IC9700 PTT Extender Box – Assembly Manual

Introduction

The IC9700 Extender box (See Information Sheet in Section2) provides an independent open collector output for each band of the IC9700 radio. The box connects to the ACC socket (8 pin DIN) of the radio for power and ALC and to the Remote jack by a 3.5mm phono mono male cable.

The Extender box includes diagnostics to check correct connection and operation and to display its status by the front panel LEDs.

Construction

The electronics are built on a double sided plated through printed circuit board using leaded components (a small number of 1208 size surface mount devices are used under the PCB for the ALC hold-off function).
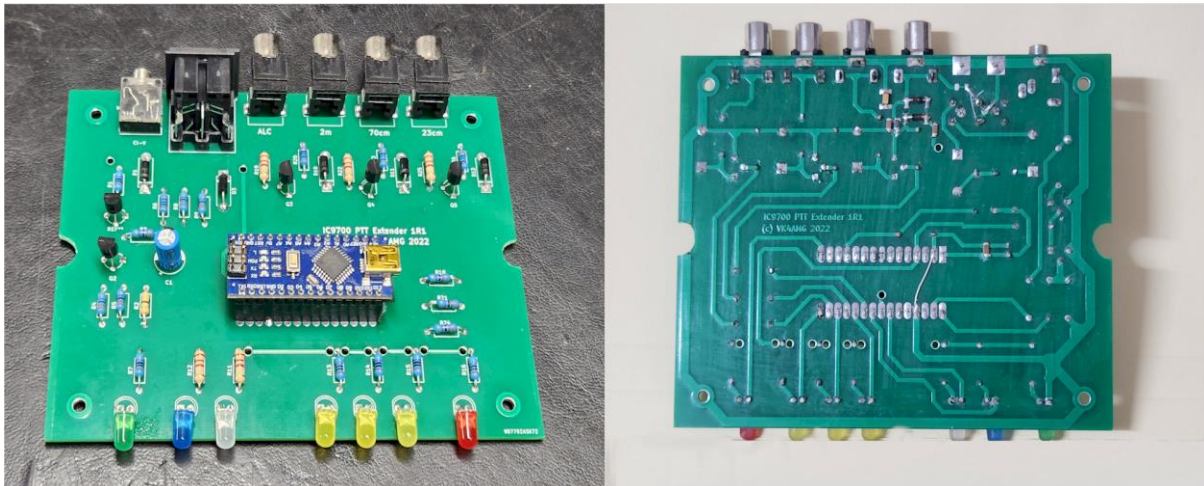
The PCB is mounted in a plastic clam shell enclosure with silk-screened front and rear panels (white on black).

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Assembly

The unit is available in kit form suitable for experienced builders. An overlay with the locations and values of the components is shown on pages 5 to 10.

It is recommended that assembly in performed in the order:

1. Modify PCB to correct 8 pin DIN jack pin errors;
2. surface mount components;
3. the leaded resistors and diodes;
4. the LEDs and transistors;
5. the electrolytic capacitor;
6. the LEDs;
7. the socket for the processor; and
8. the back panel jacks.
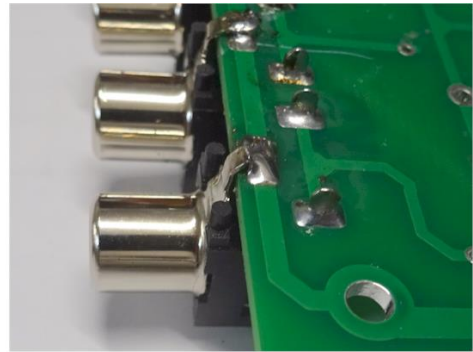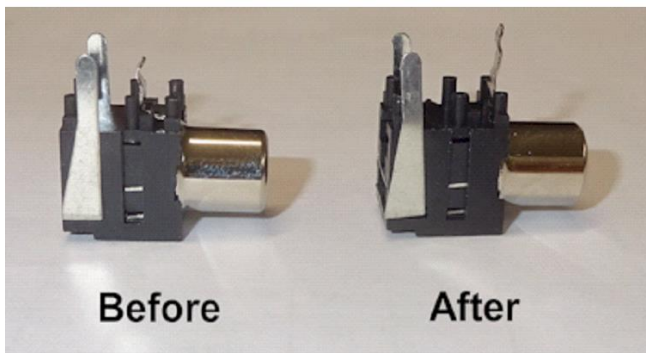
NOTE: the RCA jacks are longer in the body than the prototype parts. To ensure the board fits the case, the jacks are modified by bending the ground tag forward and bending the other pins backward. When the modified jack is installed, the jack is pressed as far toward the front (LEDs) as possible before soldering and the ground tag is bent over the back edge of the PCB for soldering.

