

# ME2T-PRO3 & ME2-HT-PRO3

## High Performance color LCD screen 144MHz Transverters



The **ME2T-PRO3** and **ME2HT-PRO3** are the enhanced versions of our popular 2m transverters ME2T-PRO-II, and ME2HT-PRO-II respectively. The enhanced transverter versions are accommodated into a more spacious, 90 mm (about 3,6") high box. The new versions are furnished with Arduino processor controller, an easy to read 3,2" color display which has been aesthetically integrated into the equipment house.

A new control PCB we had been mounted on the back plate, below the final amplifier stage. The backplate of the PRO3 transverters is furnished with more RF connectors.

Another new feature is the DB9 connector, which is also mounted on the back plate ensuring multiple connection options for transverters user. At the very first power-on you can configure the transverter to the HF radio types available at the market as described below.

The transverter we shipped with factory setting complying with the specifications your requested.

If you using the transverter on contest station we can offer MC-1 IF combiner. If you build in this optional unit you can use the spare IFo2 BNC connector to attach a second RX (SDR or normal receiver) for spotting etc. The new control unit has a place for the combiner, which can be integrated on request.

## TECHNICAL PARAMETERS

Frequency range	144-146MHz
IF frequency range	28-30MHz or 14-16 MHz
Emission modes	CW, SSB, FM, Digital
I/O impedance	50 Ohm Ant: „N” type, 2x IF BNC, 2m separate RX ”N”
Operating temp. range	0- +50 °C
LO accuracy @20 °C	Standard <0,5 ppm AXTAL TCXO
Input voltage	13,8V +/- 5%
Power consumption	0,75A on RX, 6A/TX (7A max), 10A in case HT models
IF power input	-20...+37 dBm
IF input VSWR	1:1,1 typ, max 1:1,1:1,2
Output PWR nominal	30W RF, variable btn ~5W to 30W( ~6 to 50W at HT version)
Output PWR setting	Built in analog potentiometer,
TX harmonics	<-70dB
IM3	Better than -33dBc/25/40W (HT version)
PTT control	Contact closure to GND (2.5mA)
SND output	Open collector, +50V/1A max.
RF VOX	Available, starts at >27dBm IF input
RX noise figure@20 °C	<1dB (overall)
RX gain max	28dB , (variable, 12-28dB), factory set 22dB
RX OIP3 typ.	+35 dBm,
RX IIP3 typ.	+10dBm,
RX IF mixer	HJK-251H+ (+33dBm) by MCL
TX mixer	CSYM-1815 (+17dBm) by MCL
Image rejection	>80dB
Display	3,2” color display 480x320 pixels
Displayed functions	FWD, REV, num.PWR, VSWR, Ut, It, TMP, FAN & FLT (faults)
Protection	Ant.VSWR > 2,2, Current > 7A or > 12A, TMP >60°C
Protection display	3x1sec. 2KHz tone +SWR, TMP & CUR in red color
Reset function	Auto-reset function after high SWR TMP & Current
Meter's accuracy	<2,5%
Sequencer	50mSec.delay at basic TX mixer
Dimensions	240x275x90 mm (incl. optional Fans)
Weight	2.0 kg with Fan unit
Case	ALU plate, @1mm

### Arduino processor controlled colour display unit:

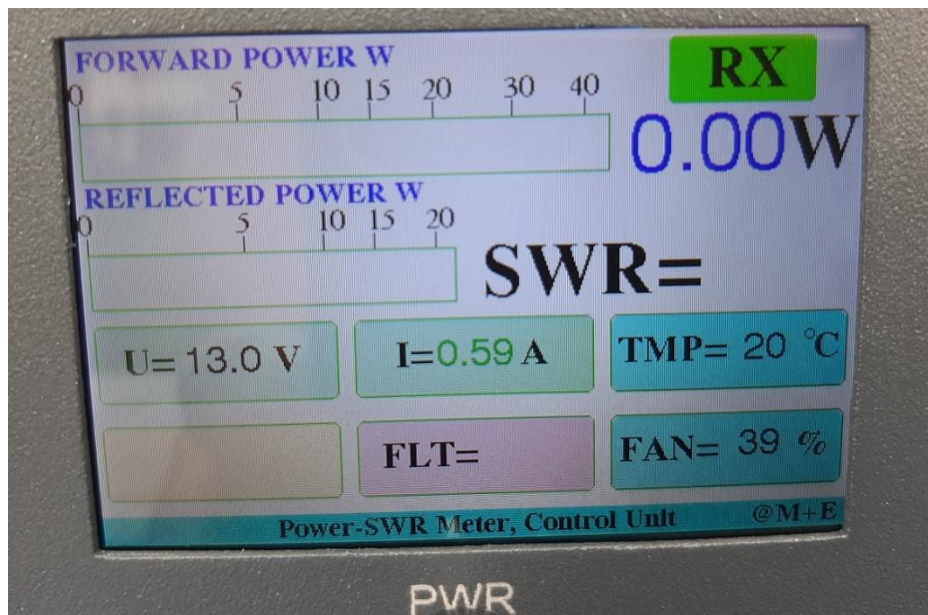
The following information/diagrams are available on 3,2” diagonal display:



