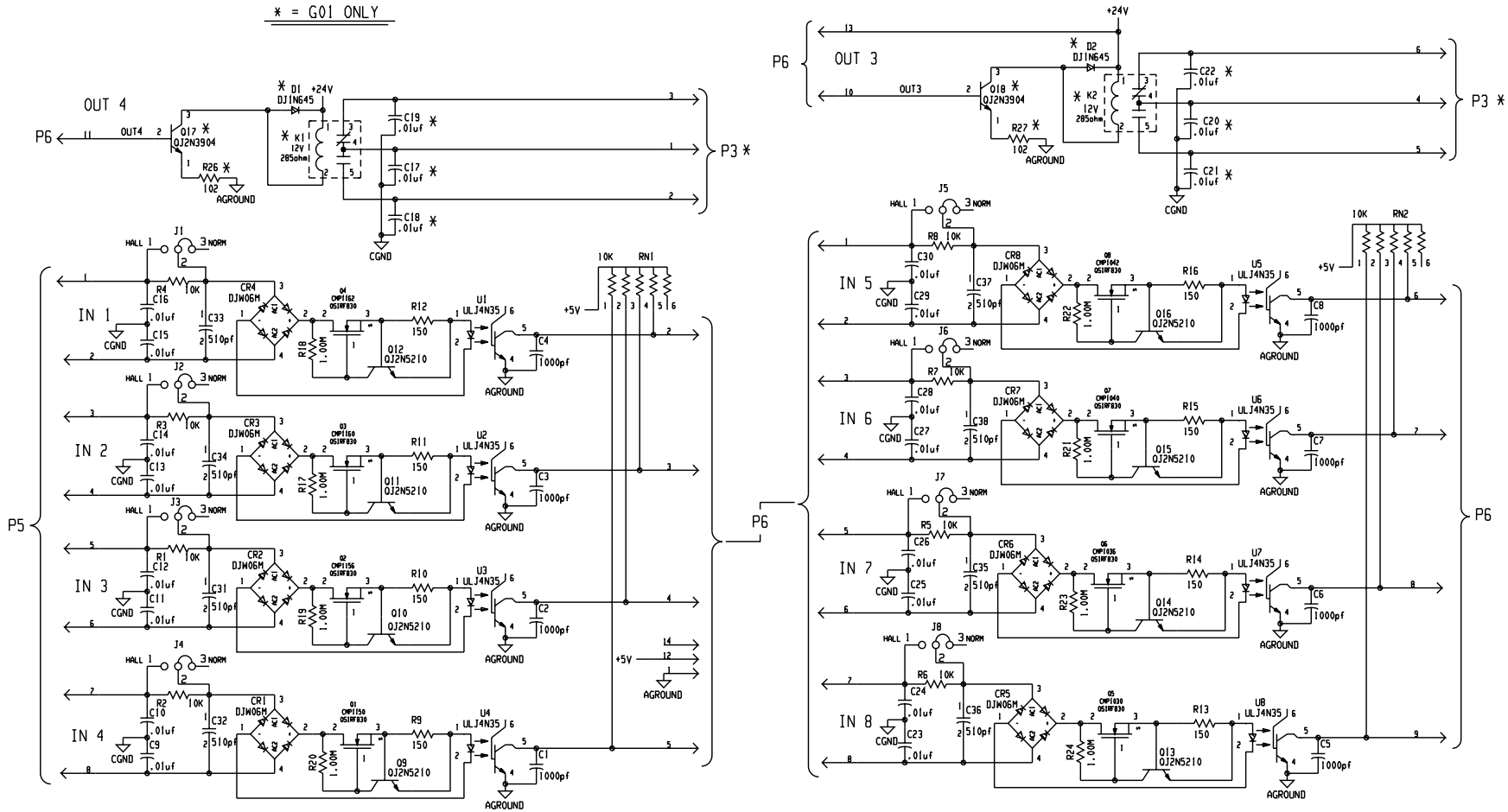
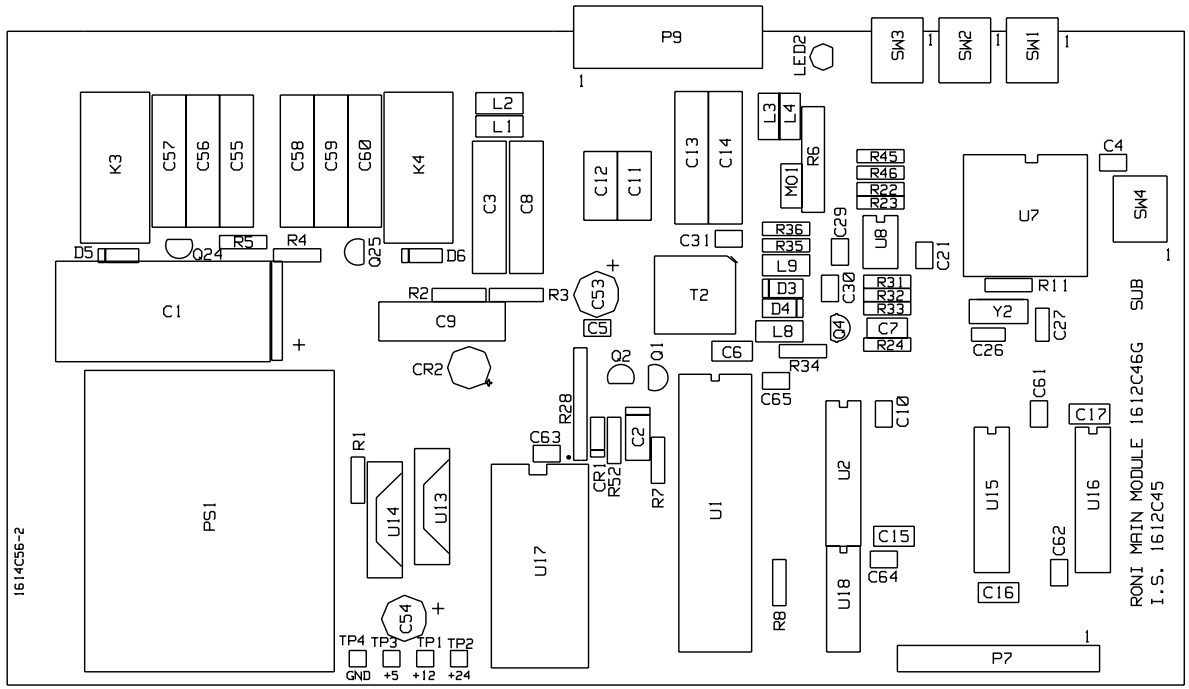


