

# RHL-RIA30 Radio Interface Installation Manual

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## REV A.2

This document is intended for certified, Locution FSA system installers and associated certified radio installation personnel only. Proprietary Locution Systems, Inc. document



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# 1. Overview

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Locution Systems is not a vendor of radio equipment or radio system technical engineering design. Because of the close link required with existing radio systems integrated with the Locution Fire Station Alerting (FSA) systems, the Locution RHL-RIA30 was developed as a radio bridging interface device. This device is intended to save radio installers significant time by eliminating the need for each radio shop to come up with an acceptable radio interface device to meet the required specifications for the Locution FSA to station backup radio interface.

The primary Locution FSA is a TCP/IP based data system that communicates with Fire Stations based on an existing LAN (Local Area Network) connection. When the Locution primary network system is deployed the existing radio system is used only as a secondary backup to the primary system. This is an important distinction to understand when evaluating a transition from a manual, radio only solution, to the Locution TCP/IP based automated network solution.

Alternately Locution provides a radio only solution option that automates the existing radio system infrastructure without using a network based solution directly to the Fire Stations. Both types of systems, and combinations of the systems, are frequently used. Both system configurations use the existing radio system infrastructure and benefit from the use of the Locution RHL-RIA30 standardization in terms of the base radio interface.

## 2. RHL-RIA30 Requirements and Functions (Quick List)

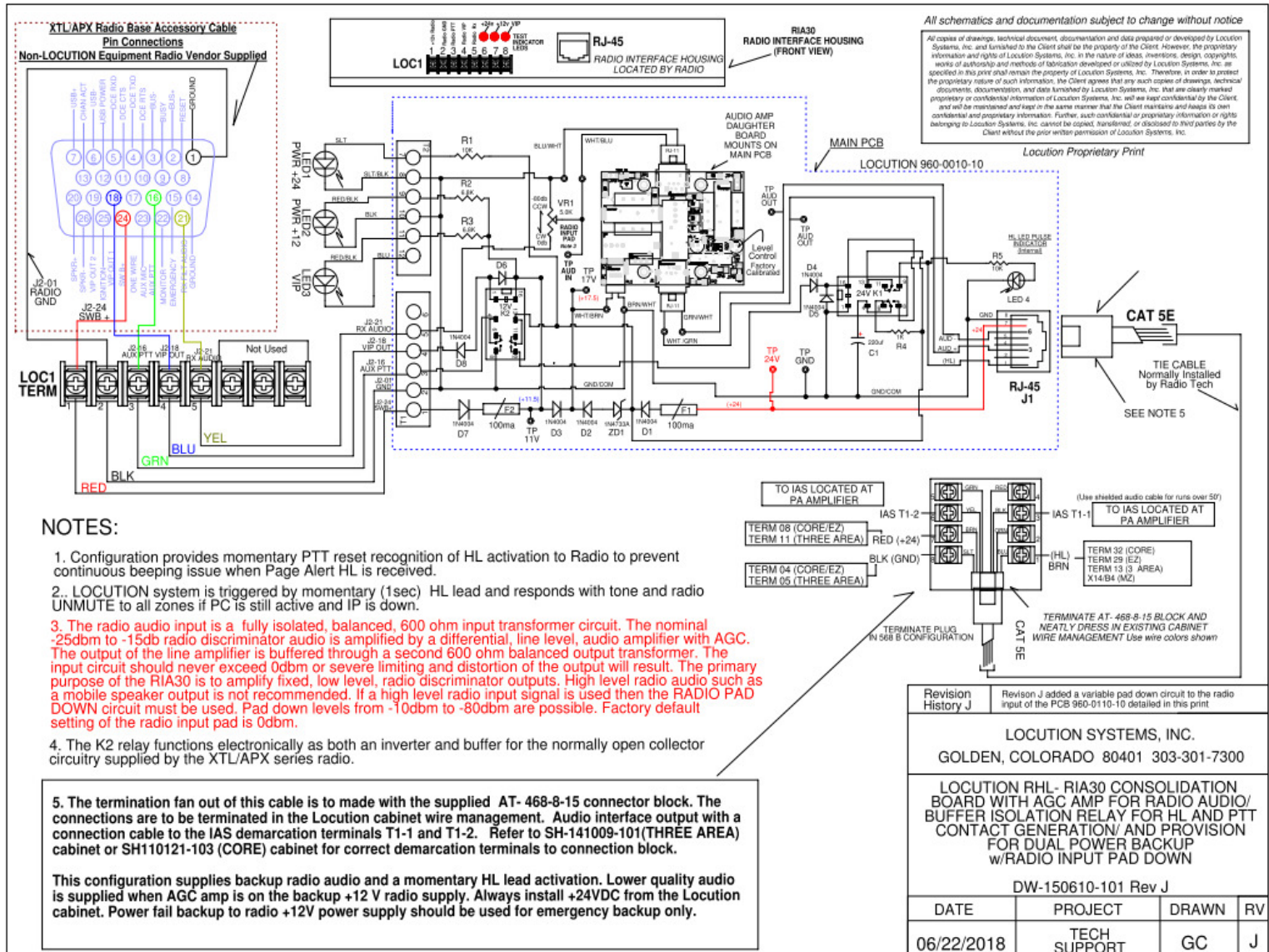
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- The Locution RHL-RIA30 is designed to be used primarily on Motorola XTL and APX series radios utilizing the 26 pin ACCESSORY PLUG connector provided on these models.
- The required radio output is a non-squelched DISCRMINATOR level audio, which provides a fixed radio audio output level independent of any of the front panel audio level settings on the radio base. This level from the radio is between -25dbm and -15dbm depending on the model of receiver used.
- Radio input levels other than the intended DISCRIMINATOR levels may be used, but are not recommended. This is especially true if the output level can be varied by the control knob or buttons on the front of the radio. It is also understood that some radio manufacturers' models may not provide DISCRIMINATOR level audio. A pad down circuit must be used for any radio audio level exceeding 0dbm. If this precaution is not observed the output of the RHL-RIA30 output audio will distort and become unusable due to the overdrive of the AGC (Automatic Gain Control) circuitry in the RHL-RIA30.
- The RHL-RIA30 provides additional signaling interface and buffer functions. These are normally used in conjunction with the CALL ALERT features of Motorola P25 digital networks. The RHL-RIA30 is compatible with all Locution Tier 1, Tier 2 and Tier 3, radio backup definitions.

