MV-2 30W & 50W Transverter

Technical Documentation

28. September 2025.

Overview

The production of the ME2T-PRO3 transceivers has been discontinued. Taking into account market demands and ongoing technical developments, the new **MV-2 series** has been developed, available in both **30 W** and **50 W** versions.

Due to low demand, the 14 MHz IF version has been discontinued. The newly implemented **SAW filters** now allow full-range transmission and reception across **144 – 148 MHz**.

Main Improvements

- Three 95% factory-assembled SMD PCBs: display board, transverter motherboard, and RF power amplifier module.
- Closed RF shielding enclosures on the mixer panel (covering both RF and crystal filter sections).
- Two built-in, high-selectivity crystal filters for RUN frequencies.
- High-slope SAW filters integrated into the band-pass filter (BPF) circuits on both the receiver and transmitter paths.
- Direct external antenna pre-amplifier connection option.
- External pre-amplifier power supply available via the DB-9 connector.
- 3.5-inch colour front-panel display.

- Analogue power control (PWR) from the front panel, with redesigned circuits for 0 – 30 W and 0 – 50 W ranges.
- Built-in front-panel switch for selecting **BYPASS – FILTER1 – FILTER2** modes.
- Revised Arduino-based software for more accurate **PWR** and **SWR** measurement.
- Larger mechanical dimensions, no internal DC wiring, simplified assembly, and additional test points for easier servicing.

Factory Configuration

Each transverter is shipped with factory settings according to the customer's specifications.

If the transverter is to be used in a contest station, the optional **MC-1 IF Combiner** can be supplied.
If this unit is installed (either by the user or the manufacturer), the spare **IFo2 BNC connector** can be used to attach a secondary receiver (such as an SDR or standard receiver) for monitoring or spotting purposes.

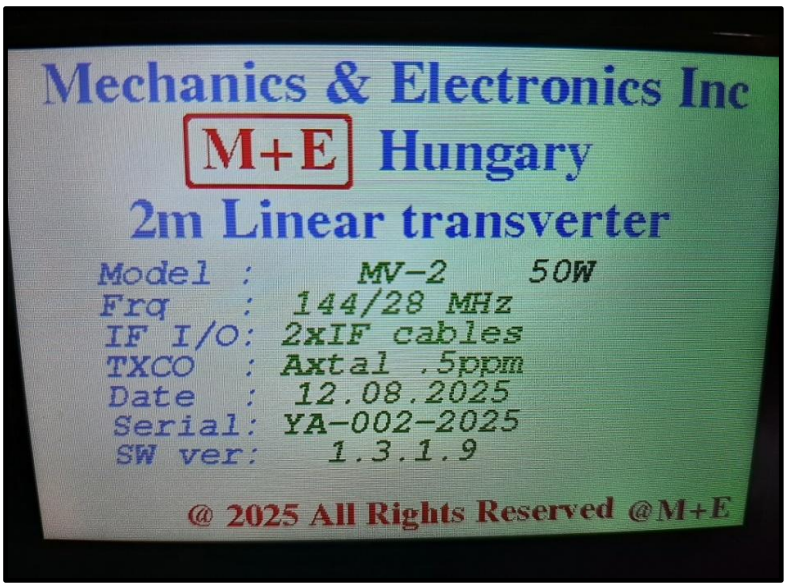
Technical Parameters

RF Frequency Range	144 – 148 MHz
IF Frequency Range	28 – 32 MHz
Supported Modes	CW, SSB, FM, Digital
Impedance	50 Ω
Connectors	Antenna: N-type; IF: 3× BNC; 2 m: 2× separate N-type
Operating Temperature Range	0 – +50 °C
Local Oscillator Accuracy @ 20 °C	< 0.5 ppm (AXTAL TCXO)
Input Voltage	13.8 V ± 5%
Power Consumption	0.7 A (RX); 6.5 A (TX 30 W); 10 A (TX 50 W)
IF Power Input	–20 to +37 dBm
IF Input VSWR	1.1 : 1 (typ.), max 1.2 : 1
RF Output Power	30 W nominal (variable 0 – 30 W); 0 – 50 W for 50 W version
Power Adjustment	Analogue front-panel potentiometer
TX Harmonics	< –70 dB
Third-Order IMD (IM3)	Better than –33 dBc @ 25/40 W (50 W ver.)
PTT Control	Contact closure to GND (2.5 mA)
SND Output	Open collector, max +50 V / 1 A
RF VOX Function	Available; activates at > 27 dBm IF input
RX Noise Figure @ 20 °C	< 1 dB
RX Gain	Max 25 dB (variable 12 – 25 dB), factory set 22 dB