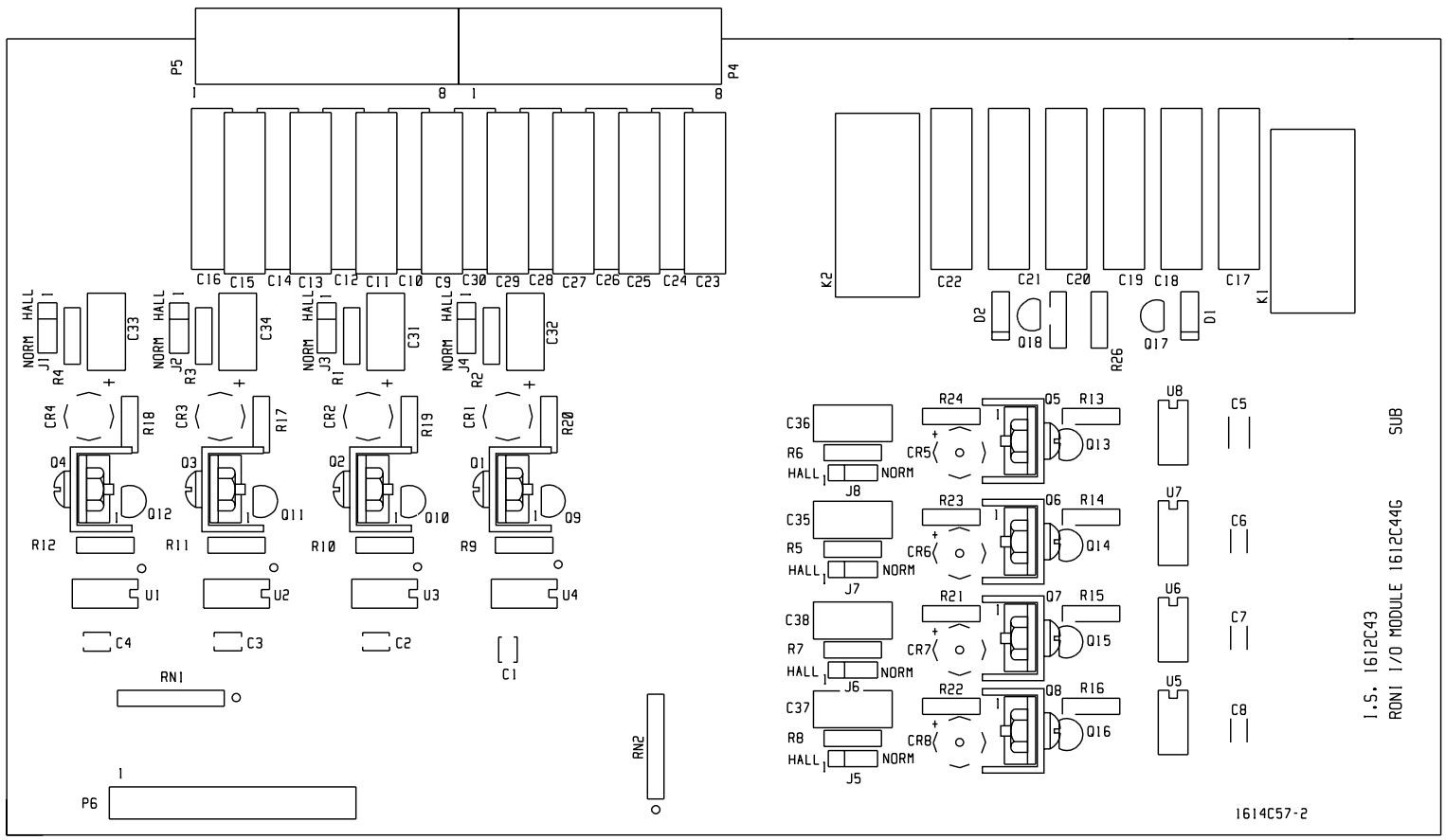
Figure 4. RONI I/O Module Circuit Board Schematic



