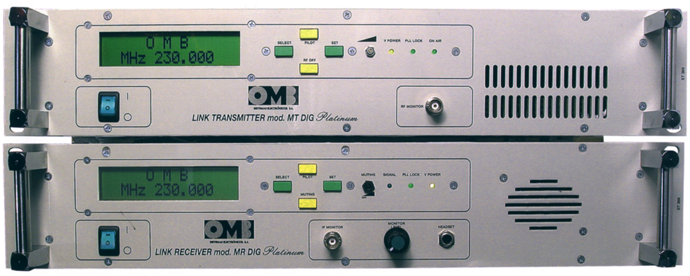
O.M.B. SISTEMAS ELECTRONICOS, S.A.

POINT TO POINT AURAL RADIO RELAY SYSTEM

MT-MR

PLATINUM

TECHNICAL MANUAL



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Limited Warranty Conditions

I.- About Installation.

1.- Mains Voltage must be kept between ± 10% about its nominal value, unless otherwise specified. If were variations exceeding this tolerance, it will be indispensable to install a voltage stabilizer system within station. If transient overvoltages, due to electric motors, or other devices of this sort connected to the distribution line, were present, or if the distribution line is exposed to atmospheric electrical discharges, it must be indispensable the installation of isolation transformers and gaseous dischargers before connecting any equipment within station.

2.- All equipments must be connected to station ground system in order to avoid damage both to equipments and maintenance personnel too. It is necessary to connect a differential automatic switch (lifesaver) at station.

3.- Some equipments does not include interlock protection for open doors, covers or connectors. In that case, these equipments must be kept in key-locked places, with access only to conveniently qualified personnel that is previously noticed about not to open doors, covers or connectors without disconnecting station mains switch before performing this job.

4.- Transmitter equipments NEVER will be operated with output powers over its nominal values, or with signals or input informations others than those specified in its individual characteristics.

5.- Ambient temperature inside equipments' room, will accomplish technical specifications of equipments installed at station lodge. In absence of such specifications, maximum allowable temperatures will be from -5 to + 45 º C for Television equipments, and from 0 to + 40 º C for Sound Broadcast equipments.

6.- In case of operation at abnormally high or extremely high temperatures (over 30 to 40 º C), it is obligatory to install a forced cooling system that will keep temperature below its upper limit. In case of operation at abnormally or extremely low temperatures, it will be obligatory to install a thermostatic controlled heating system for equipment's room.

7.- Both equipment's surroundings and room must be free of dust and dirt. Ambient relative humidity will be kept below equipment's extreme specifications. In case of absence of this specification, allowable maximum will be 90 % of relative humidity, non-condensing. Average relative humidity will be kept under 70 %, non-condensing.

8.- Every transmission equipment that can radiate some quantity of RF power, must be connected to a load or antenna system, suited to its individual specifications, before being energized.

9.- Maximum allowable VSWR in antenna systems both for Television or FM Radio Broadcast operation of a given transmitter, will be 1.25:1, unless otherwise specified.

10.- For those transmitter equipments having power valve amplifiers, and that doesn't has an automatic shutoff cycle, and must be manually turned off, as a first step high voltage, or anode voltage, will be disconnected, keeping forced cooling system working during at least 5 minutes after high voltage disconnection, and only after this time, cooling system & filament voltage can be shutted off. O.M.B. Sistemas Electrónicos, S.A., is not responsible of damages to those power valves caused by sudden AC mains failures at station where our equipments are installed.

11.- Periodically, monthly as a maximum, technical personnel must visit station in order to perform a general equipment maintenance, unless otherwise specified. This maintenance will include output power check, VSWR of antenna systems, forced cooling or heating systems checks, both for equipments and station itself, including air filters cleaning, measuring of transmission frequency with eventual correction if necessary, and will perform a general check of fundamental parameters of equipments. In the event of any important change in some operation parameter, that will require replacement or readjustment of any unit, Customer MUST CONTACT FIRST WITH O.M.B. SISTEMAS ELECTRONICOS, S.A. BEFORE ANY ATTEMPT TO READJUST OR REPLACE ANY COMPONENT OR UNIT INSIDE EQUIPMENTS, IN ORDER TO KEEP VALID THIS WARRANTY.

12.- For equipments who are located in fixed racks or cabinets, those equipments must be effectively connected, according to International Installations Standards, to station ground system, whose total impedance measured to ground can't be higher than 5 ohms. Equipments must be connected to ground system so that they can be kept out of main discharge path between tower and ground.

II.- About Transportation.

1.- O.M.B. Sistemas Electrónicos, S.A. is not responsible of damages and/or detriments derived from mishandling, steal, robbery, theft or vandalism during the act of transportation of equipments to final or intermediate destination.

III.- About Storage.

1.- O.M.B. Sistemas Electrónicos, S.A. is not responsible of damages and/or detriments derived from unappropiate storage of equipments, within inadequate warehouses or outdoors, once equipments are delivered to transportist agency.

IV.- About Projects.

1.- O.M.B. Sistemas Electronicos, S.A. is not responsible of inadequate use of equipments made or registered by our Company, accomplishing propagation projects that are not performed by our Specialists.

V.- About Systems.

1.- O.M.B. Sistemas Electrónicos, S.A. is not responsible for performance of those equipments or systems that are not made, certified or registered by our Company.

VI.- About Operation

1.- O.M.B. Sistemas Electrónicos, S.A. is not responsible of damages and/or detriments derived from inadequate or negligent operation of equipments made, certified or registered by our Company, once those equipments are operated by personnel hired and/or employed by Customer.

VII.- General.

This Warranty covers and protects, during a period of 18 months after start of operations, all equipments made , certified or registered by O.M.B. Sistemas Electrónicos, S.A., including its components and units, against failures in workmanship that may occur during operation of those equipments, with the exception of power valves or semiconductor devices that are covered by its particular Factory's Guarantee. In this case, O.M.B. Sistemas Electrónicos, S.A. only can act as intermediary for negotiation with such Factory, about accomplishment of individual Guarantees.

For Validity of this Warranty, it is indispensable that all Paragraphs, from I to VI, be respected by the Customer. Otherwise, this Warranty will be automatically voided. This Warranty is self-activated with the reception by OMB Sistemas Electrónicos, S.A. of the "Guarantee Activation Manual". returned to OMB by Customer. If such Document is not received, this Warranty will be voided.

All repairings or adjustments covered by this Warranty are free of workmanship & materials costs and expenses, but postage and transportation expenses of equipments and O.M.B. technical personnel & specialists, if required, will be carried out by the Customer.

O.M.B. Sistemas Electrónicos, S.A.

GENERAL SAFETY RECOMMENDATIONS

When connecting any OMB equipment to the Mains power , please follow these important recommendations:

- This product is intended to operate from a power source that will not apply more than 10% of the voltage specified on the rear panel between the supply conductors or between either supply conductor and ground. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.
- This equipment is also grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired socket before connecting to the product input or output terminals.
- Upon loss of the protective-ground connection, all accessible conductive parts (including parts that may appear to be insulating) can render an electric shock. Equipment must be throughly connected to Station's ground system before any attempt to connect it to Mains electrical supply.
- To avoid fire hazard, use only the fuses of correct type, voltage rating, and current rating. Refer fuse replacement to Technical Manual and qualified service personnel.
- To avoid explosion, do not operate this equipment in an explosive atmosphere.
- To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

GOOD PRACTICES

In maintaining the equipment covered in this Manual, please keep in mind the following, standard good practices:

- When connecting any instrument (wattmeter, spectrum analyzer, etc.) to a high frequency output, use the appropriate attenuator or dummy load to protect the final amplifiers and the instrument input.

- When inserting or removing printed circuit boards (PCBs), cable connectors, or fuses, always turn off power to the affected portion of the equipment. After power is removed, allow sufficient time for the power supplies to bleed down before reinserting PCBs. Always use discharge stick when available.

- When troubleshooting, remember that FETs and other metal-oxide semiconductor (MOS) devices may appear defective because of leakage between traces or component leads on the printed circuit board. Clean the printed circuit board and recheck the MOS device before assuming it is defective.

- When replacing MOS devices, follow standard practices to avoid damage caused by static charges and soldering.

- When removing components from PCBs (particularly ICs), use care to avoid damaging PCB traces.

FIRST AID IN CASE OF ELECTRICAL SHOCK

If someone seems unable to free himself while receiving an electric shock, **turn power off** before rendering aid. A muscular spasm or unconsciousness can make a victim unable to free himself from the electrical power.

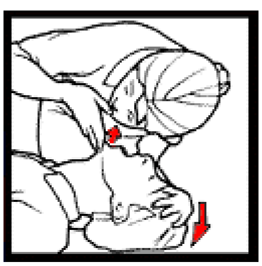
If power cannot be turned off immediately, **very carefully** loop a length of dry non-conducting material (such as a rope, insulating material, or clothing) around the victim and pull him free of the power. Carefully avoid touching him or his clothing until free of power.

DO NOT TOUCH VICTIM OR HIS CLOTHING BEFORE POWER IS DISCONNECTED OR YOU CAN ALSO BECOME A SHOCK VICTIM

EMERGENCY RESUSCITATION TECHNIQUE

Step 1

Check the victim for unresponsiveness. If there is no response, **immediately call for medical assistance**, and then return to the person.

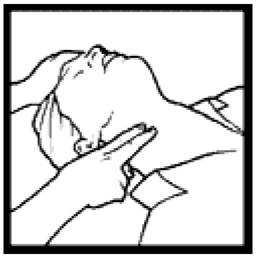


Step 2

Position the person flat on their back. Kneel by their side and place one hand on the forehead and the other under the chin. Tilt the head back and lift the chin until teeth almost touch. Look and listen for breathing.

Step 3

If not breathing normally, pinch the nose and cover the mouth with yours. Give two full breaths. The person's chest will rise if you are giving enough air.

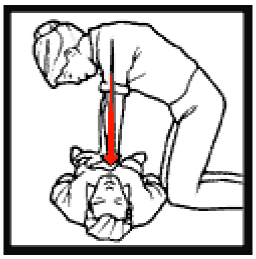


Step 4

Put the fingertips of your hand on the Adam's apple, slide them into the groove next to the windpipe. Feel for a pulse. If you can not feel a pulse or are unsure, move on to the next step.

Step 5

Position your hands in the center of the chest between the nipples. Place one hand on top of the other.



Step 6

Push down firmly two inches. Push on chest 15 times.

CONTINUE WITH TWO BREATHS AND 15 PUMPS UNTIL HELP ARRIVES.

TREATMENT FOR BURNS

- Continue treating victim for electrical shock.
- Check for points of entry and exit of current.
- Cover burned surface with a clean dressing.
- Remove all clothing from the injured area, but cut around any clothing that adheres to the skin and leave it in place. Keep the patient covered, except the injured part, since there is a tendency to chill.
- Splint all fractures. (Violent muscle contractions caused by the electricity may result in fractures.)
- Never allow burned surfaces to be in contact with each other, such as: areas between the fingers or toes, the ears and the side of the head, the undersurface of the arm and the chest wall, the folds of the groin, and similar places..
- Transport as soon as possible to a medical facility.

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POINT TO POINT AURAL RADIO RELAY SYSTEM

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POINT TO POINT AURAL RADIO RELAY SYSTEM

chapter I
PREVIOUS PATH CALCULATIONS.

1.1.- Introduction

As a preliminary knowledge, it's necessary to calculate what is the type of link we need to buy in order to solve our particular case, or if we have a certain set of equipments and antennas previously adquired, what are the capabilities of that system to cover the planned distance with the minimum required signal strength in order to assure a long-term, noise-free transmission of video and /or audio information through this way. Prior to install a certain system, Engineers have to perform some preliminary calculations to guarantee that these results will be reached.

