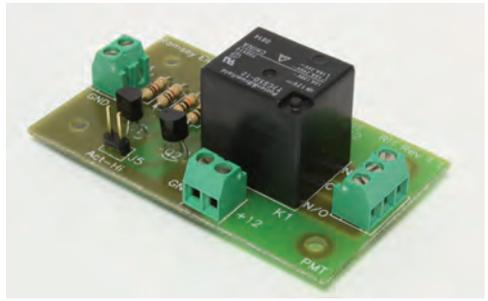


RELAY INTERFACE



Ramsey Electronics Model No.

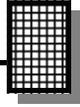
RI1

The **RI1** makes it simple to connect almost any digital output to lights, motors, or any other electrical devices that require load switching of up to 240 Volts AC or DC and 10 Amps of current! It takes a digital low (0.5 VDC or less) and high (+1 to +12VDC) and provides relay contact closures (SPDT) that can be either active high or active low.

The RI1 can be interfaced with the **TS1**, **VS1**, **UT5**, **TT7**, **TD1**, **ICI16**, **RF Wireless Link Modules**, **BD416**, **OII1**, **MD3**, and **WTS1**. It also works with many Velleman digital products, and has millions of additional real world applications!

- **Interfaces many hobby kits with real world applications**
- **Connects a SPDT Relay to almost any digital output**
- **Switches up to 240 Volts at 10 Amps**
- **Digital Low < 0.5 Volts, Digital High 1 to 12 Volts**
- **Requires 12VDC @ 50mA power supply**
- **Easily interfaces to your project through terminal blocks**
- **Compact 1.5 inch by 2.5 inch circuit board**





PARTIAL LIST OF AVAILABLE KITS:

RAMSEY TRANSMITTER KITS

- FM10A, FM25B, FM30, FM Stereo Transmitters
- FM100B, FM35 Professional FM Stereo Transmitters
- AM1, AM25 AM Broadcast Band Transmitters

RAMSEY RECEIVER KITS

- FR1 FM Broadcast Receiver
- AR1 Aircraft Band Receiver
- SR2 Shortwave Receiver
- SC1 Shortwave Converter

RAMSEY HOBBY KITS

- LBC6K Laser Beam Communicator
- SG7 Personal Speed Radar
- SS70C Speech Scrambler/Descrambler
- TT1 Telephone Recorder
- LLS1 Laser Light Show
- MD3 Microwave Motion Detector
- LEDS1 LED Strobe Light
- BE66 Blinky Eyes Animated Display
- LTS1 Laser Trip Sensor
- ICI1C Infrared Switch Control Interface

RAMSEY AMATEUR RADIO KITS

- HR Series HF All Mode Receivers
- DDF1 Doppler Direction Finder Kit
- QRP Series HF CW Transmitters and QAMP Power Amplifiers
- CW7 CW Keyer

RAMSEY MINI-KITS

Many other kits are available for hobby, school, scouts and just plain FUN. New kits are always under development. Write or call for our free Ramsey catalog.

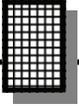


R11 Relay Interface

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INSTRUCTION MANUAL AND ASSEMBLY STEPS FOR

RI1 RELAY INTERFACE

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INTRODUCTION

The R11 is designed to provide a simple practical interface between different types of electronic circuits. The output is a high current, normally-open/normally-closed set of dry contacts. The input signal can be nearly any type of logic level or other voltage level between 0 and 12VDC. Input level pull-up, pull-down, and current limiting resistors are available if required. The R11 may be configured so that either a low (active low) or high (active high) level input signal will active the output relay.

THEORY OF OPERATION

Note: It will be helpful to reference the schematic in the center of this manual while reading this section.

For the R11 a low is anything below 0.5VDC and a high is above 1VDC. Active low means when the input applied to J3 "INPUT" pin is at a low level, 0.5VDC or less, with respect to ground, (J3 "GND"), the output relay, K1, will be energized. An active high means when the input signal is high, above 1VDC, relay K1 will be energized. A 12VDC power source must be applied to J1 or J2 to operate the R11. Resistor R4 is an optional pull-down resistor and will not be required for most applications.

