*micro*HAM © 2025 All rights reserved

TRIO

Smart Antenna Switch Controller

*micro*HAM

www.microham.com

microHAM s.r.o.
Maticna 28
92401 Galanta
Slovakia

v1.2
2025

TABLE OF CONTENT

1 - DEVICE DESCRIPTION 3

2 - PANEL DESCRIPTION 4

Front Panel 4
Rear Panel 5

3 - SETUP 6

Cables connection 6
Initial menu settings 8

4.A - FRONT PANEL USER INTERFACE 10

4.B - ARXC RELAY INTERFACE (optional) 11

ARXC.REL addressing and use 13
ARXC wiring 13

4.C - WEB USER INTERFACE 14

5 - SETTINGS MENU 16

USB Firmware Update 20

6 - HARDWARE SPECIFICATIONS 21

7 - PACKAGE CONTENTS 23

8 - WARRANTY 23

DECLARATION OF CONFORMITY 24

APPENDIX A – TRIO CONNECTORS 25

APPENDIX B – RADIO CABLE DIAGRAM 26

APPENDIX C – POWER AMPLIFIER CABLE DIAGRAM 29

1 - DEVICE DESCRIPTION

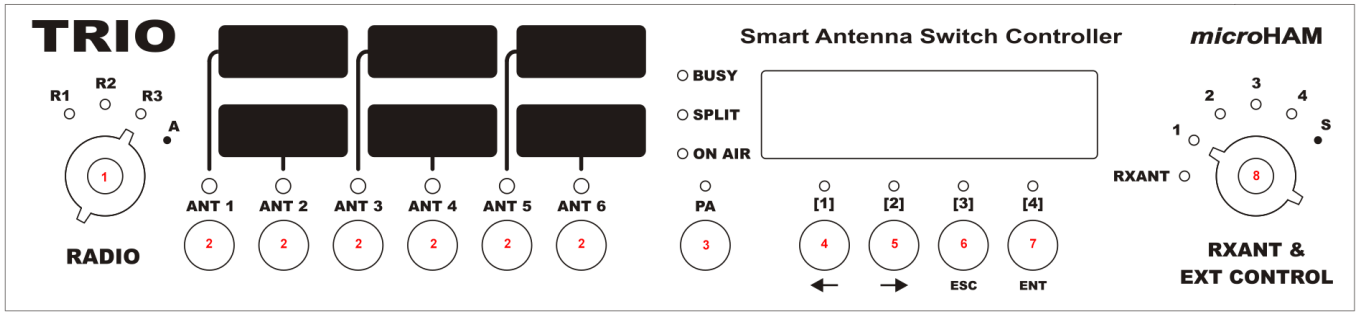
The TRIO is a remotely controlled, high power, high isolation, single radio antenna switch operating up to 70MHz. Modern, simple to setup, intuitive to use. It connects up to three (3) transceivers allowing to share common power amplifier or antenna tuner between transceivers, feeding up to six (6) RX/TX antennas, and selecting one of up to three (3) RX only antennas including a switchable bypass for a pre-amplifier or attenuator. All of this without rewiring any control or RF cable.

TRIO contains two units, a desktop TRIO CONTROLLER and an indoor TRIO SWITCH, connected by a single CAT5 cable to place both boxes optimally, thus avoiding bulky RF feedlines going to the controller located on the operating desk. The TRIO controller interconnects transceivers and amplifier control ports, providing built-in band decoder for each transceiver and one band encoder for the automatic power amplifier or tuner supporting CI-V, BCD, UDP, PTT, ALC, and INHIBIT for all connected devices. The controller unit enables complete antenna management using front panel controls and a built-in responsive web server user interface that allows the user to control the TRIO from any mobile device or computer, either locally or remotely over the Internet from a browser. A separate TRIO switch box connects all RF connections from the transceivers, amplifier, and antennas.

In addition to six (6) RX/TX antennas and three (3) RX antennas, TRIO supports up to four (4) optional ARXC.REL boxes connected to TRIO via RS-485 using CAT5 cable over distances up to 1500 m or up to 5000 m using optional ARXC.LoRa modules. Each ARXC.REL box provides four (4) individual SPDT contacts, controlled by the user-selectable template to control all types of external antenna switches including receive antenna arrays.
For each ARXC.REL box, TRIO provides separate control and real-time status on the front panel in parallel with the web server user interface.

2 - PANEL DESCRIPTION

Front Panel



1. **RADIO**
   Radio selection: Radio 1, Radio 2, Radio 3.

   A position allows automatic radio selection by related PTT input.

2. **ANTENNA SELECTION**
   Button press selects antenna. Selected antenna is indicated by RED led.
   Push and hold enables antenna split. Split is indicated by SPLIT led. TX antenna is indicated by RED, RX by GREEN led.
   SPLIT is cancelled by push and hold on RED antenna.

3. **PA**
   Enables generation of PTT for power amplifier.

4. **[1] / ←**
   Display context selection or left in menu navigation.

5. **[2] / →**
   Display context selection or right in menu navigation.

6. **[3] / ESC**
   Display context selection or return in menu navigation.

7. **[4] / ENT**
   Display context selection or enter in menu navigation.

8. **RX ANT & EXT CONTROL**

   RX ANT position – selects RX antenna RX1, RX2, or RX3.

   RxE – enables RX antenna bypass for pre-amp.

   1, 2, 3, 4 position – selects external ARXC.REL unit for control.

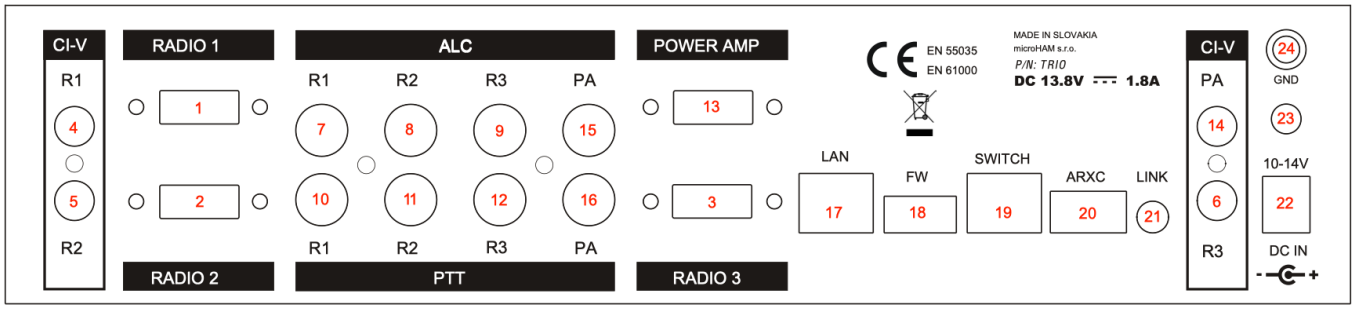
   S position - Menu

BUSY indicates state when switching to TX is not allowed, either by active inhibit, no TX antenna selected or timing sequence in progress in order to prevent hot switch.

SPLIT indicates enabled antenna split function - separate antenna for RX and TX.

ON AIR indicates when radio is switched to TX and transmits.

Rear Panel



1. **RADIO 1**
   DB9 Radio 1 port

2. **RADIO 2**
   DB9 Radio 2 port

3. **RADIO 3**
   DB9 Radio 3 port

4. **CI-V R1**
   Radio 1 CI-V port

5. **CI-V R2**
   Radio 2 CI-V port

6. **CI-V R3**
   Radio 3 CI-V port

7. **ALC R1**
   ALC output to Radio 1

8. **ALC R2**
   ALC output to Radio 2

9. **ALC R3**
   ALC output to Radio 3

10. **PTT R1**
    PTT input from Radio 1

11. **PTT R2**
    PTT input from Radio 2

12. **PTT R3**
    PTT input from Radio 3

13. **POWER AMP**
    Power amplifier port

14. **RADIO 2**
    DB9 Radio 2 port

15. **ALC PA**
    ALC input from the power amplifier

16. **PTT PA**
    PTT output to the power amplifier

17. **LAN**
    Ethernet connection to the LAN

18. **FW**
    USB A port for firmware update

19. **SWITCH**
    RJ45 connection to the TRIO SWITCH

20. **ARXC**
    External relay modules connection port

21. **LINK**
    CAN bus connection to other controller

22. **DC IN**
    Power input for controller – 13.8VDC. 5.5/2.1mm socket, positive pole on center pin.

23. **POWER**
    Power switch

24. **GND**
    Chassis, M4 stud

3 - SETUP

Installation of TRIO consists of hardware and software part. First, it is necessary to setup hardware part – connect cables.

Cables connection

1. **TRIO controller to TRIO switch.**
   Connect SWITCH to CONTROLLER using the supplied RJ45 cable. Supplied cables with RJ45 connectors are same, it doesn't matter which one is used for the switch and which for the LAN connection. On the controller make sure to plug the cable to the correct RJ45 jack as there are two RJ45 jacks, cable from the SWITCH has to be connected to the RJ45 marked **SWITCH** (without LEDs)! DO NOT connect or disconnect this cable while TRIO controller is turned on!

2. **Ethernet to TRIO.**
   Connect the RJ45 cable to the LAN jack on the controller and other end to the LAN jack on your network switch or router. Skip this step if you are not interested in having TRIO controlled by a computer.

3. **Connect transceivers.**
   Connect transceivers using the proper DB9 cable set. Some radios provide ALC and PTT ports on accessory connector, in this case, there is only one cable connecting TRIO and transceiver. Icom transceiver owners have to connect the CI-V cable to the respective RADIO CI-V jack on TRIO and the other end to the REMOTE jack on the transceiver.
   If ALC and PTT on the transceiver are bought only to a separate jacks, the cable set contains these cables too.
   If the set contains an ALC cable, connect one end to the controller's ALC jack and the other to the respective ALC input on the transceiver.
   If the set contains a PTT cable, connect one end to the controller's PTT jack and the other end to the respective PTT output on the transceiver. It can be marked as PTT OUT, SEND, TX-GND or a different name. If you are not sure what is PTT output on your transceiver refer to its user guide for details.
   If there is no dedicated cable set for your radio available (vintage radio, SDR with no HW ports, etc …) connect at least PTT output from the transceiver to the PTT input on TRIO.