Main factors determining the reliability of a certain Microwave analogic link are the following, particularly in the bands starting from 1 GHz and ending in 12 GHz :

1.1.1.- Free Space Attenuation of propagated RF signal.

1.1.2.- Presence of obstructions in the propagation path.

1.1.3.- Possible Reflection Points of propagated signal.

1.1.4.- Transmission lines and antennas used in the system.

1.1.5.- Any other RF elements and components installed through the transmission path, such as filters, circulators, diplexers, etc. attenuating in a higher or lower degree the propagated signal strength.

1.1.6.- Transmitter power output and receiver sensitivity & noise figure.

1.1.7.- Propagation path free space clearance at radio waves frequency.

Through this Introductory Study, we should briefly talk about these factors determining the behavior of any Analogic Radio Relay Link:.

1.2.- Free Space Attenuation.

Atmospheric or Free Space Attenuation within the direct path between Transmitter and Receiver sites, is a function of the system transmission frequency and the distance between both sites. This expression is affected by a coefficient depending on the Earth's region where the link will be installed, and is determined by estatistical calculations in an empirical form :

(1) $$\alpha = K + 20 \log_{10} f + 20 \log_{10} d \quad [dB]$$

Where:

α = Free Space Attenuation in dB.

f = System frequency in MHz.

d = Straight-line distance between Transmitter & Receiver, in Km.

K = Attenuation Coefficient:

K = 37.83 for Region I.
K = 32.58 for Region II.
K = 33.03 for Region III.

NOTE : Values of K are average values, and can suffer local appreciable variations depending on the atmospheric conditions of a particular climate.

In order to illustrate the calculations performed, we can apply this and the following expressions to an hypotetical link of any frequency band, say of the 2 GHz band. Assuming two points distant 32 Km., located at Radio Propagation Region II. Suppose that assigned frequency is 2038 MHz (Channel V of 1.9 to 2.3 GHz Band). If we substitute values in Expression (1) , we have:

If f = 2038 MHz
d = 40 Km
K = 32.58

Hence: $\alpha = 32.58 + 20 \log (2038) + 20 \log(40)$

Solving: $\alpha = 130.9$ dB

It's very interesting to arrive to a conclussive judgement with respect to Expression (1) :

"Free Space Attenuation between two points increases logarithmically with the frequency used and with the distance between the two points considered".

1.3.- Path Profile Analysis.

In order to analyze Terrain's profile along propagation path, in first place we must obtain the Topographic Charts at 1:50,000 covering the whole intermediate region between the two considered points. If it's required, two or more charts would be joined together at its ends, using transparent tape, to assemble the complete terrain's profile in the region of interest.

Once Topographic Chart is assembled, it will be covered with a transparent sheet in order to preserve that maps are not marked. Now we trace a straight line joining Transmitter and Receiver points, and using a rule marked in Km in the same scale of the Charts used, we mark the distance between the two points in one kilometer (or mile) intervals, obtaining the true straight-line distance between the two points, as shown in the Fig. # 1 below :

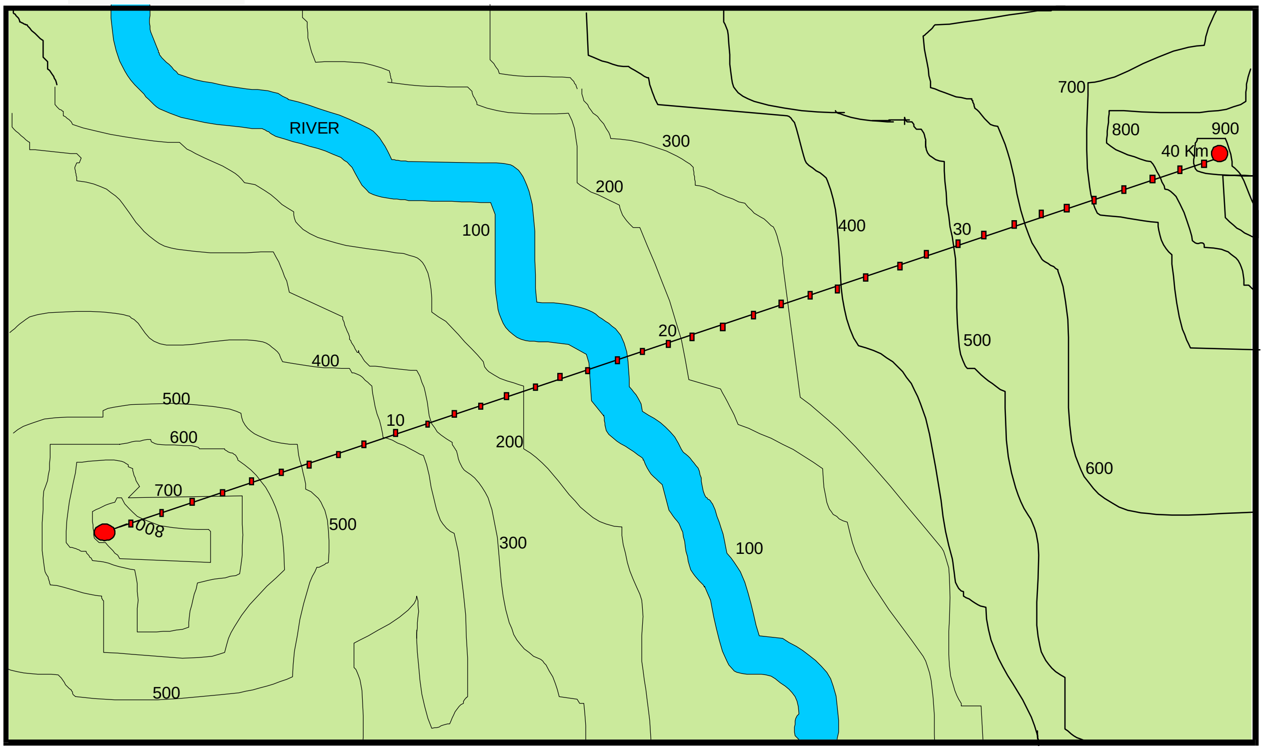

Fig.#1. TOPOGRAPHIC CHART WITH PATH BETWEEN STATIONS MARKED FOR CALCULATIONS

Once path is appropiately traced and marked as shown in Fig.#1, we obtain the straight-line distance between Transmitter point (A) and Receiver point (B), this being in our example exactly 40 Km.

Now we take a 4/3 Profile Sheet. This is a special printed paper having approximately the same curvature radius of the Earth at frequencies beyond 500 MHz over the horizontal axis. This axis is calibrated in Km (or miles). By the other hand, vertical axis is calibrated in meters (or feet) to mark the height of terrain at the different points of a certain path. Curvature of horizontal axis is made indeed in order to represent the propagated beam as a straight line traced between Transmitter and Receiver points. This virtual radius can considerably change for abnormal conditions of the lower layers of atmosphere, provoking an undesirable phenomenon known as "beam bending fading" that deviates beam up or downwards, according with the variation of atmosphere's reffraction index.

In this Profile Sheet, we mark now all heights, from one kilometer to the next one, along our propagation path AB, as shown in Fig. #2, following the horizontal-axis marks previously made along the propagation path AB in Fig. #1. The next step is to trace a straight line joining the points A and B in the Profile Sheet, taking into account the height of antennas over terrain at both terminal points.

As said in the note of Fig. #2, remember that, if it were required to widen horizontal scale for long hops, this scale can be duplicated, **but always multiplying by four the vertical scale** in order to keep the same proportions in the paper. Otherwise, the drawn profile is not valid. The same is valid for the profile made in miles and feet.

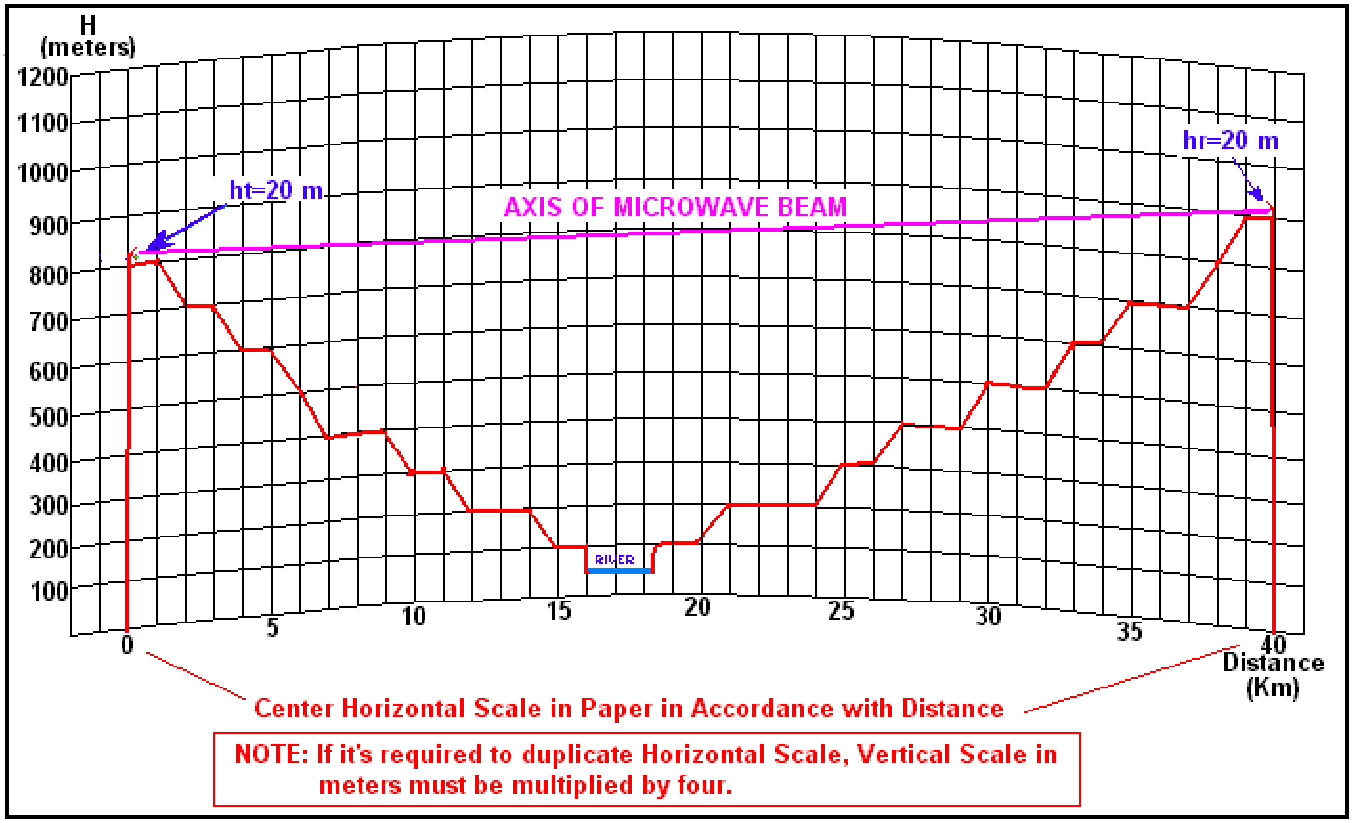

Fig. # 2. PATH MARKED IN 4/3 PROFILE PAPER SHEET.

1.4.- Fresnel or Phase Zones.

