

# 100 kW Solid State MF Broadcast Transmitter TRAM 100 LCD



Datasheet

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#### Arrangement

Only five 19" cabinets contain all components of the transmitter:

- Two amplifier cabinets
- Two filter cabinets
- One control cabinet

#### Amplifier

The amplifier section of the transmitter is consisting of two 50kW power blocks equipped with 48 power modules each. This power module forms the basic unit of the RF amplifier. It supplies somewhat more than 1kW into a special series transformer assembly (doughnut combiner) which summarises the power of all 96 power modules to the total transmitter power of 100kW.

The module is designed as one single printed circuit board, which is plugged into the assembly. The module comprises a switched RF amplifier bridge and an associated PDM modulator. Each unit supplies a completely modulated RF signal into the combining transformer. Thus, in case of a module fault the service is maintained with only slightly reduced power but without reduction of quality performance.

#### RF Output Filter

The 100kW power block has an RF output filter which is contained in two 19" cabinet.

The transmitter is factory equipped for and tuned on the determined operation frequency. The coils of the output circuit can be tuned for the whole MF band, while the capacitors are determined for sub-ranges of this frequency band.

#### Drive and Signal Processing

The transmitter is equipped with a common drive unit (PLL synthesizer) and a common PDM processing unit for all power modules. A dual synthesizer assembly in passive standby configuration is available as an option. The RF drive can also be switched to an external frequency generator or synchronised from an external standard.

#### Power Supply

A common power supply, comprising a 400 V to 210 V three-phase transformer and two three-phase rectifier units, is provided per 50 kW power block. Each rectifier unit is fed from an independent phase-shifted 210 V transformer output. This feeding provides 12-pulse ripple, only. The 400 V / 230 V feed also supplies the auxiliary equipment.

In the standard configuration, the transformer is contained in the bottom of the amplifier cabinet. As an option, we also provide a solution where the transformer is located externally from the transmitter.

#### Cooling

The components of the whole transmitter are basically air-cooled. A fan assembly located below the 100 kW power block moves the cooling air along the heat sinks of the power modules. This fan assembly compensates only the pressure drop inside the amplifier cabinet. The air is taken from the room and will be exhausted into the room.

Should external air ducts be required, an additional external blower system is needed to compensate the pressure drop in the external air ducts. Layout of the external aircooling system depends on the individual conditions at site.

#### Control Section

The control section of the transmitter comprises the 400 V / 230 V mains input, the internal distribution, a 15.6" high-resolution colour touchscreen with graphical user interface for readout and control of all transmitter conditions and parameters as well as the remotecontrol interface. Furthermore, it comprises the common drive unit (PLL synthesizer) and the AF input unit with PDM processing.

An integrated UPS backs up the power supply of the touchscreen and the internal computer during a short-term loss of mains power.