Active Low Input Operation:

For this discussion R1 will be replaced with a jumper wire and jumper JMP1 will not be installed. Resistors R1 and R2 are dependant on the specific requirements of your application and will be addressed throughout this discussion.

The input signal is connected to the J3 "Input" pin, which is connected to the base of Q1. When the input signal is low (less than 0.5VDC) the base of Q1 is taken low, which causes Q1 to turn off. This makes the collector of Q1 high. The high on Q1's collector is connected to the base of Q2, which turns it on. When Q2 is turned on, current flows thru relay K1, closing its normally open contacts, which are connected to J4 "N/C" pin and "COM" pin.

When the input signal is high (1VDC or more) Q1 will be turned on, thus applying a low level to the base of Q2, which then turns Q2 off, de-energizing relay K1. This closes the normally closed contacts of K1 connected to J4 "N/C" pin and "COM" pin.

If the input signal is supplied by an open collector device, R2 must be installed in order to provide the high level applied to the base of Q1. This is the norm for logic devices with "open collector" outputs. If the input is able to supply the required high level, R2 should not be installed—however R1 must be installed to prevent damage to Q1. This is normally the case with CMOS logic devices, and you should build your kit this way if you are using any type

of input signal that is able to supply a high voltage level.

Active High Input Operation:

For an active high input signal, Q1 and R3 will not be installed, and jumper JMP1 will be installed. The use of resistors R1 and R2 is dependant on the specific requirements of your application and will be addressed throughout this discussion.

Once again the input signal is connected to J3 “INPUT” pin, but this time we connect it to the base of Q2. When the input signal is high, the base of Q2 is taken high, causing Q2 to turn on and current to flow through relay K1. This closes the normally open contacts of K1, which are connected to J4 “N/O” pin and “COM” pin.

When the input signal goes to a low, Q2 will be turned off, thus deactivating relay K1. This closes the normally closed contacts of K1 connected to J4 “N/C” pin and “COM” pin.

If the input signal is supplied by an open collector device, R2 will be required to provide the high level applied to the base of Q2. This is the norm for logic devices with “open collector” outputs. If the input is able to supply the required high level, R2 should not be installed—however R1 must be installed to prevent damage to Q2. This is normally the case with CMOS logic devices, and you should build your kit this way if you are using any type of input signal that is able to supply a high voltage level.

A Few More Operational Notes

You may be wondering about diode D1 across relay K1. Without getting too deep into electronics theory, because a relay is an electromagnet, its coil produces a voltage of opposite polarity when it is deactivated. This voltage can damage electronic components like Q2. D1 is connected so that it acts as an open circuit when the relay is energized, but is a short circuit when the relay deactivates. This protects Q2 from the reverse voltage.

The optional resistor R4 is what is known as a “pull-down” resistor. Its purpose is to provide a low level on the base of Q1 or Q2 (depending on the R11 configuration). In some cases it is possible that transistor Q1 or Q2 may have trouble turning off. This may occur if R1 is installed because the input signal doesn't go to a low enough level, (less than 0.5VDC). Installing R4 can help in this situation. We have provided a place to install it in case you have a problem with signal levels. We cannot say for sure R4 will be required until you connect your R11 and try it. Depending on your application you can use the contacts of K1 to control any device with a current rating up to 10 amps and voltage of 240 volts. Further R11 set-up instructions are included following the assembly instructions.