Wave front propagated by transmitting antenna is going out of phase as propagated wave goes apart from the beam center more and more in a continuous fashion. The limits of phase shift suffered by this propagated wave front, as it separates from the beam center, are known as "Fresnel or Phase Zones" being these zones enclosed between well defined values like π/2, π, 3π/2, etc, and defined as follows:

First Fresnel Zone is those region where wavefront is shifted in phase from 0º (beam center) to 90º. It encloses about 70% of the total beam RF energy density. It's very important in any hop to get a total clearance, non-obstructed path for this region. As system frequency drops down, propagated energy density enclosed in this zone increases, and in the 2 GHz band it's required to release only 70% of the total beam area at First Fresnel Zone in any obstructed point along the propagation path. For upper frequency bands, starting in 4 GHz, First Fresnel Zone clearance must be total (100%) in order to assure a nominal signal strength at the receiving end.

Second Fresnel Zone is those region where wavefront is phase-shifted from 90º to 180º. Is obvious that this zone should be blocked out wherever it's possible along the propagation path, because it contributes to weaken the signal at receiving end if it's reflected over the center beam line at any point of the path. In the third, fourth, etc Zones, energy density is very weak and it can be considered as negligible.

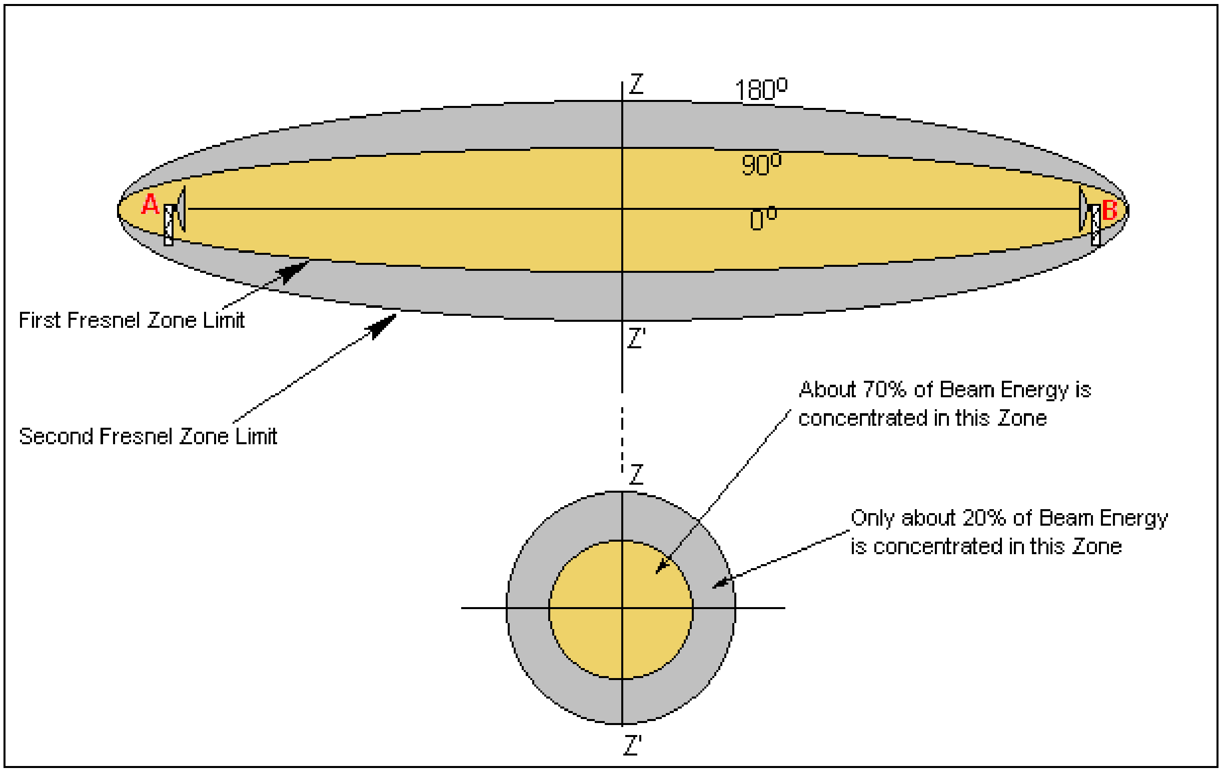

Fig. 3. DISTRIBUTION OF FIRST & SECOND FRESNEL ZONES ALONG PATH

As can be seen above in Fig. #3, higher order Fresnel Zones are distributed in concentric rings over the First Zone along the propagation path. When planning flat-terrain links, it will be relatively easy to block the Second Zone and completely clearing the First Zone, but in some hops, particularly those located between high mountains, it will be not possible. In these cases, a complete clearing of both Zones should be allowed.

Radius of any Fresnel Zone at any point of intermediate path can be easily determined by the following expression:

$$R(n) = 31.6 \sqrt{\frac{d_1 \cdot d_2}{d_3} n.\lambda} \quad (2)$$

Where:

R(n) = Radius (in meters) of a Fresnel Zone of nth. Order.

n = Order of the Fresnel Zone considered.

λ = Wavelength of propagated signal. λ[meters] = 300/f [MHz]

f = Carrier signal frequency (MHz).

d_1 = Distance from Transmitter point (A) to considered point (X). [Km]

d_2 = Distance from considered point (X) to Receiver point (B). [Km]

d_3 = Total distance from A to B. [Km]

Distances can be seen in the following Fig. # 4:

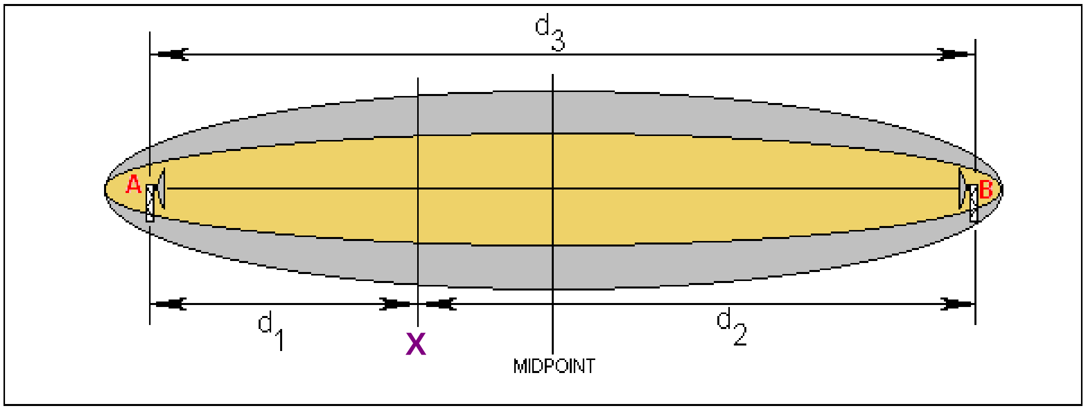

Fig. 4. DISTANCES FOR CALCULATION OF FRESNEL ZONES RADII.

In our illustrative Example, we can find the radius of the First Fresnel Zone in the point where it assumes a maximum value, in the path midpoint between A and B.

Data:
f = 2038 MHz
d_1 = 20 Km
d_2 = 20 Km
d_3 = 40 Km
n = 1

Wavelength of propagated signal will be:

λ = 300/2038 = 0.147 m

Inserting numerical values in Expression (2) :

R(1) = 31.6 (0.147 x (20 x 20)/40) ½

R(1) = 38.3 meters

Now we can calculate and trace, from one kilometer to the next, the radius of First Fresnel Zone for the whole propagation in the Profile Sheet shown in Fig. # 2, giving the results shown below, in Fig. # 5:

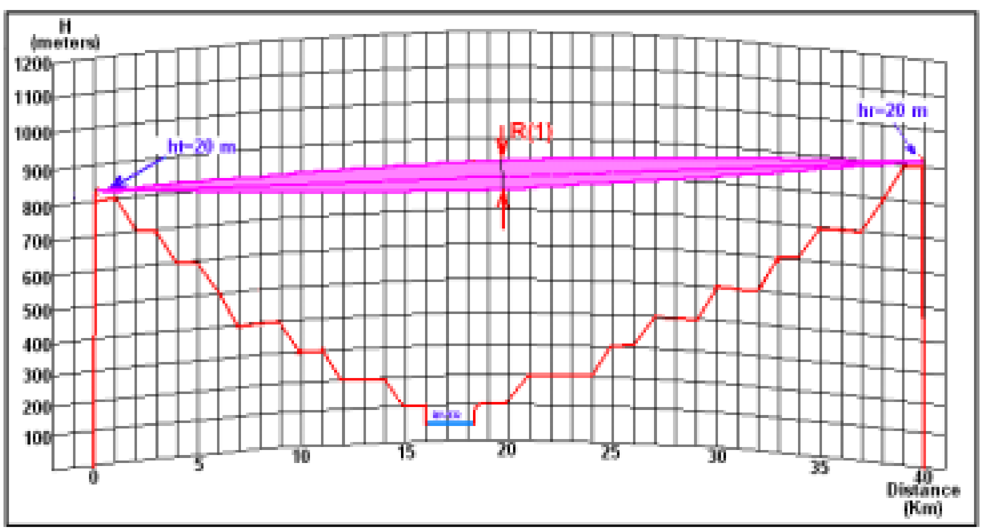

Fig. 5. FIRST FRESNEL ZONE FOR ILLUSTRATIVE EXAMPLE IN 2 GHz BAND

This profile, as can be seen, has absolute clearance both for First and Second Fresnel Zones because it's a typical inter-mountain hop. In case of partially obstructed profiles, it's allowable a clearance of 70% of total area at obstructed point,but only in this frequency band. As we said before, at higher frequencies the clearance must be 100% for First Fresnel Zone.

Given these values here obtained, it's very easy for Engineer to visually calculate its optimal antenna height at both points, A & B, also calculating the total length of transmission line needed for both ends, and its total line losses.

For calculating antenna heights over terrain, some elementary rules should be followed:

1.- In case of dealing with a link to be installed in a completely flat terrain, mainly in deserts, sugar cane plantations, across big lakes or over sea water, location of both antennas (transmitting & receiving) at the same height must be avoided, in order to move the possible reflection point from path's middle region. In this case, an "up-to-down" hop is desirable and convenient in order to increase link's reliability.

2.- Always try to release the First Fresnel Zone to a maximum, blocking as much as possible the Second Fresnel Zone.

3.- Use the minimum tower height allowable at both ends to satisfy the link's requirements, in order to minimize transmission line length (and losses), unless you are planning to use periscopic reflectors in your link.

4.- In all cases, try to move the possible beam reflection point from the center of path, arranging antennas' heights to avoid the reception of reflected signals under normal atmospheric conditions.

1.5.- Transmission Lines.

There are a wide variety of both coaxial transmission lines and waveguides in the International market for use in any frequency band. Coaxial lines are used particularly at 1.9-2.3 GHz frequency band, and waveguides are employed at higher frequencies, from 4 GHz ahead.

For links using the 1.9-2.3 GHz band, it's advisable the use of the 7/8" diameter coaxial foam-dielectric line, such as Andrew LDF5-50A. This also avoids the use of bulky and expensive air compressors or nitrogen tanks to pressurize the lines. If required transmission line is quite long, lower loss air-dielectric HJ5-50A line should be employed, and pressurization will be required in this case. But this is advisable only in extreme and critical cases. Generally the LDF5-50A (or equivalent) will satisfy the attenuation and power requirements in the most cases.

This typical transmission line has the following specifications:

Attenuation at 2 GHz .... 6.46 dB x 100 m.
Characteristic Impedance .... 50 ohms.
Maximum Allowable Frequency .... 5 GHz.
Velocity Factor 89%
Maximum Peak Power .... 44 kW.
DC Resistance:
    Inner Conductor .... 1.15 ohms/1000 m.
    Outer Conductor ....1.18 ohms/1000 m.
DC Breakdown Voltage .... 6 kV.
Capacitance .... 75 pF/m.
Inductance .... 0.187 μH/m.