RX OIP3 (typ.)	+35 dBm
RX IIP3 (typ.)	+10 dBm
RX IF Mixer	HJK-251H+ (+33 dBm) by MCL
TX Mixer	CSYM-1815 (+17 dBm) by MCL
Image Rejection	> 80 dB
Display	3.5” colour LCD, 480×320 pixels
Displayed Parameters	FWD, REV, PWR numeric, VSWR, Voltage (Ut), Current (It), Temperature (TMP), Fan Speed, Faults
IF Crystal Filters	One CW and one SSB filter, switchable from front panel
Protection	Antenna VSWR > 2.2; Current > 7 A / 12 A; Temperature > 60 °C
Protection Indicators	3× 1 s 2 kHz tone + red SWR/TMP/CUR alerts
Meter Accuracy	< 2.5 %
Sequencer Delay	50 ms at base TX mixer
Dimensions (incl. fans)	280 × 330 × 115 mm
Weight	2.2 kg (with fan unit)
Enclosure	1 mm aluminium plate

Arduino processor controlled colour display unit:

The following information/diagrams are available on 3,5” diagonal display:

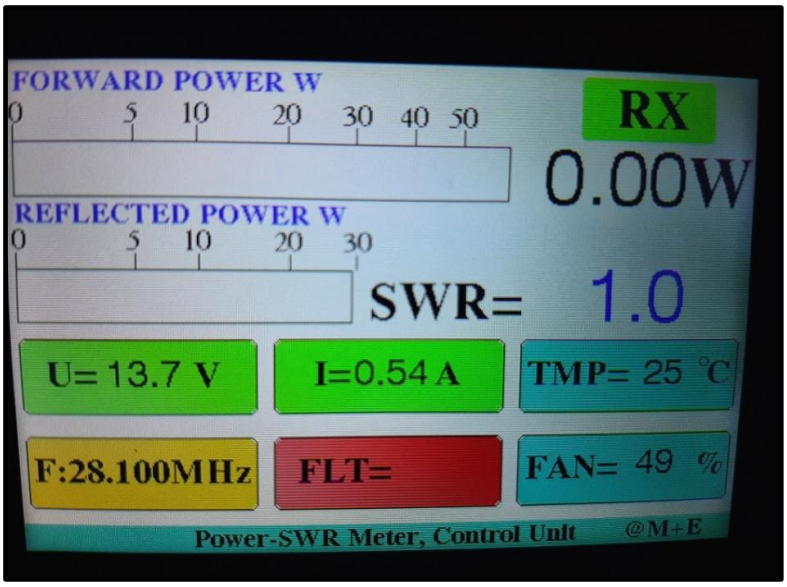


The power-on displays the basic information for 5 seconds. See the picture above.

In addition to the equipment type the following information are displayed:

- **FRQ**: mixing frequency (144/28)MHz
- **IF I/O:** 1 or 2 cable (common/separate 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.
- **SW ver**: Software version.

After 5 seconds the operational menu and graphs appear: (if Filter1 is ON)



Displayed Parameters:

- **Forward Power (W):**
  A bar graph showing the forward (output) RF power in watts.
  Full scale corresponds to **40 W** (standard) or **60 W** (high-power version).
- **RX/TX Status:**
  Displayed in the upper-right corner — **RX** (green) for receive, **TX** (red) for transmit.
- **Reflected Power (W):**
  A separate bar graph indicates the reflected power, shown both graphically and numerically.
- **VSWR (Ant SWR):**
  The calculated VSWR value remains visible during receive.
  If VSWR exceeds **2.2:1**, the unit will trigger an error message and suspend transmission.
  The unit must then be **powered OFF and ON** again to resume operation.
- **Voltage (U=):**
  Displays the measured DC supply voltage. Values exceeding **14.0 V** are shown in red.

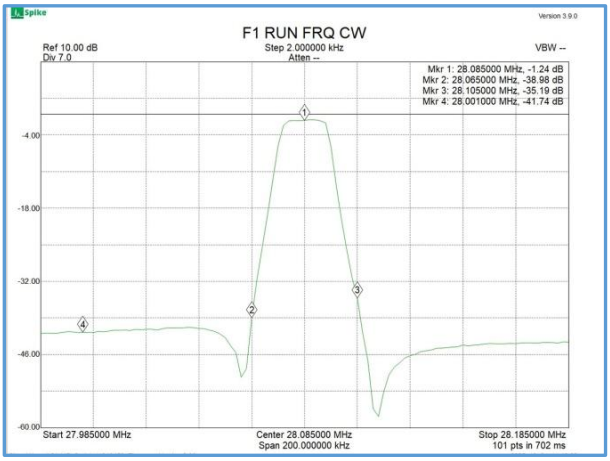
- **Current (I=):**
  Displays the supply current.
  - For the **30 W model**, values above **6.5 A** are shown in red, and at **7 A** an error message (CUR) is displayed.
  - For the **50 W model**, values above **10.5 A** appear in red; at **12 A**, an error message (CUR) is displayed, and TX is halted.
  - **Temperature (TMP=):**
    Displays the heat sink temperature in °C (°F for US versions).
  - Values above **55 °C** are shown in red.
  - Exceeding **60 °C** triggers a TMP fault message and stops transmission.
  - The unit must cool below 60 °C before operation can resume.
  - **Filter Mode (F=):**
    The lower-left frame indicates IF filter frequency or BYPASS mode.
    Output power can be adjusted using the **PWR** control knob.

