

USER OPERATIONAL MANUAL



250 WATT FM TRANSMITTER

Model MT250



GENERAL NOTICE

THE MT250 TRANSMITTER IS SET FOR 110 VAC. FOR 220 VAC. SETTING, SEE THE MODIFICATIONS SHOWN IN THE SCHEMATIC DIAGRAM ENCLOSED IN THE MANUAL

THE MT250 TRANSMITTER OPERATING FREQUENCY MAY NOT BE SET FOR YOUR AUTHORIZED FREQUENCY. IN ORDER TO SET THE FREQUENCY OF OPERATION OF THE MT250, PLEASE LOCATE, THE OME-1T SECTION OF THIS MANUAL AND ON PAGE 4 OF 4 LOCATE THE FREQUENCY SETTING EXAMPLES. THE COVER OF THE TRANSMITTER WILL NEED TO BE REMOVED IN ORDER TO GAIN ACCESS TO THE TOP PANEL OF THE FM STEREO EXCITER TO MAKE THE FREQUENCY CHANGE.

THE MT250 WAS DESIGNED AND REALIZED IN THE RICHARDSON ELECTRONICS, R&D LABORATORY OF INGENIUM SRL FACTORY.

THIS PRODUCT DOES NOT INCLUDE A DETAILED TECHNICAL MANUAL, RATHER AN ENHANCED OPERATORS MANUAL.

WHAT THIS DOCUMENTATION IS INTENDED TO DO IS TO GIVE THE USER THE CORRECT INSTRUCTIONS AND INDICATIONS ABOUT HOW TO TURN ON, OPERATE, HOW TO DO PERIODICAL CHECKS AND, HOW TO MAINTAIN THE MT250 FM STEREO TRANSMITTER.

WE ARE AWARE THAT THE TRANSMITTER DOCUMENTATION MAY PRESENT SOME SMALL AMBIGUITIES AND IMPERFECTIONS, MANY OF WHICH HAVE ALREADY BEEN NOTED AND RESOLVED IN THE NEXT RELEASE AND PRODUCTION. FOR THIS REASON, EVERY OBSERVATIONS/SUGGESTIONS OR PARTICULAR REQUESTS ARE WELCOME.

ELECTRONIC FILES OF THE SCHEMATIC DIAGRAMS IN THIS MANUAL ARE AVAILABLE AND SHOULD A LARGER MORE VIEWABLE VERSION OF ANY DIAGRAM BE REQUIRED PLEASE DO NOT HESITATE TO NOTIFY RICHARDSON ELECTRONICS, LTD.

DO NOT HESITATE TO CALL OUR TECHNICAL SUPPORT CENTER AT RICHARDSON ELECTRONICS IN LA FOX, ILLINOIS OR OUR R&D CENTER AT ANY TIME.

Richardson Electronics, Ltd.

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Returns and Exchanges

Equipment (Damaged or undamaged) should not be returned unless written approval and a Merchandise Return Authorization (MRA Number) is received from **Broadcast Richardson**. Special shipping instruction will be provided which will assure proper handling. The circumstances and reasons for the return must be included in the request for return. Equipment that is special or “custom” ordered may be not returnable. In situations where return or exchange is at the request of the customer a restocking fee may be charged. All returns must be sent freight prepaid and properly insured by customer. When communicating with **Broadcast Richardson** please refer to your Order or Invoice Number.

Unpacking

Use care when unpacking the equipment. First perform a visual inspection of the item(s) to determine if any damage occurred during shipment. Be sure to retain all the shipping materials (crates and boxes or cartons) until such time that it has been determined that the received equipment arrived undamaged. Find all PACKING LISTS and keep them to assist in locating and identifying any components or assemblies that may have been removed for shipping and might need to be reinstalled in the equipment. Make sure that all shipping straps, supports and packing materials are completely removed from the equipment prior to initialization and use.

Technical Support

Should you need technical assistance or trouble shooting guidance contact **Broadcast Richardson** in your local area or you can reach assistance from **Broadcast Richardson** in La Fox, Illinois at telephone +1 (630) 208-2200, Fax +1 (630) 208-2551. Throughout the world there are many Richardson Electronics, Ltd. offices that are also able to assist in contacting our technical support team.

WARNING!

THE VOLTAGES AND CURRENTS IN THIS EQUIPMENT ARE DANGEROUS. PERSONEL MUST, AT ALL TIMES, OBSERVE SAFETY WARNINGS, INSTRUCTIONS, AND ANY REGULATIONS.

This owner's manual is intended as a general guide for trained and qualified personnel who are aware of the dangers that are inherent in the handling and operation of potentially hazardous electrical and electronic circuits. It is not the intent of this manual to provide a complete set of safety instructions or precautions that should already be understood by trained or experienced personnel in using this or other types of electronic equipment.

The installation, operation, and maintenance of this equipment involves risks to personnel and also to the equipment. Broadcast Richardson or Richardson Electronics, Ltd. shall not be responsible for injury or damage that is the result of improper procedures or use by persons improperly trained or lacking the knowledge to perform associated tasks.

All local codes for building, safety, fire, or related standards must be observed. Consult local authorities for the standards for the area or region where the equipment will be installed and put in use.

WARNING!

AT ALL TIMES DISCONNECT AC/MAINS POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, PANELS, OR PROTECTIVE SHIELDS THAT EXPOSE LIVE CIRCUITS. USE ANY GROUNDING STICKS OR OTHER SHORTING PROBES TO DRAIN ENERGY FROM CIRCUITS BEFORE SERVICING. NEVER PERFORM MAINTENANCE, MAKE ADJUSTMENTS, OR SERVICE THE EQUIPMENT WHEN ALONE OR FATIGUED.

WARNING!

IF ELECTROLYTIC OR OIL FILLED CAPACITORS ARE UTILIZED IN THE EQUIPMENT AND THE COMPONENT APPEARS LEAKY, OR IS BULGING, OR IF THE CASE OR COVERING OF THE COMPONENT APPEARS DAMAGED OR DISTRESSED ALLOW SUFFICIENT TIME FOR THE UNIT TO COOL OR FULLY DISCHARGE BEFORE SERVICING. SERVICING HOT OR LEAKY CAPACITORS CAN CAUSE A RUPTURE OF THE CASE AND POSSIBLE INJURY.

Should accident or injury occur personnel engaged in the installation, operation, or service of the equipment should seek proper medical attention. It is advisable that such personnel have familiarity with first-aid practices.

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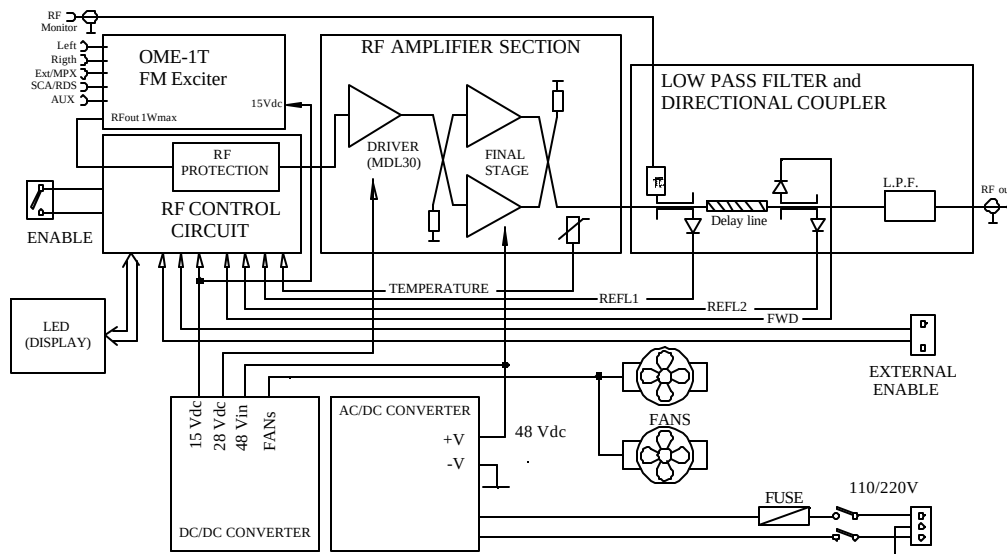
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MT250 FM LOW POWER TRANSMITTER 250 WATT

1.0 OVERVIEW

MT250 is a 250 Watt FM Low Power Transmitter. It is very simple and easy to use. It is composed by a mechanical frame (19 inches std., 3 HU high and 500mm depth), an exciter (OME-1T), a RF section, which comprises a RF control board and an amplifier section, a directional coupler and a low pass filter, a display, a power supply with a AC/DC converter and a DC/DC converter.

2.0 BASIC BLOCK DIAGRAM OF MT250



3.0 SUBASSEMBLIES DESCRIPTION

3.1 MT250 AC/DC Power Supply

This power supply is a purchasing product. It has a wide range with an input voltage of 85/265V and an output voltage of 48V. Below, the technical specifications:

Nominal Output Voltage	48V
Max Output Current	13A
Max Output Power	624 Watt
Efficiency	83% typ.
Input Voltage Range	85-265VAC (47-63Hz)
PFHC	Built to meet EN61000-3-2
Power Factor(100/200VAC) (typ)	0.99/0.95
Output Voltage Range	43.2-52.8V

Over Voltage Protection

55.2-64.8

3.2 MT250 DC/DC Power Supply

The MT250 uses a DC/DC converter. It provides a voltage of 28V to the fans and a voltage of 15V to the exciter. In addition, it supplies a voltage of 28V to the driver (MDL30). Below, the technical specifications:

Vdc Input	20 up to 53 Vdc
Output 1	15 Vdc/1.5 A
Output 2	28 Vdc/3 A

3.3 FM Stereo Exciter

The exciter is a OME -1T model. The declared nominal RF output power is 1 Watt; this signal arrives to the RF final stage through the RF protection circuit. All the input connections are arranged on the front panel. (See the annex datasheet).