Materials:

Inner Conductor .... Copper.
Outer Conductor .... Copper.
Diameter (incl. PVC sheat) .... 28 mm.
Diameter (Outer cond.) .... 24.9 mm.
Minimum Bending Radius .... 250 mm.
Minimum Number of Bendings 15
Bending Momentum .... 16.3 N/m.
Weight .... 0.49 Kg/m.
Resistance to Stress .... 147 Kg.
Resistance to Crush .... 1.4 Kg/mm.

Any authorized Antennas Catalog contains these and other Technical Specifications in event of using other type of transmission line. This is only an example of a possible use of a certain type of transmission line.

In our illustrative example, if we use two turrets having 20 m. height each, we have 20 meters of transmission line length, plus additional 10 meters calculated to acceed the Station site and internal runways within Station building. Total = 30 meters representing a loss of :

$$AL = \frac{30 \times 6.46}{100} = 1.94 \text{ dB} \quad \text{[per Station]}$$

By the other hand, it's allowable to assume 1 dB per station for connectors & coupling losses, so we have 2.94 dB of total line & connector losses per station.

1.6.- Calculation of Antennas.

Final system calculation is the required Antenna gain at each Station in order to keep the link's reliability and received signal level.

Assuming that we have a Transmitter Power output of 4 watts, that is +36 dBm, and following signal path from Transmitter output to Receiver input, we can build the following expression:

(3) $$P_t - A_{lt+con.} + G_{at} - ß + G_{ar} - A_{lr+con}. = S_{rec}.$$

Where:

P_t = Transmitter Power Output in dBm (or dBw)

$A_{lt+con.}$ = Transmission line & connectors losses at Transmitter end. (in dB).

G_{at} = Transmitter antenna gain (in dBi)

ß = Free Space Attenuation (in dB)

G_{ar} = Receiver antenna gain (in dBi)

$A_{ir+con.}$= Transmission line & connectors losses at Receiver end. (in dB).

$S_{rec.}$ = Received Signal (in dBm or dBw)

In our illustrative Example, we can replace these parameters by its numerical values in Expression (3) :

$$+36 - 2.94 + G_{at} - 130.9 + G_{ar} - 2.94 = S_{rec.}$$

That is: $$G_{at} + G_{ar} - 100.8 = S_{rec.}$$

Lets choose our parabolic antennas having the same gain (and diameter) both in Transmitter & Receiver ends, so $G_{at} = G_{ar} = G_{ant.}$

We have: $$2\,G_{ant.} - 100.8 = S_{rec.}$$

Analysis of this expression leads to a direct relationship between antennas' gain and Received Signal strength. This is a commonly used trick to calculate in a safe and easy way the required antenna's diameter.

Now, we proceed to calculate the required minimum signal strength at receiver input. For performing this, we go to the concept of Fade Margin, defined as the difference in dB existing between the nominal received signal and receiver noise threshold. This Fade Margin, under normal conditions, should be kept at least at 40 dB (the higher the better). So, the minimum required signal level at Receiver input will be:

$$S_{rec.} = S_{thr.} + FM \quad (4)$$

Assuming that our receiver has a Noise Threshold signal level of -80 dBm, we substitute the numerical values in (4):

$$S_{rec.} = -80 + 40 = -40 \text{ dBm.}$$

This value of -40 dBm will be the minimum required signal strength at Receiver's end in order to assure a reliable value of signal-to-noise ratio in the received signal.

Replacing this value in the expression relating received signal strength with antennas' gain we have the following:

$$2\,Gant. - 100.8 = -40$$

or : $$2\,Gant. = 60.8 \text{ dBi}$$

Concluding: $$Gant. = 30.4 \text{ dBi}$$

The next step is to consult any table of Parabolic Antennas in order to find the required diameter in our parabolic reflectors to obtain this gain at the system working frequency. At 2 GHz band, mesh reflector antennas are widely used, both for lighter weight and less wind load, taking into account the relatively large diameters required. An example of these mesh antennas Table is as follows:

GAIN OF ANDREW® MESH PARABOLIC REFLECTORS					
Reflector Diameter (m)	Gain at 1.9/2.3 GHz Frequency Band. (dBi) 1.9 GHz	2.0 GHz	2.1 GHz	2.2 GHz	2.3 GHz
0.6	18.2	18.7	19.0	19.5	19.9
0.7	19.6	20.0	20.5	20.9	21.3
0.8	20.8	21.2	21.6	22.0	22.4
0.9	21.9	22.2	22.7	23.0	23.6
1.0	22.9	23.1	23.7	24.0	24.4
1.2	24.2	24.9	25.2	25.7	26.1
1.4	25.8	26.2	26.7	27.0	27.5
1.5	26.3	26.9	27.2	27.8	28.0
1.8	28.0	28.5	28.9	29.3	29.8
2.0	29.0	29.4	29.9	30.1	30.6
2.4	30.6	31.0	31.5	31.9	32.1
2.5	30.9	31.3	31.8	32.1	32.8
2.8	31.9	32.5	32.9	33.2	33.7
3.0	32.5	33.0	33.5	33.9	34.2
3.5	33.9	34.4	34.9	35.1	35.6
4.0	35.1	35.5	35.9	36.2	36.8
4.5	36.2	36.7	37.0	37.4	37.9

From former Table can be easily selected the required antenna. For the system frequency used and required gain, the mesh parabolic reflector required is of 2.4 m diameter, installed at both ends, transmitter and receiver.

Once these calculations are finished, we can analyze the remaining factors of interest in System's calculations, such as:

a) Path Attenuation for 0.1 % of Operating time:

The expression is as follows: $A_{0.1} = 45 \log d + 30 \log f + 78$ [dB]

In our example, replacing numerical values:

$$A_{0.1} = 249.4 \text{ dB}$$

This will be the value of Free Space Attenuation in Fading condition, predicted for 1x1000 of total operating time.

b) CCIR Margin for 0.1% of Total Operating Time:

The expression is as follows: $M_{0.1} = 35 \log d - 10 \log p + 10 \log f - 78.5$ [dB]

Where: p = Probability of Occurrence of Fading, generally taken about 0.01, in a general form p« 0.2 .

In our illustrative example: $M_{0.1} = 30.6$ dB

This is practically the limit of this parameter. It never will be lower than 30 dB.

c) Percent of time in which this margin will be exceeded:

Expression for this Calculation is the following: % T = 0.1 (d)/2500 [%]

Where : d = Path length in Km.

In our Example: % T = 0.1 (40) / 2500

or : % T = 0.0016 %

This is a practically negligible time of fading ocurrence, since this type of link is designed for a 24-hour daily operation, or 8760 hours per year. Assuming this time as 100%, the 0.0016% will be 8760 x 0.0016 / 100 = 0.14 hours in a year, or 8.4 minutes of expected fade time.

d) Noise Considerations. Reference Noise and System Signal-to Noise Ratio:

Reference noise is defined as "the total receiver noise level in absence of signal" and it's obtained adding all random noise components involved in the appearing of noise at receiver's output terminals.

There are some components in the total noise at receiver's output. The theory of each component can be easily found in any Text Book and is not of the scope of this Introduction. It's enough to know that, for a standard video & audio microwave link as shown in our illustrative example, the noise components, and its numerical values, are the following:

a)	Noise Figure	5.0	dB
b)	Boltzmann's Noise (kT_o)	-204.0	dBW
c)	10 log BW = 60 + 10 log (4.2)	66.23	dB.
d)	Modulation Gain	- 7.09	dB
e)	Weighting + Pre-emphasis/de-emphasis	-13.80	dB
	Reference Noise (N_o)	-153.66	dBW.
	That is :	-123.66	dBm.

Received signal, as seen before, is at a -40 dBm level in order to keep the minimum Fade Margin of 40 dB. Taking into account the above calculated Reference Noise, we can find now the Signal-to noise Ratio:

$$S / N\,[dB] = -\,(N_o - S_{rec.}) = -\,(\,-123.66 - (\,-40)\,) = 83.66\ dBm.$$

If a deep 40 dB fading condition appears, and signal drops to threshold level, Signal-to-Noise Ratio will be kept in the following value:

$$S / N_{thr}\,[dB] = -\,(\,-123.66 - (-80)\,) = 43.66\ dB$$

e) Link's Propagation Reliability:

For a certain analogic Radio Link, Propagation Reliability is given by the expression:

$$\%R = 100\,(\,1 - 10^{-FM/10}\,)$$

Where: FM = Fade Margin in dB

Replacing with numerical values for our illustrative example:

$$\%R = 100 (1 - 10^{-4}) = 99.99\%$$

In other words, our formerly solved example represents a 2 GHz Radio Link whose Propagation Reliability (independent from equipment's reliability) is 99.99%. These calculations can be performed within any frequency band used, in any analogic Radio Link analyzed. Obviously, for Digital Radio Links these calculations are not completely valid, since there are other additional factors involved in system's performance.

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M T - M R   P L A T I N U M

POINT TO POINT AURAL RADIO RELAY SYSTEM

chapter II
GENERAL SYSTEM DESCRIPTION

2.1.- Introduction.

MT-MR Platinum Radio Link System is a typical STL (Studio-Transmitter Link) used to carry aural information from Production Studios to a distant Transmitter station. It is developed for practically all frequency bands below 1 GHz that are generally used for this type of service. Both transmitter and receiver are fitted with high-stability PLL-controlled oscillators, with TCXO reference frequency source, to accomplish the most severe frequency-stability Rules and Regulations around the World.

MT-MR Platinum system is capable of carry a high-quality stereophonic program and three specialized SCA channels used for commercial audio, low-frequency data transmission or telemetry/telecontrol purposes. This Radio Link not only can work as STL point-to-point system, but it can also work as multiple-repeater Relay system in any configuration, allowing to link very distant Transmission sites with its Production Studios. Facility of audio dropout at each repeater station allows the creation of province or national chains having multiple Transmitter Stations.

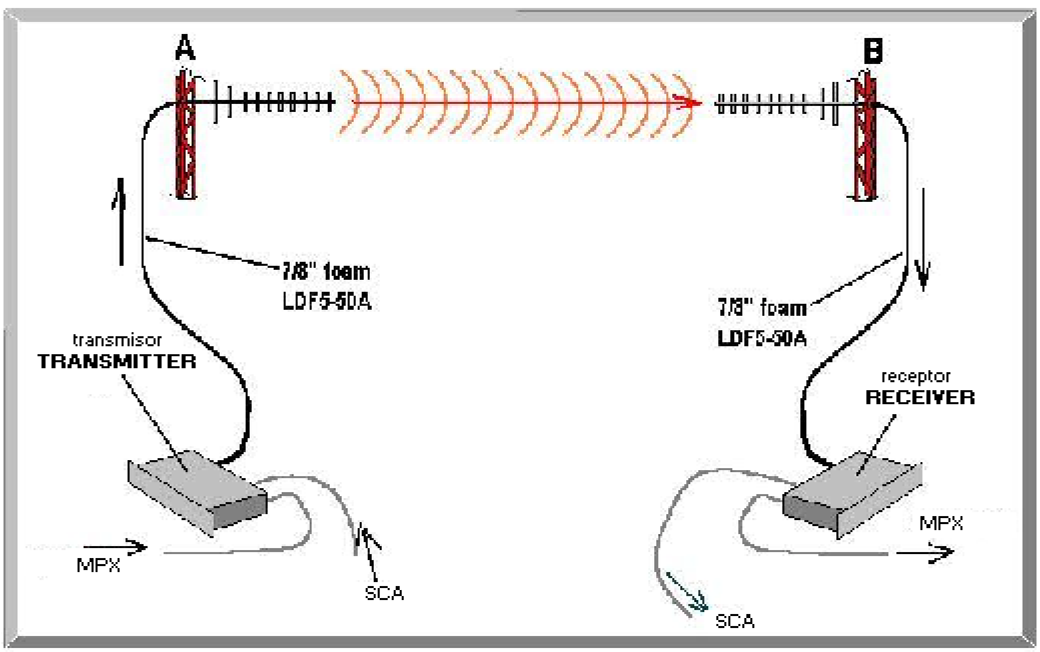

Fig #..LT/LR DIG LINK USED FOR SIMPLE STL AUDIO TRANSMISSION

As we said before, this Aural Radio Link can be built, at Customer request, in practically any frequency band designed for these linking purposes. Originally designed for 400 MHz frequency band, further development of new circuits will expand its range to 300-370 MHz, 470 MHz and even 900-960 MHz well-known frequency bands.

