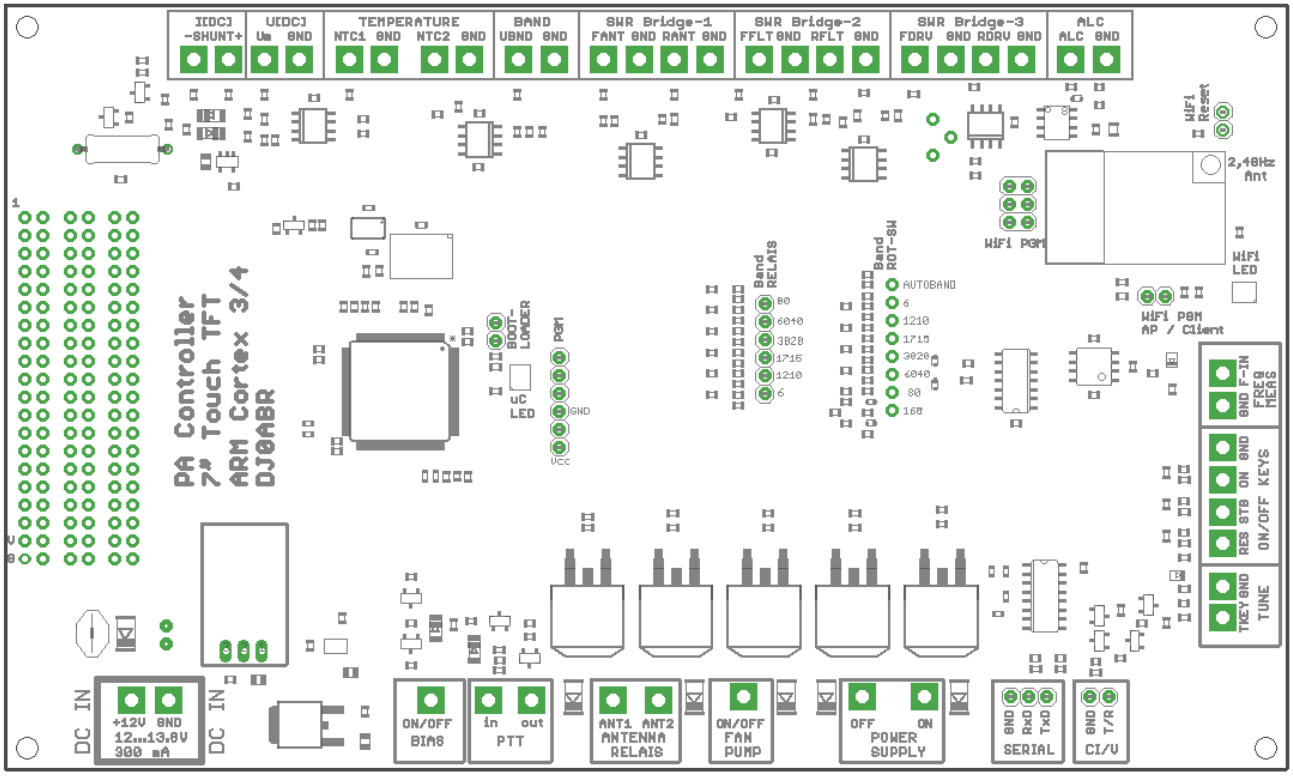
DSP-7-PA

Controller for amateur radio power amplifiers with large 7" TFT touch color display

and many measurement functions, sensors and WiFi webinterface

Connections

The DSP-7-PA board is clearly labeled on all connectors. Here is the list of connectors and their use, starting at the top left and going clockwise:



Function	Connection	Description
I[DC]	- SHUNT	If you want to measure a current of the e.g. station supply, you insert a shunt resistor into the positive supply line. This pin is connected to the shunt on the side facing the power supply. See note-2
+ SHUNT	and this to the side pointing to the load.	