4. **Connect amplifier.**
   Connect the power amplifier using the proper DB9 cable designed for your amplifier. If there is no such cable available, connect PA PTT on TRIO (16) to the KEYIN jack on your PA as well as PA ALC jack on TRIO (15) to the ALC output on your amplifier if it is required by power amplifier manufacturer. Please refer to your power amplifier manual. ALC connection can be further electronically enabled or disabled for each radio separately in the TRIO menu.

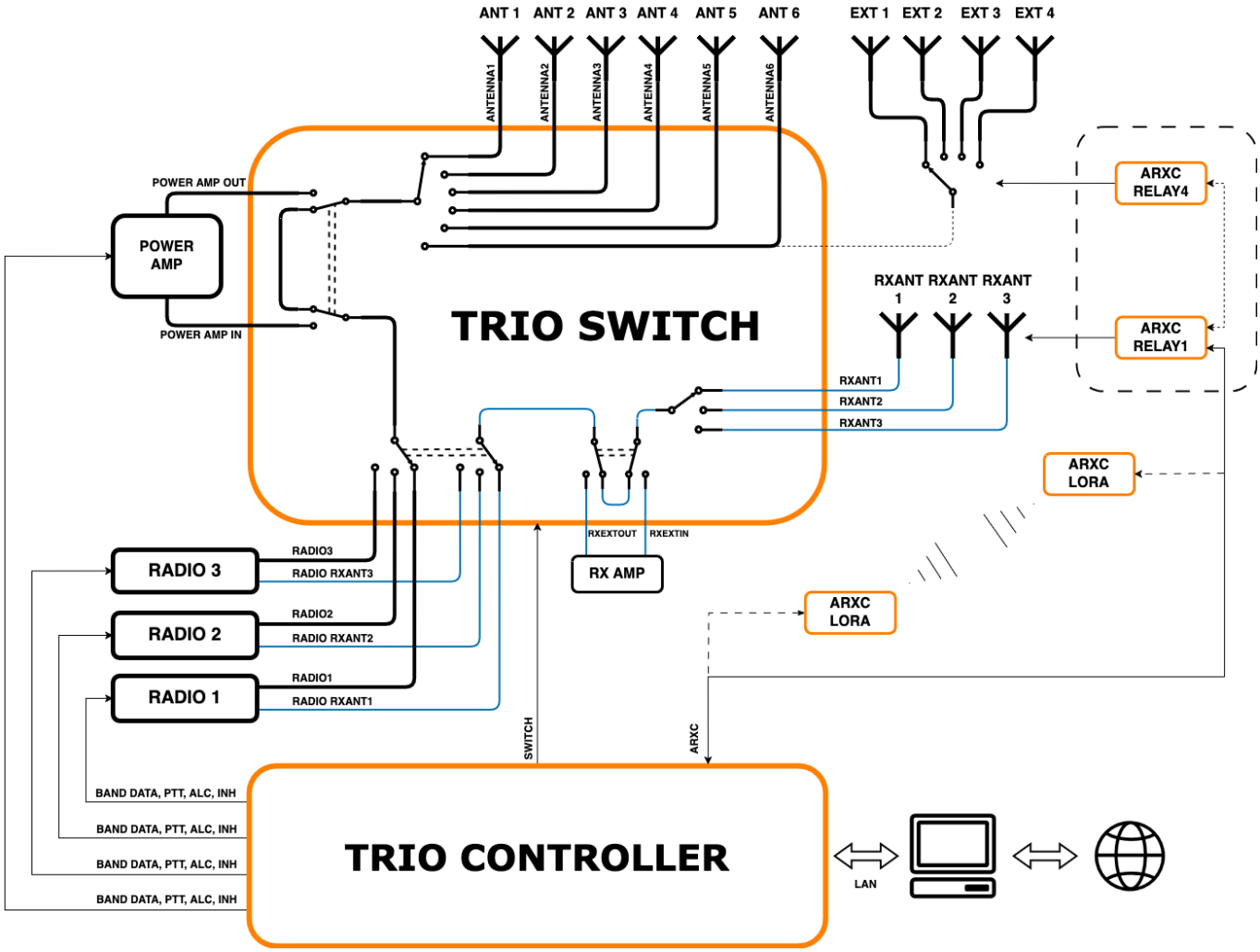
5. **RF cables to the TRIO SWITCH.**
   - Connect the antenna port of the transceiver to respective RADIO 1 – 3 ports.
   - Connect the RX antenna port of the transceiver to the respective RXANT R1 – R3.
   - If desired, connect the receive preamplifier input or attenuator to the RX EXT IN port, and output to the RX EXT OUT port.
   - Connect the power amplifier input to the POWER AMP IN port.

- Connect the power amplifier output to the POWER AMP OUT port.
- Connect RX/TX antennas to ANTENNA 1 – 6 ports. Mark each port with the antenna name for reference.
- Connect RX antennas to RX ANT 1 - 3 ports. Mark each port with the antenna name for reference.

6. **Power**
   Connect the 10-14VDC power supply to the power jack able to deliver at least 1.8A. Watch proper polarity, positive pole has to be on the center of 2.1/5.5mm plug.

7. **Grounding**
   Ground the controller case using the grounding stud (24) to the central ground point in your shack.

At this point, you can power the TRIO on by rear power switch. Keep transceivers and the amplifier turned off and prepare basic menu settings.



Initial menu settings

Before TRIO is used for the first time, it is necessary to set basic parameters of connected transceivers and power amplifier.

If transceivers used with TRIO provide some kind of band data information, TRIO has to be set to receive this information using its menu system. To enter the menu, the RXANT knob must be at the S position. Arrow <> keys are used for browsing to required menu item marked by M + reference number with abbreviated description. Pressing the ENT key cursor moves to the bottom line where arrow keys modify parameter value. Once the parameter is set, ESC key returns the cursor to the root level and arrow keys navigate to the next menu item. Once all required menu items are set, menu editing is left by turning the RXANT knob out of the S position. The menu is accessible anytime by turning knob to the S position and changing each menu item to desired value.

M10: CAT1 DATA

- sets CI-V or BCD band data input. For Yaesu and Elecraft radios set BCD. For Icom radios set to CI-V. There is also UDP choice allowing to receive frequency of the radio by UDP broadcast packets from logger over LAN, but it is not applicable in this step.

  If you are using the Icom transceiver with the the CI-V connection to TRIO, note also the CI-V speed in the next menu M11 which has to match the CI-V speed settings in the transceiver menu. By default TRIO is set to 9600Bd.
  If you are an owner of a modern Icom radio with USB connection, we recommend the following CI-V menu settings in the radio which allows independent TRIO update over CI-V and computer control over USB CI-V port. (IC-7300 and later)

  USB Serial Function = CI-V
  CI-V Baud Rate = 9600
  CI-V Address = default CI-V address of the radio
  CI-V Transceive = ON
  CI-V USB to Remote Transceive address = default remote address of the radio
  - address must be different to CI-V Address!
  CI-V Output (for ANT) = OFF
  CI-V USB Port = UNLINK (when available)
  CI-V USB Baud Rate: 115200
  CI-V USB Echo Back: OFF

- set accordingly menu **M12-M15** for Radio 2 and Radio 3.

M21: CAT PA SPEED

For automatic amplifiers, TRIO provides BCD band data and CI-V band data. Factory-designed PA DB9 cables use CI-V to inform the power amplifier (Acom, Expert, OM-Power) about transceiver frequency. This menu item sets CI-V communication speed (by default 9600Bd), which must be the same as is set in the power amplifier menu. Power amplifier communication has to be set to Icom CI-V as TRIO looks for the amplifier as an Icom transceiver. Next menu **M22** allows to set CI-V address of such simulated Icom transceiver.

M23: PA PTT TAIL

Sets how long will TRIO keep amplifier keyed after the PTT from the radio is released. To avoid hot switching, it is good to keep at least default 30ms delay, as some transceivers drop PTT output prematurely while RF is still present on its antenna connector.

M24: PA INH

Sets whether TRIO has to consider KEYOUT signal from the amplifier and block RF power from the transceiver while the T/R sequence is in progress in order to avoid hot switching. If your PA supports this feature (most do), set this function to ENABLE. When transceiver RF power is inhibited, TRIO turns on the BUSY light on the front panel.

Please note, that SPE Expert amplifiers has this signal inverted, menu **M25** has to be set to INVERT for these amplifiers. ACOMs and OM-Powers need this menu **M25** set to NORMAL.

M26: ARXC INH DLY

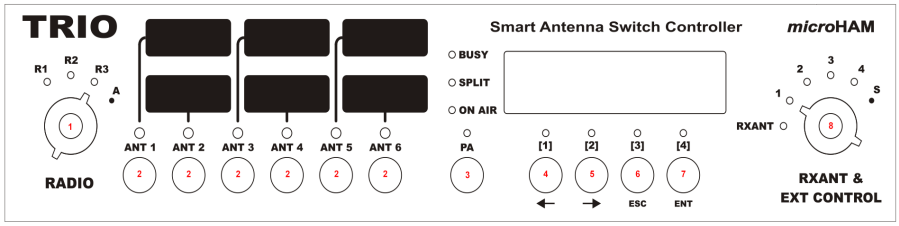
Sets duration of the inhibit signal generated by the TRIO to the radio according to T/R timing of the switch connected to any ARXC box. Applies when ARXC(x) Tx INH menu **M46-49** is enabled.

M27: RADIO1 ALC

Sets whether TRIO has to transfer ALC signal from the power amplifier to the radio. If it is desirable and recommended by an amplifier manufacturer to control drive power by ALC, set it to ENABLE. Set accordingly menu **M28** and **M29** for Radio 2 and Radio 3.

4.A - FRONT PANEL USER INTERFACE

TRIO can be operated either from the front panel, or from the browser on a computer or mobile device. This chapter describes the operation from the front panel.



RADIO SWITCHING
Radio switch (1) selects "transmit focus", sets which transceiver is connected to the amplifier and antennas. Switch has special AUTO position [A] which allows automatic focus change based on PTT input signal arriving from transceivers. AUTO position is suitable for quick radio change without touching the controller. Short click with PTT button on a microphone or footswitch attached to the radio will switch focus to the radio in use.

MAIN ANTENNAS SWITCHING
Next to the RADIO switch are six ANTENNA SELECTION buttons (2). A short press on each button selects the connected antenna indicated by the LED above the button. Changing the antenna during TX is prohibited. If there is an attempt to do this, the LED above the new antenna selection will blink and the command applies after PTT is released.