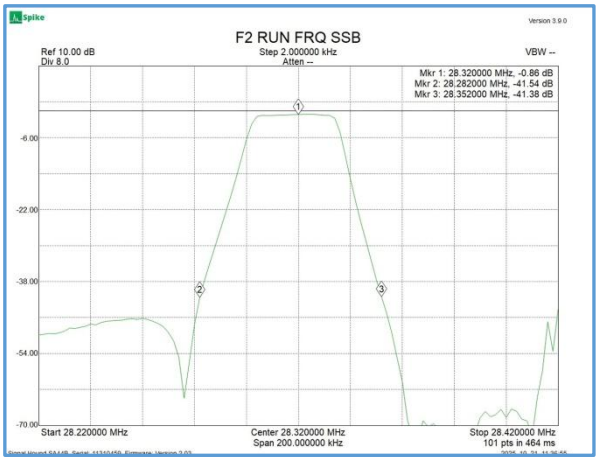
Filter Channels

CH	CH Fo	BW
1	28.040MHz	+/-7.5KHz/3dB,+/-25KHz/40dB
2	28.055MHz	+/-7.5KHz/3dB,+/-25KHz/40dB
3	28.070MHz	+/-7.5KHz/3dB,+/-25KHz/40dB
4	28.085MHz	+/-7.5KHz/3dB,+/-25KHz/40dB
5	28.100MHz	+/-7.5KHz/3dB,+/-25KHz/40dB
6	28.115MHz	+/-7.5KHz/3dB,+/-25KHz/40dB
7	28.170MHz	+/-15KHz/3dB, +/-40KHz/40dB
8	28.200MHz	+/-15KHz/3dB, +/-40KHz/40dB
9	28.230MHz	+/-15KHz/3dB, +/-40KHz/40dB
10	28.260MHz	+/-15KHz/3dB, +/-40KHz/40dB
11	28.290MHz	+/-15KHz/3dB, +/-40KHz/40dB
12	28.320MHz	+/-15KHz/3dB, +/-40KHz/40dB
13	28.350MHZ	+/-15KHz/3dB, +/-40KHz/40dB
14	28.380MHz	+/-15KHz/3dB, +/-40KHz/40dB

Two crystal filters (1-1 CW and SSB) are factory-installed and selectable from the front panel.

IF Filters characteristics: /example frqs/





Fault Display (FLT)

When a fault occurs, “FLT” is shown on the screen:

- **FLT = SWR** — VSWR exceeds 2.2
- **FLT = CUR** — Current exceeds safe limit (7 A or 12 A)
- **FLT = TMP** — Temperature exceeds 60 °C

Each fault condition triggers three 1-second warning tones at 2 kHz, followed by automatic TX shutdown.
The unit must be restarted manually.

Cooling Fan (FAN)

Fan speed is displayed as a percentage.
At **25 °C**, the fan runs at **50%**, increasing proportionally up to **100%** at 50 °C.
Above that, the speed remains constant.

Front Panel

The **MV-2 transverter** is built into a **280 × 330 × 115 mm** aluminium enclosure. The front panel includes:

- A **3.5-inch colour display**
- **Xtal Filter Selector Switch**
- **PWR Control Potentiometer**
- **ON/OFF Power Switch** (bottom-right corner)

Rear Plate

The rear panel houses the heat sink and all main connectors.

1. DC Power Connectors

Rated for **20 A**, with red = positive and black = negative.
Requires an external stabilised **+13.5 V to +14.0 V** DC supply:

- Minimum **8 A** (30 W model)
- Minimum **12 A** (50 W model)

2. PTT Input

RCA-type female connector.
A **GND RCA** activates TX.
The centre pin is at positive potential; control is possible with an NPN open collector.
Maximum load current: **2.5 mA**.

3. SND Output

RCA-type connector for **external amplifier control**.
NPN open collector output, max **+50 V / 0.5 A load** permitted.