- The RHL-RIA30 is an active device that requires external power be supplied. This power under normal conditions is supplied by the Locution FSA cabinet that the RHL-RIA30 is connected to. Additionally backup 12VDC power is supplied by the radio base. The RHL-RIA30 will always choose the 24 VDC from the Locution cabinet. If for some reason there is a failure within the power supply from the Locution cabinet, the RHL-RIA30 will draw power from the radio 12VDC. This insures that the RHL-RIA30 will provide backup radio audio as long as either power supply is active. This is an important backup failure function to recognize.
- The RHL-RIA30 is placed directly at the radio base receiver and is allowed a cable length run of 100m (330ft) between the radio and Locution FSA cabinet using standard CAT5E cable. CAT-5E installation cable is terminated in a standard 568B configuration for all interconnections.
- The RHL-RIA30 requires the installation of an ACCESSORY PLUG for each RHL-RIA30 Interface Unit at a station. The ACCESSORY PLUG connection cable from the radio base to the RHL-RIA30 terminal block should not exceed (3m) or approximately (10ft). The RHL-RIA30 should be placed within this distance from the radio base. The RHL-RIA30 should not be placed directly on the radio base or linear power supply as a "best practice" to avoid potential ingress coupling. The RHL-RIA30 must be located at the radio base, which can be up to 100m/330ft away from the Locution FSA control cabinet.
- The ACCESSORY PLUG is to be provided and installed by a qualified Motorola Radio installer. The station radios themselves (XTL/APX series) are to be provided by the agency or radio vendor.
- The ACCESSORY PLUG configuration is the standard twenty six (26) pin Motorola designation on both the XTL and APX series radios. There is one (1) ACCESSORY PLUG for each station radio which correlates to the one (1) Locution RHL-RIA30 required for every station radio.
- Everything related to the ACCESSORY PLUG is the domain of the radio installer and requires that the radio installer build the ACCESSORY PLUG adapter with the correct pins and wiring to match the Locution RHL-RIA30 interface specification. The ACCESSORY PLUG build is always to be the scope of the Motorola installer not Locution Systems.