A long press on the antenna selection button enables the ANTENNA SPLIT function indicated by the SPLIT led next to the display. In antenna split mode TRIO connects different antenna for RX and TX, and switches them automatically with PTT. The antenna for TX is indicated by red led, antenna for RX by green led. If RX antenna is same as TX, indication is red. The operator can change antenna for RX directly by pressing the desired antenna selection button. A long press on different antenna button will change the TX antenna keeping antenna SPLIT enabled. A long press on selected TX antenna disables the SPLIT function.

There are a few more advanced functions TRIO provides for antenna selections.
First is that some antenna can be set as RX only if RX only antenna is connected to the RX/TX antenna port. When such an antenna is selected, TRIO raises the INHIBIT signal to the radio preventing RF power from being sent to antenna connector which is indicated by turning on the BUSY led. Yaesu, Elecraft, and Flex radios support external inhibit, Icom and Kenwood do not. To mark some of the antennas as RX only, enter **M1: Rx-ONLY ANTs** menu, push ENT and select RX only antennas by pushing the antenna buttons. If is desirable to use connected monoband antenna also as a RX antenna on non TX bands, they can be selected as RX only antenna in this menu too, antennas can be enabled for TX on supported band in menu M2.

Second is that TRIO allows to define TX antennas available for each band individually if is supplied by band data information from the radio, either by CI-V, BCD, or UDP.
To define TX antennas enter menu **M2: Tx ANTENNAS** push ENT and select TX antennas by pushing antenna buttons for each band separately and by changing bands on the radio. Available TX antennas can be visualized by setting **M3: AVAILABLE ANT** menu to SHOW, available TX antennas will be marked by yellow led. It is also possible to prevent the selection of non TX antenna for TX for a given band by setting **M4: ONLY TX ANTs** to enable.

Each antenna button can be labeled on the front panel according to the antenna name, use supplied transparent labels, your own labels or a removable marker. Old marks can be removed by alcohol-based solvents.

POWER AMPLIFIER
Next to the antenna buttons is located the power amplifier PA button (3). Short press enables generation of PA PTT signal and opens power amplifier bypass in the TRIO switch. State is remembered for each band separately. An active state is indicated by the yellow led. When PA is enabled and TRIO receives PTT from the transceiver, TRIO immediately activates the PA PTT signal which keys the amplifier. Allow for some delay in the transceiver menu to comply with the T/R sequence timing requirements of the connected amplifier, refer to the amplifier specification sheet. TRIO PTT transfer is virtually instant using MOS driver, delay is only in order of hundreds microseconds.

SMART CONTROL – MENU, RX ANTENNAS, ARXC modules
Display, four buttons below the display and RX ANT & EXT CONTROL knob serve for multiple purposes set by a rotary knob.

When the knob is set to S position, TRIO and display enter into the menu system. Buttons ← and → navigates through individual menu items. ENT button moves the cursor to the bottom line and allows to edit particular menu item parameter with ← → buttons. ESC button escapes from editing, returns the cursor to the top line, and ← → buttons navigate back through the menu system.

When the knob is set to RXANT position, buttons [1] - [3] below the display select one of three RX antennas connected to the TRIO switch. The selected antenna is indicated by the LED above button and the RX antenna label is shown on display. The label can be changed using edit mode in the web interface. Button [4] enables or disables RX antenna loopback (RxExt) which can be used for external pre-amplifier or attenuator or for integrating additional RX antenna management system. RxExt state is remembered for each RXANT separately.

When the knob is set to 1 up to 4 positions, buttons [1] - [4] below the display control selected ARXC template. Changing the rotary knob to either 1, 2, 3, or 4 position allows to control each ARXC.REL 1 – ARXC.REL 4 module individually.

4.B - ARXC RELAY INTERFACE (optional)

ARXC RELAY (ARXC.REL) is a module with four (4) external control relays with four (4) SPDT contacts allowing the control of remote antenna switches, polarization switches, mast preamplifiers, or anything suitable to be controlled from the TRIO user interface.

ARXC.REL module contacts can be assigned to groups of three different behaviors: BCD contacts, 1 of N contacts, and TOGGLE contacts.

- **BCD** group provides output in binary code, mostly used in receive arrays control (4SQ, 8 circle) but also in some antenna switches.
- **1-of-N** group sets the output to exclusive one of N (1 of 2, 1 of 3, 1 of 4) where only one contact of N is active. Typically used for antenna switches control.
- **TOGGLE** group is actually one contact with the possibility to turn it on or off individually, for example, to enable a preamplifier, power something on/off, or any other purpose.
- There is also a special function output called **PTT** which copies PAPTT output on TRIO and can be used as an external sequencing source.

TRIO can handle up to four ARXC.REL boxes using preprogrammed templates applied to each ARXC.REL box separately. Template for ARXC1 module is set in menu **M30: ARXC1 MODE**.

Available choices are:

- **BCD4**, sets all 4 contacts to BCD outputs. Template is suitable to control 16 position switch.
- **BCD3 + TOGGLE**, sets 3 contacts to BCD outputs and one to toggle. Template is suitable to control 8 circle with separate omni position or pre-amp control.
- **BCD3 + PTT**, sets 3 contacts to BCD outputs and one to PTT. Template is suitable to control 8 circle with PTT sequencing.
- **BCD2 + 2x TOGGLE**, sets 2 contacts to BCD outputs and two individual toggles. Template is suitable to control 4 square with separate omni position and pre-amp control.
- **BCD2 + TOGGLE + PTT**, sets 2 contacts to BCD outputs, one to toggle control and one to PTT clone. Template is suitable to control 4 square with sequenced and bypass controlled pre-amplifier.
- **1-of-4**, sets all 4 contacts to exclusive 4 outputs. Template is suitable for 4 way antenna switch control.

- **1-of-3 + TOGGLE**, sets 3 contacts to exclusive 3 outputs and one toggle. Template is suitable for 3 way antenna switch control with individual pre-amplifier on/off.
- **1-of-3 + PTT**, sets 3 contacts to exclusive 3 outputs and PTT. Template is suitable for 3 way antenna switch or polarization switch (H/V/RHCP) with PTT sequencing.
- **1-of-2 + 2x TOGGLE**, sets 2 contacts to exclusive 2 outputs and two individual toggles. Template is suitable for 2 way antenna switch and 2 separate on/off output control.
- **1-of-2 + TOGGLE + PTT**, sets 2 contacts to exclusive 2 outputs, one to toggle control and one to PTT clone. Template is suitable to control 2 way switch with sequenced and bypass controlled pre-amplifier.
- **4 x TOGGLE**, set all 4 contact to four, individually controlled on/off outputs.
- **3 x TOGGLE + PTT**, set 3 contact to three, individually controlled on/off outputs with PTT sequencing. Template is suitable for 2/3 antenna stack control with sequenced preamp.

Same as menu M30 sets ARXC1 module mode, menu M31, 32, 33 sets mode for ARXC2, ARXC3, and ARXC4 modules respectively. All ARXC modules are connected in parallel to ARXC bus on TRIO, address (1, 2, 3, or 4) is set by dip-switch on the ARXC module.

If selected template contains the BCD output, menu **M34: ARXC1 DIR** sets azimuth of zero position BCD output. Menu allows to chose from 8 directions: N, NW, E, SE, S, SW, W, and NE. Feature is not available in 16 position BCD4 template.
Menu M35-37 sets azimuth direction for ARXC modules 2, 3, 4 respectively.

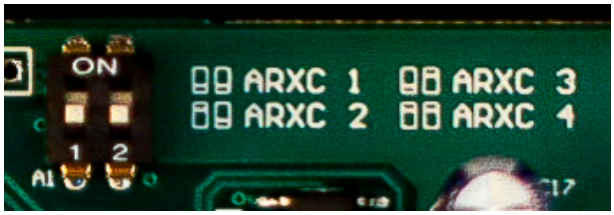
If selected template contains 1-of-N output, menu **M38: ARXC1 OFF** sets whether it is possible to toggle active output, in other words, if it is possible to set active output off without moving position to another output. When enabled, active output can be toggled by repeated press on the same button associated to the active output.
Menu M39-41 sets the OFF feature for ARXC modules 2, 3, 4 respectively.

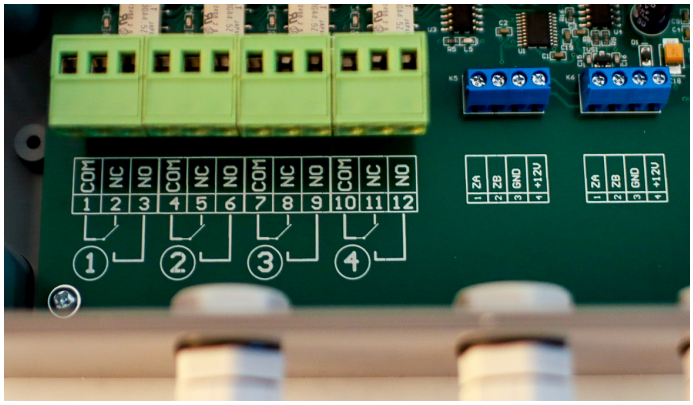
If selected template contains 1-of-N output, menu **M42: ARXC1 LINKED** allows to logically daisy-chain the outputs of two ARXC modules together in order to expand the number of outputs. Modules must be cross linked, meaning module X must be linked to module Y, and module Y to module X. Menu M33-45 sets LINK feature for ARXC modules 2, 3, 4 respectively.

If ARXC module controls antenna switch which handles additional TX antennas, it is necessary to enable protection which will prevent the switch to change state during TX same as TRIO does for main antennas. To enable protection menu **M46: ARXC1 Tx INH** has to be set to enabled.
Menu M47-49 sets protection for ARXC modules 2, 3, 4 respectively.

ARXC.REL addressing and use

To recognize and properly control a particular ARXC.REL module, each module needs to have a unique address. Address is set by a combination of the two DIP switches according to the drawing on the PC board next to DIP switch.





Contacts are located at a removable terminal block for simpler assembly. Each energized relay is indicated by LED indicator and each relay can be manually energized by related pushbutton to help in-field troubleshooting.

ARXC wiring

In order to control the ARXC module, it must be connected to the TRIO. If the control cable between the TRIO and the ARXC module, or between the different ARXC modules for any reason cannot be installed, communication can be established by the RF link using pair of ARXC LoRa modules. In this case, external 12V supply must be provided on the ARXC side of the RF link.