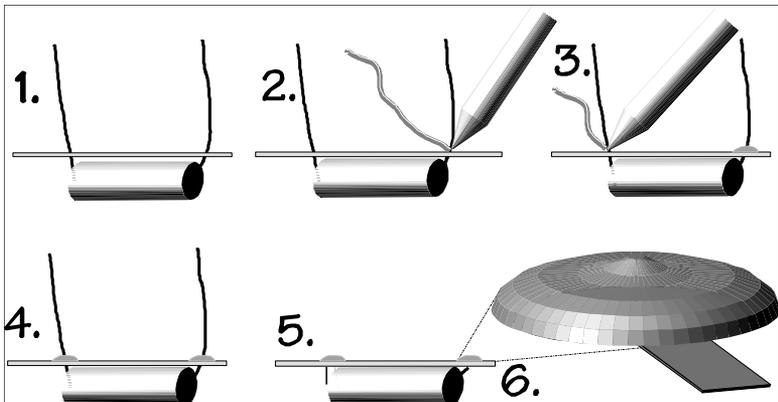
RAMSEY “LEARN-AS-YOU-BUILD” ASSEMBLY STRATEGY

Be sure to completely read through all of the steps and check the boxes as you go to be sure you didn't miss any important assembly instructions. Although you may be in a hurry to see results, before you switch on the power check all wiring and capacitors for proper orientation. Also check the board for any possible solder shorts and/or cold solder joints. Any of these mistakes could have detrimental effects on your kit - not to mention your ego!

Kit building tips:

Use a good soldering technique - let your soldering iron tip gently heat the traces to which you are soldering, heating both leads and pads simultaneously. Apply the solder to the iron and the pad when the pad is hot enough to melt the solder. The finished joint should look like a drop of water on paper - somewhat soaked in.

Mount all electrical parts on the topside of the PC board. This is the side that has few or no traces on it, the side with the silkscreen writing. When parts are installed the part is placed flat to the board and the leads are bent on the backside of the board to prevent the part falling out before soldering (1). The part is then soldered securely to the board (2-4), and the remaining lead length is then clipped off (5). Notice how the solder joint looks close up, clean and smooth with no holes or sharp points (6).



Warning: Use only rosin core solder or solder designed to be used with electronic equipment. Use of acid core solder will void your warranty and produce a board that will disintegrate in a short period of time.

RI1 Parts List

Semiconductors

- 1 1N4002 (marked 1N4002) (D1)
- 2 2N3904 NPN General Purpose transistors (marked 2N3904) (Q1,2)

Resistors

- 2 1K ohm resistors (marked brown-black-red) (R1, 4)
- 1 2.2K ohm resistor (marked red-red-red) (R1 w/input greater than 5V)
- 2 10K ohm resistors (marked brown-black-orange) (R2,3)

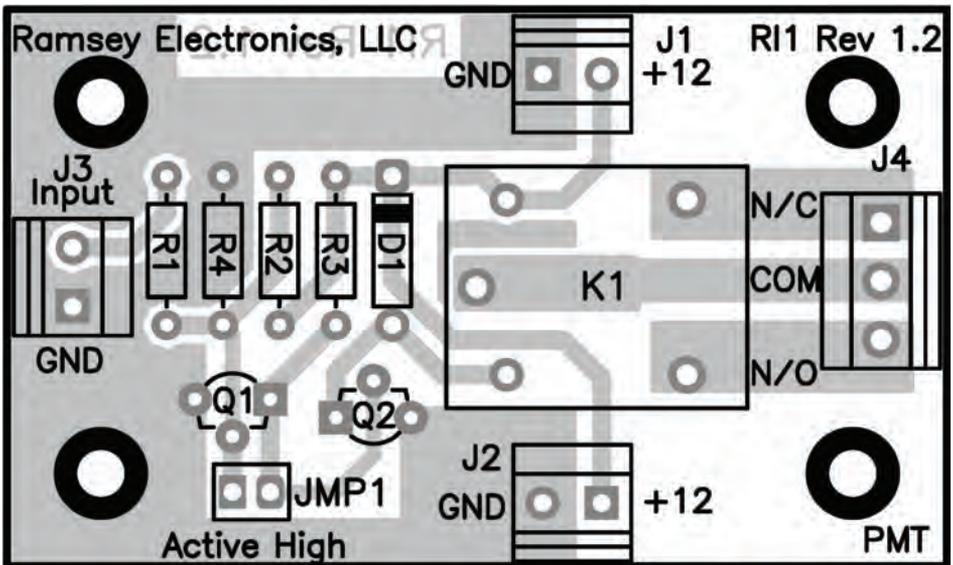
Relay

- 1 Single Pole Double Throw (marked T7CS5D-12) (K1)

Connectors

- 3 Two terminal, terminal block (J1,2,3)
- 1 Three terminal, terminal block (J4)
- 1 2 pin header (JMP1)
- 1 Shorting block

RI1 PARTS LAYOUT DIAGRAM





HIGH VOLTAGE ADVISORY!