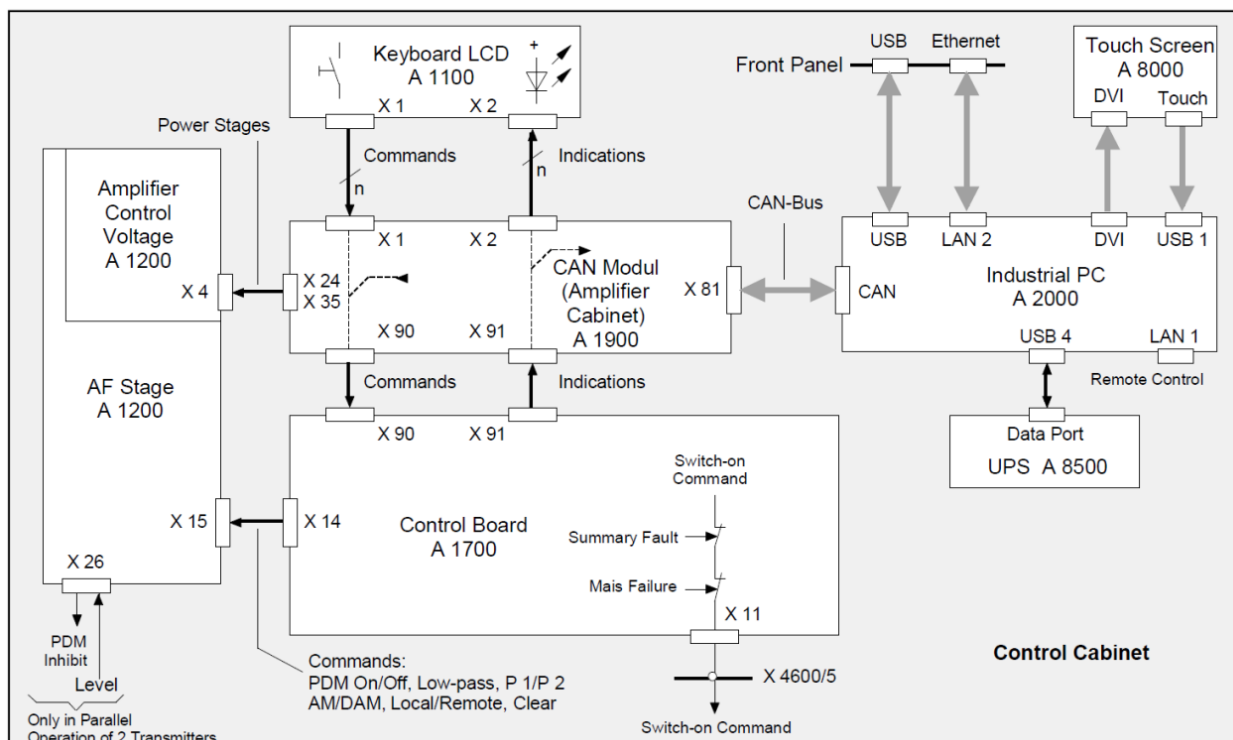
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### Transmitter control

Transmitter control is through the industrial PC A 2000. It passes all commands given via the touchscreen A 8000 to the CAN module A 1900, which is  $\mu$ P-controlled. The commands are routed to the individual assemblies in the cabinets via the CAN module and the control board A 1700. In local mode, command inputs are made through the touchscreen or the keyboard A 1100. The keyboard allows only a restricted command input. It is only in-tended for operation when the computer control fails. Remote control is also through the industrial PC. For this purpose, it possesses an Ethernet port LAN 1. This provides a web /SNMP interface for operation via the LAN (Local Area Network).



### Special Features

- Computer supported transmitter control
- Simple and intuitive operation via a high-resolution 15.6" touch screen
- Front panel LED's give a quick visual check on the operating status of the transmitter
- Integrated event protocol available
- Remote control via an Ethernet interface with integrated HTML-web server (SNMP-Interface optional)
- Operation with reduced power possible (from 20 % to 95 % settable in steps of 5 %)
- Automatic switchover procedures, e.g. day-night switchover possible
- 125 % positive peak modulation
- AM or DAM <sup>1)</sup> operating mode
- Optional automatic power reduction and modulation switching when mains power is supplied by an auxiliary system (e.g. a GENset) possible.
- Separate protective circuits in each power module

1) DAM = Dynamic-controlled Amplitude Modulation, the residual carrier is set at the factory to 0.6 (corresponds to 4.44dB) by default, but can be adjusted between 0.5 (corresponds to 6dB) and 1.0.