1./ **The power-on displays** the basic information for 5 seconds. See the picture above.  
In addition to the equipment type the following information are displayed:

- **FRQ:** mixing frequency (144/28, or 144/14 MHz respectively),
- **IF I/O:** 1 or 2 cable (common/split IF I/O) mode, LP or HP power IF,
- **TCXO:** type and stability of the built-in TCXO,
- **Date:** manufacturing date of the unit,
- **Serial:** serial number of the unit.

2./ After 5 seconds the operational menu and graphs appear:



**- Forward power W;**

The bar graph of forward (output) power expressed in Watts.

The full scale of the FWD bar graph is 40Watts or 60W at HT version. The numeric value of output power expressed in Watts is also displayed.

**- RX/TX;**

In upper-right corner of the display indicates reception/transmission status.

When receiving, "RX" in green, "TX" in red respectively is displayed in the field.

**- Watts;**

Forward output power numerical display.

**- Reflected PWR Watt;**

This bar graph can be seen below the FWD bar graph. The full scale displaying signs the same power in numbers.

**- "S" ant SWR;**

The calculated VSWR value remains displayed during receiving as well.

In case of a  $SWR > 2,2$  the unit displays error message executes and auto-reset, finally the transmission is suspended.

Below Reflected bar graph the following measured values are displayed in 3 fields:

**- U=**

Measured power supply voltage. Whenever it exceeds +14V threshold level, the display changes into red numbers.

**- I=**

Measured supply current. In case  $I > 5,5A$  or  $10.0 A$ , the display changes into red numbers, and exceeding the  $7A$  or  $12A$  threshold level an error message is displayed and auto-reset is executed.

**- TMP=**

The heatsink's temperature expressed in °C. Or in °F at the USA versions. Whenever  $TMP > 55$  °C the display value changes into red numbers, and exceeding the  $60$  °C threshold level an error message is displayed and auto-reset is executed. Supposing that a repeated error message occurs, the unit must be switched off, as the operational conditions are provided exclusively when the heatsink temperature has dropped below  $60$  °C.

As a default, the lower-left frame is empty. You can set the output power by the PWR knob. The output power can't be set to 0! The minimal power is about 8-10% of the nominal power.

**- FLT=**

If a fault occurs: FLT will be displayed on the screen.

In case of an  $SWR > 2,2$  "FLT=**SWR**" is displayed in red letters and three, 2 KHz pitch and 1 sec duration warning tone can be hear. In case of  $I > 6A$ , in case of HT version  $12A$  respectively, "FLT=**CUR**" is displayed in red letters, and three 2KHz pitch and 1 sec duration warning tone can be hear. In case of  $TMP > 60$  °C "FLT=**TMP**" is displayed in red letters and three 2KHz pitch and 1 sec duration warning tone can be hear. The unit emits 3 warning sound signals and then executes an auto-reset. Following it (and termination of the potential error cause) the transverter becomes operational again.

**- FAN**

The fan's cooling speed is expressed as a percentage in this frame. The fan's basic speed at  $25C$  is 50%. Above this level the speed increases proportionally as the heatsink temperature rises up to  $50 C$ . At this point, the fan speed does not increase any higher.

## REAR PLATE



The transverters rear plate accommodates the heat sink and the connectors as follows:

**1./ DC connectors:** 20A rated connectors; **red = POSITIVE**, black = NEGATIVE.

The equipment operates from an external +12,5 V ... +14,0 V stabilized voltage power supply.

**2./ PTT:** The black (yellow) RCA type female connector: is the input for transmission triggering. To place the transverter into TX it requires a GND on transmit. The center connector is at positive potential, the PTT can be controlled by an NPN open collector too. The maximum load current is 2.5 mA.

**3./ SND:** red RCA type connector controls an external final amplifier switching a positive voltage. It is an NPN open collector output. Up to +50 V or 0,5A load is permitted.