4. DB-9 Connector — Pin Assignment

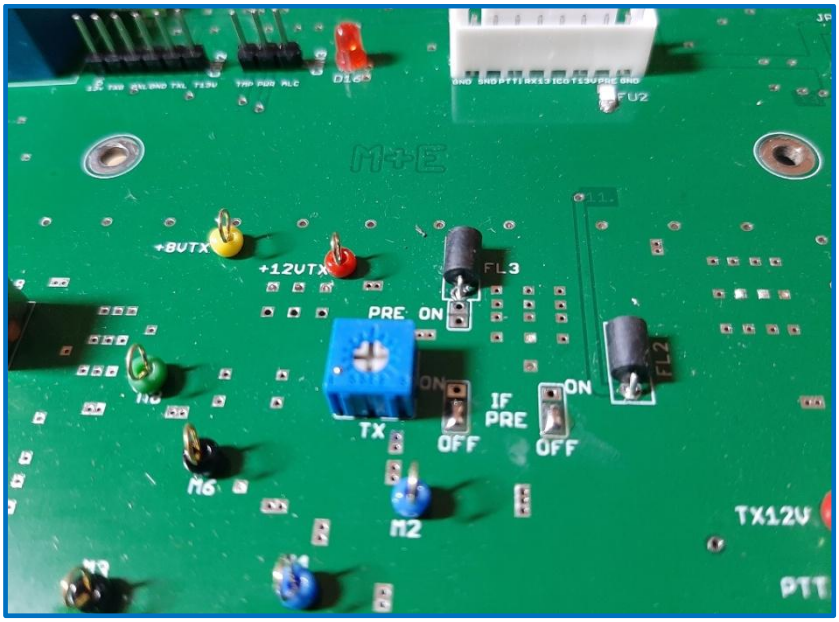
DB-9 Pin	Function
1	GND
2	SND(TX Gnd)
3	PTTi (GND to TX)
4	+13.8V
5	ICOM (+13V to tvtr)
6	TX 13.8V/0.5A (FU1)
7	PRE 13.8V/0.7A (FU2)
8	NC
9	GND

IF Input and Output Connections

IF Input (IFi)

The **IF input BNC connector** accepts signal levels from **–20 dBm to +37 dBm**, compatible with various HF radios.

- For **low-level radios** (below –10 dBm), the **internal IF amplifier** may be enabled.
- For **IF levels above –10 dBm**, solder the **centre and OFF jumper positions** together.
- To **enable the IF preamplifier**, solder the **centre and ON jumpers** together, which also connects the amplifier's power supply (PRE ON).



Built-In Attenuator Jumper Settings

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 is ON)
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 is ON)

Jumper positions on the board is here:

Typical Jumper Setups for Different Radios

Levels, cables	Radio types
Low PWR, 2x IF cables	K2,K3,K3s,K4,TS590S,TS590SG,TS850,TS950SDX,IC756,FT2000, FT1000MP, FTDX5000, IC756,TS990S,TS850 mod..
Low PWR, 1x IF cable	IC7600,IC7610,IC7700,IC7800,FLEX6300,FLEX6400, FLEX5000,FLEX6600, IC765..
High PWR, 2x IF cables	Flex models,
High PWR, 1x IF cable	IC9100, IC746, FLEX1500, FLEX3000, ADAC,TS2000, FT450, FT950, FTDX10,FTDX3000, FTDX1200,IC7000,TS570, IC7300, FT991,IC705,IC710,

Operational Notes

- To **protect the RX IF amplifier**, always connect the **PTT cable**.
  Although the unit includes an RF VOX function, **do not rely on it** as a substitute for proper PTT control.
- RF VOX activates only in **single-IF-cable mode**, and only for IF levels above **+27 dBm**.
- Never exceed **5 W IF power** to the attenuator.
- Using **high-power HF radios (100 W)** without a dedicated transverter output is entirely at your own risk.

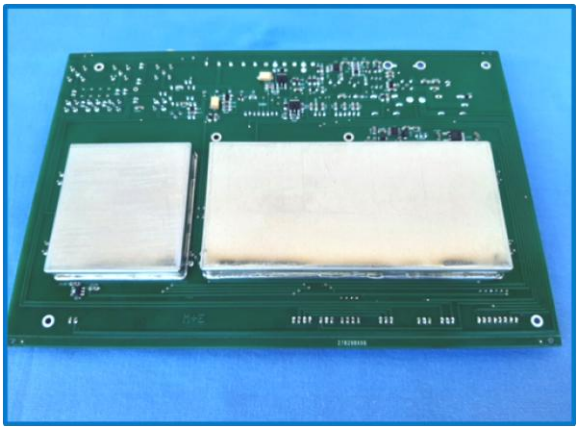
IF Output Connectors (IFo1, IFo2)

- **IFo1** — main IF output
- **IFo2** — available only on the **MV2-X** model (optional secondary output)
- In single-IF-cable mode, **JP5 = ON** enables connection to a **second receiver (e.g. SDR)**.
- When using the **MC-1 IF Combiner**, IFo2 remains available even in dual-IF-cable configurations.

Antenna and RX Inputs

- **ANT Connector:** N-type connector for 2 m antenna connection.
  (Optional common/separate RX input available.)
- **RX1 / RX2 Inputs:**
  Two independent 2 m receiver inputs.
  RX2 is functional only on the **ME2-X model**; on **MV-2 models**, this connector is inactive.
- **10 MHz REF Input:**
  Not used in this version of the transverter.

2m Transverter Unit



The main transverter block diagram you can find here and the RF block diagram is here:

The **transverter PCB** features a **new integrated design**, combining the control circuits, the **IF crystal filter unit** (CW and SSB filters), and the **RF transmitter/receiver mixer**.