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### Graphical user interface (GUI)

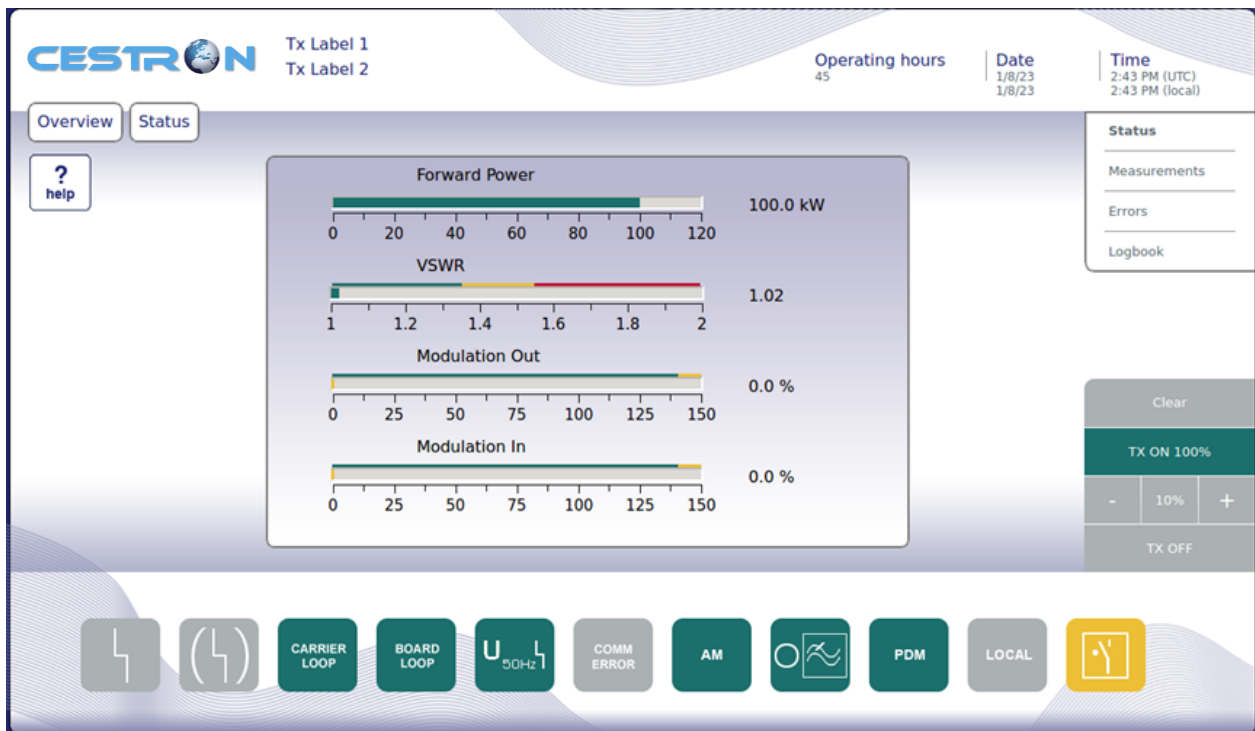


Figure 1: Status indication