Each transmitter/receiver couple has its oscillator and RF circuits designed for 20 MHz sub-bands tuning within each frequency band selected. Customer must take care in choosing the type of antennas adequate for the selected frequency band. OMB has some models of good-performance Yagis for all allowable link frequency bands into the MT-MR Platinum system's working range.

System can operate connected to 110-120 vAC or 220-240 vAC Mains sources. Both MT Platinum transmitter and MR Platinum receiver has incorporated a sturdy heavy-duty switching Power Supply in order to withstand AC voltage fluctuations, keeping the overall system reliability in a high-level value.

There are plenty of metering facilities both at transmitter and receiver. Digital Display of MT Platinum allows to supervise transmitted and reflected power levels, and also equipment's carrier frequency deviation. Pilot LEDs also supervise the oscillator's PLL frequency lock, normal operation of the Switching Power Supply and normal RF output selected. In the other hand, MR Platinum multimeter allows to supervise both received RF signal strength and incoming carrier modulation level.

Also, MR Platinum receiver has a pilot LED indicating local oscillator's PLL frequency lock, and another LED indicating the presence of a normal received signal level. There also exists some monitoring facilities like a headphones connection and audio level control, and a small monitoring speaker to locally check received audio quality. To avoid unpleasant noise to be reproduced by receiver's audio amplifier circuits in event of any abnormal behavior like a fading or an AC failure at transmitter station, MR Platinum receiver also has incorporated a mute or squelch circuit to cut out the audio output signal when signal-to-noise ratio of incoming signal lowers to some pre-determined mute threshold level. This muting circuit can be set on or off from a switch located at Receiver's front panel.

All cable connectors are located at rear panels, both at system's transmitter and receiver. This fact contributes to a better organization and neat appearance of the racks where equipments are mounted. We recommend to install both transmitter and receiver in standard 19" normalized closed cabinets, both to keep this presence at its best level, and to preserve equipment from dust and dirtiness.

Concerning this aspect, both equipments will be installed in environments that are free from dust and dirtiness, and only under climatic conditions prescribed in their correspondent Technical Specifications. We recommend the use of air- conditioned rooms where it's possible. Otherwise, equipments' room must has a ventilating and de-humidifier system in order to keep the system operating under stable and safe climatic conditions. Under local conditions involving the possibility of severe AC failures, it is advisable to select the DC feeding for both Transmitter and Receiver, if necessary. Both equipments are delivered to Customer fitted with DC mains supply requirements. This DC supply will have + 15 vDC, negative to ground. Under severe AC failure conditions, it will be better to adquire this option, and connect equipment/s to a 15 vDC Battery rack, this battery being in turn connected to a DC Battery Charger to keep battery always charging under "floating" conditions.

NO INTERNAL ADJUSTMENT OR PRESETTING IS REQUIRED DURING NORMAL OPERATION. EQUIPMENTS SHALL BE PROPERLY GROUNDED AND BE OPERATED WITH ALL THE COVERS CLOSED TO PREVENT ELECTRICAL HAZARDS AND COMPLY WITH EMC STANDARDS.

OMB hence recommends for these equipments not to be handled by unskilled personnel, together with antenna system, transmission lines and the remaining components, both at Transmitter & Receiver heads and related equipments and station's antennas system. A good installation, made by skilled and trained personnel will avoid many future troubles during system's exploitation process.

All the operations described in the Certification of Limited Warranty must be accomplished to have the right of make any claim concerning this Warranty, having free equipment service by OMB's technical personnel during this first system's exploitaition phase.

2.2.- System Technical Specifications.

Frequency Range .... All < 1 GHz Frequency Bands assigned for Radio Links operation (at request).

Modulation .... F3 (direct over carrier).

Oscillators' tuning ranges .... 20 MHz.

Frequency Stability .... ± 2 ppm (more at request).

Transmission Power Output .... 10 watts pep.

Reception Noise Figure .... ≤ 6 dB.

Pre-emphasis Time Constant ....50 or 75 usec. Selectable.

Baseband Frequency Response .... 30 Hz - 60 KHz at 0 ± 0.15 dB.

Mains input .... 100-240 vAC. 47 to 63 Hz.

DC Mains Input .... 15 vDC, negative to ground.

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MT-MR PLATINUM

POINT TO POINT AURAL RADIO RELAY SYSTEM

chapter III
THE MT PLATINUM LINK TRANSMITTER

3.1.- Description.

MT Platinum Transmitter is a device used to transmit multiple audio information through the UHF frequency spectrum (for aural links, generally are used the medium-upper UHF band upto 960 MHz, or the lower microwaves range in the 2 GHz band, depending on Country standards). Originally designed for 400 MHz band, it is being developed also for the 220, 300,470 or 960 MHz bands, according to the particular needs specified by Customer. This transmitter is used together with the MR Platinum receiver to form the MT-MR Platinum aural point-to-point Radio link system.

MT Platinum is an wideband FM Transmitter having 10 watts p.e.p. output in all versions (each version is built for a particular frequency band) having a transmission baseband comprising one main program audio channel and three subsidiary (SCA) auxiliary channels, also used to transmit low speed data (RDS) through system. These channels can also be used to receive information from different stations (telemetry) or to control equipments at these stations (telecontrol). LT DIG is built around independent modules joined together to integrate equipment within a solid and sturdy duraluminum closed cabinet. Dimensions of this cabinet are reduced; only a low height of 2U, and 44 cm. depth, with a standard 19" width for rack mounting. Modules are easily replaceable in event of a failure.

Fundamental control & supervision elements are all located in the Equipment's Front Panel. All connectors are located in the Rear Panel, thus avoiding the audio or RF cables to drop in the Equipment's front, obstructing the reading of the supervision elements.

Main transmitter oscillator generating directly the RF carrier frequency is a VCO device (voltage-controlled oscillator) whose frequency is kept locked into its value by a PLL (Phase-Locked Loop). This control loop gets a sample of the RF output of the oscillator, frequency-dividing it and making a phase-comparison with another reference signal of the same frequency, this signal obtained from a reference thermally-stabilized oscillator (TCXO) whose output signal is also frequency-divided before being phase-compared with the RF sample. Phase comparison is made at the lowest possible frequencies in order to minimize the frequency error or phase "jitter" at phase comparator circuit. Output of phase comparator is a DC error voltage who sets the exact value of oscillator's center frequency. Frequency divider circuits of reference oscillator are externally programmable within tuned frequency band. This fact allows a complete programming of selected operating frequency, since comparison between almost any desired frequency and the reference frequency is allowable, once both are divided. Conditions are only 1) desired frequency must follow the programming order given by the frequency setting steps of PLL synthesizer, that is, 25 KHz apart. and 2) Selected frequency must be situated into the synthesizer's programmable band. This Equipment uses a Microcontroller unit (specialized Microprocessor) fitted with a Digital Display to control the programmable dividers setting. Microcontroller can be internally programmed with a broad set of frequencies covering practically all assigned Equipment's tuning sub-band. Another security element has been introduced in this circuit: carrier operating frequency can not be altered or changed unless a certain password is entered into Microcontroller Unit.

This is a three-digit password and arrangements can be made to be known only by authorized personnel, in order to avoid any non-authorized tampering or alteration of its nominal value. However, some routine measurements can be taken from Digital Display via Microcontroller unit without knowing of such password.

Transmitter is fitted with a 10 watts, broadband - tuned, RF Power Amplifier whose active amplifier element, generally an RF Power Amplifier Integrated Circuit, changes according to the frequency band selected. There are several types of power amplifiers, including some having a Power Transistor as amplifier element, but all of them has the same power level of 10 watts in their respective working frequency band.

3.2.- Transmitter Technical Specifications.

R.F. Power output .... 10 watts pep.

R.F. Output Connector .... N female.

R.F. Output Impedance .... 50 ohms, unbalanced.

Working Frequency Range .... 200 to 980 MHz, in 20 MHz sub-bands.

Harmonic Supression .... > 55 dBc.

Modulation .... FM, F3 direct over carrier.

a)Measurements in Monaural Mode:

Signal to Noise Ratio........................ .... > 60 dB.
Conditions: ±75 KHz carrier deviation with 400 Hz tone.
Measured in 30 Hz - 20 KHz band.

Harmonic Distortion......................... .... < 0.07%.

Pre-emphasis......................... .... 50 or 75 usec. selectable.

Audio Frequency Response. .... ± 0.5 dB within 30 Hz - 15 KHz band.

Audio Input Level.. Adjustable. 0 dBm. nominal for ±75 KHz deviation.

Audio Input Impedance. .... 10 Kohms balanced. XLR input connector.

b) Measurements in Stereophonic Mode:

Baseband Input Impedance .... 10 Kohms unbalanced. BNC Female connector.

Total Harmonic Distortion .... < 0.27 %.

Baseband Signal to Noise Ratio .... > 67 dB.
Conditions: 400 Hz tone measured in 30-20,000 Hz band.

Frequency Response .... ± 0.6 dB from 30 Hz to 100 Khz.

Channel Separation .... 45 dB.

c) Supply Requirements:

Mains Supply .... 117 to 230 vAC. 47 to 63 Hz.

Power Consumption .... 27 watts.

Cooling System .... Forced Convection by "Wind Tunnel". Axial Blower.

d) Subsidiary Channels:

Input Impedance .... 10 Kohms unbalanced. BNC Female connector.

Subcarrier Input Level .... Adjustable. 0 dBm nominal for ±7.5 KHz carrier deviation.

SCA Upper Baseband Frequency Response .... ±0.6 dB from 40 to 100 KHz.

e) General Specifications:

Dimensions .... MKS system: 82 mm height x 326 mm depth x 445 mm width.

Dimensions .... Old English system: 3.2" height x 12.83" depth x 17.51" width.

Front Panel Dimensions .... MKS system: 483 mm width x 88 mm height.

Front Panel Dimensions .... Old English system: 19" width x 3.47" height.

Working Temperatures Range .... -10ºC to +50ºC.

Weight .... 6 Kg (13.2 lbs).

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3.3.- Audio Processor Unit.

This unit receives the main program audio signal, together with the three possible upper-baseband SCA channels. Program audio can be introduced into this unit following two different ways:

a) Monaural mode.
b) Stereo Multiplex mode.