- SAW filters (TA2675A)have replaced traditional tuned LC circuits.
- The **IF crystal filters** are enclosed in a **shielded housing** beneath the PCB.
- Each filter operates within the **RUN frequency range** on both RX and TX paths.
- Filters are **50 Ohm**, with bandwidths of **±7.5 kHz (CW)** and **±12.5 kHz (SSB)**.
- The filters are selectable via a **front panel switch**.

Receiver part

- **Preamplifier:** PGA-103+ (Mini-Circuits) — excellent dynamic range
- **RF Mixer:** HJK-251+ (Mini-Circuits) — high linearity
- **IF Amplifier:** ASB ASF240 MMIC — low noise, high dynamic
- **RX Gain Adjustment:** via "RX" potentiometer on the main panel

A **0.5 ppm AXTAL low phase noise TCXO** is factory-installed as standard.

Transmitter part

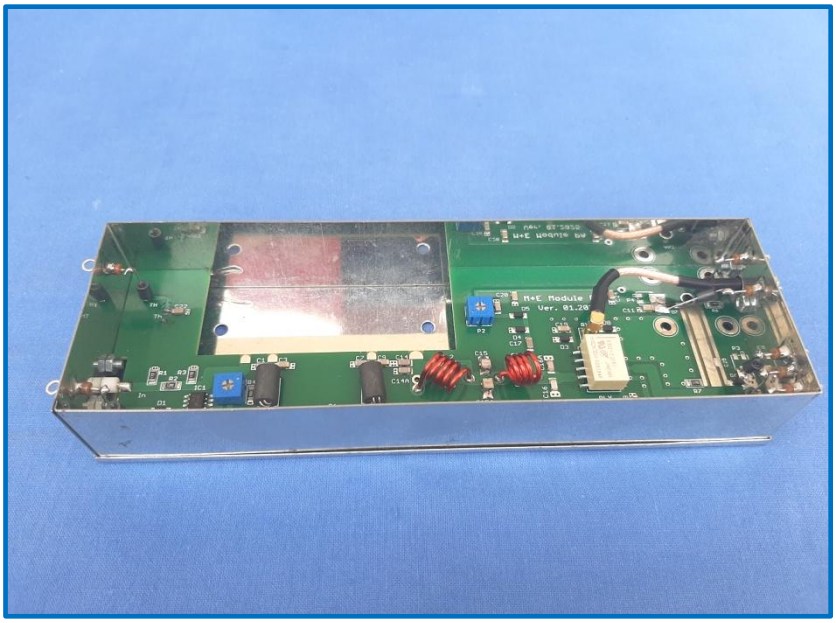
- **10 dB attenuator** precedes a jumper-selectable IF amplifier
  (used when TX IF < –10 dBm)
- **TX Mixer:** CSYM-1815 (Mini-Circuits) — requires +7 dBm LO input
- **Post-mixer SAW filter** ensures high spectral purity
- **Dual-gate FET amplifier** provides signal drive (~120 mW output)
- **Power control:** via second FET gate, adjustable between –0.8 V and +1.5 V
- **Driver amplifier:** ASB ASL550 MMIC

- Transverter unit PCB bottom view is here:

Sequencer and Timing Control

The Arduino microcontroller generates a **sequencer (SEQ)** signal for the mixer unit with a **50 ms delay**.
When the **SND output** activates an external power amplifier, the RF signal is held back until relays are fully engaged — preventing premature keying or relay arcing.

2m 30W & 50W Power Amplifier Module (PA)



The **PA module** is based on **Mitsubishi RF amplifier modules** and includes an **ALC circuit** and **NEC EB2-12NU RF relays**.
The transverter's RF signal is passed through a **–3 dB attenuator** before reaching the RF module.

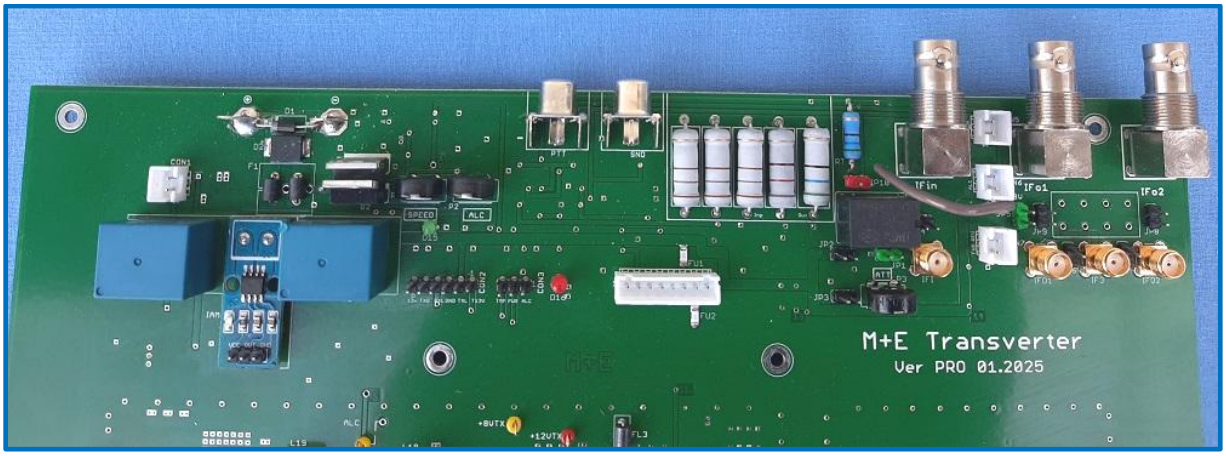
Amplifier class: AB1 (set by the Mitsubishi bias network, P1 adjustment inside the PA enclosure).