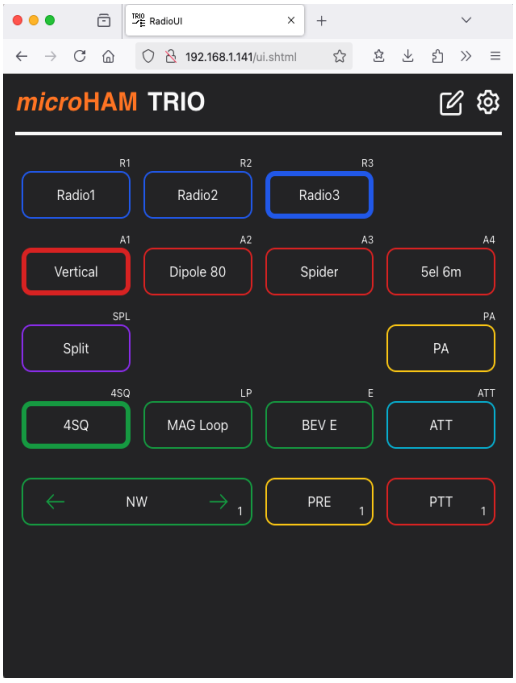
ARXC MODULE	TRIO ARXC PORT
ZA	A
ZB	B
+12V	+12V
GND	GND

Each of the ARXC module has a 4 pole terminal for connecting wires of the interconnecting cable. ZA and ZB poles serve for communication wires, +12V and GND poles serve for power. All 4 wires have to be connected to the TRIO ARXC terminal. On the ARXC.REL can be found two sets of terminals for simpler daisy-chain connection to additional modules. Both terminals are connected in parallel, it is not important which one is used. The communication line should be a twisted pair, we recommend to use readily available CAT5 or CAT6 cables. If the distance is long (hundreds of meters), terminate both ends of the communication line by a 150 ohm resistor connected between the ZA and ZB poles. Use unused wires in the CAT5 cable in parallel for each power lead connection to minimize voltage drop, especially if you use power leads also for powering other devices like a preamplifier, and antenna switch or a similar device. For proper ARXC module functionality voltage at its power terminal should be at least 7V. Maximal total consumption (including powered device) is 600mA internally limited in the TRIO by a polymer fuse. It is enough to power four ARXC modules, however, if provided power reserve is not enough due to the power requirements of controlled devices, use TRIO provided power output only for ARXC modules and power the controlled devices using separate power supply.

Specifications:

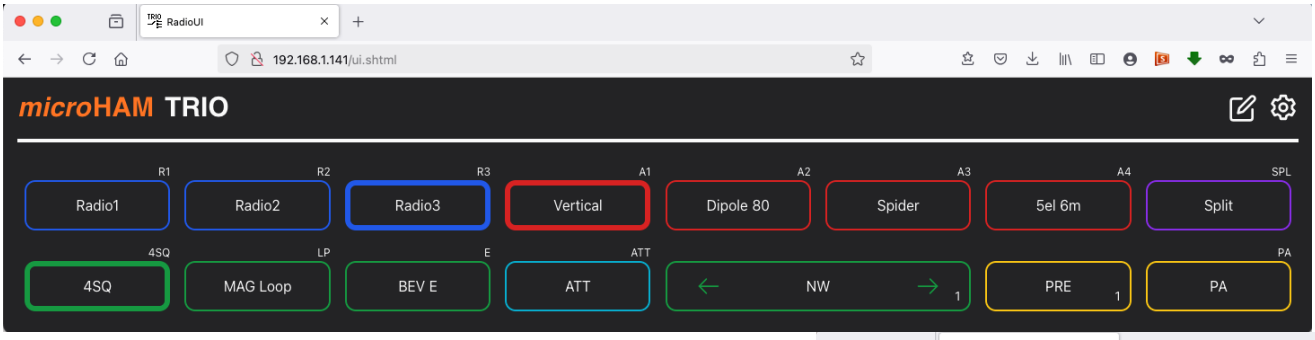
Power:	7-16V DC
Consumption:	15-150mA (depends on number of actuated relays)
Relay contacts:	Four (4) individual SPDT contacts, 30V DC, 1A

4.C - WEB USER INTERFACE

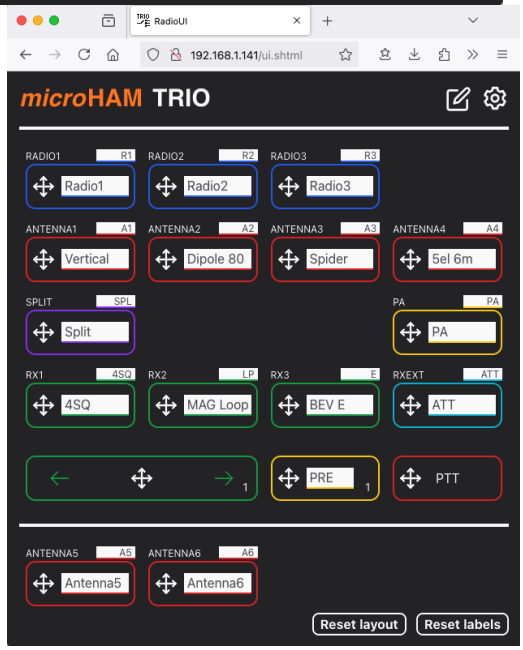


WEB interface is another way to control antennas and TRIO features, providing seamless remote control from a computer or mobile device connected to the local LAN network or Internet. Web-server built-in the TRIO provides an auto resizeable dashboard supporting any display format, and allows user to freely organize buttons to reflect needs and available real estate on computer desktop. The web interface does not contain menu settings available from the TRIO controller front panel, but supplements functions that are hard to edit on controller, like network settings, password protected access, and labels. The settings changed in the web interface are stored back to the controller.

To access web UI, first, make sure TRIO is connected to your local network same as the device you want to access TRIO from. Menu M81: USE DHCP must be set to YES and menu M82: LAN STATUS has to show assigned IP address. Then you can enter "**trio.local**" in your browser or type in the IP address of the TRIO shown in the menu M82.

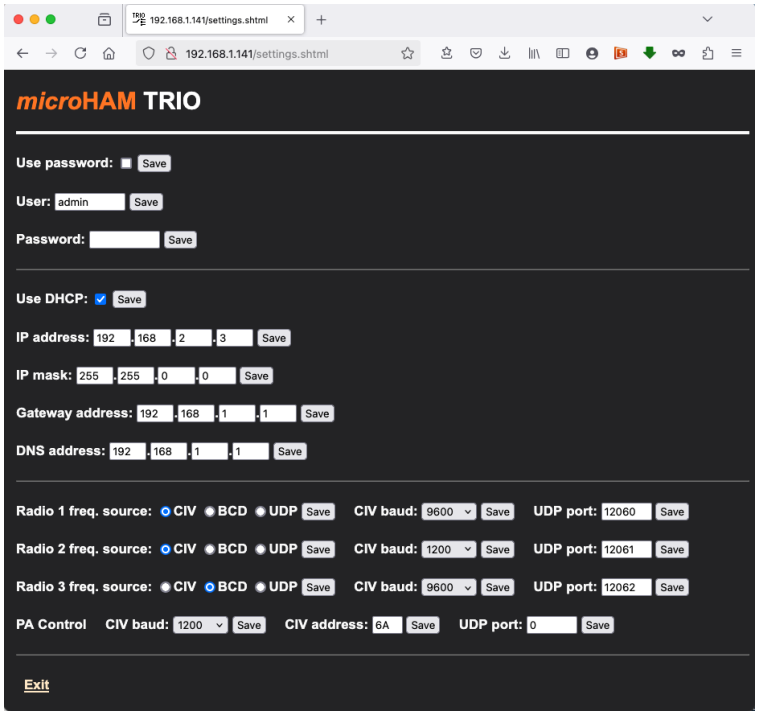


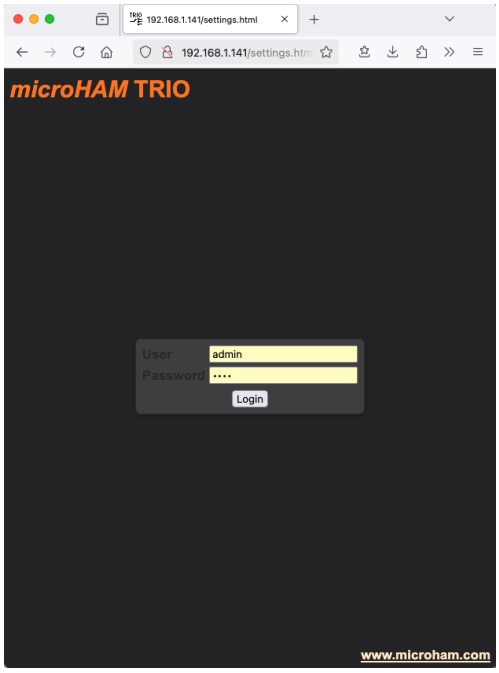
Web UI provides all buttons available on the controller front panel, including RX antennas selection and ARXC controls, all visible on the dashboard. Clicking on the notepad button UI switches to edit mode where it is possible to rename button labels, reposition buttons, and hide unused buttons by dragging them to the bottom container from where can be anytime brought back to the dashboard.



In addition, there is a SPLIT button which replaces the long press of the antenna button on the controller. In SPLIT mode, antenna buttons contain two colored halves, bold red half shows which antenna is used for TX, and bold green for RX. The split antenna button accepts a click to each half to control RX and TX part. Grey TX half indicates that the antenna is set as RX only antenna in menu M1.

Clicking on the gear icon opens the settings window allowing you to set password protected access, network parameters, CAT parameters, and UDP ports for all transceivers and power amplifier.





For operation over the Internet, you need and Internet connection with a static IP address or running dynamic DNS service on the server side. TRIO must have static IP address outside of the DHCP range of your router or reserved IP address, and you must have enabled the forwarding feature for the port 80 used by the TRIO to its local IP address in your home Internet router. Another option is to set up your own VPN and use the same web UI access as on local computer. If it is something you cannot manage yourself, please ask your Internet service provider and/or router vendor for help.

5 - SETTINGS MENU

MENU of the TRIO controller allows to set individual parameters of complete controller behavior. There are no internal switches, jumpers or trimmers, all settings can be set in menus. Settings menu is invoked by turning the RXANT rotary switch to the utmost right S position.

List of MENU Items:
- unless explicitly stated, default value is bold.