Normally, Stereo MPX mode is employed by almost all FM Broadcast stations, but MT Platinum transmitter offers the option of link broadcast station with monaural audio (p.e., for AM stations links) using the standard pre-emphasis characteristics. This monaural signal enters Audio Processor Unit via a balanced XLR female connector, with two live inputs incoming to the two inputs (inverter & non-inverter) of an Opamp to get a common, unbalanced output. This first amplifier stage also works as an active pre-emphasis circuit using its own feedback loop. Pre-emphasis time constant can be changed by a jumper from 50 to 75 usec., or vice versa, to comply with U.S. or Europe transmission standards. Pre-emphasis curve can be exactly adjusted by a potentiometer. Once pre-emphasized, monaural audio signal passes through a 19 KHz Low-Pass Filter, and is furtherly amplified by the other section of the same OpAmp.

At this stage's output, Monaural & Stereo audio signals are joined together. Obviously the presence of one of the two audio signals excludes the other. That is, transmitter uses Stereo, or Monaural audio, once at a time. At this circuit point are also added the three sub-carrier signals from the three SCA optional channels, being these SCA signals previously filtered by series capacitors, that is by simple RC high-pass filter elements. Now, composite baseband is amplified again by the two sections of an OpAmp U5. Between both amplifier sections there is a variable capacitor to optimize high-frequency end of baseband response when stereo multiplexed signal is used. Finally, this unit includes an optional clipper circuit who can be internally connnected or disconnected by a jumper.

This clipper circuit avoids any carrier overdeviation produced by high audio peaks incoming from this unit. Action of this circuit considerably distorts audio signal peaks, so audio level must be always kept under the clipping thresholds. This circuit is used as a security element only.

At clipper's output, composite baseband signal has increased its level to exceed the required to frequency-modulate Equipment's VCO between the allowable limits of ± 75 KHz. Overall level of composite baseband can be adjusted by a potentiometer, whereas each baseband component has its own level adjustment potentiometer (monaural or stereo program audio, and the three SCA channels.

3.4.- VCO (Voltage-Controlled Oscillator) & PLL (Phase-Locked Loop) Units.

These units generates the RF carrier signal, directly at the assigned transmission frequency. It comprises a Voltage-Controlled Oscillator who is frequency-modulated by the audio baseband signal incoming from the Audio Processor Unit. This unit is located within RF Amplifier's box. Oscillator's frequency is deviated up and downwards from its center value, according to the alternating baseband signal level. Center frequency value is kept constant by the AFC (Automatic Frequency Control) circuit, this comprising a PLL (Phase-Locked Loop), this located at Mother Board unit. Allowable deviation limits of carrier frequency are ± 75 KHz from its center value. Once carrier is generated by an NFET, and frequency-modulated by a group of varicap diodes located at FET's gate circuit in order to modify oscillator's working frequency. Some varicaps are used in parallel in order to linearize the circuit's modulation characteristic curve. Output of oscillator is properly isolated to avoid amplitude changes with any eventual variation of the load conditions at circuit's output. This isolation is reached using a first transistor buffer stage, followed by another transistorized amplifier stage. Both stages uses BFR93L transistors. An RF sample is drawn out from the buffer stage's output to feed the frequency pre-scalers (dividers) of PLL circuit.

RF sample drawn out of VCO's output is fed to pre-scaler or frequency divider circuits at U3 (MB1501), who divides incoming signal's frequency, feeding in turn the resultant low frequency signal to the phase-comparator circuit of the same IC. This IC is fed, by the other hand, with the 12.8 MHz signal incoming from the external TCXO Reference Oscillator, this signal being also divided in frequency (at internal programmable dividers into the same IC) by the rate ordered by Microcontroller unit, this rate chosen by the Microcontroller in order to reduce the reference frequency to a value that can be compared with the value of the signal obtained from the RF sample to reduce and keep the phase difference between both signals to zero when the VCO output falls in the desired frequency value. Phase comparator circuit (also within the same IC) produces a DC error voltage proportional to the phase difference between both signals; the reference signal and the RF sample drawn out from VCO's output. This DC error voltage is amplified in a differential amplifier and fed to varicaps D1-D5 at VCO in order to keep its bias voltage, and consequently its capacitance in a such value that VCO's output signal frequency will be the previously ordered by the Microcontroller unit. To adjust the operating frequency to any value within the prescribed frequency sub-band, only it's required to follow the instructions given in this Manual, watching the Microcontroller's Display screen, and operating the two access push-buttons of the Microcontroller unit in order to set the desired frequency.

3.5.- Microcontroller or Control Unit & Attached Display Unit:

This unit is directly attached to the back side of Equipment's Front Panel, containing the main supervision & control elements that checks and controls all transmitter's operational parameters. This unit works closely together with PLL section, sending directly to this unit the frequency-change orders concerning frequency programming of PLL internal pre-scaler circuits located at PLL Integrated Circuit, in accordance with frequency that is chosen and entered to Microcontroller. This unit also receives information from PLL concerning its phase-lock condition, and allows to release the RF power at equipment's output only with phase-locked condition is reached.

Control Unit contains the Microcontroller device, an specialized Microprocessor type T89C51RD2 having a clock frequency of 11.0592 MHz.This device controls, through ADC0834 Integrated circuit, the possible selection points of the PLL's internal programmable divider, that determines the binary frequency-division rate, that is, the operating frequencies of the VCO. It also has an series interface MAX232 coupling to the RS232 output interface to remotely-control equipment. Microcontroller's display device is the Liquid Crystal Display CMC216E05, who is coupled to Microcontroller's output ports through its "D" outputs (D0, D1, D2, ...D7).

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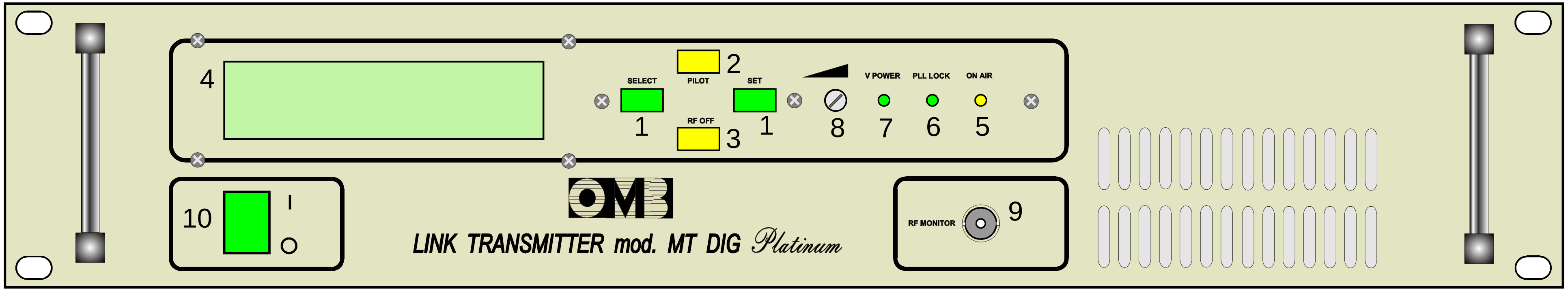


1 - Keypad for frequency programming and meter select function

2 - Keypad for pilot tone level measurement

3 - Keypad for RF output level function

4 - Digital readout frequency and multimeter

5 - V Power indicator

6 - PLL lock indicator

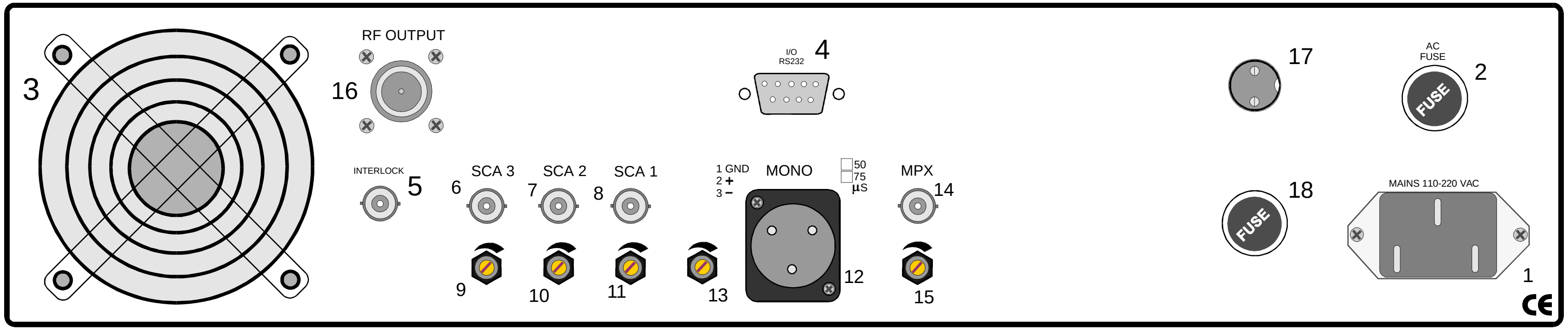
7 - RF power enable indicator

8 - RF power level adjust

9 - RF sampler

10 - Power Switch

OMB - ZARAGOZA SPAIN	
Aural Link Transmitter mod.MT-DIG Platinum front panel layout	
DATE July 2003	FILE frontpanel MT layout.cdr



1 - MAINS SUPPLY CONNECTOR

2 - AC FUSE 1A

3 - FAN

4 - DB 9 PIN INPUT / OUTPUT CONNECTOR FOR TELEMETRY (opt.01)

5 - BNC FEMALE FOR CONNECTION OF THE INTERLOCK LOOP -
A CONNECTION TO GROUND INHIBIT RF POWER

6-7-8- BNC FEMALES FOR SUBCARRIERS GENERATORS INPUTS

9-10-11- SCA INPUT ADJUSTING LEVELS

12 - XLR FEMALE BALANCED MODE MONO AUDIO INPUT

13 - MONO INPUT ADJUSTING LEVEL

14 - BNC FEMALE FOR THE COMPOSITE MPX INPUT

15 - MPX INPUT ADJUSTING LEVEL

16 - N FEMALE FOR RF OUTPUT POWER

17 - EXTERNAL 15V DC POWER

18 - EXTERNAL 15V DC POWER FUSE

OMB - ZARAGOZA
SPAIN

TITLE MT DIG PLATINUM AURAL LINK TRANSMITTER
rear panel layout

DATE 06-2003

DRAWING NO. Rear panelMT layout.cdr

MT-MR PLATINUM

POINT TO POINT AURAL RADIO RELAY SYSTEM

chapter IV
THE MR PLATINUM RADIO LINK RECEIVER

4.1.- Description.

MR Platinum Radio Link Receiver is a wideband, high quality equipment, conceived to integrate a STL (Studio-Transmitter Link), together with MT Platinum Link Transmitter. Designed in first instance for 400 MHz band, MR Platinum Receiver is being now developed to receive multiple frequency-modulated audio signals over the whole sector of frequency spectrum assigned to Radio Relay and STL service, mainly at 200,300, 470 and 900 MHz frequency bands, covering both VHF & UHF frequency ranges. As happens with MT Platinum transmitter, the MR Platinum receiver is designed to operate in 20 MHz sub-bands. Not only it can operate within a one-hop STL, but it also can integrate more complex Relay systems, working in baseband-repeater stations with or without dropout & insertion at each repeater.

MR Platinum receiver is a completely solid-state device who can operate 24 hours daily along many years without any service interruption or loss of service quality. It can receive a wideband monaural program , or a multiplexed stereophonic audio plus three SCA or RDS channels, containing audio analogic information, or digital low speed data. Its baseband distortion level, sensitivity, image rejection and noise level can be compared with many higher-priced equipments characteristics. However, this receiver is one of the cheapest available at professional Broadcast market in our present days.