- **RF Modules:**
  - 30 W version — RA30H1317M
  - 50 W version — RA80H1415M
- The PA is intentionally limited below the module's maximum drive capacity to ensure excellent **intermodulation performance (IMD)**.
- A **temperature sensor** monitors the heatsink.
  - The **cooling fan** is standard in 50 W models and optional in 30 W versions.

After the PA stage, a **low-pass filter (LPF)** and **SWR/PWR metering circuit** ensure clean RF output.
The Arduino software calculates and displays the forward power using the characteristics of the PA's RF diodes.

The final PA module PCB is here:

Control Unit



The **control board** is a new **SMD-based design** integrating all key operational circuits:

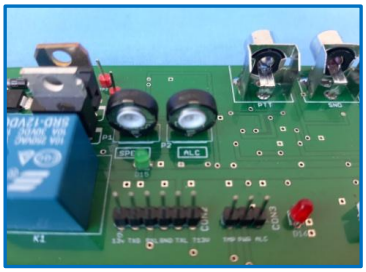
- **Cooling fan speed controller**
- **Fixed 20 dB / 5 W RF attenuator**
- **Jumper matrix** for radio type configuration
- **RF VOX circuit** (protects RX IF amplifier if PTT is not connected — not a replacement for proper PTT use)
- **0–W power regulation circuit**, using a DC/DC converter to control the FET's gate voltage (–V to +V range)

Adjustments and Controls

PWR Potentiometer	Analogue power control, located on the front display board.
SPEED Potentiometer	Adjusts cooling fan base speed.
ALC Potentiometer	Adjusts automatic level control circuit.
ATT Potentiometer	–10 dB RF divider for fine-tuning the IF drive level.

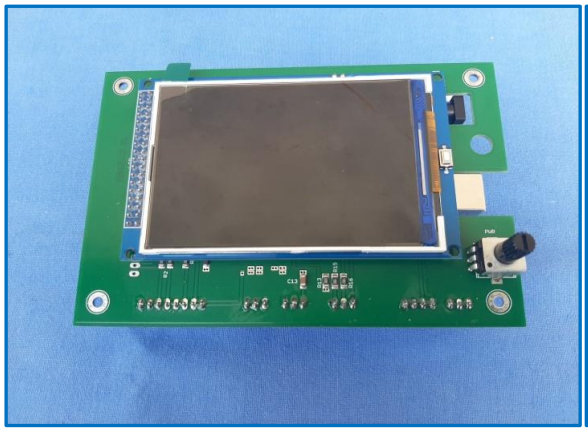
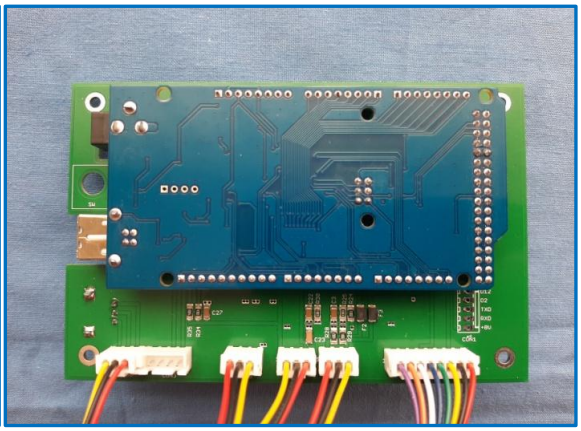
This PCB also hosts:

- The **switching and relay control circuits** for IF connections,
- Prepared footprint for the **optional MC-1 IF Combiner**, which splits the IF signal into two outputs (IFo2 for a secondary SDR receiver).




You can find the control unit's circuit diagram here.

Arduino and Display Control Units

Arduino control unit circuit diagram here:

The **MV-2 transverter** is managed by an **Arduino Mega 2560** controller, which handles both the analogue inputs/outputs and the **3.5-inch colour LCD driver**.