M1: Rx-ONLY ANTs — Antenna buttons select RX only antennas. Should be used for single band TX antennas or when RX only antenna is connected to one of the 6 main antenna ports. TRIO will rise INHIBIT to transceiver when selected. Default **None**.
* *Requires radio with inhibit input (Yaesu, Elecraft, Flex).*

M2: Tx ANTENNAS — Antenna buttons select TX antennas for **selected band**. Band is changed on attached transceiver. Default **None**.
* *Requires working band data transfer from at least radio.*

M3: AVAILABLE ANT — SHOW, **DO NOT SHOW**.
Enables available antennas for current band visualization.
* *Requires previous TX antenna definition in menu M2.*

M4: Tx ONLY ANTs — ENABLED, **DISABLED**.
Disables antennas not available for TX on current band.
* *Requires previous TX antenna definition in menu M2.*

M10: CAT1 DATA — **NONE**, CIV, BCD, UDP, default None.
Sets Radio 1 band data source.

M11: CAT1 SPEED — 1200, 2400, 4800, **9600**, 19200**.**
Sets Radio 1 CIV data rate.

M12: CAT2 DATA — **NONE**, CIV, BCD, UDP.
Sets Radio 2 band data source.

M13: CAT2 SPEED — 1200, 2400, 4800, **9600.**
Sets Radio 2 CIV data rate.

M14: CAT3 DATA — **NONE**, CIV, BCD, UDP.
Sets Radio 3 band data source.

M15: CAT3 SPEED — 1200, 2400, 4800, **9600**, 19200.
Sets Radio 3 CIV data rate.

M21: CAT PA SPEED — 1200, 2400, 4800, **9600**, 19200**.**
Sets power amplifier CIV data rate.

M22: CAT PA ADDR — adjustable, default **6A**.
Sets simulated Icom radio address.

M23: PA PTT TAIL — 0-500ms, default **30ms**.
Sets un-key delay for power amplifier.

M24: PA INH — ENABLED, **DISABLED**.
Sets if connected power amplifier supplies inhibit (KEYOUT) signal.

M25: PA INH INV — **NORMAL**, INVERTED.
Sets polarity of inhibit signal from the power amplifier.

M26: ARXC INH DLY — 0-500ms, default **10ms**.
Sets inhibit time for antenna switches connected to AXRC module.

M27: RADIO1 ALC — **ENABLED**, DISABLED, default Enabled.
Allows Radio 1 ALC control from the power amplifier.

M28: RADIO2 ALC — **ENABLED**, DISABLED, default Enabled.
Allows Radio 2 ALC control from the power amplifier.

M29: RADIO3 ALC — **ENABLED**, DISABLED, default Enabled.
Allows Radio 3 ALC control from the power amplifier.

M30: ARXC1 MODE — **NOT CONNECTED**, BCD4, BCD3 + TOGGLE, BCD3 + PTT, BCD2 + 2x TOGGLE, BCD2 + TOGGLE + PTT, 1-of-4, 1-of-3 + TOGGLE, 1-of-3 + PTT, 1-of-2 + 2x TOGGLE, 1-of-2 + TOGGLE + PTT, 4 x TOGGLE, 3 x TOGGLE + PTT,
Selects operating template for ARXC 1 module.

M31: ARXC2 MODE — **NOT CONNECTED**, BCD4, BCD3 + TOGGLE, BCD3 + PTT, BCD2 + 2x TOGGLE, BCD2 + TOGGLE + PTT, 1-of-4, 1-of-3 + TOGGLE, 1-of-3 + PTT, 1-of-2 + 2x TOGGLE, 1-of-2 + TOGGLE + PTT, 4 x TOGGLE, 3 x TOGGLE + PTT
Selects operating template for ARXC 2 module.

M32: ARXC3 MODE — **NOT CONNECTED**, BCD4, BCD3 + TOGGLE, BCD3 + PTT, BCD2 + 2x TOGGLE, BCD2 + TOGGLE + PTT, 1-of-4, 1-of-3 + TOGGLE, 1-of-3 + PTT, 1-of-2 + 2x TOGGLE, 1-of-2 + TOGGLE + PTT, 4 x TOGGLE, 3 x TOGGLE + PTT
Selects operating template for ARXC 3 module.

M33: ARXC4 MODE — **NOT CONNECTED**, BCD4, BCD3 + TOGGLE, BCD3 + PTT, BCD2 + 2x TOGGLE, BCD2 + TOGGLE + PTT, 1-of-4, 1-of-3 + TOGGLE, 1-of-3 + PTT, 1-of-2 + 2x TOGGLE, 1-of-2 + TOGGLE + PTT, 4 x TOGGLE, 3 x TOGGLE + PTT
Selects operating template for ARXC 4 module.

M34: ARXC1 DIR — **NONE**, N, NE, E, SE, S, SW, W, NW
Selects azimuth for display for BCD template at zero index.

M35: ARXC2 DIR — **NONE**, N, NE, E, SE, S, SW, W, NW
Selects azimuth for display for BCD template at zero index.

M36: ARXC3 DIR — **NONE**, N, NE, E, SE, S, SW, W, NW
Selects azimuth for display for BCD template at zero index.

M37: ARXC4 DIR — **NONE**, N, NE, E, SE, S, SW, W, NW
Selects azimuth for display for BCD template at zero index.

M38: ARXC1 OFF — ENABLED, **DISABLED**.
Enables toggle possibility of active output for 1-of-N temple.

M39: ARXC2 OFF — ENABLED, **DISABLED**.
Enables toggle possibility of active output for 1-of-N temple.

M40: ARXC3 OFF — ENABLED, **DISABLED**.
Enables toggle possibility of active output for 1-of-N temple.

M41: ARXC4 OFF — ENABLED, **DISABLED**.
Enables toggle possibility of active output for 1-of-N temple.

M42: ARXC1 LINKED — **NONE**, ARXC2, ARXC3, ARXC4.
Selects other ARXC module for daisy-chaining two ARXC modules using 1-of-N template.

M43: ARXC2 LINKED — **NONE**, ARXC1, ARXC3, ARXC4.
Selects other ARXC module for daisy-chaining two ARXC modules using 1-of-N template.

M44: ARXC3 LINKED — **NONE**, ARXC1, ARXC2, ARXC4.
Selects other ARXC module for daisy-chaining two ARXC modules using 1-of-N template.

M45: ARXC4 LINKED — **NONE**, ARXC1, ARXC2, ARXC3.
Selects other ARXC module for daisy-chaining two ARXC modules using 1-of-N template.

M46: ARXC1 Tx INH — ENABLED, **DISABLED**.
Prevents any output changes while radio is in TX state.

M47: ARXC2 Tx INH — ENABLED, **DISABLED**.
Prevents any output changes while radio is in TX state.

M48: ARXC3 Tx INH — ENABLED, **DISABLED**.
Prevents any output changes while radio is in TX state.

M49: ARXC4 Tx INH — ENABLED, **DISABLED**.
Prevents any output changes while radio is in TX state.

M60: R1 PA ENABLE — **ENABLED**, DISABLED.
Allows to disable the PA loop activation for Radio 1.

M61: R2 PA ENABLE — **ENABLED**, DISABLED.
Allows to disable the PA loop activation for Radio 2.

M62: R3 PA ENABLE — **ENABLED**, DISABLED.
Allows to disable the PA loop activation for Radio 3.

M70: LINK ID — **DISABLED**, 1-30.
Sets unique TRIO LINK address.

M80: USE PASSWORD — YES, **NO**.
Enables password protected access to web UI.

M81: USE DHCP — **YES**, NO.
Enables TRIO IP address assignment by the DHCP server.

M82: LAN STATUS — Connection status, displays IP address when connected to LAN.
Shows status of LAN connection and TRIO IP address.

M83: MAC ADDRESS — Shows unique MAC address of TRIO controller.

M90: BACKLIGHT — 10-100%, default **60%**.
Sets display intensity.

M91: BEEP VOLUME — 0-100%, 25% steps, default **100%**.
Sets internal beeper intensity.

M98: RESET ALL — YES, **NO**.
Resets all menu content to factory default values.

M99: NEW FIRMWARE — YES, **NO.**
Allows firmware update over LAN.
** Requires TRIO connected to Internet enabled LAN.*

After selecting YES on particular firmware version text, next process is automatic. TRIO first downloads update to its internal flash memory and if download passes without any integrity check errors, update procedure starts automatically. During update display is blank, various LEDS blink or lit, just wait until update finishes and TRIO boots to its main screen, it takes a while, up to one minute.

Do not turn off the TRIO power or disconnect LAN cable during the update. No damage will occur but you'll have to repeat update procedure again or perform update from the USB flash drive.

USB Firmware Update

If TRIO firmware cannot be updated over the internet, alternative method is to use USB FLASH ("thumb") drive:

1. Copy the update file **trio.upd** available at our webpage Downloads section to the root directory of a USB FLASH drive. Don't place the update file to any subdirectory. Don't rename the file.
2. Turn off main power switch, push and hold the **PA** button, then turn main power switch on. The red ONAIR led starts to flash. The display will remain blank.
3. Insert the USB FLASH drive to the **FW** connector on the rear panel. BUSY and SPLIT leds will briefly flash and the SPLIT led than blink while the update file is getting recognized and loaded into TRIO. This process should not take more than a minute. The new firmware will be started automatically.
4. Remove the USB FLASH drive from TRIO and continue operating.