# 3 Detailed Schematic and Installation Wiring Detail

## 3.1 SCHEMATIC AND WIRING DIAGRAM RHL-RIA30



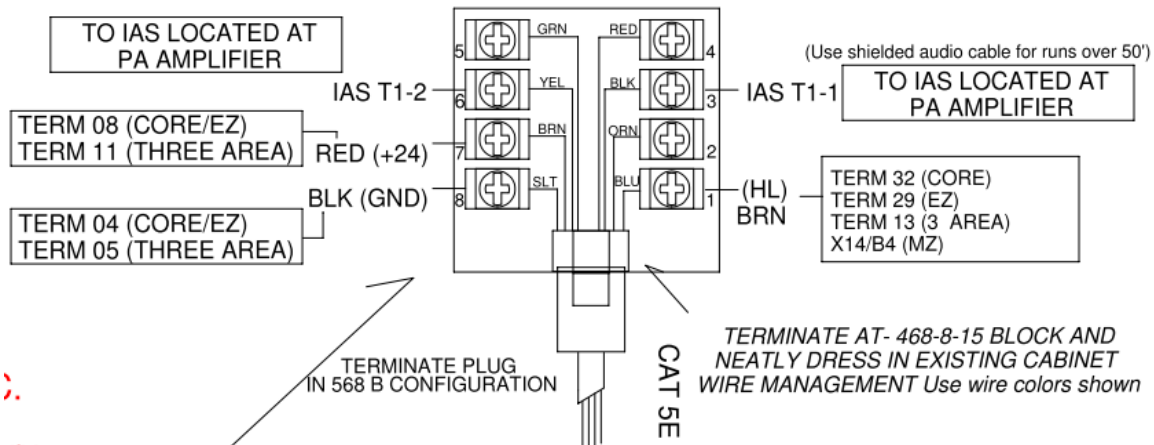
The wiring shown in Schematic 3.1 is for the standard Motorola XTL and APX series radios. The schematic shows the required five (5) wires that must be connected for the full functionality of the RHL-RIA30 with all signaling and audio amplification features.

### NOTE:

- It is possible to use only the audio amplification portion of the interface. No PTT, or VIP lead control.
- The VIP signaling lead can be used as a buffer for legacy radio devices such as the Federal Signal Informer to provide an HL signal to the Locution cabinet.

## 3.2 Installation to the Locution Cabinet

The supplied TERMINATION BLOCK for connection of the RHL-RIA30 radio interface is shown in Diagram 3.2.1 below.



**DIAGRAM 3.2.1**

The TERMINATION BLOCK is terminated and stored in the existing vertical wire management chamber of the Locution cabinet. This is true for all Locution cabinet types. The TERMINATION BLOCK has three (3) wires that terminate to the Locution cabinet demarcation blocks: (+24VDC, GND, and HL) and two (2) audio wires (T1/T2 balanced) that are run to the Locution IAS (Intelligent Audio Switch) box. Runs over 50 ft to the IAS should as a best practice use shielded audio wire to the IAS. The shield, if used, should be tied to an available GND terminal at the amplifier. The shield should only be terminated at one end of the audio cable run.

## 3.3 CALL ALERT SIGNALING (VIP LEAD TRIGGER)

The radio VIP lead, when taken to radio GND, produces a +24 VDC signal on Terminal 1 of the TERMINATION BLOCK. This +24VDC is used to trigger the Locution cabinet HL lead. This HL trigger causes the Locution software to activate the Locution cabinet in a prioritized radio backup mode. The HL mode activates non data functions for a specific period of time. (180 sec default) These functions include unmuting the radio audio, triggering FSA lights, and triggering Response Timers. **The HL lead trigger is only recognized in software if network connectivity is down.** The HL lead will be ignored if the network is up. This is useful for situations where the radio HL lead is activated for every dispatch to the station base radio. The radio audio would then need to remain muted unless network dispatching is down.

The timing and signaling of the RHL-RIA30 is intended for use with Motorola CALL ALERT digital signaling. This mode of signaling requires that the Locution LCDI (Locution Console Data Interface) be installed on a dedicated Motorola MCC-7500 console position. The LCDI software then generates a CALL ALERT signal to the station radio if the Locution PrimeAlert Server detects that network connectivity to a station is down and that the dispatch must be sent in a secondary radio backup alert mode. The LCDI software uses the alias tables in the console to send the CALL ALERT in an automated

mode in the same way that a CALL ALERT can be initiated in a manual mode on a console position.