When installing the pre-programmed Arduino Nano processor, the USB connector is at the R18, R21, R24 (top right-hand, looking at the front) side of the PCB.

Testing

Before power the module, inspect all solder joints and check for shorts between tracks. Test the operation of the module before installing in its case.

The module may be powered by connecting the 8 pin DIN cable to the IC9700 and switching on the radio. The green 'Power' LED will light. The yellow 'band' LEDs and the red 'PTT' will flash. If a bench power supply is used, do not exceed 15V dc.

If the Nano processor is connected to terminal program on a PC serial port (check Windows/Control Panel/Ports to determine the port in use), a sign-on message (e.g. `"20230123_IC9700_PTT_Box_Nano"`) and "Initialised" will be displayed.

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With the IC9700 transmit power at minimum, operate the PTT and press the 'reset' button on the Nano. This will run the startup initialisation again. The red 'PTT" will flash and the yellow 'band' LEDs will continuously flash. Remove the PTT of the radio, the red 'PTT' LED will extinguish, while the yellow LEDs will continue to flash indicating the box does not know which band is selected. As there is no data received via the disconnected CI-V, the TxD LED will flash indicating the box is requesting the band information from the radio.

Make sure the remote address is the default 'A2'; the remote port baud rate is '19200'; and USB CI-V and remote control are uncoupled in the IC9700 connections menu (see following sections or user manual P 8-13). Connect the CI-V cable ad rotate the frequency dial. The RxD LED should flash while the frequency is changing. The LED for the band-in-use will light steady. Apply the PTT on the radio the red 'PTT' LED will light and extinguish when the PTT is removed.

With a band PTT output connected to an amplifier PTT or test load (up to 28V dc 100mA), apply the radio PTT and confirm the amplifier is switched to transmit then to standby on removal of the PTT.

Remove the CI-V cable from the box. Note that after a short delay the 'band' LEDs flash indicating the band is not known. The TxD LED will flash a number of times as the box attempts to poll the radio for the operating band. Apply PTT and note the red 'PTT' LED flashes indicating he CI-V fault. No PTT outputs are operated.

Correct operation of the ALC hold-off may be confirmed by viewing the ALC bar of the 'meter' display on the IC9700. When the radio is initially switched to PTT, the ALC bar will be at the maximum value (right-hand end of the bar) and will quickly slide back to the normal value for the power level set (should still be 0W). The ALC hold-off may be disabled by removing C3 under the PCB.

If the ALC from the amplifier(s) is/are being used, connect the amplifier(s) ALC to the ALC RCA jack. Check the operation of the ALC is normal.