*Sub 4
1612C46

Figure 5. RONI Main Module Component Outline Drawing

* Denotes change since issue



*Sub 4
1612C44

Figure 6. RONI I/O Module Component Outline Drawing

* Denotes change since issue

RELAY OUTPUT NETWORK INTERFACE

Typical Catalog Number

R O N 1 4 4 9 N N N

BASE UNIT

Includes 8 voltage monitoring inputs with 2 msec. time tagging resolution power supply and hall effect transducer power supply . . . . . .

Power Supply

48 Vdc	4
125 Vdc, 250Vdc, or 120 Vac	1

Hall-effect Transducers

0	0
4	4
8	8

Hall effect transducers may be ordered separately, Catalog #1504B47G01

Control Output Relays

None.	0
4 form C trip rated relay output contacts with on/off delay timers and programmable control logic	4

Network Interface

9600/1200 bps INCOM®	9

Future

. . . . .	N

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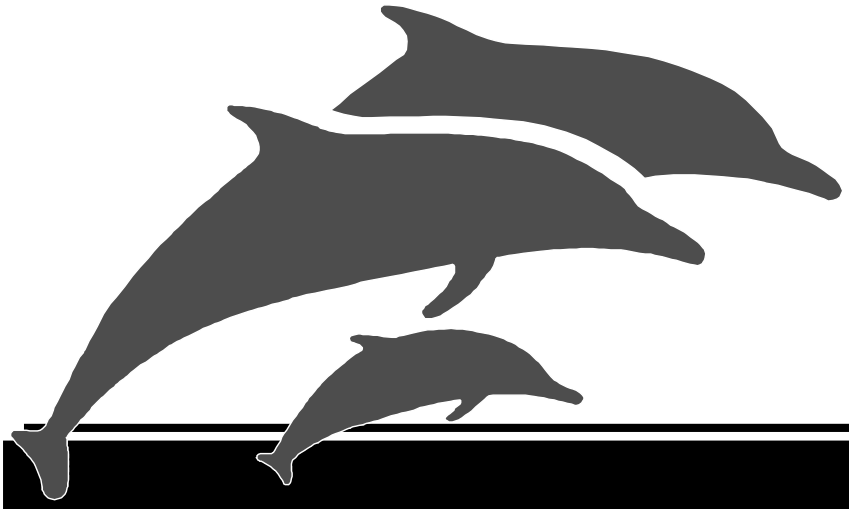
Instruction Leaflet

40-608A

RONI Relay Output Network Interface

USER'S GUIDE



WRELCOM™

Intelligent Family of Relay Communication Products

Substation Control and Communications

ABB Power Automation and Protection Division

4300 Coral Ridge Drive

Coral Springs, Florida 33065

(954) 752-6700

Printed in U.S.A.

OCTOBER 1996

We recommend that the user of this equipment become acquainted with the information in this users guide before energizing the system. Failure to do so may result in injury to personnel or damage to the equipment, and may affect the equipment warranty.

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CONTENTS