3.4 MT 250 RF Control Circuit

The RF input circuit has 3 main functions:

- 1) RF power control**
- 2) RF protection**
- 3) Measurement/status indication**

RF Power Control. A pin diode attenuator manages the RF input power coming from the exciter (OME-1T). This attenuator can be manually controlled by RT3 trimmer, in order to adjust the right output power. The AGC control regulates the power, manually set, versus frequency and/or temperature changes.

Moreover, the input attenuator includes a soft start, activated at the switching on or after any RF protection intervention.

When the MT250 works at a very high temperature and/or high reflected output power, a derating circuit provides to decrease the output power in order to maintain the equipment on duty, even at low power.

RF Protection. A fast comparator switches when the output detected reflected power exceeds a pre-set threshold. The regulation of this threshold is made by RT2 trimmer, adjusted in factory at a value of 40 Watt reflected power. When the protection is switched on, the protection circuitry cuts the RF signal applied to the final stage amplifier very quickly, in about 1 micro second.

Measurement/status indication. The two main measurements, FWD and REF power, are displayed by two BAR LEDS. The MT300 status is indicated with 3 leds: RF nominal, RF fault, RF derating. The RF fault is on when the output power is lower than 3 dB related to the nominal output power. If the power decreases in derating conditions, the fault is off in all cases. The enable SW1 switch is on the front panel. It is possible to operate on the enable using the contacts on the rear panel, too. The enable of the amplifier is realized when the SW1 is on and the rear panel enable is closed.

WARNING: with enable off, there is no RF out but all the internal circuits are supplied (stand by condition).
So, switch off the mains before operating inside.

3.5 **MT250 RF Amplifier**

The RF amplifier section provides to amplify the RF signal coming from the RF control circuit.

It is composed by:

- MDL30 (Driver)
- 90 deg. 2 way hybrid splitter
- a pair of final stage amplifiers mounting SD2931-10 devices
- 90 deg. 2 way hybrid combiner

The **MDL30** provides the first step of amplification of minimum 17dB gain in order to correctly drive the final stages. It is composed by a stage operating in class AB. Below, the technical specifications:

VCC	28V
Idq	200 mA typ.
Frequency range	FM (87.5-108 MHz)
Power Gain	> 17 dB typ.
Output Power	> 25 W

The **2way splitter** is made by a 90 deg. Hybrid structure and provides to split in quadrature the input signal. Below, the technical specifications:

Frequency	87.5 – 108 MHz
Input power	50W Max
Return Loss (S11)	<-17 dB
Return Loss (S22 ed S33)	<-15 dB
Isolation (S32)	>15 dB
Insertion Loss (S21=S31)	<0.6 dB

The **final stage** is an amplifier for FM signal operating in band II (87.5 – 108 MHz), with nominal output power of 250 Watt CW.

Normally it works up to 280 Watt, in order to win the Insertion loss of the circuitry that follows the amplifiers, as the Directional couplers and Low Pass Filter.

It is a balanced amplifier, including a pair of single end sections, each one using a high power MOSFET with the input / output matching network printed on the pcb. The RF MOSFET's bias are integrated on this printed circuit board. The polarization is in class B, with a 10 mA quiescent current per section. The two sections are split and combined by 90 deg. hybrid.

VCC nominal	48V
IDC (@ Full Power)	10 A typ.
Idq	20 mA typ.
Frequency range	FM (87.5-108 MHz)
Power Gain	Typ. 16 dB
Output Power	280 W min

The **2 way Combiner** is a 2 way in quadrature structure, and it provides to sum each two final stage sections to have 250 W power at the common port. One unbalancing 50 Ohm resistor warranties the isolation between the input ports, in order to maintain the Transmitter on duty, in case one of the final stages will be on fault (- 6dB derating).

Below, the technical specifications:

Frequency	87.5 – 108 MHz
Power handling	400 W Max
Return Loss (S11)	<18 dB
Return Loss (S22 ed S33)	<18 dB
Isolation (S32)	>18 dB
Insertion Loss (S21=S31)	< 0.4 dB

3.6 Low Pass Filter and Directional Coupler Unit

The filter has a particular elliptic configuration; this configuration has been specifically chosen to guarantee the values of the harmonic components levels.

In-band Insertion Loss	<0.5 dB
Insertion Loss @ 175MHz	>55 dB
In-band Return Loss	<-20 dB

The directional coupler is a block composed by 2 directional couplers and a quarter wave delay line. Both ports of each directional coupler are used. Two of them detect the reflected power, one detects the FWD power and one is used as RF monitor. The function of the delay line is to have two reflected power signals detected at 90° of electrical angle. In this way, it is possible to have a quite constant reflected power level vs the phase angle of that signal. The RF monitor is connected to the front panel (RF monitor port) to have 0 dBm nominal signal.

4.0 MT250 Technical Specifications

Environmental

Storage Temperature:	-20/+65 °C
Operating Temperature:	-5/+45 °C
Guarantee Performance Temperature:	0/+45 °C
Relative Humidity (Non Condensing):	< 90%
Guarantee Performance Altitude:	2000 m, (6560 ft)
Cooling:	> 150 cubic meters/hour

RF Characteristics

Frequency Range:	87.5 – 108 MHz, 50Khz step, synthesized.
Output Power:	250 Watt nominal, (VSWR < 1.8:1).
RF Power Devices Technology:	MOSFET
Off lock Attenuation:	> 60 dBc
RF Output connector:	N Female
RF Output Impedance:	50 Ω
RF Output monitor level:	0 dBm nominal (BNC connector on the front panel)
RF Spurious:	< -95dBc @ +/-1MHz (Exceed .EBU/CCIR/FCC)
Harmonic:	< -90dBc
Frequency stability:	< 500 Hz / 6 months @ Center Frequency
Inputs:	Mono, Stereo, MPX, AUX, SCA/RDS
Input Impedance:	600 Ω or 5K Ω unbalanced
Modulation Type:	F3E/F8E Direct FM at the carrier frequency
Frequency deviation:	+/-75KHz=100%
Variation of sensitivity for 75 KHz Deviation:	+/-1dB from 87.5 to 108 MHz
AF Limiter:	+1dB
Center Frequency Shift:	< +/-500Hz, (Due to +/-75KHz Mod)
Stereo Operation:	CCIR 450/S2 "Pilot Tone System"
Asynchronous AM SNR: (REF=100% AM Mod, @400Hz, BW=30Hz to 20KHz, FM Mod OFF)	- 56dB
Synchronous AM SNR: (REF=100% AM Mod, @400Hz, BW=30Hz to 20KHz, FM Mod +/-75KHz @400Hz)	-50dB

Electrical

Power Supply:	96/130 or 200/268 V, Single Phase AC, 48 to 62Hz.
Power Consumption:	< 580 VA
Power Factor:	> 0.9

R & Mono Input

Input connectors:	BNC female (front panel)
Input Impedance:	1 Mohm resistive, unbalanced, source impedance <10kOhm
Input level (For +/-75KHz deviation):	3 to 9 dBm/600Ω
Frequency response (30Hz to 15KHz):	+/- 0.15dB
Pre-emphasis:	Flat/50μSec/75μSec +/-3%
THD (30Hz to 15KHz):	0.1%
FM S/N Ratio (REF= +/-75KHz):	
Weighted CCIR 468-2; BW= 30Hz to 20KHz	
flat	-68dBc
with de-emphasis 50μsec	-73dBc
with de-emphasis 75μsec	-76dBc
No-weighted; BW= 30Hz to 20KHz	
flat	-73dBc
with de-emphasis 50μsec	-76dBc
with de-emphasis 75μsec	- 78dBc
Audio Filter rejection: (19KHz to 100KHz)	>30 dB
19KHz suppression:	> 46dB

External MPX Input

Input connectors:	BNC female (front panel)
Input Impedance:	10KΩ
Input level (For +/-75KHz deviation):	3 to 9 dBm/600Ω
Composite amplitude response (30Hz to 100KHz):	+/- 0.5dB
Composite phase response (30Hz to 53KHz):	+/- 0.5°
SNR: (30Hz to 200KHz; with de-emphasis 50μsec)	> 75dB

Stereo Operation (L & R Channels)

Input connectors:	BNC female (front panel)
Input Impedance:	1 Mohm resistive, unbalanced, source impedance <10kOhm
Input level:	3 to 9 dBm/600Ω
Audio Filter Attenuation:	> 68 dB @ 19 KHz
Crosstalk Attenuation (From 30 Hz to 15 KHz):	> 50 dB
Pre-emphasis:	Flat/50 μSec/75 μSec +/-3%
38 KHz Suppression:	> 50 dB
Sub-Carrier Frequency:	38 KHz +/- 2Hz
Pilot Frequency:	19 KHz +/- 1Hz
Phase Difference 19/38 KHz:	0° +/- 2°
THD on Encoded Channels (30Hz to 15KHz):	< 0.1%
Audio Response (30Hz to 15KHz):	+/- 0.25dB
Nominal Pilot Deviation:	+/- 7KHz
Pilot Output level:	1 Vpp, square wave

SCA/RDS & AUX input

Input connectors:	BNC type female (front panel)
Input Impedance:	5KΩ
Input level (for +/-7.5KHz deviation @97.5MHz):	2.2Vpp/5KΩ
Amplitude Response (10KHz to 100KHz):	+/- 0.15dB

6.0 Set up procedure

The MT250 is shipped in a wooden box. It can be removed by lifting them with the banding straps that are provided. This equipment can operate independently, and, thanks to its standard mechanical frame (19 inches), it can be located in a rack.

The MT250 is supplied for 220Vac, +/- 15%, single phase at 50Hz or 60Hz operation but it can work for 110VAC single phase, because its AC/DC power supply is a full range model. The normal current draw is approximately 2.6 amps for 220Vac operation, but, if supplied at 110Vac, the normal current is around 5.3 amps. It is installer's care to correctly connect the three wires (line, N, GND) to the mains line. Before switching the transmitter on, it is necessary to connect the output power connector to either a dummy load or an antenna.