Put the module in its case and screw the sections together. The PCB is supported by the LEDs and rear panel jack. It does not need to be screwed to the case.
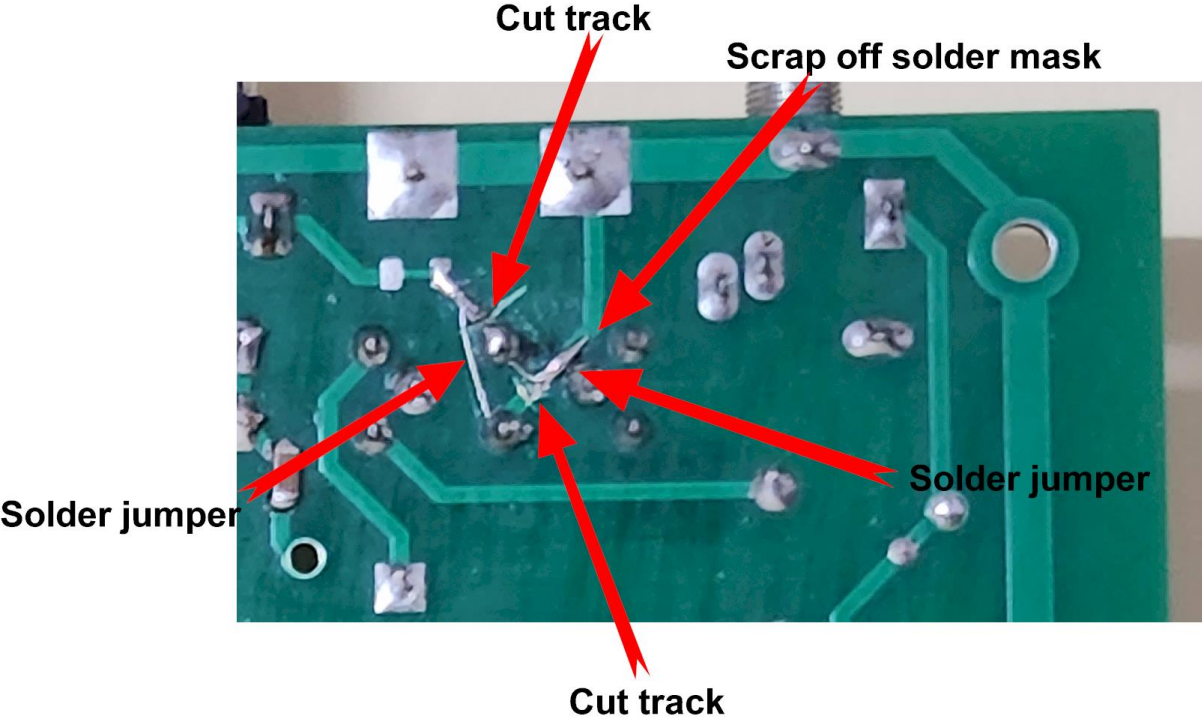
Put the IC9700 PTT Extender in pride of place next to your radio, and confidently enjoy multi-band amplifier operation.
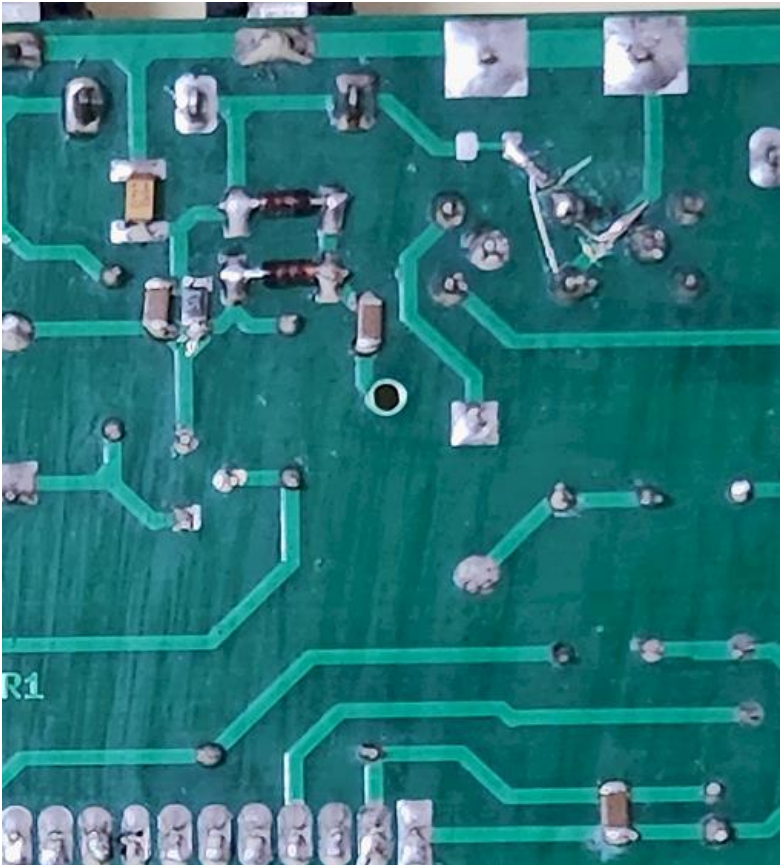
73

George   VK4AMG

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Correct PCB 8 pin DIN jack pinout errors

Solder links and SMD components

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Bill of Material   1R21   04 Mar 2023

20230304__PTT_Extender_1R21_Revision   4-Mar-23   VK4AMG

No	Designator	Designation	Qty
1	C1	100u 25V	1
2	C2,C3,C4	0.1u 50V 1208 SMD	3
3	C5	1uF 25V 1208 SMD	1
4	D1,D3,D10,D11,D12	1N4004	5
5	D13,D14	1N4148	2
6	D2	LED Green	1
7	D4	LED Blue	1
8	D5	LED White	1
9	D6,D7,D8	LED Yellow	3
10	D9	LED Red	1
11	Q1,Q2,Q3,Q4,Q5	BC548	5
12	R20,R23,R26	10R	3
13	R1,R2,R6	100R	3
14	R7,R13,R14,R15,R16	470R	5
15	R11,R12,R22,R19,R25	2k2	5
16	R3,R4,R5,R8,R9,R10,R18,R21,R24	4k7	9
17	R27	47k 1208 SMD	1
18	R28,R29	Not Fitted	0
19	CI-V	Jack_3.5mm	1
20	J1,J2,J3,J4	RCA_Single_Jack	4
21	DIN	Conn_8pin_DIN	1
22	Nano 5V 16MHz	Arduino_Nano	1
23	PCB		1
24	Case including 4x clear plastic feet		1
25	Back and front panel -Silk screened		1
26	Connector Strip 15 pin		2
27	Cable 8 pin DIN M-M		1
28	Cable 3.5 mm phono mono M-M		1