U[DC]	Um, GND	Voltage measurement input. This connector can be connected to a positive voltage (up to 100V) to make a voltage measurement, e.g. of the station power supply. See note-3
TEMPERATURE	NTC1, GND	Temperature measurement-1: for this you connect here a NTC Type: B57703M103G (10kohms)
NTC2. GND	Temperature measurement-2: to connect an NTC Type: B57703M103G (10kohms) here	
BAND	UBND, GND	ICOM devices output a voltage whose level corresponds to the selected band. This function can be used alternatively to the CI/V interface to use the automatic band/antenna switching.
SWR Bridge-1	FANT, GND	connect to measurement coupler-1 with its output of the leading power, see note-1
RANT, GND	connect to measurement coupler-1 with its output of the returning power, see note-1	
SWR Bridge-2	FFLT, GND	connect to measurement coupler-2 with its output of the forward power, see note-1
RFLT, GND	connect to measurement coupler-2 with its output of the returning power, see Note-1	
SWR Bridge-3	FDRV, GND	connect to measurement coupler-3 with its output of the forward power, see note-1
RDRV, GND	connect to measurement coupler-3 with its output of the returning power, see note-1	
	ALC, GND	ALC output to reduce the control power of the transceiver, depending on the current consumption of the PA (adjustable).
FREQ MEAS	F_IN, GND	connect this terminal via a suitable coupling capacitor (e.g. 10pF) to the transceiver antenna terminal to measure the frequency.
EMERGENCY STOP	RES	an emergency stop button can be connected here. If a relay is used to switch the station power supply on/off, it can be switched off here. The same function can be performed via touch keys on the display.
STB	A pushbutton can be connected here. Each press of the button switches between active mode and standby. The same function can be executed via touch keys on the display.	

SWITCH ON	ON	A switch-on pushbutton can be connected here to start the power supply after switching on or after an emergency stop. If a relay is used to switch the station power supply on/off, it can be switched off here. The same function can be executed via touch keys on the display.
	TKEY	can be connected to the TKEY line of an Icom device. As soon as the Icom transceiver is in tuning mode, the power amplifier is switched off.
CI/V	T/R, GND	Icom CI/V Interface. If this connector is connected to an ICOM transceiver, the tuned frequency is read out and the matching antenna is switched on (if an antenna switch is available).
SERIAL	RxD, TxD, GND	Universal RS-232 interface. Used to flash new firmware versions into this device.
POWER SUPPLY	ON	After power on this connector goes to GND. You can connect a relay (against +12V) to switch on the station power supply. As soon as you switch to “active” the connection becomes high impedance again. See note-5.
OFF	in normal operation this connection is high impedance. You can connect a relay (against +12V) here. If an emergency stop situation is detected, this terminal goes to GND and the relay picks up. See note-5.	
FAN, PUMP	ON/OFF	as soon as a set temperature is exceeded, this connection goes to ground. A 12V relay can be connected directly (against +12V) to e.g. switch on a fan.
ANTENNA RELAY	ANT1	Connector for an antenna relay, see note-4
ANT2	Connector for a second antenna relay, see Note-4	
PTT in	is connected to the PTT output of a transceiver (open=RX, GND=TX)	
	PTT out	is connected to the PTT input of the power amplifier (open=RX, GND=TX)
	BIAS ON/OFF	+12V output can be used as BIAS supply for the power amplifier. Will be switched on only during transmission.
12..13,8V	+12V, GND	Power supply of this device incl. display. Here a voltage between 8 and 15 volts must be connected.

additional pin headers in the middle of the board:

Function	Connection	Description

BAND RELAY	80	Connection to a relay (via a driver transistor) to activate the corresponding band in the output filter. This output goes to 3.3V when activated. When no output is active, the 160m band is selected. These outputs can have 4 different band configurations which are selectable in the SYSTEM menu of the firmware, so most different filter-band combinations are possible.
	60/40	
	30/20	
	17/15	
	12/10	
	6	
BAND RED SWITCH	160	These pins can be connected to a rotary switch (common pin of this switch with GND). When connected, the band can be selected with this switch. When not connected, the bands can be selected by touch keys on the display.
	80	
	60/40	
	30/20	
	17/15	
	12/10	
	6	
	AUTOBAND	
BAND ROT SWITCH, Alternate Functions	160	When not used for band selection, these pins can be connected to PTTs of up to 4 transceivers. Together with a relay board, these pins are used as input selectors.
	80	
	60/40	
	30/20	
BOOTLOADER	Jumper present	Connect these two pins with a jumper and switch on the power supply. The controller goes into bootloader mode and waits for a new firmware via the serial interface. See firmware update instructions.
not jumpered	normal operation	
WIFI PGM API/CLIENT	jumper plugged	When switching on with plugged jumper the WiFi interface starts its own AP (access point, no password). A WLAN device (PC, smartphone …) can log on to this AP. Open a browser and enter this IP: 192.168.1.4 to display the controller web server and configure the WiFi.
	Jumper not inserted	When switching on without a jumper, the WLAN interface attempts to log into your local network as a client. WLAN LED: blue: login in progress, green: login successful. Use AP mode above to enter your local WLAN ID and password.
WiFi RESET	connect briefly to reset the WiFi interface.	
WiFi PGM	jumper plugged	WiFi interface is connected to the controller and the built-in web server displays the controller status and values

jumper not plugged	a serial interface (3.3V levels !!!) can be connected here to flash new firmware into the WiFi interface. DO NOT connect directly to a PC RS232 interface, always use a voltage converter !	