After this procedure, it is possible to turn the transmitter on. On the front panel, the mains led indicates the status of the MT250. If it is on, the equipment has been correctly supplied. Through the enable switch, always on the front panel, the transmitter reaches the maximum power. Other leds provide further information on the MT250

- RF nominal (green): on if some RF output power appears
- Derating (yellow): on in two situations
 - when the reflected power is higher than 10dB (the transmitter power output is warranted until VSWR 2:1. If the VSWR is higher, the derating protection intervenes. It stabilise the output power at a non-dangerous value for the amplifier)
 - when the working temperature is too high (the temperature protection intervenes when the room temperature is $\geq 45^{\circ}$. In this case, the output power is reduced of about 6dB)
- Fault (red): on if the transmitter has other faults (for example, input power without output power, with the following fault on the RF amplifier or RF control circuit).

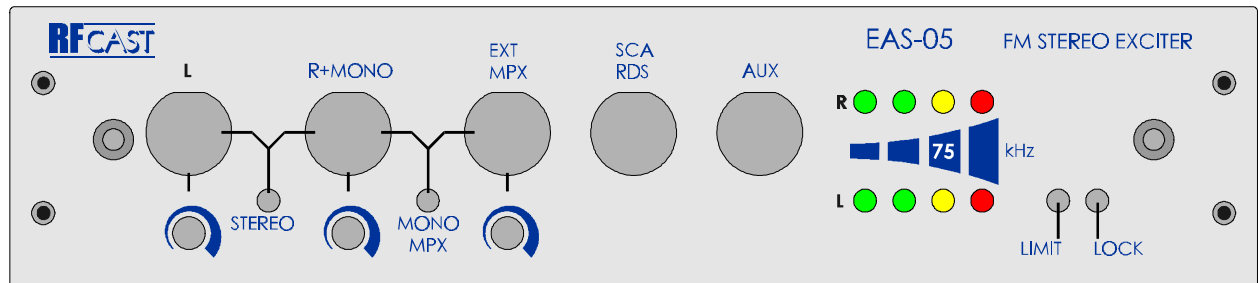
Balanced Amplifier Advantages

The choice of using two RF devices has been decided in order to improve the ruggedness of the amplifier in case of mismatched dummy load. Thanks to the 90 deg. hybrid isolation the amplifier stages are not influenced by the operating condition changes of the load (antenna, filter, and so on...).

Moreover, the amplifier is more immune to the oscillations than one realised with only one RF device.

The two hybrid RF devices allow the amplifier to produce output power (-6 dB) even if one of them breaks or damages. In case of a single device, its fault provokes the amplifier switching off and the complete disappearance of output power.

*1W FM Broadcast Exciter
for Mono / Stereo Operations
(87.5 to 108 MHz Version)*



GENERAL

Power Output	1.0W min., 1.5W typ.
RF Output Impedance	50 W Unbalanced, VSWR less than 2:1 for full output.
RF Output Connector	BNC type (Rear panel).
Frequency Range	87.5 to 108 MHz in 50 kHz steps.
Frequency Control	Manually settable synthesizer (3 internal rotary switches).
Reference and Freq. Stability	TCXO; ±300 Hz , 0° to 50°C temperature increment.
Modulation Type	F3E/F8E Direct FM at the carrier frequency.
Modulation Sensitivity Variation (REF= ±75kHz)	± 5% from 87.5 to 108 MHz.
Modulation Capability	± 150 kHz.
Modulation Indication	Peak reading LEDBAR with overmodulation led indicator (Red led).
AF Limiter	Deviation increment (REF=± 75 kHz) less than 1dB for 6dB of input audio level increasing. Internally jumper settable (On / Off).
Off Lock Attenuation	> 60 dBc.
RF Spurious	Exceeds EBU/CCIR/FCC requirements: -95 dBc @ ±1 MHz min. out of carrier.
AM Asynchronous S/N Ratio	-58dB min. , -60dB typ, Conditions: REF.=100% AM Mod. @400Hz, BW=30Hz to 20 kHz, no FM modulation present.
AM Synchronous S/N Ratio	-55dB min., -58dB typ, Conditions: REF.=100% AM Mod. @400Hz, BW=30Hz to 20 kHz, FM Mod. ± 75 kHz @ 400Hz, 97.5 MHz.
Status Indication	LED Status Indicators: MONO/MPX, STEREO, LIMIT and LOCK (Front panel).
DC Input Power	15 V_{DC} ± 5%, 650 mA max.
Ambient Temperature Range	0°C to 50°C (operational to -20°C).

RFCAST

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PHYSICAL

Cabinet size	6.65" (169 mm) wide x 0.4" (39.6 mm) high x 7.36" (187 mm) deep – Front panel: 7.56" (192 mm) x 1.72" (43.6 mm) .
Net Weight	2.98 lbs , (1350 gr).
Finish	Front panel: Background RAL 1013 with blue serigraphy on treated aluminum; Internal parts and rear panel: Treated aluminum; Covers: Painted RAL 8017 galvanized iron.

MONO AURAL OPERATION**“R+MONO” INPUT**

Audio Input Impedance	1 MW resistive, unbalanced, source impedance < 10k Ω	
Audio Input Connector	BNC Type (Front panel).	
Audio Input Level	Internally programmable by jumpers: +0 to +3 dBm (Fine adjustment on front panel) +3 to +6 dBm (Fine adjustment on front panel) +6 to +9 dBm (Fine adjustment on front panel).	
Audio Frequency Response	$\pm$ 0.15dB , 20Hz to 15 kHz .	
Pre-emphasis	Flat , 50 or 75 msec $\pm$ 3% selectable by internal jumper.	
Harmonic Distortion	0.03% or less, 30 Hz to 20 kHz.	
THD	< 0.1% (typ. 0.05%), 30 Hz to 20 kHz.	
FM S/N Ratio (REF= $\pm$ 75 kHz)	Weighted CCIR 468-2	Unweighted BW=30 Hz to 20 kHz
	FLAT: -70 dBc min., -75 dBc typ.	FLAT: -75 dBc min., -80 dBc typ
	50 μ sec: -75 dBc min., -80 dBc typ.	50 μ sec: -78 dBc min., -83 dBc typ.

WIDEBAND STEREO OPERATION**EXTERNAL MPX INPUT**

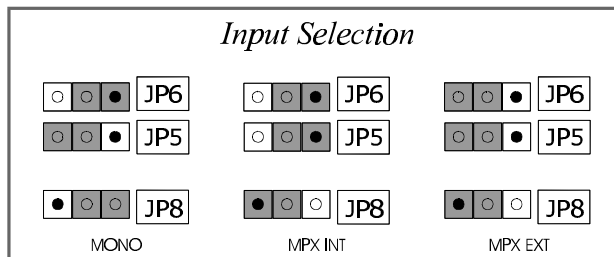
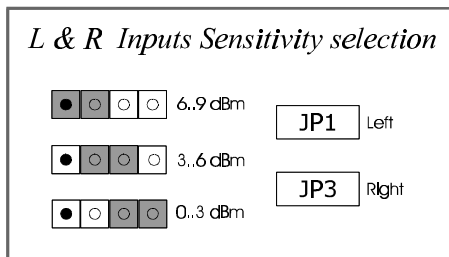
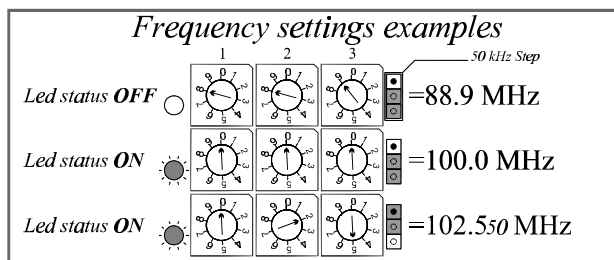
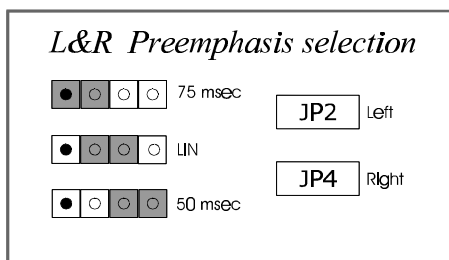
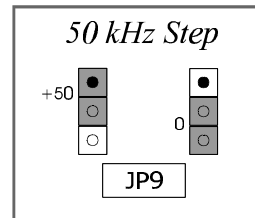
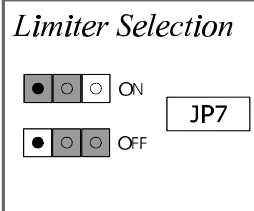
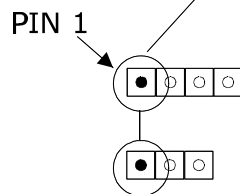
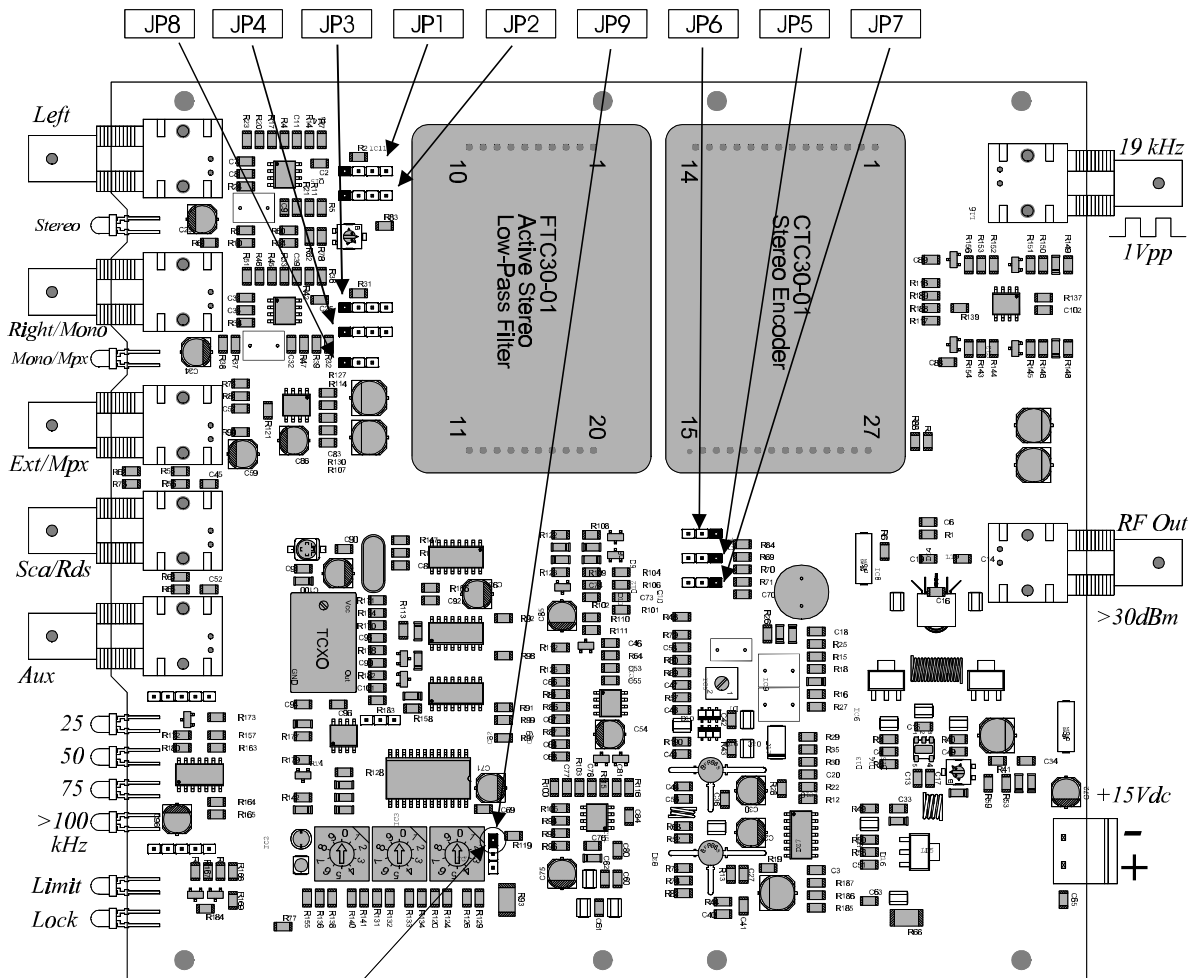
Audio Input Impedance	>10 kW resistive, unbalanced.
Audio Input Connector	BNC Type (Front panel).
Audio Input Level	3.1Vpp to 6.2 Vpp (Continuously adjustable from front panel) for $\pm$ 75 kHz deviation @ 97.5 MHz.
Composite Amplitude Response	$\pm$ 0.1dB , 20Hz to 100 kHz .
Composite Phase Response	$\pm$ 0.5° from linear phase, 20 Hz to 53 kHz.
Harmonic Distortion	0.05% or less (0.03% typ.) , 20 Hz to 100 kHz.
Composite FM S/N Ratio (REF= $\pm$ 75 kHz)	-78 dBc min. , (-83 dBc typ), 30 Hz to 200 kHz, with 50 μ sec de-emphasis.