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CI-V / Remote Settings   (refer P8-13 of IC9700 Instruction Manual)

MENU » SET > Connectors > CI-V

CI-V Baud Rate (Default: Auto) Selects the CI-V data transfer rate. When "Auto" is selected, the baud rate is automatically set according to the data rate of the connected device.

CI-V Address (Default: A2h) Sets the CI-V address. "A2h" is the default address of the IC-9700.

CI-V Transceive (Default: ON) Turns the Transceive function ON or OFF. • OFF: The status is not output. • ON: The status is output. When you change a setting on the transceiver, the same change is automatically set on other connected transceivers or receivers, and vice versa

CI-V USB/LAN→REMOTE Transceive Address (Default: 00h) Sets the address used to remotely control the transceiver or the receiver, through the [USB] port or the [LAN] port. The external equipment control signal is output from the [REMOTE] jack.

CI-V USB Port (Default: Unlink from [REMOTE]) Selects the internal connection type between the [USB] and [REMOTE] CI-V ports. • Link to [REMOTE]: The [USB] and [REMOTE] CI-V ports are internally connected. • Unlink from [REMOTE]: The [USB] and [REMOTE] CI-V ports are not internally connected. Each port functions independently. CI-V

USB Baud Rate (Default: Auto) Selects the CI-V data transfer rate when remotely controlling the IC-9700 through the [USB] CI-V port. When "Auto" is selected, the baud rate is automatically set according to the data rate of the external device. This setting is valid only when the "CI-V USB Port" item is set to "Unlink from [REMOTE]."

CI-V USB Echo Back (Default: OFF) Turns the Data Echo Back function ON or OFF, when remotely controlling the IC-9700 through the [USB] CI-V port. This setting is valid only when the "CI-V USB Port" item is set to "Unlink from [REMOTE]."
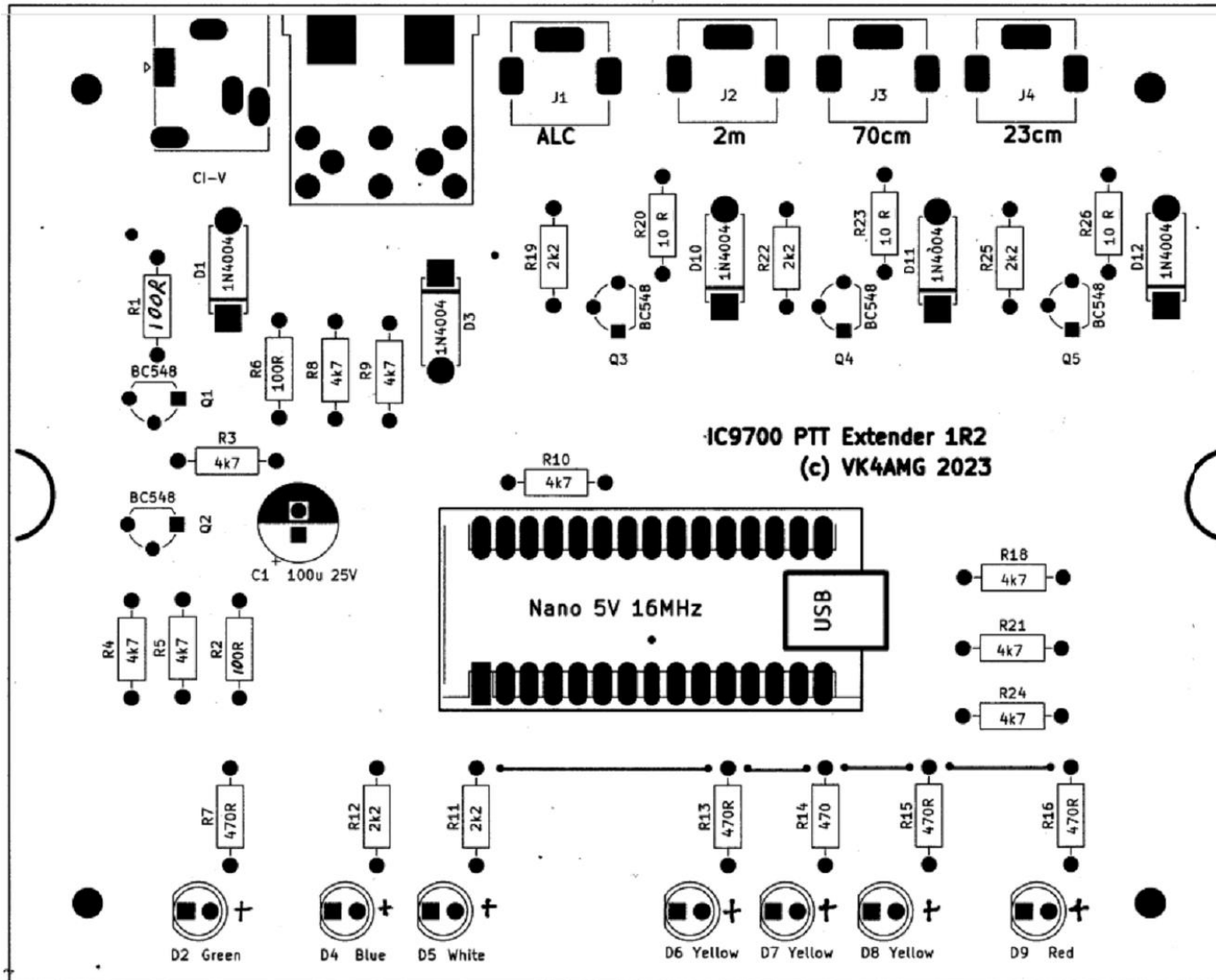
CI-V DATA Baud Rate (Default: OFF) Selects the CI-V data transfer rate when remotely controlling the IC-9700 through the [DATA] jack.   *Set to 19200 baud.*