**4./ DB9** connector: different in- and outputs with pin assignment according to the following table:

DB-9 Pin	Function
1	GND
2	SND(TX Gnd)
3	PTTi(GND to TX)
4	+13.8V
5	ICOM (+13V to tvtr)
6	RX pre 12V/750mA(on RX)
7	NC
8	NC
9	TX +13.8V(0.5A)

5./ **IFi**= The IF input BNC connector accomodates input levels from -20 to +37dBm. It can be configured to different level RF output HF radios. In case low level type radios (below -10dBm) you can use the internal IF amplifier. See the possible jumper settings:

**Position of built in attenuator jumpers**

Low PWR IF input (-20..+27dBm) 2x IF cable connection		Low PWR IF input (-20..+27dBm) 1x IF cable connection
JP1	ON	ON
JP2	OFF	ON
JP3	OFF	OFF
JP4	OFF	ON
JP5	ON	OFF(ON- 2nd RX)
High PWR IF input (+27..+37dBm) 2x IF cable connection		High PWR IF input (+27..+37dBm) 1x IF cable connection
JP1	OFF	OFF
JP2	ON	ON
JP3	ON	ON
JP4	OFF	ON
JP5	ON	OFF(ON-2nd RX)

Jumper positions on the control PCB [here](#):

**Jumper setup for several type radio:**

/LIST NOT COMPLETE!/

Levels,cables	Radio types
Low PWR, 2x IF cables	K3,K3s,K2,TS590S,TS590SG,TS850,TS950SDX,IC756,FT2000,FT1000MP, FTDX5000, IC756,TS990S,TS850 mod,
Low PWR, 1x IF cable	IC7600, IC7610, IC7700,IC7800,FLEX6300,FLEX6500,FLEX5000,FLEX6300,FLEX6600, IC765
High PWR, 2x IF cables	Flex models,
High PWR, 1x IF cable	IC9100, IC746, FLEX1500, FLEX3000, ADAC,TS2000, FT450, FT950, FTDX3000, FTDX1200,IC7000,TS570, IC7300, FT991

**In order to save the RX IF amplifier please don't forget to connect the PTT cable, the unit contains an RF VOX unit too but don't use it to save applying a PTT cable!**

**The RF VOX starts working at an IF level exceeding +27dBm, but only in case of single IF cable mode. Never apply more than a 5W IF level to the attenuator!**

**Using high power HF radio's (100W) without low level transverter output is your own risk. Use it every time carefully!**

**6./ IFo1, IFo2 = IF outputs. IFo2 applies exclusively in case of an ME2-XP, for PRO3 types this connector is free. In case of single IF cable mode you can set JP5 ON, for 2<sup>nd</sup> (SDR) receiver. If you are using MC-1 IF combiner, you can use IFo2 BNC which attaches to second receiver, in case 2x IF cables too.**



**7./ ANT. connector: „N” type connector to connect a 2m antenna. (Optional common/separate RX input).**

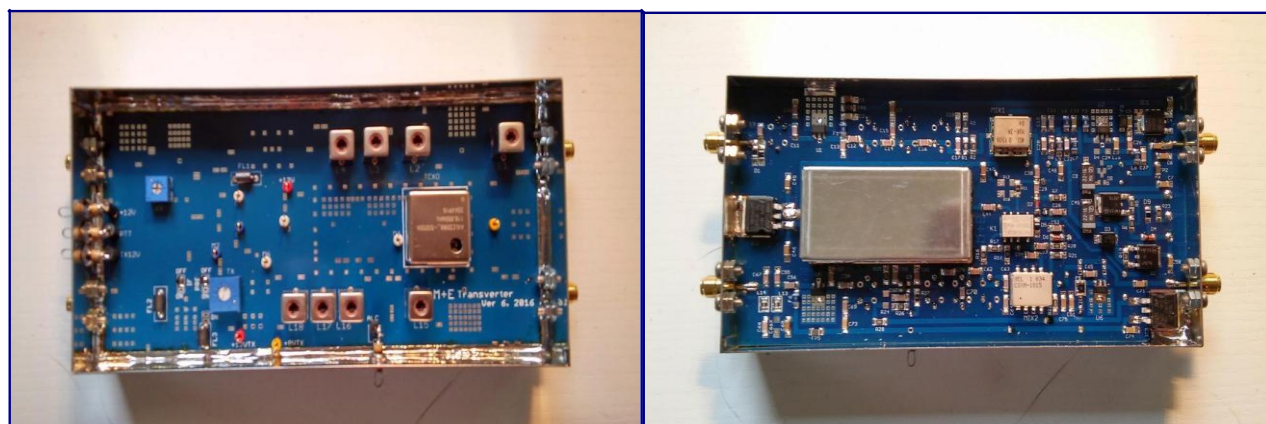
**8./ RX1, RX2: 2m RX inp. (RX2 applies exclusively in case of an ME2-XP) to connect a second 2mRX antenna. For PRO3 types this connector is not used.**