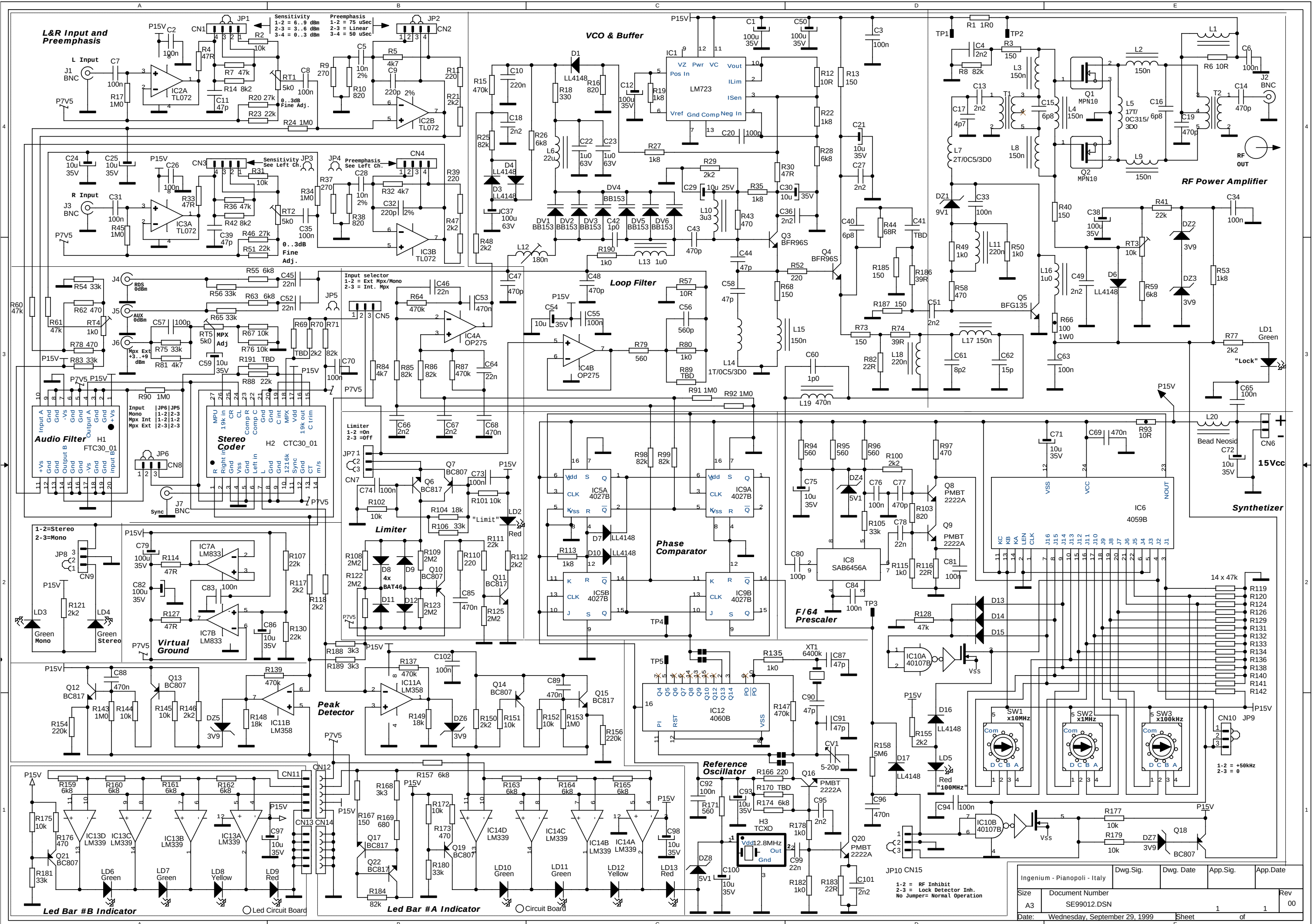
BUILT IN STEREO ENCODER OPERATION

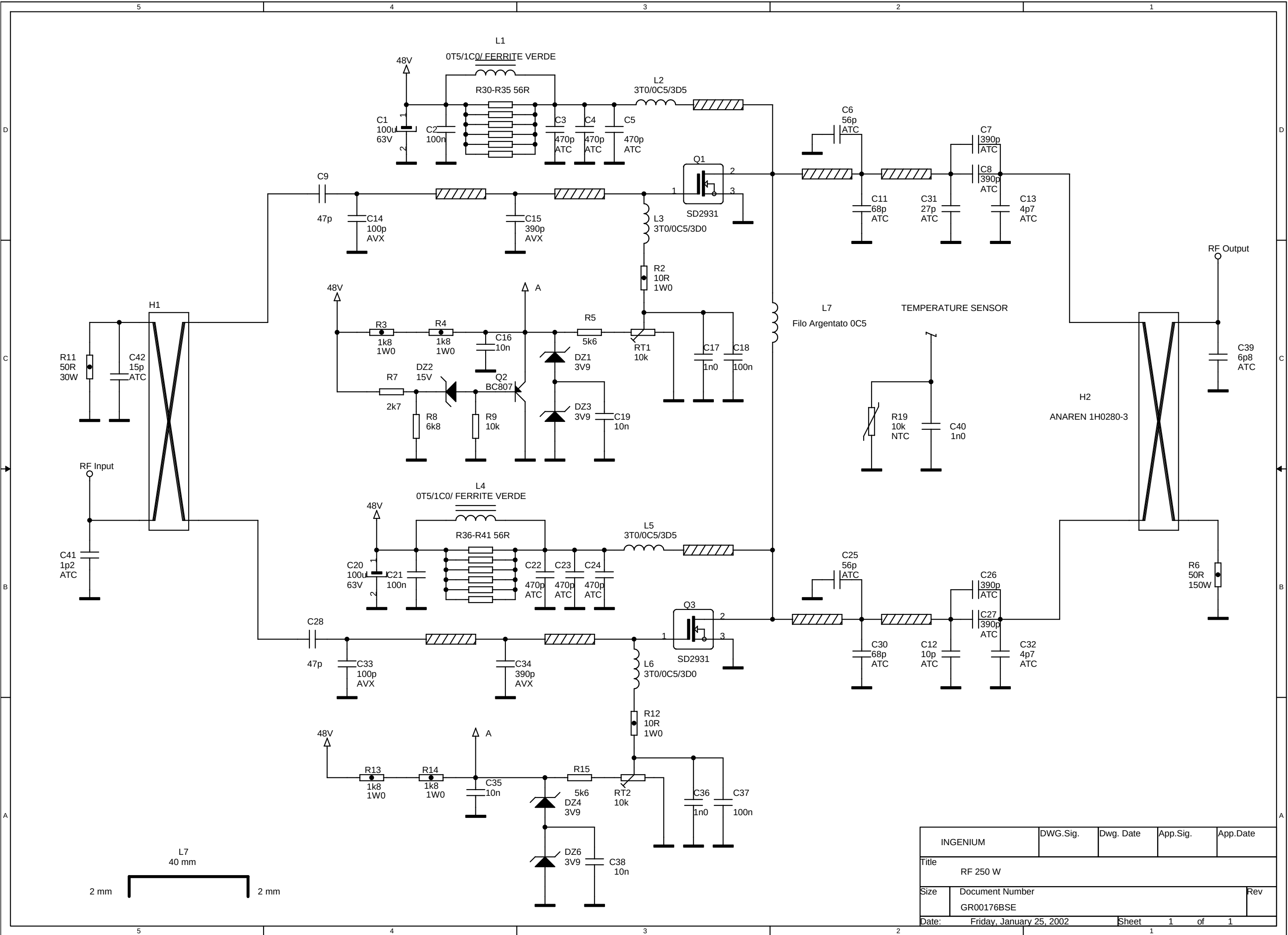
"L" & "R" Input Impedance	1 MW resistive, unbalanced, source impedance < 10k Ω
Audio Input Connectors	BNC Type (Front panel).
"L" & "R" Input Level	Internally programmable by jumpers: +0 to +3 dBm (Fine adjustment on front panel) +3 to +6 dBm (Fine adjustment on front panel) +6 to +9 dBm (Fine adjustment on front panel).
Audio Filter Response	± 0.15dB, 20Hz to 15 kHz.
Audio Filters Attenuation	>70 dB @ 19 kHz.
Pre-emphasis (each Channel)	Flat, 50 or 75 msec selectable by internal jumpers.
Stereo Separation (demodulated encoded channels)	50 dB min. (55 dB typ) , 20 Hz to 15 kHz.
Subcarrier Frequency	38 kHz $\pm$ 2Hz.
Subcarrier Generation	Internal Crystal.
Pilot Frequency	19 kHz $\pm$ 1 Hz.
Pilot Output Level	1 Vpp , Square Wave.
Pilot Output Connector	BNC Type (Rear panel).
Phase Difference 19/38 kHz	0° $\pm$ 2°.
38 kHz Suppression	> 50 dB.
Harmonic Distortion on Encoded Channels	<0.1% (0.05% typ.) , 20 Hz to 15 kHz.