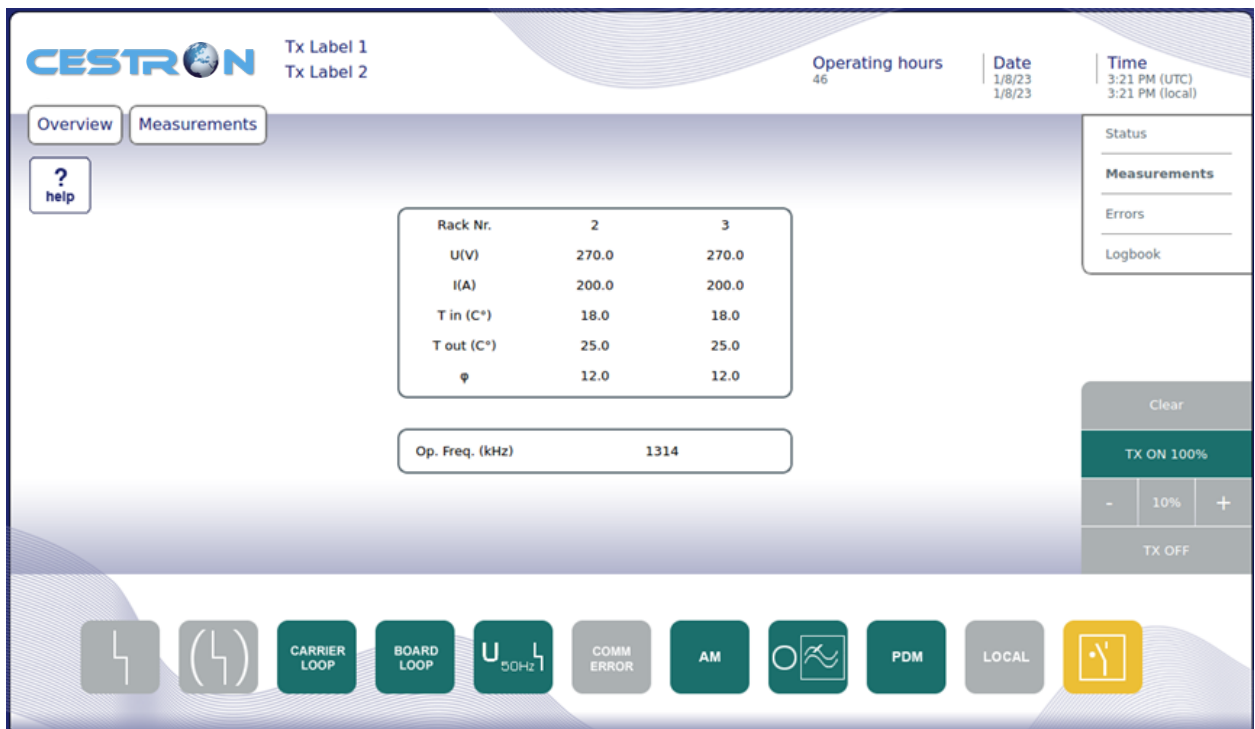


Figure 2: TX parameter measurements

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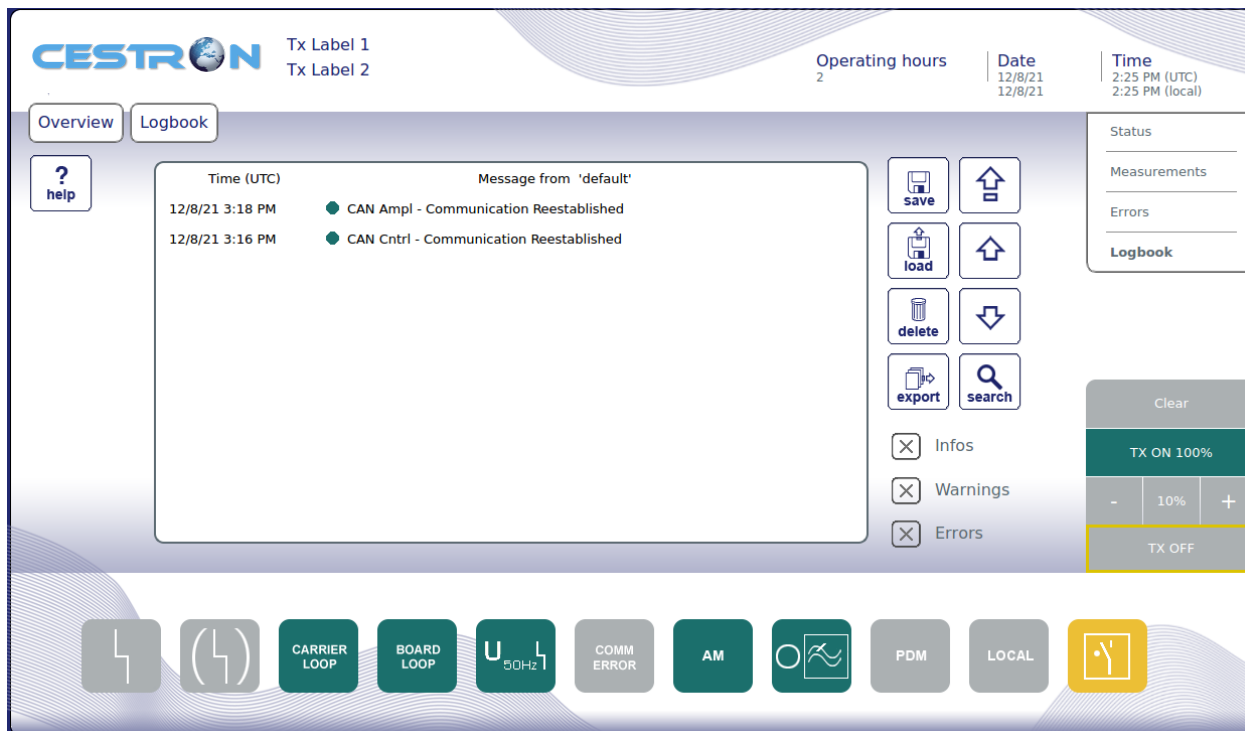