This kit can be connected to and control AC line voltages. If AC line voltages or voltages in excess of 30 Volts are to be controlled with this kit **EXTREME CARE** must be exercised in the building, testing, and operation of this kit! At all times, treat this kit as being 'live'! You must build it into a suitably insulated enclosure such as a plastic box or mount it in a properly grounded metal chassis.

If you do not feel comfortable working with potentially lethal voltages, don't hesitate to return your kit and we will be happy to provide a full refund! By choosing to assemble this kit you agree to take full responsibility for your own safety and the safety of those that may operate the product.



The RI1 is a unique kit in that you will not place all of the parts in the kit. The parts to be installed will depend on the type of input provided and if you need the relay to be energized with a high or low input. When installing the diode and resistors save the trimmed component leads until all assembly is complete.

ASSEMBLY STEPS

SECTION "A" Perform these steps for all configurations.

- A1. Install D1, a 1N4002 diode. This part has a black body with a white band at one end. Match this band with the silkscreen band on the circuit board.
- A2. Install J4, a 3 terminal, terminal block. Make sure that the opening for the connecting wire is facing outward. Also ensure sure this part is mounted flush and square to the circuit board.
- A3. Install J1, a 2 terminal, terminal block. Make sure that the opening for the connecting wire is facing outward. Also make sure it is mounted flush and square to the circuit board.
- A4. Install J2, another 2 terminal, terminal block. Install it just like J1.
- A5. Install J3, the last 2 terminal, terminal block. Install it just like J1.
- A6. Install Q2, a 2N3904 NPN transistor. You will need to identify it by the text on the flat side. Install it so that its profile matches the orientation of the printed silkscreen on the circuit board.
- A7. Install JMP1, a 2 pin header.
- A8. Install K1, a single pole double throw relay (T7CS5D-12). Make sure this part is mounted flush and square to the circuit board.

- A9. Install the two pin jumper block across the pins of JMP1.

SECTION “B” - Active Low Configuration Perform these steps only if you need the relay to be energized with a low from the input source.

- B1. Install R3, a 10K ohm resistor (brown-black-orange). Resistors have no polarity so they may be installed in either direction.
- B2. Install Q1, a 2N3904 NPN transistor. Match its profile to the circuit board silkscreen.
- B3. Remove the two pin jumper block from JMP1. You may place this jumper block on one pin on JMP1 so that it stays with the kit in case you want to change your configuration in the future.

SECTION “C” These steps set up the R11’s input to match its source. *Read all of the following steps before installing any parts.*

- C1.

- If the input source does not limit the input current and for CMOS inputs, install a 1K ohm resistor (brown-black-red) as R1 .
- If a supply of over 5 volts is directly switched to the R11’s J3 “Input” and “GND,” install a 2.2K resistor (red-red-red) as R1.
- Do not install this resistor for open collector or open drain configurations. Instead, install a trimmed component lead in its place.
- If you aren’t sure if R1 is needed for your application, it is best to install the 1k ohm resistor as R1 to give your input transistor some protection.

- C2.

- If your circuit is open collector, open drain, or requires a pull-up resistor, install R2, a 10K ohm resistor (brown-black-orange)
- For CMOS inputs or supplies that are directly connected to the R11’s input, do not install R2

- C3. If you need a pull-down resistor, install R4, a 1K ohm resistor (brown-black-red).

SETUP AND TESTING

*** **BEFORE TESTING—REMEMBER THE HIGH VOLTAGE WARNING!** ***

Do not connect a load to the J4 until testing is complete.