SCA/RDS & AUX INPUTS

Audio Input Impedances	>5 kW resistive, unbalanced.
Audio Input Connectors	BNC Type (Front panel).
Audio Input Level	2.2Vpp for ± 7.5 kHz deviation @ 97.5 MHz.
Amplitude Response	± 0.15dB, 10 kHz to 100 kHz.







Product Code **GR00176** **Description** **250W RF Module**

Document Code **Revisione** **File** **Emission Signature**

Drawing Date **Dwg Signature** **Emission Date**

Item	Reference	Cod	Description	Accessories Data	Q.ty	UM
1		CS00045	Circuit board RF MT250 FR4 1.6mm		1,00	PZ
2		CS00046	Circuit board RF MT250 Arlon320 1.6mm		1,00	PZ
3	H 1	CS00025	Circuit board FM Coupler		1,00	PZ
4	H 1	CS00026	Circuit board FM Coupler parte superiore		1,00	PZ
5	R 2	RN00001	SMD Resistor 2512 10R 1W 5%		1,00	PZ
6	R 3	RN00014	SMD Resistor 2512 1K8R 1W 5%		1,00	PZ
7	R 4	RN00014	SMD Resistor 2512 1K8R 1W 5%		1,00	PZ
8	R 5	RS00047	1206 SMD Resistor 5k6R 1/8W 1%		1,00	PZ
9	R 7	RS00043	1206 SMD Resistor 2k7R 1/8W 1%		1,00	PZ
10	R 8	RS00048	1206 SMD Resistor 6k8R 1/8W 1%		1,00	PZ
11	R 9	RS00050	1206 SMD Resistor 10KR 1/8W 1%		1,00	PZ
12	R 12	RN00001	SMD Resistor 2512 10R 1W 5%		1,00	PZ
13	R 13	RN00014	SMD Resistor 2512 1K8R 1W 5%		1,00	PZ
14	R 14	RN00014	SMD Resistor 2512 1K8R 1W 5%		1,00	PZ
15	R 15	RS00047	1206 SMD Resistor 5k6R 1/8W 1%		1,00	PZ
16	R 19	RI00002	NTC Thermistor, screw type, 10kR 0,5W		1,00	PZ
17	R 30	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
18	R 31	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
19	R 32	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
20	R 33	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
21	R 34	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
22	R 35	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
23	R 36	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
24	R 37	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
25	R 38	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
26	R 39	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
27	R 40	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
28	R 41	RS00023	1206 SMD Resistor 56R 1/8W 1%		1,00	PZ
29	C 1	CA00013	HI-V electrolytic aluminum capacitor 100uF 63V 105" 10x13mm.		1,00	PZ

Product Code GR00176 Description 250W RF Module

Document Code Revisione

Drawing Date Dwg Signature

File Emission Signature

Emission Date

Item	Reference	Cod	Description	Accessories Data	Q.ty	UM
30	C 2	CC00062	SMD Ceramic multilayer capacitors 1206 100nF 50V 10% X7R		1.00	PZ
31	C 3	CH00039	HI-Q RF porcelain capacitor ATC100 B 470pF 10% 200V		1.00	PZ
32	C 4	CH00039	HI-Q RF porcelain capacitor ATC100 B 470pF 10% 200V		1.00	PZ
33	C 5	CH00039	HI-Q RF porcelain capacitor ATC100 B 470pF 10% 200V		1.00	PZ
34	C 6	CH00027	HI-Q RF porcelain capacitor ATC100 B 56pF 5% 500V		1.00	PZ
35	C 7	CH00038	HI-Q RF porcelain capacitor ATC100 B 390pF 5% 200V		1.00	PZ
36	C 8	CH00038	HI-Q RF porcelain capacitor ATC100 B 390pF 5% 200V		1.00	PZ
37	C 9	CC00022	SMD Ceramic multilayer capacitors 1206 47pF 100V 5% NP0		1.00	PZ
38	C 11	CH00028	HI-Q RF porcelain capacitor ATC100 B 68pF 5% 500V		1.00	PZ
39	C 12	CH00015	HI-Q RF porcelain capacitor ATC100 B 10pF 5% 500V		1.00	PZ
40	C 13	CH00010	HI-Q RF porcelain capacitor ATC100 B 4p7F +/-0.5p 500V		1.00	PZ
41	C 14	CH00031	HI-Q RF porcelain capacitor ATC100 B 100pF 5% 500V		1.00	PZ
42	C 15	CC00034	SMD Ceramic multilayer capacitors 1206 470pF 100V 5% NP0		1.00	PZ
43	C 16	CC00050	SMD Ceramic multilayer capacitors 1206 10nF 100V 10% X7R		1.00	PZ
44	C 17	CC00038	SMD Ceramic multilayer capacitors 1206 1nF 100V 10% X7R		1.00	PZ
45	C 18	CC00062	SMD Ceramic multilayer capacitors 1206 100nF 50V 10% X7R		1.00	PZ
46	C 19	CC00050	SMD Ceramic multilayer capacitors 1206 10nF 100V 10% X7R		1.00	PZ
47	C 20	CA00013	HI-V electrolytic aluminum capacitor 100uF 63V 105" 10x13mm.		1.00	PZ
48	C 21	CC00062	SMD Ceramic multilayer capacitors 1206 100nF 50V 10% X7R		1.00	PZ
49	C 22	CH00039	HI-Q RF porcelain capacitor ATC100 B 470pF 10% 200V		1.00	PZ
50	C 23	CH00039	HI-Q RF porcelain capacitor ATC100 B 470pF 10% 200V		1.00	PZ
51	C 24	CH00039	HI-Q RF porcelain capacitor ATC100 B 470pF 10% 200V		1.00	PZ
52	C 25	CH00027	HI-Q RF porcelain capacitor ATC100 B 56pF 5% 500V		1.00	PZ
53	C 26	CH00038	HI-Q RF porcelain capacitor ATC100 B 390pF 5% 200V		1.00	PZ
54	C 27	CH00038	HI-Q RF porcelain capacitor ATC100 B 390pF 5% 200V		1.00	PZ
55	C 28	CC00022	SMD Ceramic multilayer capacitors 1206 47pF 100V 5% NP0		1.00	PZ
56	C 30	CH00028	HI-Q RF porcelain capacitor ATC100 B 68pF 5% 500V		1.00	PZ
57	C 31	CH00020	HI-Q RF porcelain capacitor ATC100 B 27pF 5% 500V		1.00	PZ
58	C 32	CH00010	HI-Q RF porcelain capacitor ATC100 B 4p7F +/-0.5p 500V		1.00	PZ