Display Unit

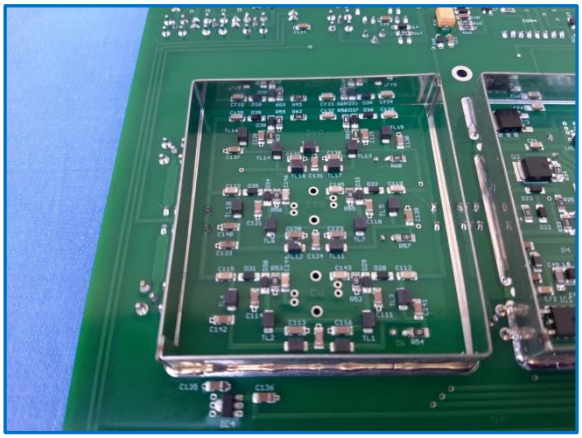
- Type: 3.5” LCD, 480×320 pixels, 16-bit colour, **non-touch**.
- Connected via **standard flexible ribbon cables**, ensuring easy maintenance or replacement.
- Displays:
  - FWD/REV Power
  - Numeric Power Output
  - VSWR
  - Voltage (U) / Current (I) / Temperature (TMP)
  - Fan speed (FAN %)
  - Faults (FLT)
  - Operational mode (RX/TX)
  - Filter/BYPASS status

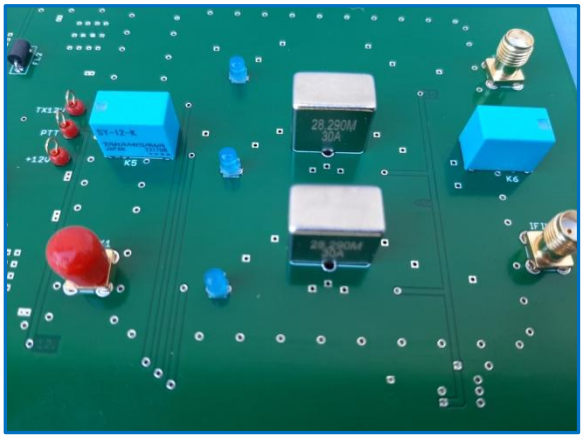
Microcontroller Logic

The Arduino manages:

- Sequencer timing (TX delay: 50 ms)
- Fan speed regulation
- Overcurrent and overtemperature protection logic
- Display updates at ~2 Hz refresh rate
- Fault detection and acoustic warnings (2 kHz tone, 3 × 1 s)

IF Crystal Filter Unit





The crystal filter unit circuit diagram is here:

A key upgrade in the MV-2 design is the **integrated IF crystal filter assembly**.

- Each unit includes **one CW** and **one SSB** crystal filter, both switchable on **RX** and **TX** sides.
- 50 Ω input/output impedance, with high selectivity.
- Operated by a **3-position front-panel switch**:
  - **CW Filter:** ±7.5 kHz bandwidth
  - **SSB Filter:** ±12.5 kHz bandwidth
  - **BYPASS:** disables both filters for wideband operation

Performance

- **Adjacent channel suppression:** ≥ –35 dB
- **SSB mode:** reduces sideband noise of the driving HF transceiver by at least 35 dB
- **CW mode:** effectively rejects strong nearby signals

When BYPASS is selected, the transverter operates across the entire **144–148 MHz** range without restriction.

Using the Transverter

Operating the **MV-2 transverter** is straightforward and safe when the recommended setup steps are followed.

Once you have specified the radio type you intend to use, the transverter will be **factory-configured** accordingly.
Depending on your radio, you will need to connect either:

- **Two IF cables** — for separate RX and TX IF connectors, or
- **One IF cable** — if your transceiver uses a shared IF I/O port.

Internal jumpers are preset at the factory for your radio type.
If you wish to connect a **different radio**, you must know the **TX IF output level** of that transceiver and adjust the jumpers accordingly (see configuration tables in previous sections).

Basic Setup Procedure

1. Connect a **stabilised 13.8 V DC power supply**:
   - 30 W version → minimum 7–8 A
   - 50 W version → minimum 12 A
     Use cables of adequate cross-section to prevent voltage drop.
2. Connect:
   - The **2 m antenna** to the *ANT* connector.
   - (Optional) an **external power amplifier**, controlled via the *SND* output.
   - The **PTT control line** between your radio and the *PTT* input.
   - The **SND output** from the transverter to the PA relay input (+50 V / 0.5 A max).

3. Switch the transverter **ON**.
    - The start-up screen will show factory settings (these do not automatically update if jumpers are modified; such changes must be made via the Arduino program).
4. Connect the **IF cable(s)** between the transceiver and the transverter.
5. Set your **radio to transverter (TVTR) mode**, following your radio's manual.
6. Verify reception of known beacons or stations.
    - If no signal is heard, check cables, IF frequency, and connection settings.
7. Press **PTT** on your radio — the transverter should switch to **TX** mode (indicated in the upper-right corner of the LCD).
8. In **CW mode**, key down and adjust output power using the **PWR knob**.
    - If the HF radio cannot provide sufficient IF drive, fine-tune using potentiometer **P3 (ATT)** on the control unit.