Figure 3: Logbook

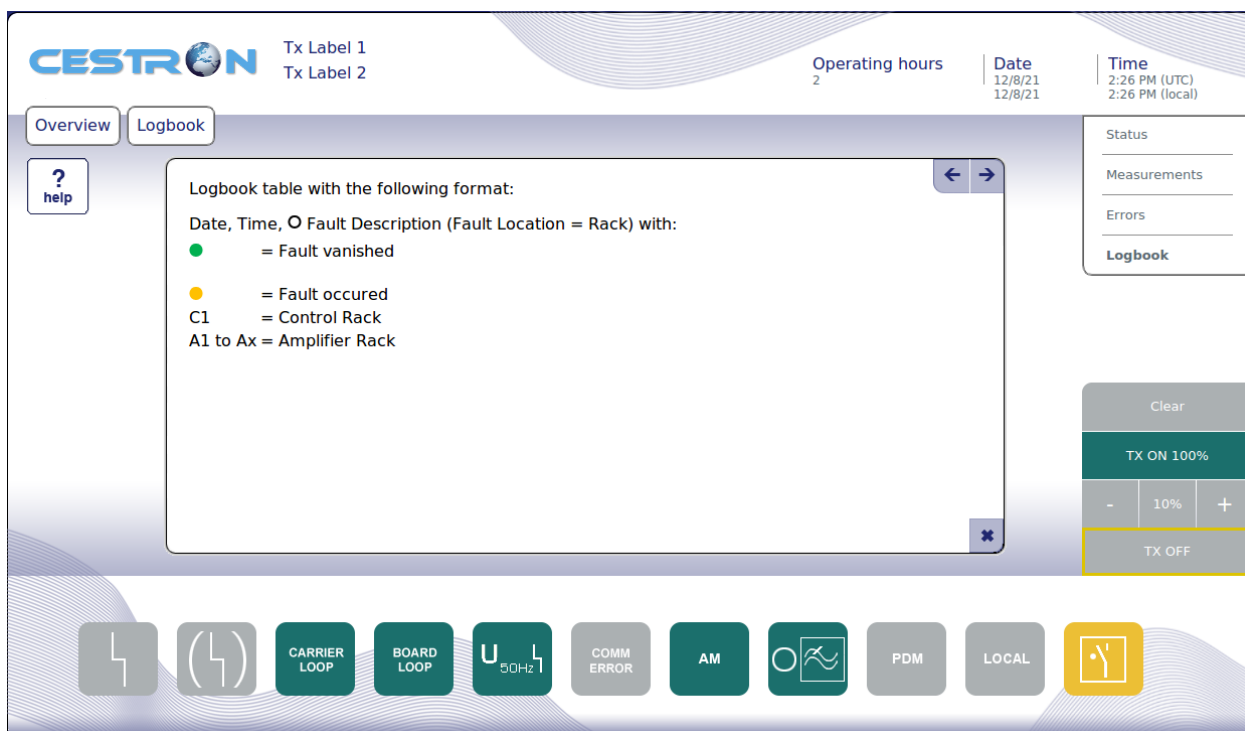


Figure 4: Integrated help function

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#### Technical Data

Amplifier configuration	Two 50 kW power blocks, equipped with 48 individual power modules. Each power module comprises an RF amplifier and an envelope modulator. One further power module of the same type is employed as driver module for the 100 kW power block.
RF output power	100 kW carrier power Typical > 80 kW DRM power with external DRM Exciter
RF power reduction	Output power continuously adjustable from 20% to 100% in steps of 5%
Frequency range	525 kHz to 1710 kHz The TX will be equipped for and tuned on the determined operation frequency in factory (components for other frequencies on request)
Frequency stability	Deviation < $\pm 2$ ppm Input for external synchronization (selectable 1 / 2 / 5 / 10 MHz)
Operation modes	AM (A3E) DCC mode DAM (X3E) or AMC / EAMC (selectable by jumper setting) DRM with external DRM Exciter
RF output connector	3-1/8" EIA
Load impedance	50 Ohm unbalanced
Load VSWR	Max. 1.3 VSWR > 1.3: Automatic RF power reduction VSWR > 1.5: Automatic RF power shutdown
Out-of-band emissions	According to ITU-R SM.328-10
Spurious & Harmonics	According to ITU-R SM.329-12 ( $\leq 50$ mW from 9 kHz to 1 GHz)
Modulation system	Pulse Duration Modulation (PDM)
AF input	600 Ohm balanced (can be changed inside the unit to $\geq 2000$ Ohm) Adjustable from - 10 dBu to + 10 dBu referred to 100% modulation
AF range	30 Hz to 10 kHz Two audio lowpass filters available (4.5 kHz / 6.75 kHz)
AF response	$\pm 0.5$ dB (30 Hz to 10 kHz) with band limiting filters switched off
AF harmonic distortion (THD)	$\leq 1\%$ at 95% modulation
Modulation capability	100% continuously, 125% peak program capability
Carrier shift (amplitude drop)	$\leq 1\%$
Signal-to-noise ratio	$\geq 60$ dB referred to 100% modulation