Product Code **GR00176** **Description** **250W RF Module**

Document Code **Revisione** **File** **Emission Signature**

Drawing Date **Dwg Signature** **Emission Date**

Item	Reference	Cod	Description	Accessories Data	Q.ty	UM
59	C 33	CH00031	HI-Q RF porcelain capacitor ATC100 B 100pF 5% 500V		1,00	PZ
60	C 34	CC00034	SMD Ceramic multilayer capacitors 1206 470pF 100V 5% NP0		1,00	PZ
61	C 35	CC00050	SMD Ceramic multilayer capacitors 1206 10nF 100V 10% X7R		1,00	PZ
62	C 36	CC00038	SMD Ceramic multilayer capacitors 1206 1nF 100V 10% X7R		1,00	PZ
63	C 37	CC00062	SMD Ceramic multilayer capacitors 1206 100nF 50V 10% X7R		1,00	PZ
64	C 38	CC00050	SMD Ceramic multilayer capacitors 1206 10nF 100V 10% X7R		1,00	PZ
65	C 39	CH00013	HI-Q RF porcelain capacitor ATC100 B 6p8F 5% 500V		1,00	PZ
66	C 40	CC00038	SMD Ceramic multilayer capacitors 1206 1nF 100V 10% X7R		1,00	PZ
67	C 41	CH00002	HI-Q RF porcelain capacitor ATC100 B 1p2F +/-0.25p 500V		1,00	PZ
68	C 42	CH00017	HI-Q RF porcelain capacitor ATC100 B 15pF 5% 500V		1,00	PZ
69	RT 1	RK00007	SMD Cermet Trimmer TS53YL 10KOhm 20%		1,00	PZ
70	RT 2	RK00007	SMD Cermet Trimmer TS53YL 10KOhm 20%		1,00	PZ
71	R 6	RL00024	RF Power Resistor Floridalab 50R 150W		1,00	PZ
72	R 11	RL00006	RF Hi-Power Resistor MXP 50R 20W 2% TO-220		1,00	PZ
73	DZ 1	EZ00003	SMD Zener diode 3V9 0,5W SOD80		1,00	PZ
74	DZ 2	EZ00009	SMD Zener diode 15 0,5W SOD80		1,00	PZ
75	DZ 3	EZ00003	SMD Zener diode 3V9 0,5W SOD80		1,00	PZ
76	DZ 4	EZ00003	SMD Zener diode 3V9 0,5W SOD80		1,00	PZ
77	DZ 6	EZ00003	SMD Zener diode 3V9 0,5W SOD80		1,00	PZ
78	Q 1	QQ00057	Rf Power Mosfet SD2931-10		1,00	PZ
79	Q 2	QB00031	Low-freq. Bipolar transistor (SIGNAL) BC807 PNP 80MHz 45V 250mW SOT23		1,00	PZ
80	Q 3	QQ00057	Rf Power Mosfet SD2931-10		1,00	PZ
81	H 2	AN00012	90 degree hybrid couplers 1H0280-3 90-180MHz 400W		1,00	CM
82	L 1	CU00004	Enamelled copper wire SOUDREX 0,50mm Grade1	3T0/0C5/2D5	2,00	CM
83	L 2	CU00004	Enamelled copper wire SOUDREX 0,50mm Grade1	3T0/0C5/4D5	2,00	CM
84	L 3	CU00004	Enamelled copper wire SOUDREX 0,50mm Grade1	3T0/0C5/3D0	2,00	CM
85	L 4	CU00004	Enamelled copper wire SOUDREX 0,50mm Grade1	3T0/0C5/2D5	2,00	CM
86	L 5	CU00004	Enamelled copper wire SOUDREX 0,50mm Grade1	3T0/0C5/4D5	2,00	CM
87	L 6	CU00004	Enamelled copper wire SOUDREX 0,50mm Grade1	3T0/0C5/3D0	2,00	CM

Product Code

GR00176

Description

250W RF Module

Document Code

Revisione

Drawing Date

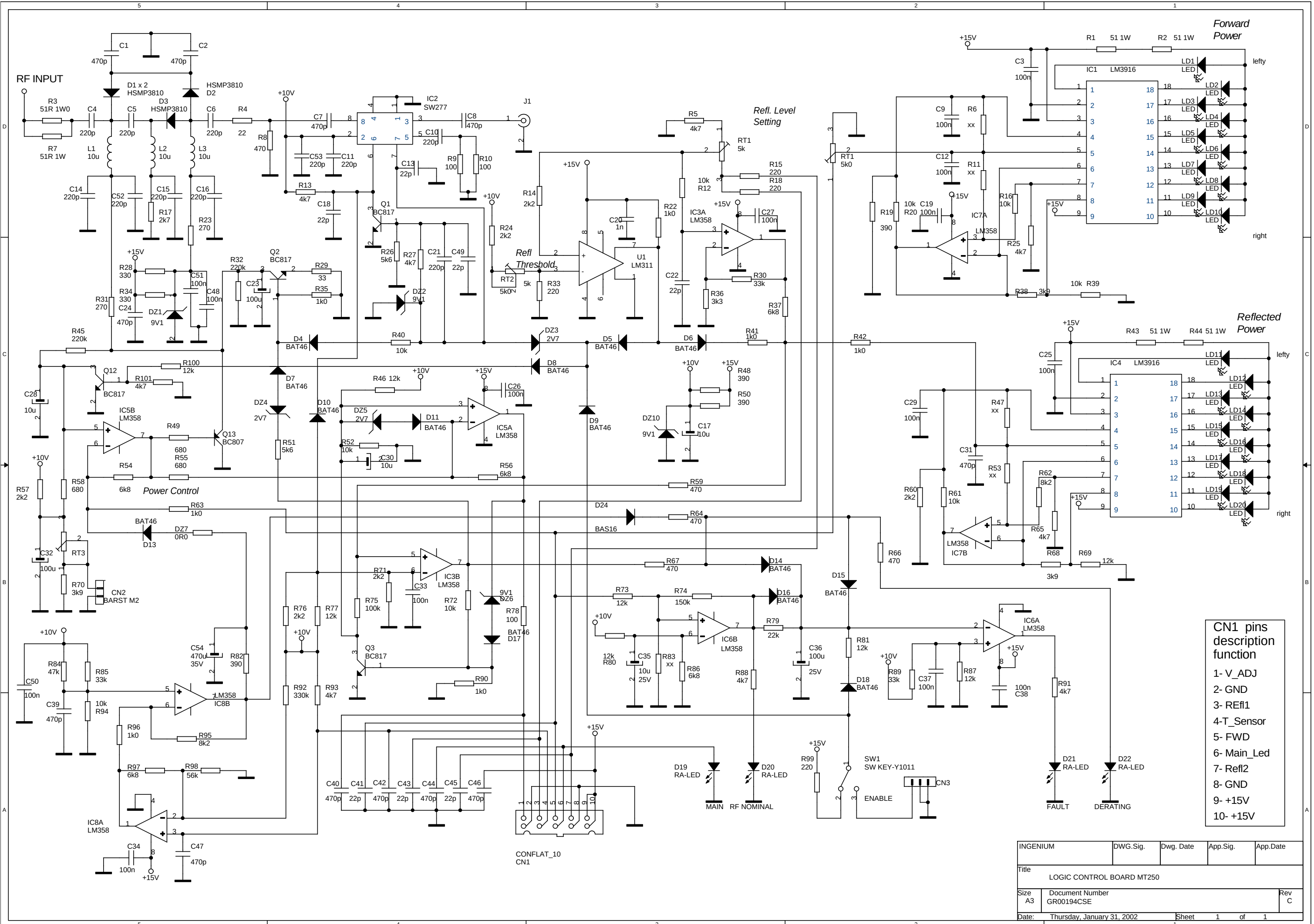
Dwg Signature

File

Emission Signature

Emission Date

Item	Reference	Cod	Description	Accessories Data	Q.ty	UM
88	L 7	CU00004	Enamelled copper wire SOUDREX 0,50mm Grade1	CAVALLOTTO 2x40x2mm	4,40	CM
89	FB 0	FH00018	Balun core NEOSID FT8 / F100b 14x8mm Green		2,00	PZ
90		GR00070	MDL30 87,5-108MHz 30W 28V 17dB		1,00	PZ
91		PM01001	Dissipatore MT250		1,00	PZ
92		PM01032	Power Combiner Heatsink RF MT100-MT250		1,00	PZ