- T1. Verify that the unit is properly assembled for your specific application, paying special attention to section C of the assembly steps.
- T2. Connect a 12 VDC supply to either J1 or J2 “+12” and “GND” but do not apply power to the circuit at this time.
- T3. Connect the input circuit to J3 “Input” and “GND.” Don’t forget to connect the input circuit ground to the R11’s ground (J3 “GND”)!
- T4. Connect an ohm meter between the J4 “N/C” pin and J4 “COM” pin. These are the normally closed contacts of the relay, and they should be connected even without power to the circuit. The meter should measure zero or just a few ohms.
- T5. Connect an ohm meter between the J4 “N/O” pin and J4 “COM” pin. These are the normally open contacts of the relay. The meter should measure an open circuit. Leave the meter attached at this location.
- T6. Power-up the input circuit and the R11.
- T7. Set your input circuit so that it causes R11 K1 to energize. Verify, with the meter, that J4 “N/O” pin to J4 “COM” pin reads just a few ohms.
- T8. Move the meter back to J4 “N/C” and “COM”. Verify, with the meter, that these pins are an open circuit.
- T9. Power-down the input circuit and the R11.
- T10. If all the measurements have been achieved successfully you may now connect a load to the relay via J4. **If you are using the R11 to switch any voltage higher than 30 Volts, treat this circuit as a high voltage device and practice proper care and handling!**

TROUBLESHOOTING

The most common reason for a hobby kit to fail is improper installation of parts. Approximately 95% of the kits that come back to the factory for repair have improperly installed components, even after phone or email support has recommended reviewing the kit for these problems. We have thousands of examples that prove that even those with vast electronic experience can make mistakes on a simple kit! So before you reach for the phone, please recheck your kit for the following:

- Proper Parts Placement
- Proper Parts Orientation
- Solder Bridges
- Incomplete, fractured, or cold solder joints (any solder joint that causes you to have the slightest question should be re-soldered).
- Proper power connection
- Proper input circuit connection (don't forget the ground connection)

For the Faults given below, follow the instructions in the order they are given. This will lead you to where the problem exists. All voltages given have a tolerance of +/- 10%.

FAULT: Relay will not energize.

SOLUTIONS FOR ACTIVE HIGH CONFIGURATION: Ensure JMP1 is installed. Check to make sure the board is powered. Verify the input at J3 pin 2 is 1VDC or greater. If the voltage at Q2 base (input) is 0.7 Volts or greater, check Q2 and K1 coil for an open; if less than 0.5, check the input circuits R1, R2, and R4. If R4 is installed, remove it. If your switching source requires a pull-up resistor or if you are not sure, install or check R2.

SOLUTIONS FOR ACTIVE LOW CONFIGURATION: Ensure JMP1 is uninstalled. Check to make sure the board is powered. Verify the input at J3 pin 2 is 0.5 VDC or less. If Q2 base (input) is 0.7 VDC or greater, check Q2 and K1 coil for an open, if not, check Q1. If the voltage on Q1 base is greater than 0.5 VDC and R2 is installed, remove it, if the voltage is lower, check Q1 for a short.

FAULT: Relay stays energized.

SOLUTIONS FOR ACTIVE HIGH CONFIGURATION: Ensure JMP1 is installed. Verify the input voltage at J3 pin 2 is less than 0.5 VDC. If Q2's base voltage is less than 0.5 VDC check Q2 for a short, if it is higher, check R1, R2 and R4. If R2 is installed for a pull-up resistor, make sure a piece of wire is installed for R1. If necessary install R4.

SOLUTIONS FOR ACTIVE LOW CONFIGURATION: Make sure JMP1 is not installed. Verify the input at J3 pin 2 is 0.7 VDC or greater. If Q2 base (input) is 0.5 VDC or less, check Q2 for a short. If it is greater, check Q1. If Q1 base is 0.5 volts or less, check R1, R2, and R4; if greater than 0.5 volts, check Q1 for an open.