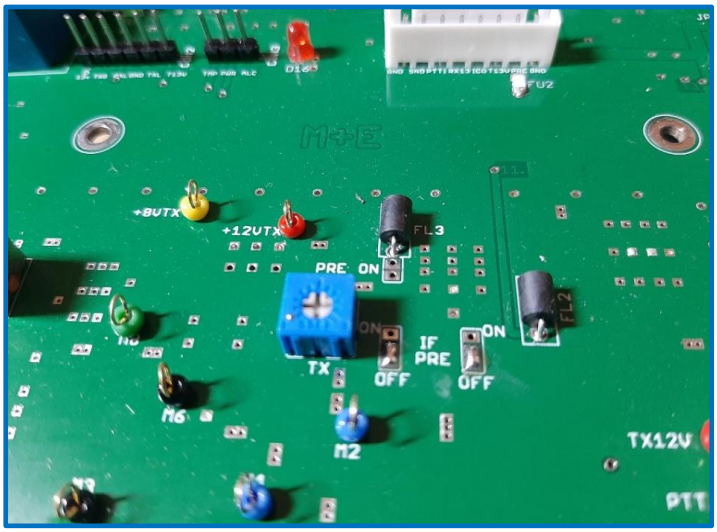
Power Adjustment

- Set the **front-panel PWR knob** to maximum.
- Use the **P3 ATT trimmer** (on the control board) to set the **desired maximum RF output**.
    - Example: If your external PA requires only 15 W drive, set P3 accordingly.
- For fine calibration, you may also use the **TX gain trimmer** on the mixer board (marked "TX").
    - Recommended for **LDMOS amplifiers** to maintain linearity.

Low-Level IF Radios (–20 dBm to –10 dBm)

Many HF radios deliver very low IF drive levels.
In such cases:

- Enable the **TX IF preamplifier** inside the transverter:
    - Set the **IF PRE jumpers** (centre to ON position).
    - Enable **IF preamp DC power** (PRE ON jumper).
    - Set **PWR** to maximum and adjust output using **P3 ATT** and **TX gain** as needed.



High-Power IF Radios (3–5 W IF Output)

For radios providing 3–5 W IF output:

- Enable the **–20 dB / 5 W attenuator** (refer to jumper tables).
- Adjust **TX gain potentiometer** on the main transverter board.

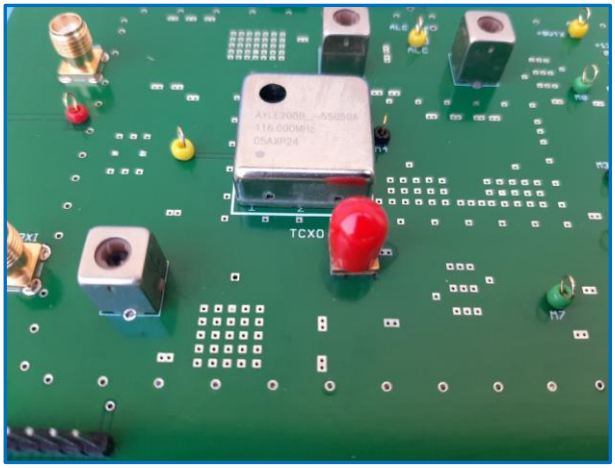
If the external PA does not require the transverter's full rated output, you can reduce it as follows:

1. Set **PWR knob** to maximum.
2. Adjust **P3 ATT** to obtain the desired RF power (e.g. 15 W).
3. Optionally, adjust **TX gain** on the mixer board for further precision.

Receiver Gain Adjustment

If you are using a **high-gain preamplifier**, total gain may become excessive, causing your S-meter to show S2 or higher noise levels.
Use the **RX potentiometer** on the transverter board to reduce RX gain until the noise floor returns to **S0**.
This does not affect external noise sources.

The MV-2 also provides an **SMA connector** on the motherboard (ahead of the SAW filter) for direct connection of an external preamplifier.



This configuration provides **lower noise figure and higher dynamic range**.
If total system gain becomes too high, connect the **SMA–SMA cable** here instead of using the RX1 input (both are 50 Ω).
A preamplifier gain of at least **+20 dB** is recommended, accounting for cable losses.

The transverter's **factory-set cable mode** is displayed during startup.

Operating Configurations

The following wiring layouts (available as PDF diagrams) illustrate typical system setups for MV-2 transverters:

1. Contest station
2. Contest station with dual radios
3. Single-antenna station
4. Single-antenna station using a single-connector radio

Summary

The MV-2 30 W and 50 W transverter series is a new generation of 2 m transverters that we designed for both contesting and normal operation.

The MV-2 transverter has exceptional RX dynamic range, < 1 dB noise figure, and high transmitter selectivity.

The built-in SAW filter, crystal filters operating at RUN frequencies, and Arduino control provide the user with a high-quality device.

Other important features include:

- High linear TX signal (IM3 < –33 dBc)
- Easily adjustable RF power (0–30 W / 0–50 W)
- Built-in protection against overcurrent, overheating, and high SWR
- 3.5-inch color display
- An advanced, robust, flexible, and service-friendly device for VHF operators.