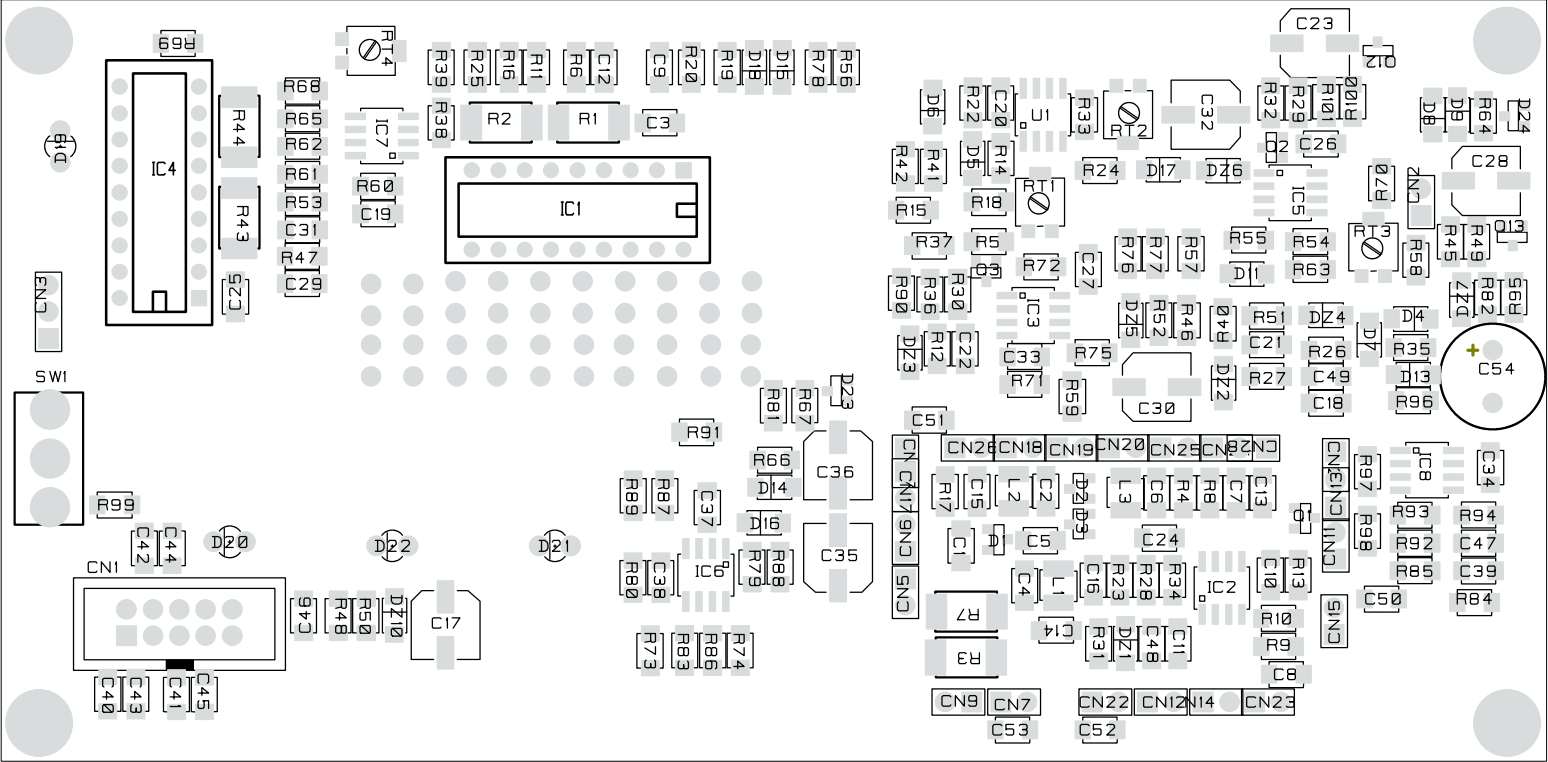


CN1 pins
description
function

- 1- V_ADJ
- 2- GND
- 3- REfl1
- 4-T_Sensor
- 5- FWD
- 6- Main_Led
- 7- Refl2
- 8- GND
- 9- +15V
- 10- +15V

INGENIUM	DWG.Sig	Dwg. Date	App.Sig	App.Date
Title LOGIC CONTROL BOARD MT250				
Size A3	Document Number GR00194CSE			Rev C
Date: Thursday, January 31, 2002	Sheet 1	of 1		

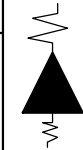
ATTENZIONE!!! TUTTI I LED E SWI SONO DA MONTARE DAL LATO MASSA



CORTOCIRCUITARE D23

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TITLE
MT250 LOGIC CONTROL BOARD

PRODUCT	DOC. CODE	FILENAME
MT250	GR00194CLO	GR00194CLO.PCB

MATERIAL

FR4 SP. 1.6

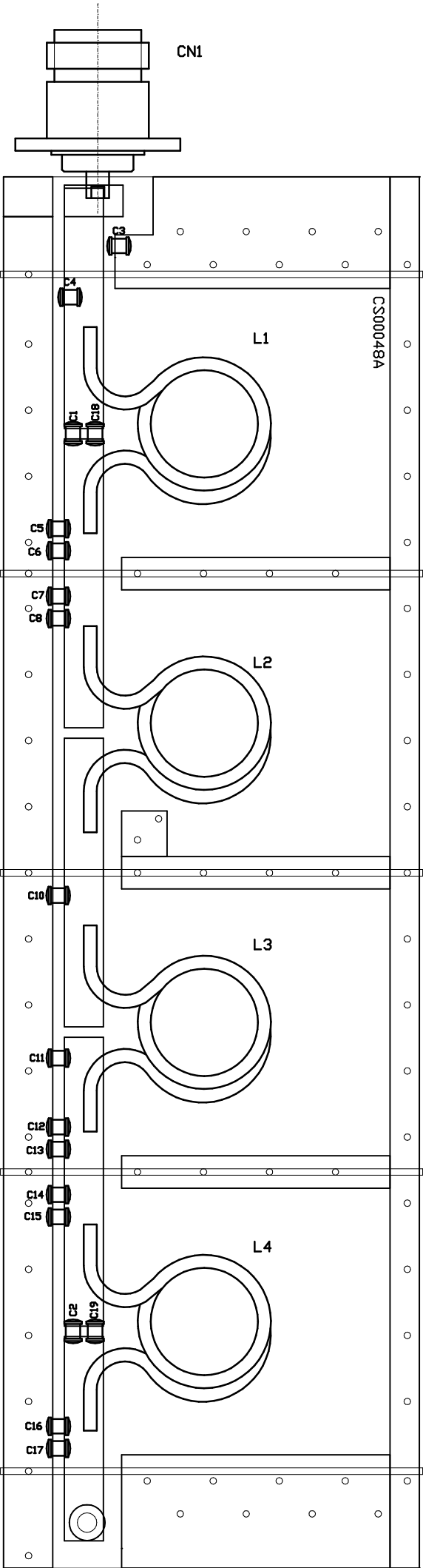
REV.	DWG DATE
C	10/12/2000

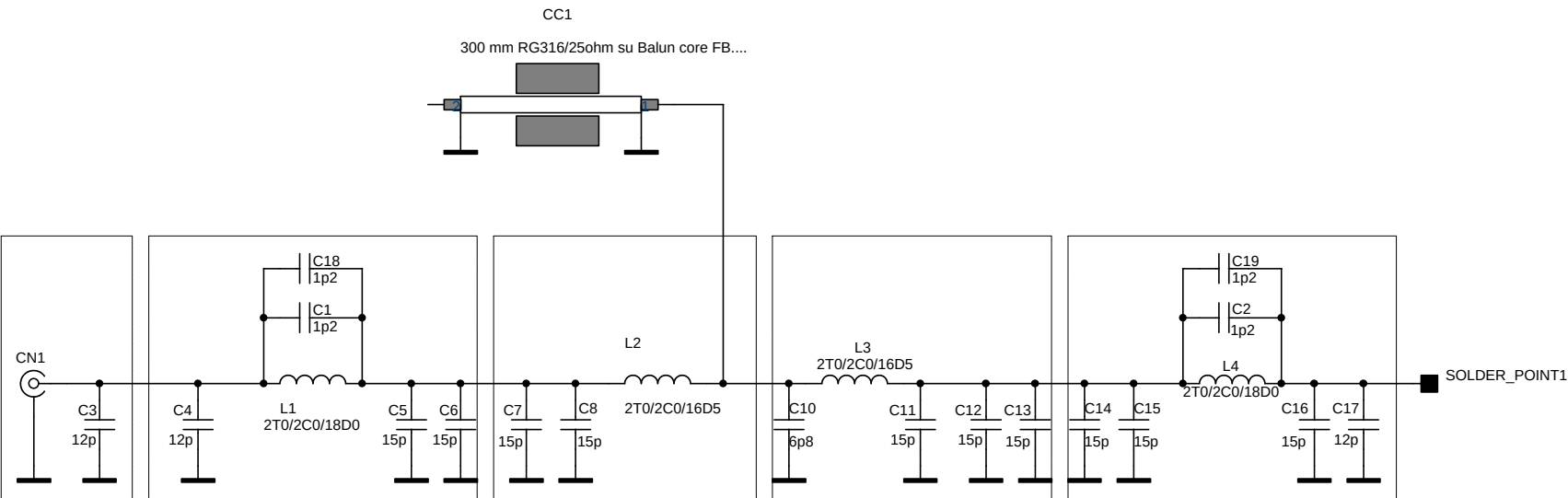
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EMIS. DATE