RI1 SPECIFICATIONS

Input Requirements:	Low = < 0.5 volts High = > 1.2 volts < 12 volts
Modes of Operation:	Relay Active High Input Relay Active Low Input
Relay Output Configuration:	Single Pole, Double Throw
Maximum Switching Rate:	300 operations/minute (no load) 30 operations/minute (full load)
Maximum Load:	10 Amps @ 120/240VAC 10 Amps @ 28 VDC
Power Requirements:	12VDC @ 50mA
Dimensions:	1.5in (W) X 2.5in (L) X 0.875in (H) 31.1mm (W) X 63.5mm (L) X 22.2mm (H)
Weight:	0.7 Oz, 0.0198 Kg

CONCLUSION

We sincerely hope that you will enjoy the use of this Ramsey product. As always, we have tried to compose our manual in the easiest, most “user friendly” format possible. We value your opinions, comments, and suggestions on what you would like to see in future publications. Please submit comments or ideas to:

Ramsey Electronics, LLC
Attn. Hobby Kit Department
590 Fishers Station Drive
Victor, NY 14564

or email us at: techsupport@ramseyelectronics.com

And once again, thanks from the folks at Ramsey!

THE RAMSEY KIT WARRANTY

1. GENERAL:

Notice that this is not a "fine print" warranty. We want you to understand your rights and ours too! All Ramsey kits will work if assembled properly. The very fact that your kit includes this new manual is your assurance that prior to release of this kit, a varied group of knowledgeable people have assembled this kit from scratch using this manual. During this process, changes and additions are noted by each assembler and integrated into the final version of the manual...which you have! If you need help, please read through your manual carefully, all information required to properly build and test your kit is contained within the pages! However, customer satisfaction is our goal, so in the event that you do have a problem, please note the following:

2. DEFECTIVE PARTS:

It's always easy to blame a part for a problem in your kit. Before you conclude that a part may be bad, thoroughly check your work. Today's semiconductors and passive components have reached incredibly high reliability levels, and it's sad to say that our human construction skills have not! But on rare occasions a sour component can slip through. All of our kit parts carry the Ramsey Electronics Warranty that they are free from defects for a full ninety (90) days from the date of purchase. Defective parts will be replaced promptly at our expense. If you suspect any part to be defective, please mail it to our factory for testing and replacement. Please send only the defective parts, not the entire kit. The part(s) MUST be returned to us in suitable condition for testing. Please be aware that testing can usually determine if the part was truly defective or damaged by assembly or usage. Don't be afraid of telling us that you "damaged it" or "burned it out", we're all human and in most cases, replacement parts are very reasonably priced. Remember, our goal for over three decades is to have a happy customer, and we're here to work WITH you, not AGAINST you!

3. MISSING PARTS:

Before assuming a part value is missing, check the parts listing carefully to see if it is a critical value such as a specific coil or IC, or whether a RANGE of values is suitable for the component (such as a "100 to 500 uF capacitor"). Often times, common sense will solve a mysterious missing part problem. If you're missing five 10K ohm resistors and received five extra 1K resistors, you can pretty much be assured that the "1K ohm" resistors are actually the "missing" 10 K parts ("Hum-m-m, I guess the orange band really does look red!") Ramsey Electronics project kits are packed with pride in the USA by our own staff personnel. While separate QC checks are made on all product kits, we too are human, and once in a great while there is a chance something can get through those checks! If you believe we packed an incorrect part or omitted a part clearly indicated in your assembly manual for your Ramsey kit, please contact us with information on the part you need. Contact our Repair Department via telephone, email or writing. Please have your invoice number and date of purchase handy.

4. REFUNDS:

All Ramsey products, kit or factory assembled units have an unconditional 10 day (from the date of purchase) return policy to examine our products. If you are not satisfied for any reason, you may return your unassembled kit with all the parts and instructions, or your factory assembled and tested product, together with your proof of purchase to the factory for a full refund less shipping. The return package should be packed securely. Insurance and tracking is highly recommended. A reminder, this applies to unassembled kits. They must be in the same new condition as received, not partially assembled! Assembled kits cannot be returned for credit. No RMA's are required; simply return to Ramsey Electronics LLC, Attn: Product Returns, 590 Fishers Station Drive, Victor, NY, 14564. If you have any questions, please contact us at 585-924-4560.