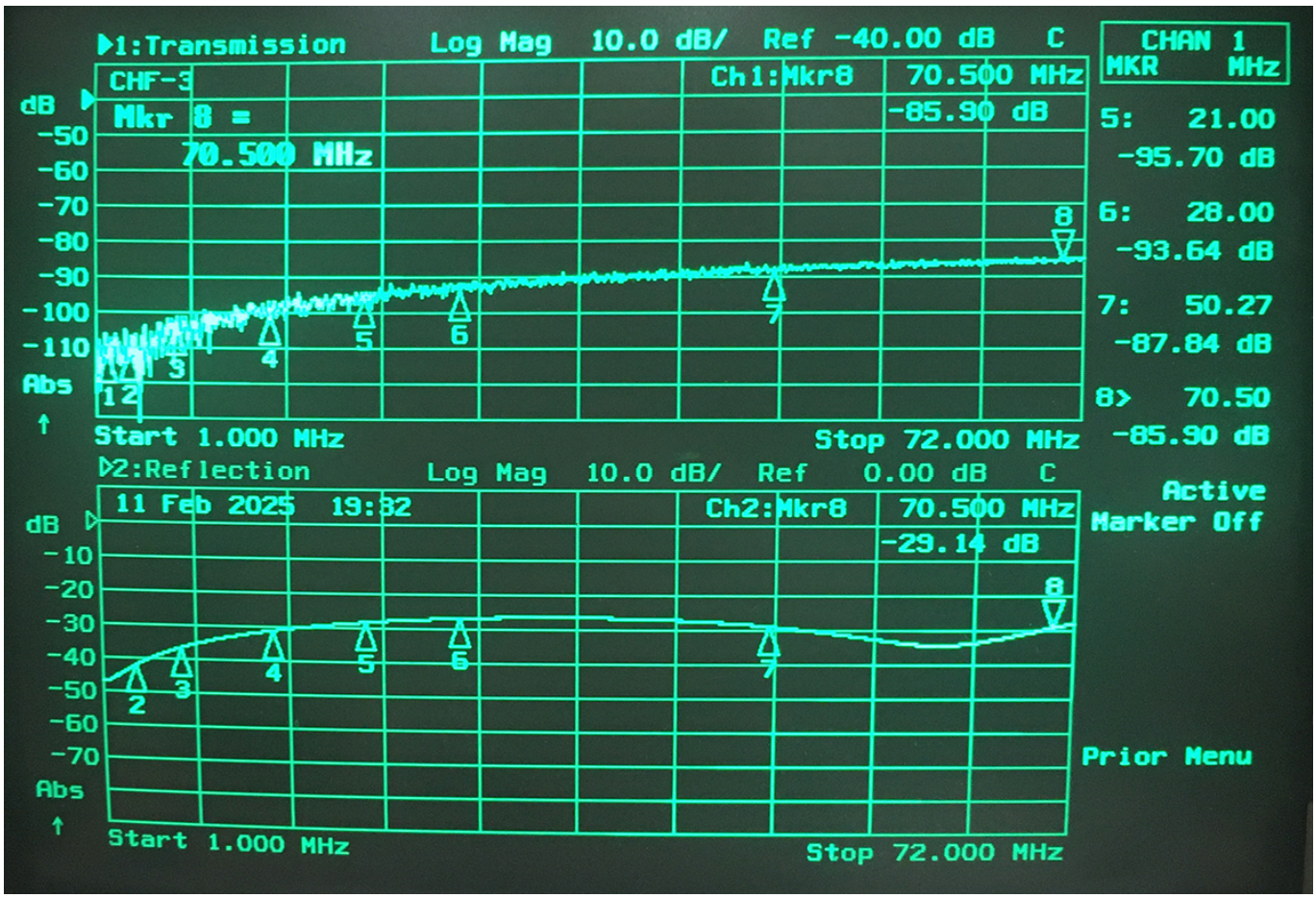
If the update process fails the BUSY, SPLIT and ONAIR leds will indicate the possible cause of failure:

- BUSY and SPLIT leds flash – **trio.upd** file not found in the root directory of USB FLASH drive.
- BUSY led lit, ONAIR led flashes – connected device is not recognized as standard Mass Storage Class USB FLASH drive. This might be a nonstandard device, a complex device, e.g. embedding an USB HUB (such as the older U3 "smart drives", or the FLASH/fingerprint combinations, etc.), or simply a different device such as a keyboard, connected by mistake.
- SPLIT led lit, BUSY led flashes – USB FLASH disk's format is unknown. This may happen, when the FLASH disk is partitioned or formatted in an unusual way. Use simple and low capacity USB FLASH disks, which usually come with traditional simple partition table and FAT file system.

Please note, that current supplied through the USB-A connector is limited to approximately 100mA, and does not allow using traditional rotary USB disks.

6 - HARDWARE SPECIFICATIONS

TRIO CONTROLLER	
POWER	11-14VDC, max. 1.8A, 5.5/2.1mm positive center socket
RADIO CAT CIV	3x input 1200-19200Bd, 3.3V levels, TTL compatible
PA CAT CIV	1x bidirectional, 1200-19200Bd, 3.3V levels, TTL compatible
PTT INPUT	4x ground activated, max. +12V
INHIBIT INPUT	1x configurable polarity, max. +12V
PTT OUTOUT	1x OptoMOS output, max. 48V, 300mA
INHIBIT OUTPUT	3x open collector, 10KΩ pullup to 12V, max. 100mA, grounded for TX
ALC	3x isolated switch, max +/- 48V, <30Ω
BCD INPUT	3x 4bit, TTL compatible, max. +12V
BCD OUTPUT	1x 4bit, open collector, max. 100mA
ARXC	RS-485 bus, +12V/600mA output, short protected
USB A	USB 2.0, full speed, mass storage, max. 100mA load
LAN	IEEE 802.3, 100BaseTX, auto MDI/MDIX
LINK	CAN bus
DIMENSIONS	W: 280mm D: 120mm H: 65mm
WEIGHT	0.5kg net
TRIO SWITCH	
POWER	max. 3KW up to 30MHz, 1.5KW up to 55MHz, 1KW up to 72MHz
	full power rating @ SWR <2.0, half power on each range @ SWR <3.0
RADIO PORTS	3x SO239
ANTENNA PORTS	6x SO239
POWER AMPLIFIER PORTS	2x SO239
RX ANTENNA PORTS	3x F
RADIO RX PORTS	5x SMA
RL	<-25~40dB @<55MHz, <-20~30dB @72MHz
IL	<-0.1 @28MHz, <-0.16 @72MHz
ISOLATION	<-90dB @28MHz, <-85dB @72MHz between adjacent radio ports
RADIO PORTS	Disconnected = open
ANTENNA PORTS	Disconnected = grounded, configurable to open on switch PCB bottom side
RX ANTENNA PORTS	Disconnected = open
RX RADIO PORTS	Disconnected = open, connected port grounded on TX
CONTROL	Serial, RJ45 cable to TRIO Controller
DIMENSIONS	W: 275mm D: 190mm H: 65mm
WEIGHT	1.7kg net



Typical parameters, VNA screenshot @ switch configuration:
Isolation between radio ports R1 and R2.
RL at R1 port connected to A6 port, A6 loaded by 50ohm.

7 - PACKAGE CONTENTS

The product includes TRIO controller 1pc, TRIO Switch 1pc, LAN cables 2pcs, power plug 1pc.

If the shipment is incomplete, please contact your supplier or us at the following address:

E-mail: support@microham.com

phone: +421 910 716 140

by Post: **microHAM s.r.o.**
Maticna 28
92401 Galanta
SLOVAKIA

8 - WARRANTY

*micro*HAM warrants this product for two (2) years. The product must not be modified in any way or the warranty is voided.

What is covered: During the warranty, *micro*HAM, s.r.o., will repair or replace defective product at their sole discretion. You must send the unit postpaid with a copy of the original invoice to the distributor from whom you purchased the product. *micro*HAM will pay return shipping.

What is not covered: This Limited Warranty does not cover (1) correction of installation or software errors in the user's computer(s), (2) damage caused by misuse, negligence, user modifications or failure to follow the user manual, (3) connection to improper or excessive voltage or voltage surges, (4) the incorrect installation of any cables connected to the device by the user, (5) using excessive power beyond specifications, or (6) weather related storm, lightning or electrostatic discharge damage.

*micro*HAM assumes no liability or responsibility for damage to other devices or injuries to persons as a consequence of using our products.

If the terms of the above warranty are not acceptable, return the unit, all associated documents and accessories in the original package, prepaid, to *micro*HAM or to your supplier for refund less shipping and a restocking fee.

DECLARATION OF CONFORMITY

European Union Declaration of Conformity

We, microHAM s.r.o., Matičná 28, 92401 Galanta, Slovakia, declare under our sole responsibility for the equipment name TRIO (TRIO Controller + TRIO Switch), model TRIO, serial number 0001 and higher that the equipment is in conformity with the following relevant Union harmonization legislation directives:

2014/35/EU relating to electrical equipment safety designed for use within certain voltage limits
2014/30/EU relating to electromagnetic compatibility and that the equipment is in conformity with the following harmonised standards and/or other normative documents or technical specifications:

EMC 2014/30/EU:
EN 55032:2015+A11:2020
EN 55035:2016
EN 61000-4-2:2009
EN 61000-4-3:2006+A2:2010
EN 61000-4-4:2012
EN 61000-4-5:2014+A1:2017
EN 61000-4-6:2013
EN 61000-4-8:2010
EN 61000-4-11:2019

RoHS 2015/863/EU:
EN 63000:2018

On behalf of microHAM s.r.o.
Ing. Jozef Urban, CEO
30th January 2025

Federal Communications Commission Statement (USA)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna. Increase the separation between the equipment and receiver. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. Consult the dealer or an experienced radio/TV technician for help.

Information for Users on Collection and Disposal of Old Equipment and used Batteries.

These symbols on the products, packaging, and/or accompanying documents mean that used electrical and electronic products and batteries should not be mixed with general household waste. For proper treatment, recovery and recycling of old products and used batteries, please take them to applicable collection points, in accordance with your national and local legislation.