### **2m transverter unit**

The basic transverter unit, apart of minor modifications, is the same as the ME2T-PRO-II unit. As a default 0.5 ppm AXTAL low side noise TCXOs are installed.. The transverter equipment's block diagram is available [here:](#), the RF diagram [here:](#)



Transverter basic unit photos:



Transverter unit PCB bottom view is [here](#):

### **2m 30 & 50W module PA:**

The PA unit is based on the 30 or 50W Mitsubishi modules, furnished with an ALC circuit, and contains NEC EB2-12NU type RF relays as well. The output signal of the transverter drives the RF module across -3dB attenuator. We set the RF module to AB1 class by a bias circuit from Mitsubishi. The ME2HT-PRO3 version's PA comprises an RA80H1415M type 80W RF module. However in order to reach the best IMD, we have disabled driving the modules over the nominal output power.

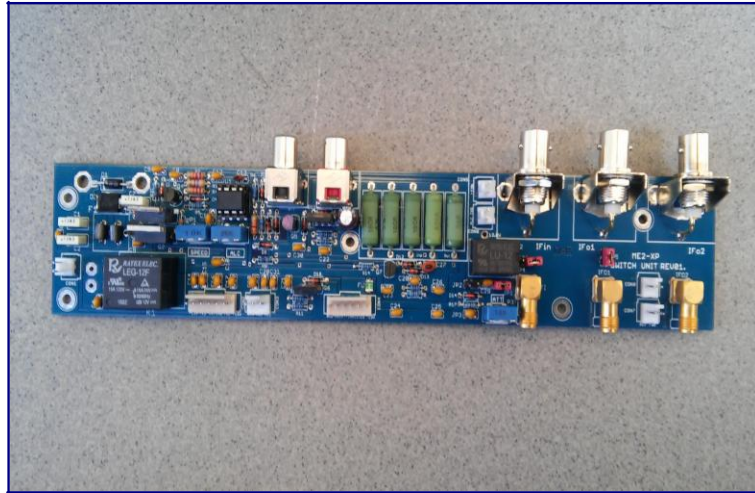
The PA contains a temperature sensor to check the temperature of the heatsink. For the „HT” (50W) transverters the cooling fan is a standard feature, but in the 30W version it is an option.

The final PA module PCB is [here](#):

### **POWER and SWR meter:**

The PWR/SWR unit comprises a simple PWR/SWR meter bridge. The Arduino controlled display visualises the actual FWD/REV power and VSWR values in a color bar graph with ~2.5% accuracy.

## CONTROL UNIT:



The built in control unit is a new development, comprising all the necessary circuits to control the transverter, regulate the cooling fan's speed, a 20dB/5Watt RF attenuator, as well as the jumper tabs to configure the transverters to different HF radio types. The unit contains also the RF VOX unit (don't use it to replace of PTT input!) to save the RX IF amplifier if you forget to connect the PTT cable.

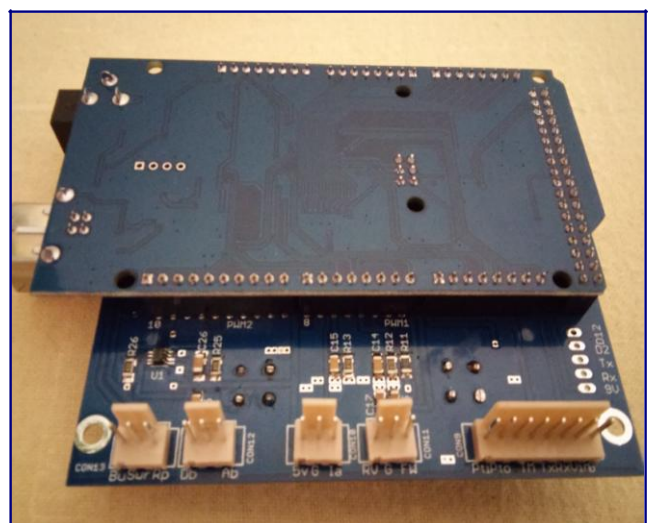
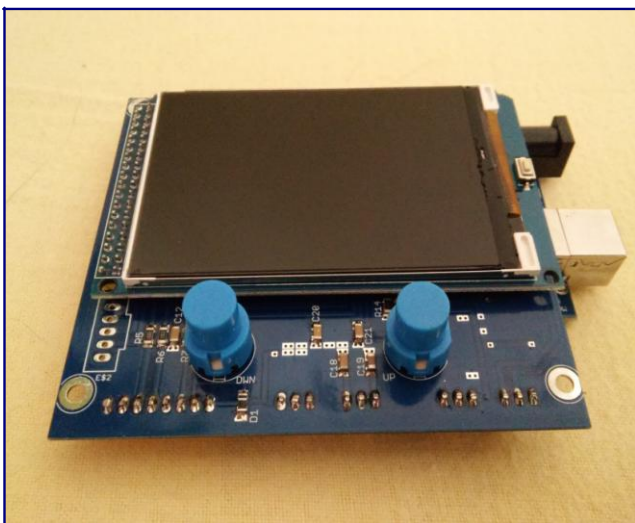
This PCB accommodates the switching circuit and the IF connectors relays. You can find the unit's circuit diagram [here](#).