When the CALL ALERT is received by the station radio, the radio produces a closure to ground on the VIP lead. This VIP lead is recognized by the RHL-RIA30. The RHL-RIA30 responds with an approximate 650ms closure of the PTT contact to the radio. This has the same effect as “jacking” a mic connected to the station base radio. The PTT is recognized through the radio digital signaling channel and is flagged to the LCDI software as a completed CALL ALERT. The Locution FSA system then repeats the dispatch information (audio) on the primary channel for the station or stations that have a network outage. Additionally the 650ms VIP/PTT signal is extended by the RHL-RIA30 to provide an approximately 1500ms, +24VDC, signal to the Locution cabinet HL trigger lead. This 1500ms allows accurate software recognition of the HL trigger. The HL trigger then initiates the radio backup functions programmed and hardwired into the Locution station cabinet. These would include non-data functions such as unmuting the backup radio audio, triggering the station FSA alert lighting, and triggering the Response Timer action if a Response Timer is part of the station alerting equipment package.

### 3.4 Audio Input Levels to the RHL-RIA30

The required radio output to the RHL-RIA30 is a non-squelched, DISCRMINATOR level audio, which provides a fixed radio audio output level independent of any front panel audio level settings on the radio base. This level from the radio is normally between -25dbm and -15dbm depending on the model of radio receiver used.

#### Extended Radio Input Data Point Detail (Approximate Reference Values)

The values listed below are nominal factory calibration points and are included for reference only:

|                |                                               |
|----------------|-----------------------------------------------|
| -30dBm input = | -12.25 dbm Output                             |
| -25dBm input = | -7.50 dbm Output                              |
| -20dBm input = | -2.70 dBm Output* Factory Calibration Setting |
| -15dBm input = | +2.30 dBm Output                              |
| -10dBm input = | +3.75 dBm Output                              |
| -5dBm input =  | +4.00 dBm Output                              |
| 0dBm input =   | +4.00 dBm Output* Factory Calibration Setting |

NOTE: These audio data points represent a tight AGC range on the RHL-RIA30 for radio input levels of -15 dBm and above. The AGC curve is not adjustable. The AGC action pulls the discriminator radio input up to a solid line level and limits additional increase to a nominal level comparable to the Locution SCU (Station Control Unit) output for accurate single input mixing. The 0dBm level should not be exceeded without using a pad down circuit or the AGC action will distort the vocal audio above 0dBm.

Normal radio discriminator (APX/XTL series) output is low. (-30 dBm to -15 dBm) The RHL-RIA30 line amp and the AGC circuit are necessary to provide a radio audio line level that can be matched closely to the SCU line level. The circuit also balances and isolates the radio input and output audio. This represents a potential 30 dBm range that can be accommodated. The nominal input for the radio is -20dBm

### 3.5 High Level Radio Audio Input Levels to the RHL-RIA30

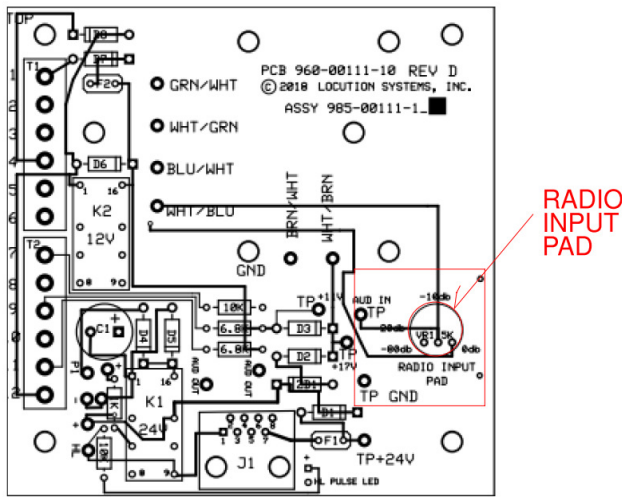
Radio input levels other than the intended DISCRIMINATOR levels may be used, but are not recommended. This is especially true if the radio output level can be varied by the control knob or buttons on the front of the radio. It is also understood that some radio manufacturers' models may not provide DISCRIMINATOR level audio. A pad down circuit

must be used for any radio audio level exceeding 0dbm. If this precaution is not observed the output of the RHL-RIA30 output audio will distort and become unusable due to the overdrive of the AGC (Automatic Gain Control) circuitry in the RHL-RIA30.

There are two acceptable means of pad down for high level radio input levels depending on the release version of the RHL-RIA30: A built in RADIO INPUT PAD, or an external TX-1A isolation transformer.