Essentially speaking, MR Platinum receiver is an specialized FM reception equipment, double-conversion super-heterodyne type, tuned by a Voltage-Controlled local oscillator (VCO) who in turn is stabilized and tuned by a Phase-Locked Loop (PLL) . Selection of received frequency by PLL is obtained through a Microcontroller device (specialized Microprocessor) who is previously programmed with all the frequencies that Equipment can receive within its operational sub-band. This Microcontroller selects the operating frequency by sending digital orders to the programmable frequency divider circuits at PLL unit , who sets this frequency and keeps it constant, thanks to the high-stability reference oscillator (TCXO) employed in the Automatic Frequency Control loop.

Operational parameters of this receiver can be easily checked while it is normally functioning, also through Microcontroller unit, since this unit is fitted with a Interactive Digital Display, this allowing to perform both the received frequency setting and the main parameters readings. This receiver includes a double-section active filtering pre-selector system at its front end that highly improves its selectivity, overall noise figure and image-rejection characteristics. Both pre-selector filter sections has low-noise transistor amplifier stages integrally built within the same filter unit.

Both active amplifier stages cancels filter insertion losses and increases the net gain of received signal to the proper level to drive the mixer stage at optimal conversion efficiency. Mixer stage is also a low-noise, double-balanced device that mixes this received RF signal with another incoming from the VCO local oscillator in non-linear heterodyning process, in order to produce a third signal, the Intermediate Frequency (IF) signal, this containing all the information of the main audio program plus the SCA channels, that were contained int he original RF signal received. This IF signal is then demodulated, separating the main audio program (stereo or mono) and the three SCA or RDS channels, amplifying these signals to the correct output level in separate circuits, and finally delivering these informations at receiver's respective outputs. In case of receiving a composite multiplexed stereo signal, this signal is fed directly to the Broadcast transmitter at station without any type of decoding or intermediate device. Nevertheless, L+R audio component of the stereo signal can be locally monitored at the built-in speaker included in this receiver, or also it can be heard by using external headphones, at operator's choice.

As happens with transmitter, thiss receiver is normally fed by an internal Switching Power Supply, delivering ±15 volts DC to feed all Receiver active circuits. This receiver, as transmitter also is, is delivered to Customer having the additional facility of being able to be fed by a +15 vDC floating-battery system. This condition is generally applied in sites and stations where the AC failures are frequent. Floating-battery system not only can be used with AC battery chargers, but can be used with solar cells and/or wind generators, or using practically any form of non-conventional energy sources.

MR Platinum receiver is completely shielded against external interferences, and can be operated in high RF-contaminated environments, as Radio Broadcast Centers with multiple transmitters within the same room. Its low-value (<6 dB) Noise Figure is reached thanks to the use of the low noise two-staged RF pre-amplifier included in the Pre-Selector Filter casing. This RF pre-amplifier includes two RF low noise, surface-mounted transistors having a cutoff frequency in the range of the microwaves spectrum, with superb intermodulation characteristics, increasing receiver's sensitivity, and enabling it to operate in long-hop links.

Also it's required to mention the outstanding reference system used by local oscillator's PLL as a secondary frequency standard. This system uses a TCXO (Thermally-Controlled Xtal Oscillator) as low-frequency reference standard for PLL phase-comparison circuits, making the frequency stability of this receiver to be exceptionally high for its reduced cost.

All supervision and control elements including the Digital Display are situated in the Front Panel, whereas all connectors and cables are located at Rear Panel. Supervision elements are only the strictly required for performing all operational checks and to supervise Equipment's and system status. Controls are reduced to a minimum in order to simplify Equipment's operation and maintenance.

4.2.- Technical Specifications.

Frequency Working Range ....From 200 to 960 MHz, in 20 MHz sub-bands.

Sensitivity .... Stereo mode. 1 mV for S/N = 60 dB.
Monaural mode. 100 uV for S/N = 45 dB.

Selectivity ....± 100 KHz at –3 dB.
± 350 KHz at -70 dB.

Total Harmonic Distortion ....< 0.3 %.

Stereo Channels Separation .... 45 dB from 50 to 15000 Hz.

Output Audio Level .... For both stereo & mono modes: +8 dBm max.

Audio output impedance ....For both stereo or mono modes: 1 Kohm.
Stereo: unbalanced.
Mono: balanced or unbalanced.

Noise Figure .... < 6 dB.

Image Rejection .... typ. 60 dB.

Baseband modulation input .... Frequency, class F3.

Local Oscillator Tuning Range .... 20 MHz.

Frequency stability .... ± 2 ppm (more at request)

Local Oscillator Tuning Steps ....25 KHz (fine tuning by TCXO pot.)

Baseband Frequency Response .... 30 Hz to 60 KHz at – 0.15 dB.

Unweighted Signal to Noise ratio .... > 68 dB with 0.2 mV input. (typ. 72 dB)

De-emphasis (mono mode) .... 50 or 75 usec. Selectable.

RF Input connector ....Type N Female.

Stereo baseband output connector .... BNC Female.

Monaural audio output connector .... Cannon XLR Female.

Telemeasurements/ Telecontrol Interface RS-232 Connector .... DB-9 male.

Cooling .... Forced convection by axial cooling fan.

Teperature Working Range .... –10 to +45 ºC.

Maximum Relative Humidity .... 90% non-condensed.

Mains input line voltage .... Single-phase. 100 to 240 vAC. 47 to 63 Hz.

Alternative Mains supply .... +15 vDC. Negative to ground.

Power Consumption .... < 20 watts.

Dimensions ....Metric system: 82 mm H x 326 mm D x 445 mm W.
English system: 3.22" H x 12.83" D x 17.51" W.
Front Panel Dimensions .... Metric system: 483 mm W x 88 mm H.
English system: 19" W x 3.47" H.

Weight .... 6.5 Kg (14.3 lbs.)

4.4.- Receiver Performance.

This device receives the RF modulated carrier signal incoming from antenna at assigned frequency within VHF or UHF band, filtering it in first place in order to cancel all spurious RF components whose frequencies are below or beyond the assigned frequency sub-band, and amplifies the resulting RF carrier signal in order to increase its level to those required to drive the Mixer stage situated at PLL/VCO unit, keeping Receiver's Noise figure as low as possible. This unit is composed in first place by a three-section bandpass filter, followed by an active amplifier stage composed by a low noise RF transistor working in class C common emitter configuration. Omce carrier is amplified in this stage, it is filtered again by another three bandpass sections having a slightly norrower bandwidth than first sections.
Then, signal is amplified again by a twin-stage cascaded pre-amplifier in order to raise its level to the required for driving the mixer stage.

As said before, after RF signal crosses through output bandpass filter section, it is amplified again by the second pre-amplifier stage, composed by two cascaded transistors, also working in common emitter, class C configuration. These two transistors increases signal level to adequately the low-noise double-balanced Mixer stage.

Bandpass filter sections are factory-adjusted. Tuning of these sections are very critical, being its adjustment very sensitive. Only a slight misadjustment can change the sensitivity , selectivity and noise characteristics of the whole receiver. It is not advisable to re-touch the tuning capacitors at field under any circumstances, unless some very slight readjustments that are indicated ahead in this Manual, only in case of changing the receiver's operating frequency.

In case of any problem with pre-selector filter unit, damaged unit must be replaced with a new one, previously adjusted at Factory for the sub-band employed, and the damaged unit must be sent to the OMB Laboratories for its analysis and repair.

Once receiving frequency is programmed, as indicated ahead in Microcontroller Unit's performance description, we can proceed to energize receiver, adjusting receiving frequency in the RF Generator. If receiving frequency is exactly adjusted, the frequency (obtained with a frequency counter) at IF TEST terminal of IF Processor & Demodulator Unit will be exactly 10.7000 MHz. If a slight difference exists, it can be corrected with a little re-touch of TCXO's fine frequency adjustment capacitor using a non-inductive adjustment tool, in order to cancel this small difference. Correct procedure is as follows:

-Connect unmodulated RF Signal Generator (it must be a precision device having a frequency error not greater than 0.9 ppm) at Receiver's antenna input connector. Adjust level to receive –40 dBm and frequency to the nominal receiving value.

- Connect the input of a Spectrum Analyzer in the terminal <**IF TEST**> at Mixer & IF Unit. Check the purity of unmodulated IF signal over the whole frequency spectrum. Now connect the Digital Frequency Meter at the same test point, reading IF value, and performing the indicated corrections as required.

- Check now if Receiver's sensitivity is within its normal value, decreasing input RF signal's amplitude until reach the noise threshold value. If sensitivity is lower than originally, it's allowed to re-touch slightly, over the same point, the variable tuning capacitors of input bandpass filter section at RF Active Pre-selector unit, in order to optimize both sensitivity and selectivity until its normal values are reached. Once this procedure is finished, re-check IF value at test point <**IF TEST**> as before.

IF unit receives the 10.7 MHz I.F. signal, together with all spurious components produced in the non-linear process of mixing the Local Oscillator and RF signals. In the most used version of MR Platinum receiver, it can be fitted with an additional IF output connector, to enable it to be used as a component of a repeater station. Other versions not intended to be used as repeaters, but in STL links only, does not has this IF output enabled.

In the most general version of this unit, IF received signal follows two different paths within this unit: in the first, or demodulation path, this complex spectrum is adequately amplified and filtered to obtain only the 10.7 MHz IF component. This signal includes all the modulating baseband, and is amplified and amplitude-limited within limiter/discriminator integrated circuit TDA 1599. This IC has the multiple functions of amplifying and amplitude-limiting the incoming IF signal, and can also perform the further process of baseband demodulation through its discriminator internal section, but in MR Platinum receiver this function is reserved for a CA 3189E in 10.7 MHz IF unit. This IC also contains an internal squelch or muting circuit that cuts off demodulated baseband signal output when noise level added to IF signal reaches some threshold, as happens in signal fading propagation conditions. Mute threshold is obviously adjustable by a potentiometer, having this mute voltage a further amplifier circuit in order to trigger a relay to cut off baseband output when noise level raises beyond prescribed threshold.

Second path, or repeater path, is the other way followed by IF signal. Here the signal suffers a double filtering process, being also amplitude-limited and internally filtered again by a limiter IC. Afterwards, this processed and purified IF signal is amplified and delivered to the IF output connector, to be used in a heterodyne repeater arrangement. This second path is normally omitted in normal production receivers, and included in IF Processor & Demodulator unit at Customer's request.

Microcontroller unit and Display are similar to those used in MT Platinum transmitter.These cards are directly attached to the back side of Equipment's Front Panel, containing the main control & supervision elements of receiver. Microcontroller unit works closely together with PLL section of Local Oscillator, sending it the corresponding orders, concerning the internal frequency divider programming at PLL circuit, and in accordance with the chosen reception frequency entered to Microcontroller via the push-buttons Control Panel. Microcontroller unit also receives information about the PLL's phase lock condition, allowing audio at receiver's output only when PLL is locked in phase. Microcontroller Unit uses a specialized Microprocessor device, or Microcontroller type AT89S8252 having a clock frequency of 11 MHz. This device controls, via ADC08234 integrated circuit, the possible fixing points for the different binary division rates at the internal programmable frequency divider of PLL integrated circuit, choosing in this way the receiving frequency. Microcontroller device also has an associated MAX232 interface matching with the RS232 output series interface connector located at Rear Panel to remotely control and supervise Equipment's performance. Visual organ of Microcontroller unit is the Liquid Crystal Digital display V20350, coupled to Microcontroller's output ports through its "Dx" inputs (D0, D1, D2 ... D7).