CI-V DATA Echo Back (Default: OFF) Turns the Data Echo Back function ON or OFF, when remotely controlling the IC-9700 through the [DATA] jack
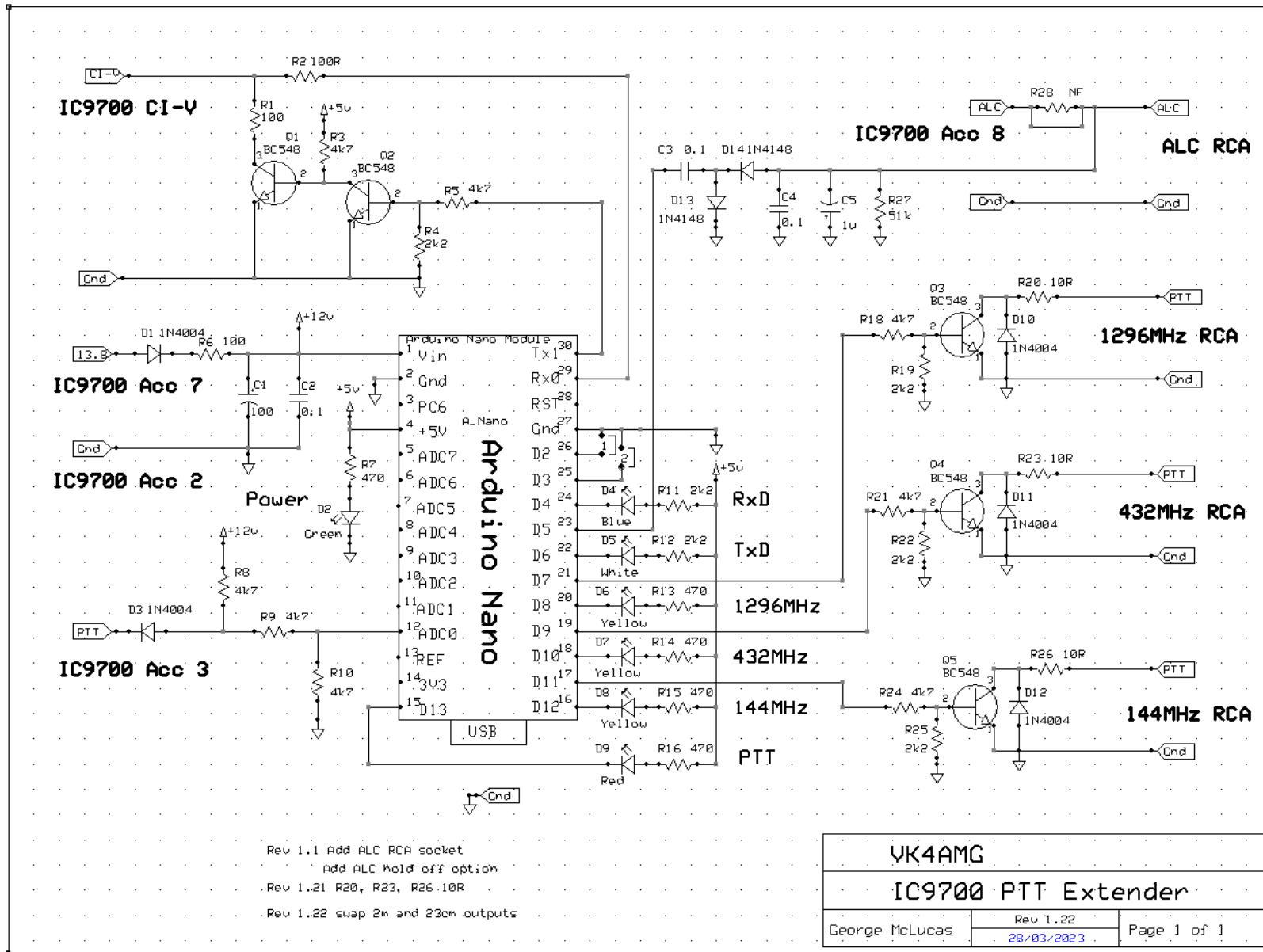
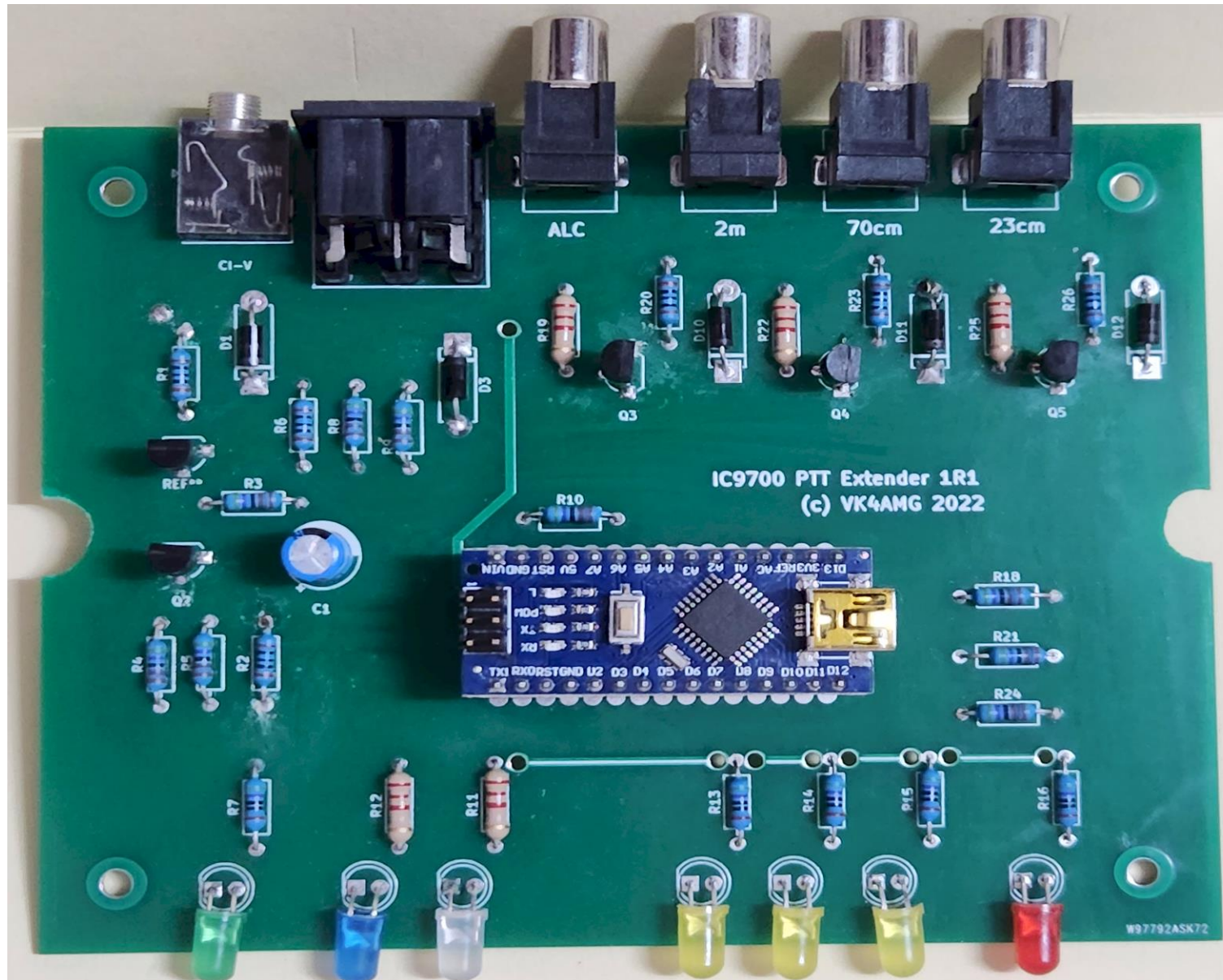# IC9700 PTT Extender Box – Assembly and Testing