If the RHL-RIA30 PCB board is a Revision D or higher an internal -80dbm pad down control is available on the RHL-RIA30 printed circuit board. This is the only variable resistor control that should be touched as all other adjustments on the printed circuit board have been carefully factory calibrated. To gain access to the internal radio pad down control, first verify that the RHL-RIA30 is a Revision D release or higher based on the label on the bottom of the unit. If the unit is Revision D or higher remove the four (4) bottom case cover screws and expose the printed circuit board. The exact placement of the -80dbm pad is shown in Diagram 3.5.1. Using a TIMS (Test Instrument Measuring Set), or similar line level audio signal generator, input a 1K test signal level comparable to the radio input that is to be padded down. Adjust the pad down control until no

distortion in the output signal is heard. The internal RADIO INPUT PAD control has marked reduction reference points of -10 dbm, -20dbm, and -80dbm. The -80dbm pad down point turns the radio input circuit off.



### DIAGRAM 3.5.1

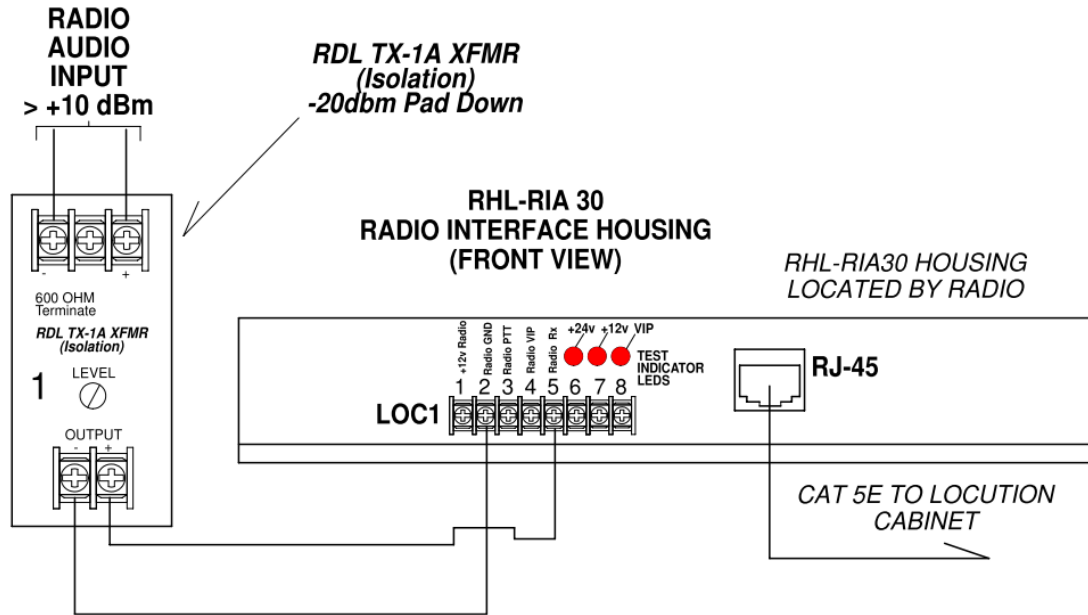
## Radio Audio Input Pad Using an External TX1-A Transformer

### DIAGRAM 3.5.2

The RDL TX-1A is available from Locution. It works as both an unbalanced to balanced isolation transformer in coupling the radio base audio output and as an adjustable -20dBm pad down circuit. Audio level at the RHL-RIA30 input must not exceed 0dBm.

Using a TIMS (Test Instrument Measuring Set), or similar line level audio signal generator, input a test 1K signal level comparable to the radio input that is to be padded down. Adjust the pad down control until no distortion in the audio output signal is heard.

**DIAGRAM 3.5.2**



## 4. RHL-RIA 30 SPECIFICATIONS

|                          |                                      |
|--------------------------|--------------------------------------|
| Input Voltage Primary:   | +24VDC                               |
| Input Voltage Secondary: | +12VDC                               |
| Power Draw Max:          | 48 ma                                |
| Input Audio Range:       | -30dBm to 0dbm                       |
| Output Audio Range:      | -15dBm to +4dBm (AGC)                |
| Dimensions:              | 7.85" L X 4.34W X 2.0" H             |
| Operational Temp Range   | 0 C to 55 C                          |
| Case Grounding           | Non-Conductive/ Fully Isolated       |
| Max Cable Length         | 10 ft Radio Accessory Plug Connector |
| Max Transmission Cable   | 330 ft to Locution Cabinet           |