Note-1: Measurement coupler

this device can process the measuring voltages of up to 3 power/SWR measuring couplers.

The measurement couplers must output a voltage which is proportional to the power in dBm. This is the case for all high-quality measurement couplers based on the Analog Devices AD8307. Also self-made measurement couplers can be used.

Boards for high quality measurement couplers for the range 100kHz to 60 MHz are also described on www.dj0abr.de.

Note-2: Shunt resistors

This board supports four measuring ranges: 10A, 50A, 100A and 200A.

The value of the shunt resistor depends on the desired measuring range:

range		
10A	5	milliohms
50A	2	milliohms
100A	1	milliohms
200A	0.5	milliohms

Note-3: Voltage measurement ranges

This board supports four measuring ranges: 50V , 100V, 1000V, 4000V

The ranges 50V and 100V are supported by resistors which are already on the board. For the ranges 1kV and 4kV (intended e.g. for tube amplifiers) the following voltage dividers must be connected additionally:

range	
50V	close jumper on the board
100V	standard
1kV	add additional voltage divider
4kV	add additional voltage divider

External voltage divider:

Rp : connect between pins Um and ground

Rv : connect between the voltage to be measured and pin Um

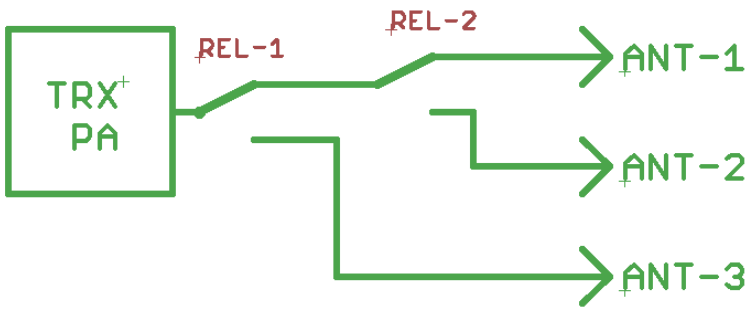
1kV range: Rp=5,6kohm, Rv=2,2Mohm

4kV range: Rp=4,3kohm, Rv=6,8Mohm

Note: these two resistors must be connected as close as possible to the voltage to be measured to keep high voltage away from this board !

Note-4: Antenna Relay

This device supports three measurement couplers, one of these measurement couplers can be additionally connected to relays to connect up to 3 antennas to this coupler. Usually this is done for the shortwave range. So you use measurement coupler-1 for shortwave and connect its output to a relay board. The relays are then switched on automatically depending on the selected band. In combination with the CAT (CI/V) interface a completely automatic antenna switching is possible. Suitable relay boards are described on www.dj0abr.de.



The relay board requires 2 relays, as wired in the picture.

Reverse diodes are not required, they are already present on the board. The relays are connected from connector ANT1 and ANT2 each against +12V.

Note-5: ON/OFF relay for power supply

There are two connections which can switch 12V relays directly (return diode is already present on the board).

POWER SUPPLY ON:

As soon as you turn on the power, this connector goes to GND, so a relay is energized, the controller is in “Standby”. If you switch the controller to “active” to start transmitting, this connection becomes high impedance again, a relay would drop out again.

The reason for this is an important safety function: You connect a relay in latching mode here. In

“active” mode this output is dropped out, but because of the latching the relay remains energized. In case of any failure in the power supply, the relay can drop out by itself and is no longer forced to “ON”. So after a fault, the PA remains off and will not turn on by itself.

If you use the DJ0ABR overcurrent fuse board, this connector is connected to the “ON” relay.

POWER SUPPLY OFF:

this connection is high impedance during operation, so a connected relay drops out. In case of an emergency shutdown, the connection goes to GND, so a relay picks up.

If you use the DJ0ABR overcurrent fuse board, this terminal is connected to the “OFF” relay.