APPENDIX A – TRIO CONNECTORS

DB9 RADIO1, RADIO2, RADIO3

NAME	TYPE	PIN	DESCRIPTION
INHIBIT	OUTPUT	1	open collector
BAND DATA 3	INPUT	2	TTL
BAND DATA 2	INPUT	7	TTL
BAND DATA 1	INPUT	3	TTL
BAND DATA 0	INPUT	8	TTL
PTT	INPUT	6	TTL, in parallel to R1/R2/R3 PTT
ALC	OUTPUT	9	Analog, in parallel to R1/R2/R3 ALC
GND	GND	5, SHELL	GND

DB9 POWER AMP

NAME	TYPE	PIN	DESCRIPTION
INHIBIT	INPUT	1	TTL
BAND DATA 3	OUTPUT	2	open collector
BAND DATA 2	OUTPUT	7	open collector
BAND DATA 1	OUTPUT	3	open collector
BAND DATA 0	OUTPUT	8	open collector
PTT	OUTPUT	6	MOS, in parallel to PA PTT
ALC	INPUT	9	Analog, in parallel to PA ALC
CIV	INPUT/OUTPUT	4	TTL, in parallel to PA CIV
GND	GND	5, SHELL	GND

CI-V R1, R2, R3

NAME	TYPE	PIN
CIV	INPUT	TIP
GND	GND	SLEEVE

CI-V PA

NAME	TYPE	PIN
CIV	INPUT, OUTPUT	TIP
GND	GND	SLEEVE

ALC R1, R2, R3

NAME	TYPE	PIN
ALC	OUPUT	TIP
GND	GND	SLEEVE

ALC PA

NAME	TYPE	PIN
ALC	INPUT	TIP
GND	GND	SLEEVE

PTT R1, R2, R3

NAME	TYPE	PIN
PTT	INPUT	TIP
GND	GND	SLEEVE

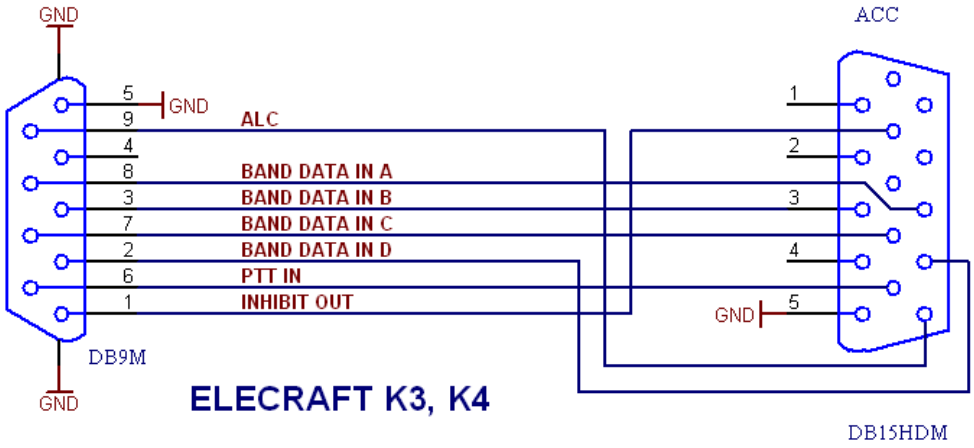
PTT PA

NAME	TYPE	PIN
PTT	OUPUT	TIP