Top side component layout Leaded

IC9700 PTT Extender Box – Assembly and Testing
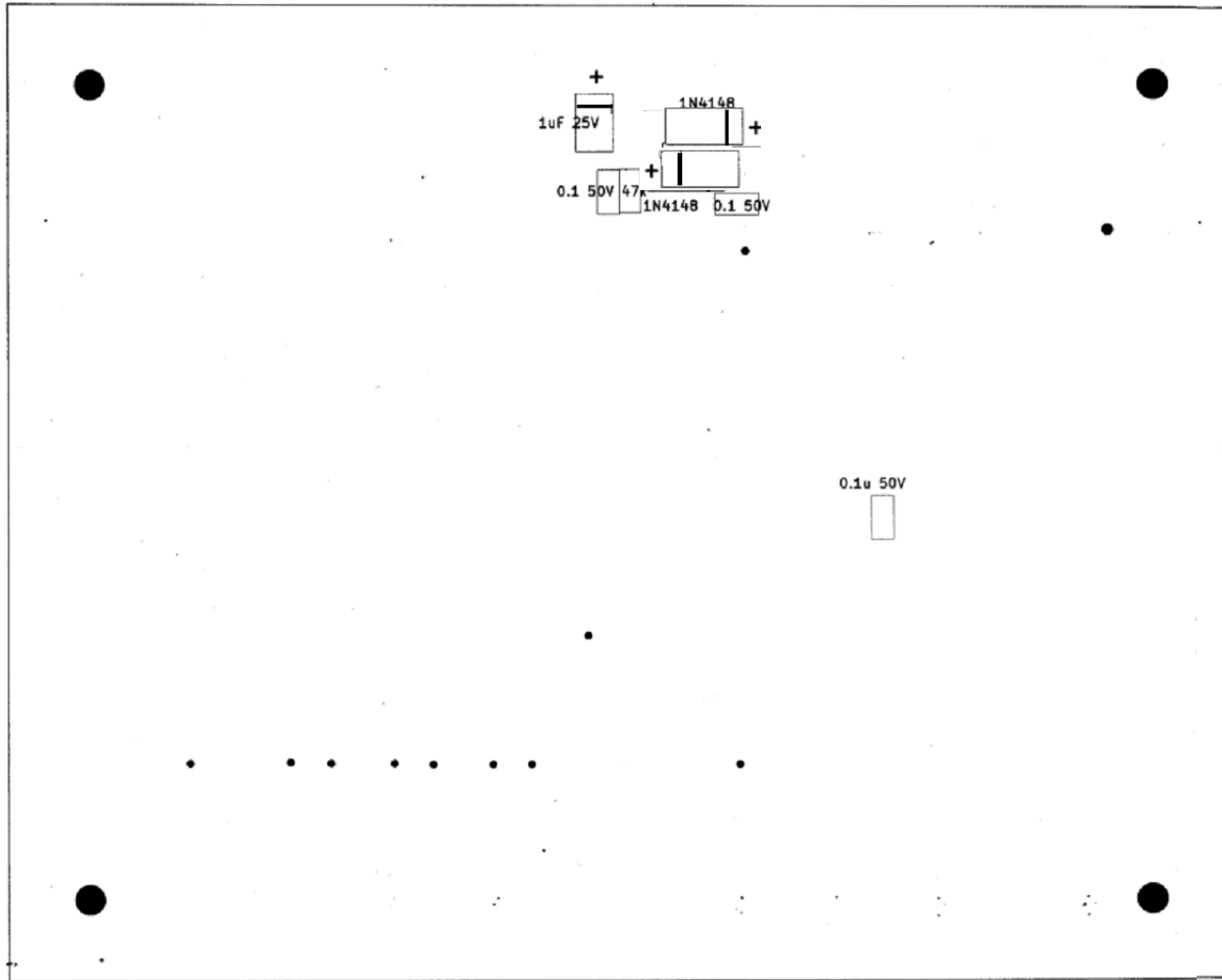
Bottom side component layout SMD

IC9700 PTT Extender Box – Information Sheet

Introduction

The Icom IC9700 provides a single "SEND" signal on the ACC socket. Many operators prefer a separate PTT to each of their amplifiers / LNAs.