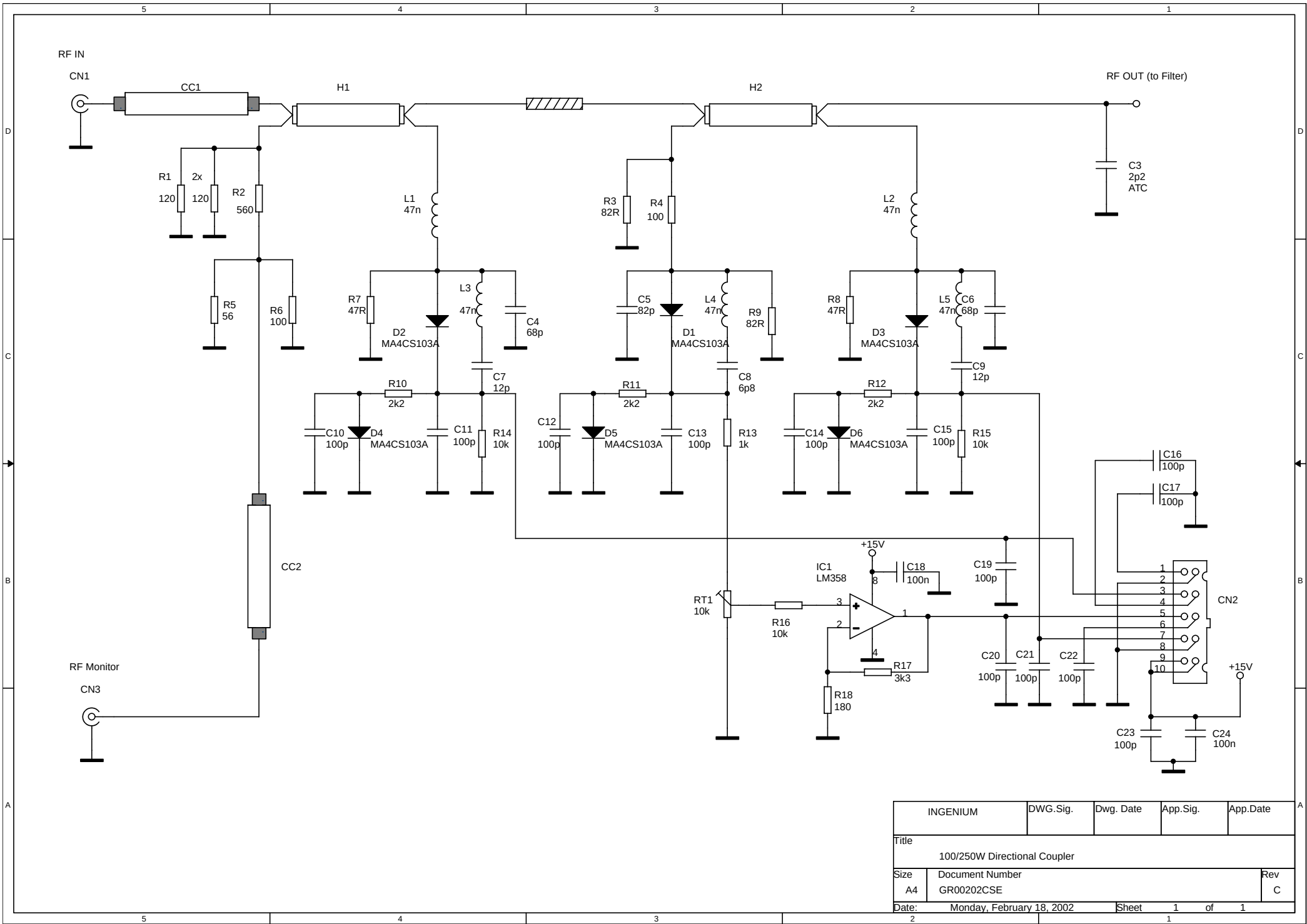
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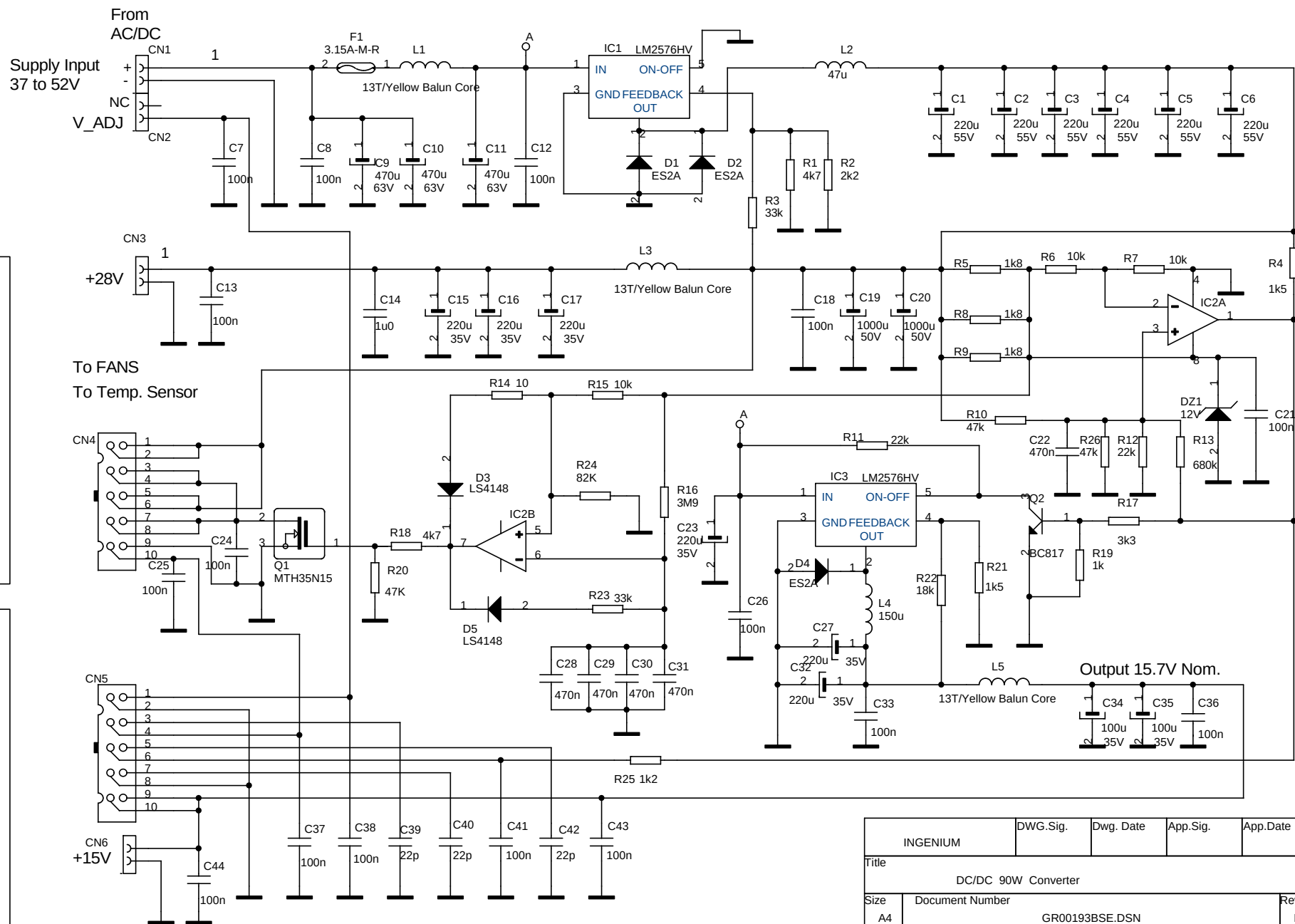
Part Code





INGENIUM		DWG.Sig.	Dwg. Date	App.Sig.	App.Date
Title GR00175 - 250W Low Pass Filter					
Size A4	Document Number GR00175ASE				Rev A
Date: Monday, November 26, 2001		Sheet 2		of 2	





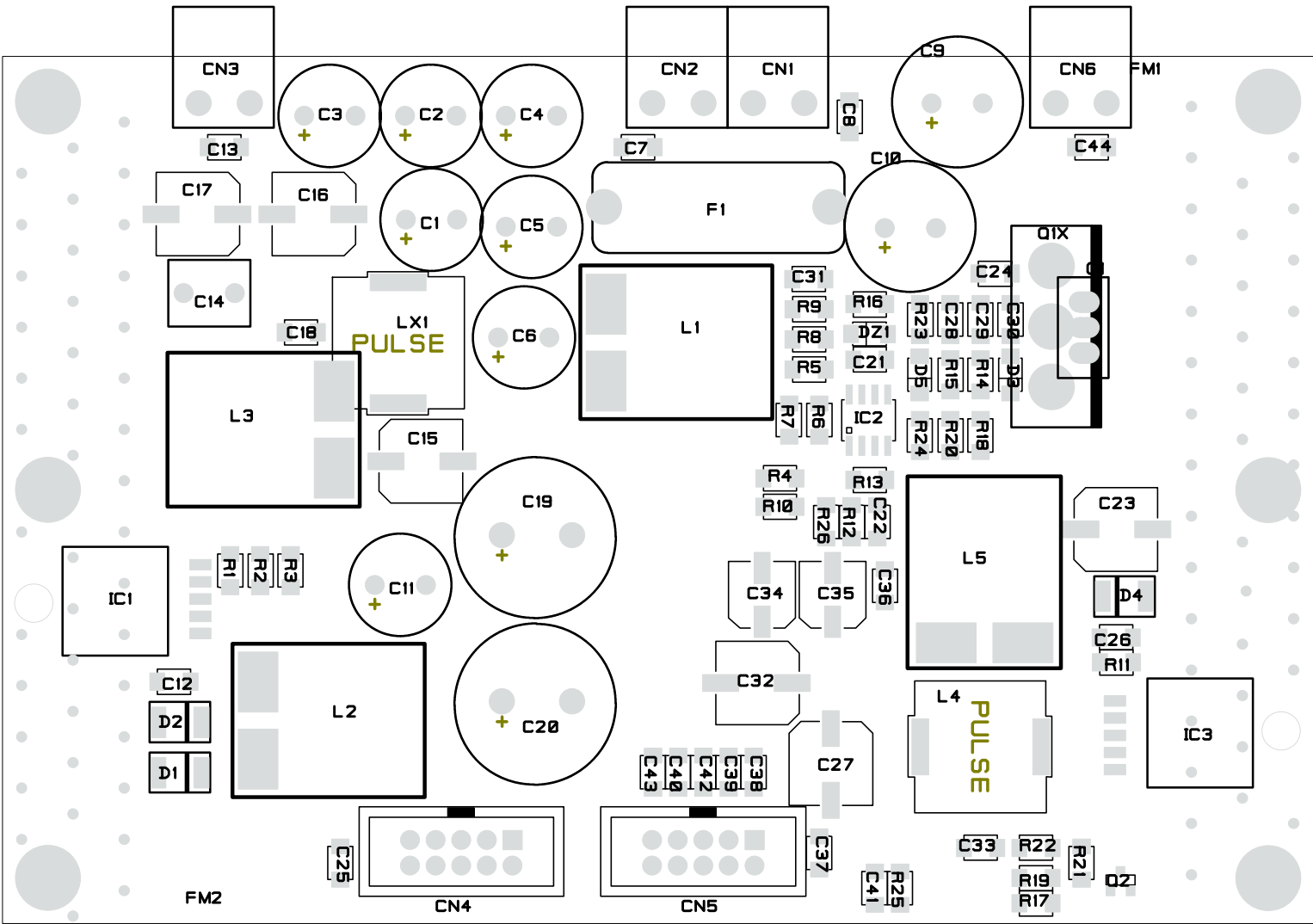
CN4 pins description function

- 1- +28V
- 2- +28V
- 3- -28V
- 4- -28V
- 5- +28V
- 6- +28V
- 7- -28V
- 8- -28V
- 9- GND
- 10- T_Sensor

CN5 pins description function

- 1- V_ADJ
- 2- GND
- 3- Ref1
- 4- T_Sensor
- 5- FWD
- 6- Main_Led
- 7- Ref2
- 8- GND
- 9- +15V
- 10- +15V

INGENIUM		DWG.Sig.	Dwg. Date	App.Sig.	App.Date
Title DC/DC 90W Converter					
Size A4	Document Number GR00193BSE.DSN				Rev B
Date:	Tuesday, November 27, 2001		Sheet	1 of 1	



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SUBCONTR. R&D CUSTOMER LOGISTIC PRODUCTION



TITLE

DC/DC CONVERTER

PRODUCT

GR00193BLO

DOC. CODE

FILENAME

GR00193BLO.PCB

REV.

B

DWG DATE

07/03/2001

DWG SIGN.

EMIS. DATE

EMIS. SIGN.

FINISH

SOLDER VERDE

Part Code

CS00042A

SCALE