5. FACTORY REPAIR OF ASSEMBLED KITS:

Most of us at Ramsey are technically oriented and we do realize that things happen! Even following the best practices, with all of the best intentions, there is that chance that your kit doesn't work when you have completed it. Each manual goes into detailed troubleshooting based on the specific kit to help you troubleshoot the problem. We have found that 95% of returned kits involved wrongly installed components (wrong part or backwards polarity). This section of the warranty assumes you have gone through all those steps, and have now reached the point that you need to send it back.

To qualify for factory repair of customer assembled kits, the following conditions apply:

1. Kits must not be assembled with acid solder flux
2. Kit boards or circuits must not be modified in any manner from the version received
3. Kits must be fully assembled, not partially assembled. Our warranty does not include "finishing" your kit!
4. Must include a full description of the problem encountered including the troubleshooting steps you have already done.
5. Must not include non-standard, non-Ramsey accessories, cases, enclosures, knobs, etc. or any batteries.
6. Must include the minimum repair fee of \$25 USD in the form of check, money order or credit card authorization.
7. Ramsey Electronics, LLC reserves the right to refuse any repair due to excessive errors in construction methods.
8. If, due to customer construction methods, the repair is estimated to exceed the minimum flat rate, Ramsey Electronics, LLC will contact the customer to discuss the repairs needed and to receive authorization and payment for repair prior to repair.
9. In the unlikely case that a defective part is found to be the cause of the problem, the repairs will be made at no-charge to the customer, and any payments received for repair will be returned or credited back to the customer.
10. Properly pack your kit, insure the package, and use a carrier that can be tracked. Ramsey Electronics, LLC is not responsible for any loss or damage in shipment. Send the package together with your repair fee to the return address below. No RMA is required.

6. FACTORY REPAIR FEES:

Please understand that our Tech Support Group personnel are not volunteers! They are a dedicated group of highly trained technicians each configured with a very properly equipped test bench. Upon receipt of a repair, the setup, testing, diagnosis, repair, paperwork, and repacking of your kit requires nearly an hour of their time regardless of the size or complexity of the kit! The minimum repair fee represents ½ hour Tech Support time at \$50/hour USD. We try to keep all kit repairs within the realm of the \$25 flat rate whenever possible...and trust us; we exceed that time spent on most kits received more often than not!

7. CONTACT INFORMATION AND RETURN ADDRESS:

Technical Questions

RAMSEY ELECTRONICS, LLC
Attn: Tech Support
590 Fishers Station Drive
Victor, NY 14564
585-924-4560; 585-924-4886 Fax
techsupport@ramseyelectronics.com

Product Repair & Returns

RAMSEY ELECTRONICS, LLC
Attn: Repairs
590 Fishers Station Drive
Victor, NY 14564
585-924-4560; 585-924-4886 Fax
repairs@ramseyelectronics.com

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REQUIRED TOOLS

- Soldering Iron
- Thin Rosin Core Solder
- Needle Nose Pliers
- Small Diagonal Cutters

ADDITIONAL SUGGESTED ITEMS

- Helping Hands Holder for PC Board/
Parts
- Desoldering Braid

Manual Price Only: \$5.00
Ramsey Publication No. MR11
Assembly and Instruction manual for:
RAMSEY MODEL NO. R11
Relay Interface



RAMSEY

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590 Fishers Station Drive
Victor, New York 14564
Phone (585) 924-4560
Fax (585) 924-4555
www.ramseykits.com

TOTAL SOLDER POINTS

36

ESTIMATED ASSEMBLY TIME

Beginner..... 1.5 hrs
Intermediate..... 1 hrs
Advanced..... 0.5 hrs