This "box" monitors the CI-V serial communications from the 3.5mm jack to determine the band in operation by the MAIN and reflects the radio PTT to the box's RCA jack the band in use.

The box connects to the radio by the ACC via an 8pin DIN cable and the 3.5mm CI-V jack. This connection provides the supply for the box and provides an optional connection of the ALC from each amplifier to the radio.

Front panel LEDs indicate CI-V data states, band-in-use, radio PTT state.

The box is designed to avoid conflict with other applications using the CI-V bus (either 3.5mm or USB). Selecting "transceiver" option in the CI-V menu ensure regular updates of the radio frequency to the box.

The box is housed in a polyester instrument enclosure. The font panel carries the status LEDs. The rear panel carries a 3.5mm phone jack for CI_V, an 8 pin DIN socket, three sets for RCA jacks providing PTT connections for the three bands, and a RCA jack connected to the ALC on the Acc socket.

Enclosure

The electronics uses leaded components mounted on a single sided printed circuit. The microprocessor is an Arduino Nano connected by headers. The PCB is mounted on the base of a 140 x 110 x 35mm polyester instrument enclosure. The front panel carries the power and status LEDs.

The rear panel carries the 3.5mm phone jack for the 5V CI-V serial data, an 8pin DIN socket with pinouts matching the IC9700, and dual RCA female jacks for ALC and PTT for the three bands. An RCA female jack provides connection to the IC9700 ALC pin on the ACC connector.

Operation

When the radio is turned on, the Box is powered via the ACC cable. A Power LED indicates the Box is operating. After initialisation, the front panel LEDs are flashed in turn. No outputs are operated during initialisation. Band-in-use LEDs will be extinguished until valid CI-V band / frequency messages are decoded. If the PTT is applied by the radio when the Box initialises, the red PTT will flash rapidly as a warning, nothing further will occur until the PTT is removed.

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CI-V activity is indicated by the flashing the TxD and RxD LEDs. Once band or frequency information is decoded, the band-in-use by transceiver is indicated on one of three yellow LEDs. Application of the PTT will then be indicated on the red PTT LED and the PTT output for the operating band will be grounded.

The box includes a ALC holdoff function. When PTT is not applied or if the PTT is applied but the band has not been decoded, maximum ALC voltage is applied to the IC9700 and ALC connected amplifiers. This prevents the radio from transmitting unless the CI-V and the Extender Box are working correctly. IC9700 RF output is then not active for 100ms after PTT is applied. This function prevents the possibility of RF output spikes and holds off the RF power output until PTT and changeover functions are active.

On removal of the PTT, the red PTT LED will extinguish. Any change of band / frequency will be indicated on the yellow "band-in-use" LEDs. If no valid band /frequency CI-V messages are decoded for 30 seconds, the extender will poll the IC9700 for the "band-in-use". If a valid status is not received from the IC9700, the yellow "band-in-use" LEDs will flash, and no further output operations will occur until normal operation is established. In the absence of PTT and band broadcasts from the IC9700, the extender will poll the IC9700 for the "band-in-use" every 30 seconds. This means the PTT Extender is ready to apply the PTT for the appropriate band. 10mS PTT debounce is applied to the PTT input signal.

NOTE: The USB CI-V and remote control must be uncoupled in the IC9700 connections menu. That is "remote control" jack communicates with PTT Extender, USB CI-V communicates with computer applications.

NOTE: Satellite Operation. The IC9700 indicates the operating band is the Main or Sub that is selected (highlighted). For correct PTT to an amplifier the transmitting band (normally Sub) must be selected. Check operation before increase the power of the transmitter to operating levels.

Specification

Power supply	13.8 Vdc 100mA max from IC9700 ACC pin 2
Baud rate	19200 8, n, 1. Remote link in IC9700 configuration must be set to match.
CIV	Icom IC-R8600 CI-V Reference Guide.
PTT output	V max up to 24 Vdc. Active low 1V @100mA
	Latency < 10mS key down key up.
ALC holdoff (Option)	Delay of IC9700 power output provided as sequencing of active PA /LNA 100 ms.

Revision history. 14 Feb 2023   Minor revision to ALC hold off function description.
                 4 Jan 2023   Photos now show silk screen front and rear panel
                            Minor revision to "band-in-use" polling.
            10 Nov 2022   Initial writing