GND	GND	SLEEVE

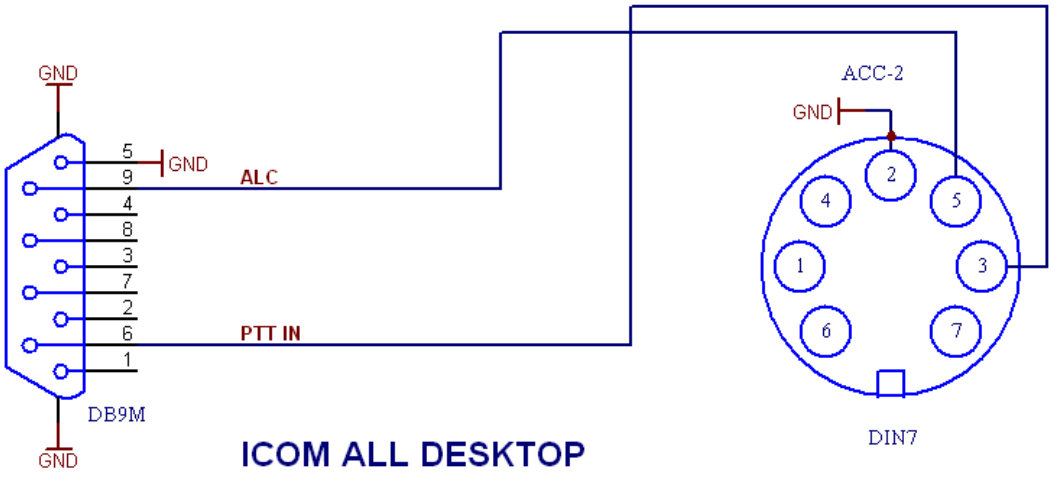
APPENDIX B – RADIO CABLE DIAGRAM

* all connectors orientation are shown from the soldering side

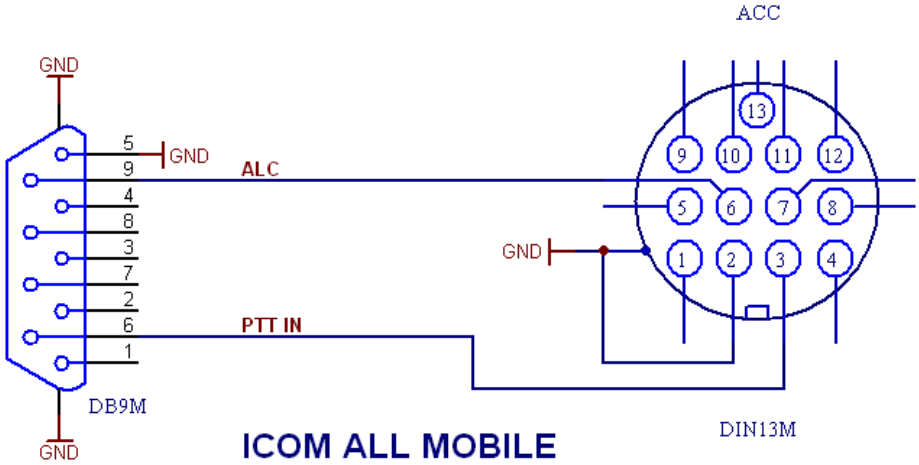
DB9-EL-ACC



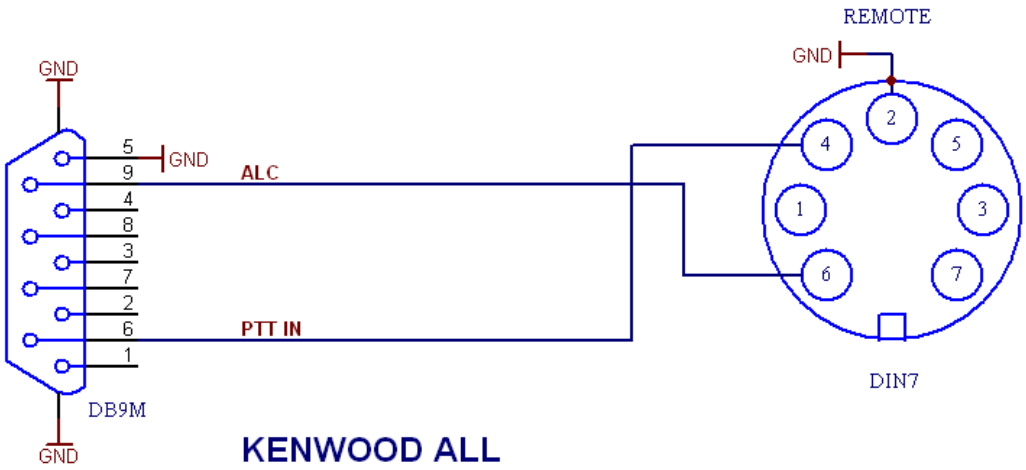
DB9-IC-DIN7



DB9-IC-DIN13

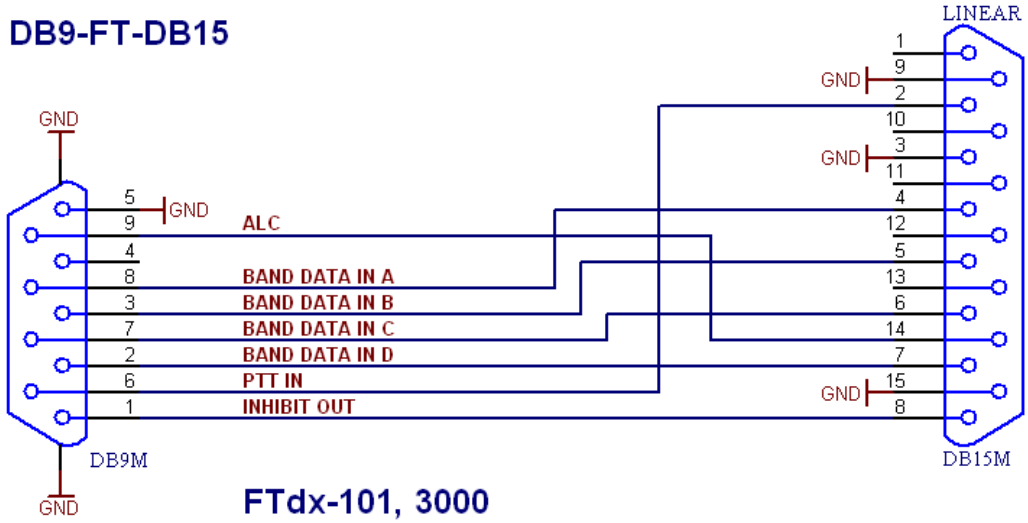


DB9-TS-DIN7



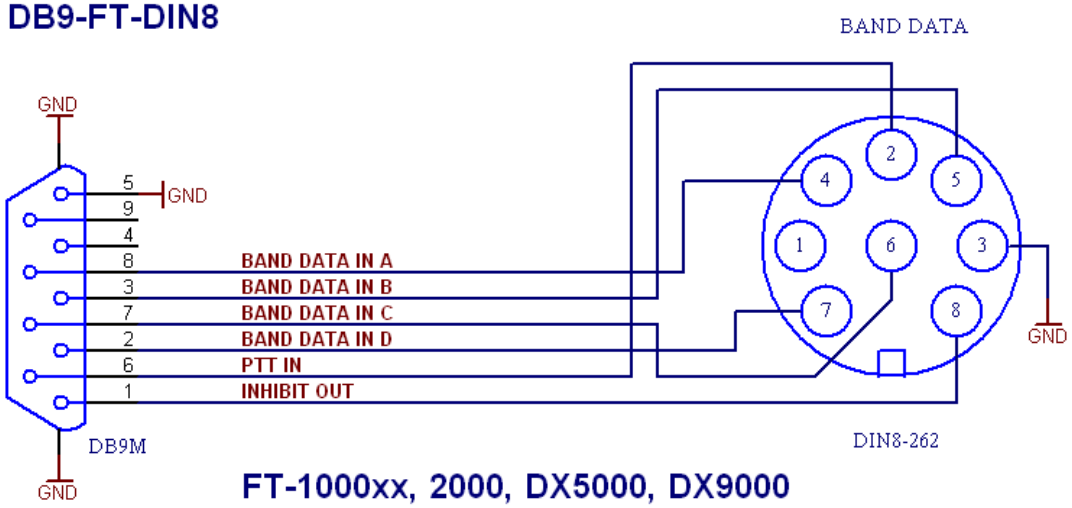
KENWOOD ALL

DB9-FT-DB15



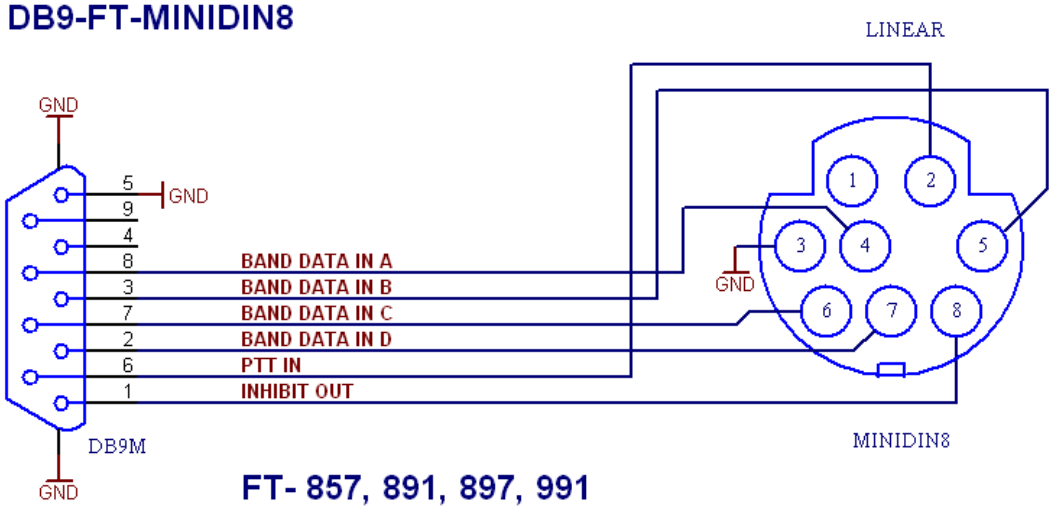
FTdx-101, 3000

DB9-FT-DIN8



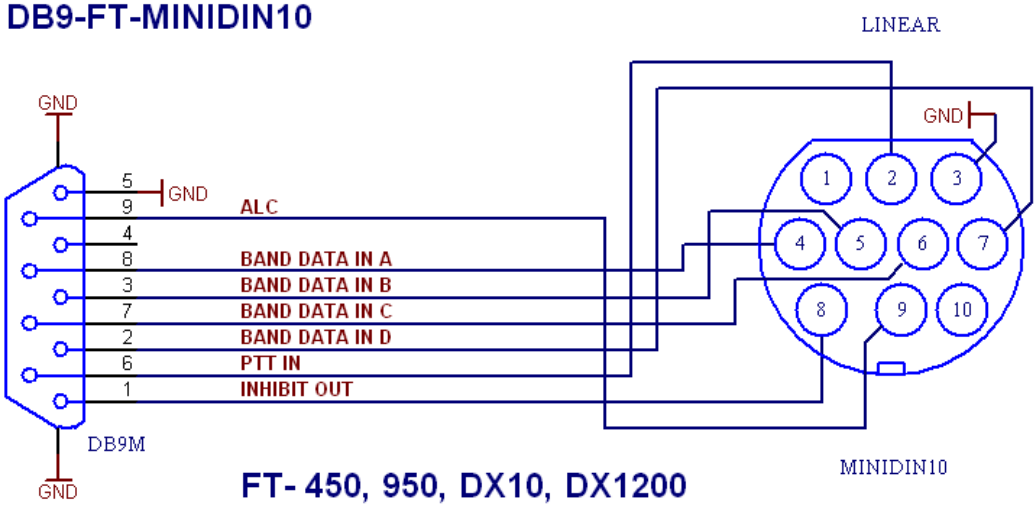
FT-1000xx, 2000, DX5000, DX9000

DB9-FT-MINIDIN8



FT- 857, 891, 897, 991

DB9-FT-MINIDIN10

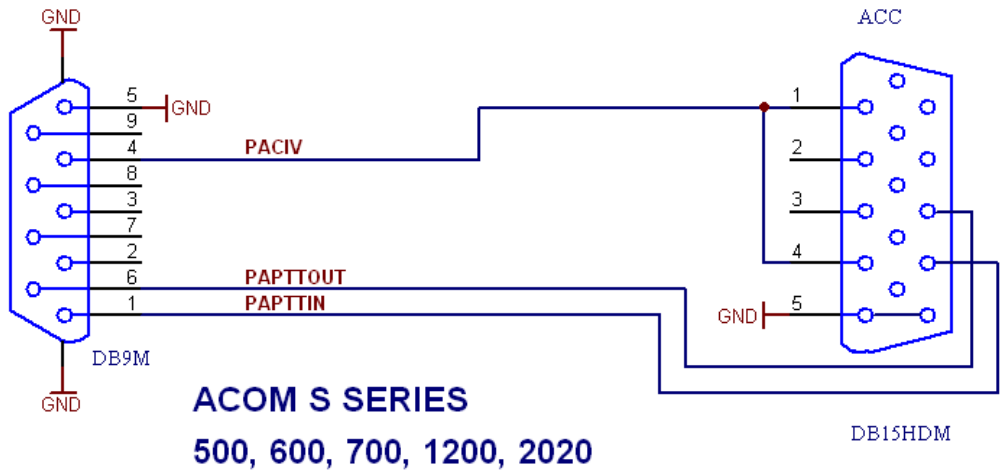


FT- 450, 950, DX10, DX1200

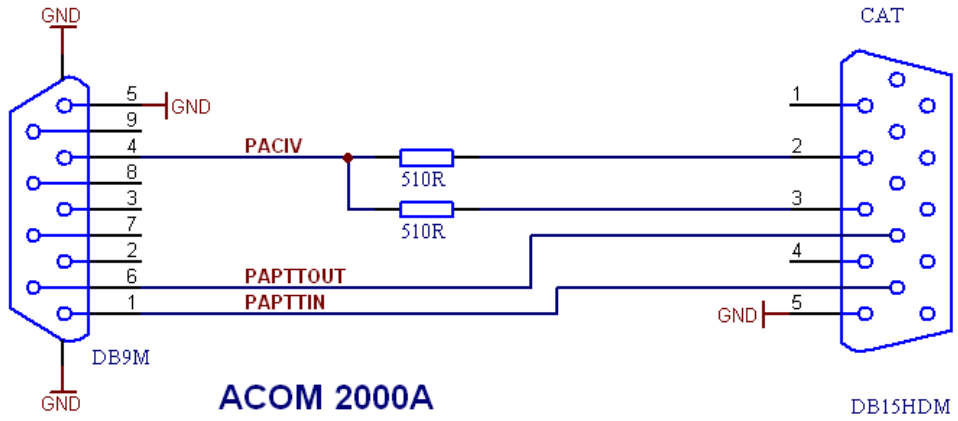
APPENDIX C – POWER AMPLIFIER CABLE DIAGRAM

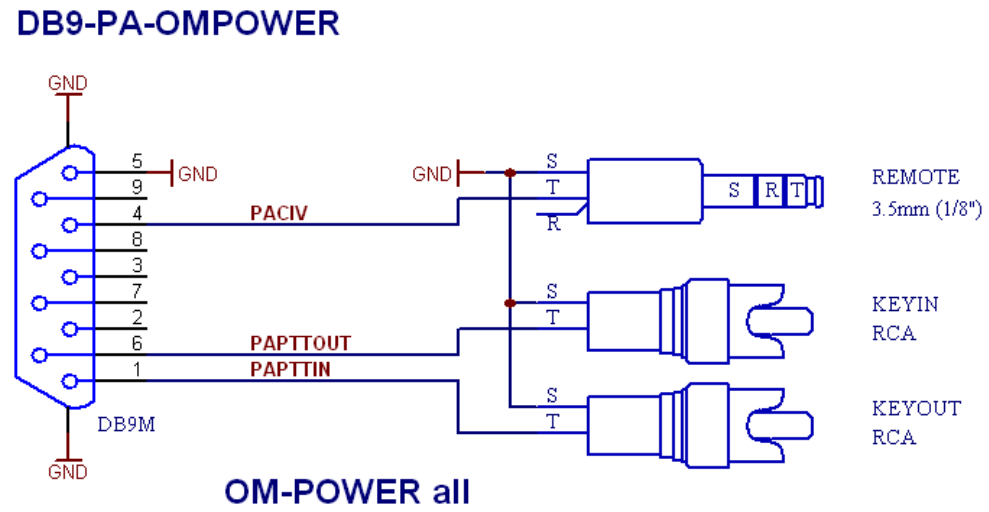
* all connectors orientation are shown from the soldering side

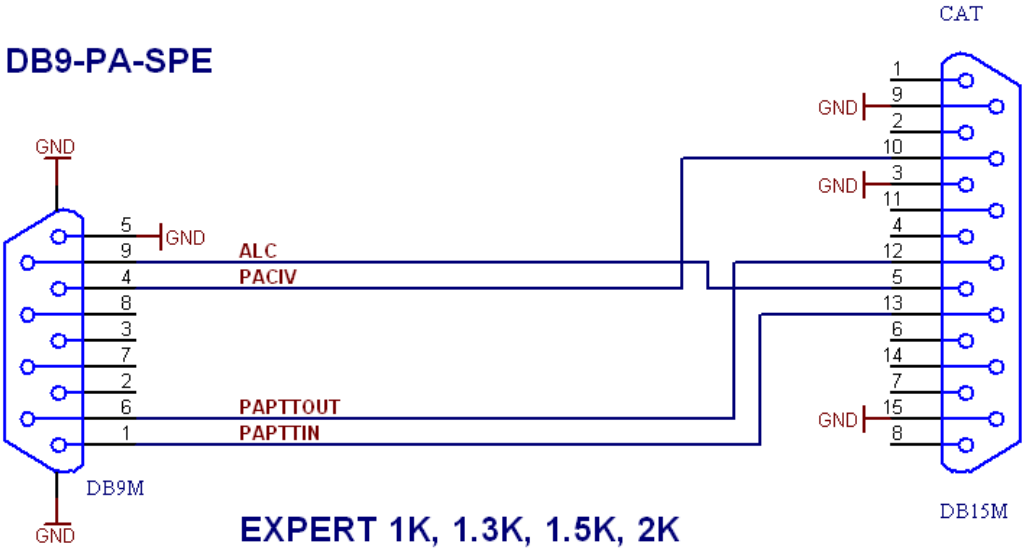
DB9-PA-ACOM-S



DB9-PA-ACOM2000







ICOM IC-PW1, IC-PW-2 can use DB9-IC-8 cable which is compatible also with these amplifiers.