Power supply	3N 400 V, TN-S resp. TN-C mains configuration (5-wire resp. 4-wire)

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Mains frequency	50 Hz (60 Hz on request)
Permissible voltage variation	$\leq \pm 5\%$ with full performance $\leq \pm 10\%$ with minor performance degradation
Power factor	$\geq 0.95$
Power consumption	$\leq 114.9$ kW at no modulation $\leq 172.4$ kW at 100% modulation
Overall efficiency	$\geq 87\%$
Metering	15.6" high-resolution colour touchscreen with GUI for digital readout and control of all transmitter conditions and parameters Set of analogue meters (RF crosspointer meter, voltmeter, amperemeter) for additional analogue readout of relevant transmitter parameters (Option)
Local control	Local / Remote, Transmitter On / Off, PDM On / Off RF power P1 / P2, Mode AM / DAM Audio lowpass filter On / Off Audio lowpass filter 4.5 kHz / 6.75 kHz Readout and control of all transmitter conditions and parameters LEDs for additional indication of most relevant status information Event logbook and counter for transmitter operating hours Integrated Quick Reference Guide (comprehensive help function) Scheduler with ten editable timer settings
Remote control interface	Ethernet with integrated HTML web server Ethernet with SNMP (Option) Floating relay contacts (Option)
Environmental temperature	- 10° C ... + 45° C
Relative humidity	Max. 90% (non-condensing)
Installation altitude	Max. 2000 m above sea level (higher altitudes on request)
Cooling system	Air cooling with internal fan assembly below the power block (air intake from the room, exhaust air into the room) Cooling air consumption approx. 6600 cbm / h External blower system with filtering and air ducts on request
Dimensions	WDH = 3000 mm x 1000 mm x 2000 mm

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## Schematic Diagram TRAM 100 LCD