## ARDUINO, Display and Arduino control units:

ME2T-PRO3 and ME2HT-PRO3 is controlled by ARDUINO MEGA. We are using analog inputs and outputs as well as the color LCD driver of Arduino. The LCD is 3.2" and 480x320 pixels 16 bit, no touch type.

You can find the circuit diagram of the Arduino control unit [here](#).

We would like to use this controller in our LDMOS amplifiers too, so a few features are not in use on this PCB.



Pictures of ARDUINO control & display unit. Arduino control unit PC is [here](#):

## Usage the transverter:

### We can set transverter levels, jumpers to your radio type before the shipping, by your request!

Connect a stabilized power supply of 13,8V voltage output and capable at **least 7A or 12A** (in case of an ME2HT-PRO3).

Connect the 2m antenna cable, the external power amplifier - if you have one-, connect the PTT cable, and the SND output to control the relays of the external PA.

Turn the transverter ON. The start-up screen displays the factory settings.

(Modifying your jumpers setting doesn't automatically change the screen details! It can be altered only in the Arduino program.) Check, whether the transverter receives or not. (Beacons, stations). If not, please check your cables, radio IF frequency etc. Pushing the PTT of the radio, the transverter must switch into TX state. Switch to TX in CW mode (key-down), and set the required output power level with PWR button.

Supposing that the HF radio does not provide the required IF signal level, (+ or -) you can set the level.

With P3 (ATT) potentiometer on the transverters control unit, and you can set the maximum nominal PO of the transverter with PWR knob. It shall be 30W, or 50W respectively, for lower power requirements set the PWR knob to maximum, and use the P3 to set the required PWR!

We built in PREAMP possibility from 2024 January: On pin 6 of DB connector are +12V/750mA on RX.

### If you have low IF output radio: (-20 to -6dBm)

Lot of radios have very low IF drive levels (below -6dBm.) In this case you need to use the built-in TX IF amplifier. Please open the TVTR and mixer box top covers. Look the jumpers at the right up corner: set the IF PRE jumpers center to ON positions. Set the IF preamp DC „ON” jumper too! Set the PWR button to max. output (e.g. Nominal output power) If the power is too much you can reduce it with input P3 attenuator (on control unit) and with the TX gain trimmer (on the mixer unit, signed with “Tx”, nearest hole at rear panel).

On case of 3-5W IF output radios you need to switch ON the -20dB/5W attenuator. (see the jumper table) the TX gain potmeter also be set. (this potentiometer is on the basic transverter unit, hole close to rear panel).

Supposing that your external PA does not require the transverters full nominal driving power, you can reduce it without modifying the IF signal level of your HF RIG.

- set the PWR knob on frontpage to max PWR position,
- set the P3 ATT trimmer on control unit up to max. desired PWR (for example 15W)

If the output PWR is too much, set the P3 to middle position, and set the “Tx” gain potmeter on mixer unit to the required output PWR. (It's highly recommended in case LDMOS amplifiers) You can see the different operation possibilities at the end of this page in pdf drawings format.

### Rx part settings:

If you using high gain preamplifier it possible the nominal gain of transverter will be too much and your S meter indicates S2 or more „noise”. You can reduce the transverter gain easy with built in RX potmeter. (transverter unit, hole close to front panel) Set the basic noise back to S0 on receiver. This setting doesn't help if the noise generated by external electrical or similar noise source.

You can see on following drawings the different wiring possibilities of PRO3 transverters:

1. [Contest station..\(pdf\)](#)
2. [Contest station with 2x radio.\(pdf\)](#)
3. [Single ant. Station.\(pdf\)](#)
4. [Single ant Station with single ANT connector radio.\(pdf\)](#)