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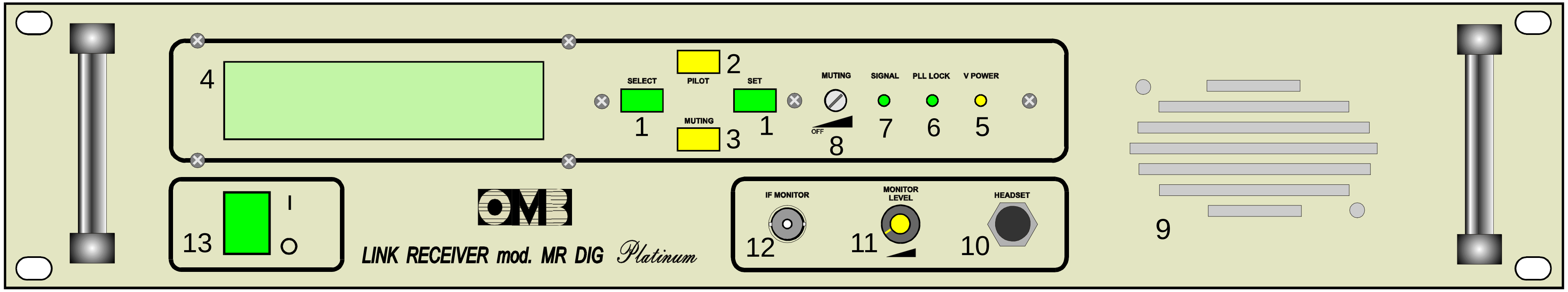
Once audio information merges from IF Unit, this baseband information will be adapted and matched to the external equipments to which they will go, by modifying its output impedance, level, etc. in order to optimize matching with external circuits. By the other hand, this baseband information, together with the parameters defining the operational status of receiver, can be locally supervised in the Equipment itself. Coupling component between the external outputs or the internal supervision elements, and audio baseband outgoing from IF unit, is the Audio Output card, and the tiny "Monitor Card", this late directly mounted over the Headphones jack, giving audio output both for monitor headphones and loudspeaker. Audio card is mounted at the back side of the Equipment's Rear Panel.



1 - Keypad for frequency programming and meter select function

2 - Keypad for pilot tone level measurement

3 - Keypad for muting function

4 - Digital readout frequency and multimeter

5 - V Power indicator

6 - PLL lock indicator

7 - Muting enable indicator

8 - Muting level adjust

9 - Monitor Loudspeaker

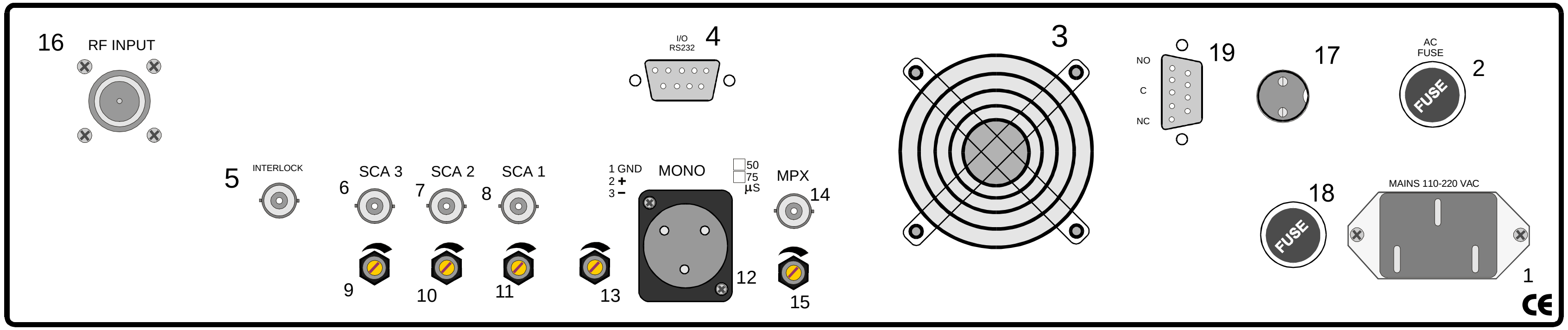
10 - Headphone monitor jack

11 - Monitor level adjust

12 - IF monitor output

13 - Power switch

OMB - ZARAGOZA SPAIN	
Aural Link Receiver mod.MR DIG Platinum front panel layout	
DATE July 2003	FILE frontpanel MR layout.cdr



1 - MAINS SUPPLY CONNECTOR

2 - AC FUSE 1A

3 - FAN

4 - DB 9 PIN INPUT / OUTPUT CONNECTOR FOR TELEMETRY (opt.01)

5 - BNC FEMALE FOR CONNECTION OF THE INTERLOCK LOOP - THE CONNECTION GOES TO GROUND WHEN MUTE IS ON

6-7-8- BNC FEMALES FOR SUBCARRIERS OUTPUTS

9-10-11- SCA OUTPUT ADJUSTING LEVELS

12 - XLR FEMALE BALANCED MODE MONO AUDIO OUTPUT T

13 - MONO OUTPUT ADJUSTING LEVEL

14 - BNC FEMALE FOR THE COMPOSITE MPX OUTPUT

15 - MPXOUTPUT ADJUSTING LEVEL

16 - N FEMALE FOR RF INPUT POWER

17 - EXTERNAL 15V DC POWER

18 - EXTERNAL 15V DC POWER FUSE

19 - RELAY CONNECT WITH MUTE

OMB	OMB - ZARAGOZA SPAIN
TITLE	MR PLATINUM rear panel layout
DATE 06-2003	DRAWING NO. Rear panel MR layout.cdr

MT-MR PLATINUM

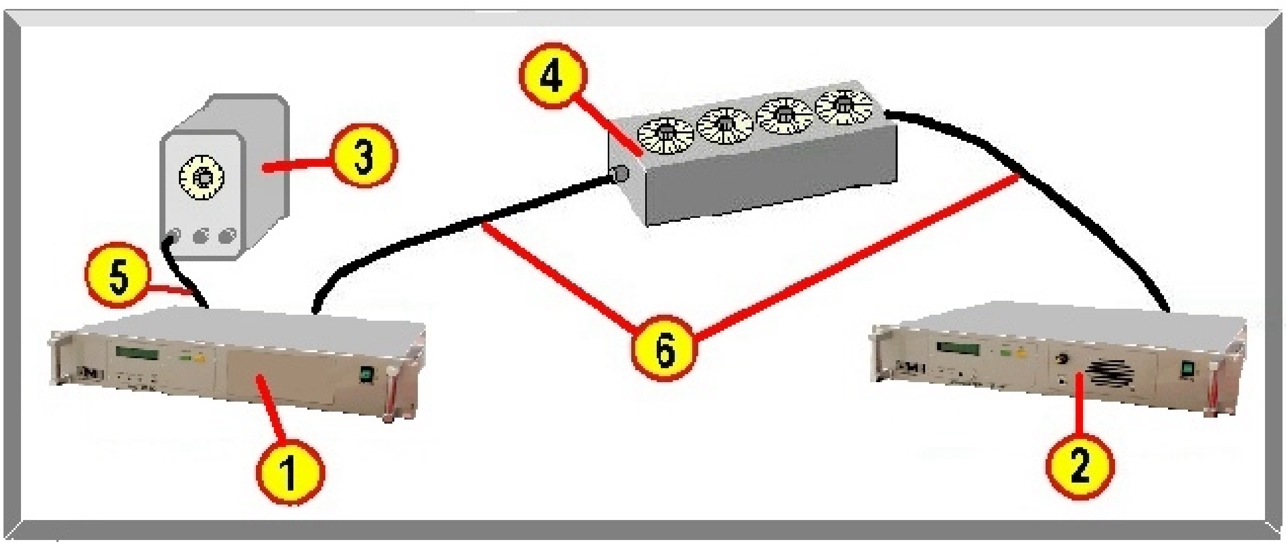
POINT TO POINT AURAL RADIO RELAY SYSTEM

chapter V
INSTALLATION AND OPERATION OF AURAL LINK

5.1.- Installation and Checks.

1.- Unpack receiver & transmitter equipments and verify that all controls, modules, displays, etc. and the cabinets itself are intact and free of blemishes, scratches, etc. Otherwise, operate as established by Law. Verify the integrity of antennas & transmission lines. Divide the equipments who are going to be installed to both stations, i.e. transmitter & receiver stations.

2.- Before sending equipments & accesories to the correspondent stations, make an operative test. Connect transmitter & receiver back-to-back in the following way:



SYSTEM BACK-TO-BACK CONNECTION

Description of Setup components is the following:

1.- Transmitter.
2.- Receiver.
3.- Audio Baseband Tone Generator. Calibrated 0 - 100 KHz. Connected to Stereo Baseband input (BNC connector).
4.- Decade Variable Calibrated RF Attenuator. It must withstand the 10 watts of RF power from Transmitter.
5.- Coaxial 75 ohms cable.
6.- RF low-loss 1/2" coaxial cable. 50 ohms.

3.- Before turning equipments on, check transmission & reception frequencies within allowed sub-band, by verfying Transmitter Oscillator and Receiver Local Oscillator settings at Display screens.

4.- Adjust variable RF attenuator to obtain a nominal -40 dBm signal at receiver's input. [+30-(-40) → 70 dB att.]

5.- Rotate power control potentiometer at transmitter fully counter clockwise, decreasing power output to a minimum.

6.- Turn on both transmitter & receiver equipments.

7.- Once transmitter & receiver PLLs are locked in phase, slowly turn clockwise power control potentiometer at transmitter, until it reaches its nominal power output of 10 watts (+30 dBm). Check that reflected power at transmitter is well below the allowed security margin. Transmitter is set for Stereo transmission (pre-emphasis & filter OFF).

8.- Verify receiver Display reading in < **SIGNAL>** > line. This reading must coincide with the received signal level of -40 dBm. Log reading.

9.- Connect the mute circuit at receiver (<**MUTE**> switch ON) and progressively decrease received signal by increasing attenuation with the variable attenuator, until mute circuit just triggers on. Assure that no noise or "hiss" can be heard in the monitor speaker of receiver during this procedure. Check the attenuator scale reading. Its reading must be equal or more than 100 dB attenuation. Log receiver's Display reading for this RF signal level.

10.- Restore input signal level at receiver of -40 dBm by reducing attenuation. Turn on baseband tone generator. Calibrate it to produce a 1 KHz/ 0 dBm tone. Adjust transmitter baseband input level to deviate ±75 KHz. Remember that Baseband Tone Generator must be connected to Stereo Baseband Input BNC Connector at transmitter.

11.- Check receiver Display at < **DEV>** > bar indicator.. It must indicate 75 KHz deviation or 100% modulation.

12.- Perform a frequency response check, from 30 Hz to 100 KHz, keeping output amplitude of Baseband Tone Generator constant, and reading receiver's Check that frequency response keeps within the receiver's Technical Specifications. Log any frequency drop values at SCA sub-carrier frequencies between 67 & 92 KHz. Log stereo baseband frequency response curve.

13.- Set Baseband Tone Generator to 1 KHz / 0 dBm. Connect its balanced output to XLR input connector at transmitter. Set pre-emphasis & filter ON. Verify that transmitter's deviation keeps in ±75 KHz.

14.- Connect an Audio Test Set or Psophometer having a calibrated VU Meter (in dB) in Hi-Z to XLR balanced audio connector output at receiver. Verify that VU Meter reading is 0 dB.

15.- Set receiver for monaural reception. Read VU Meter. The reading should be the same as before (0 dB).

16.- Perform a frequency response check for monaural mode. Always keep output amplitude of Baseband Tone Generator constant, and reading external VU Meter. Frequency response will run between 30 Hz and 15 KHz. Check that obtained frequency response curve is within the allowable receiver's Technical Specifications. Log this curve.

17.- Connect a Distortion Meter (or the same Audio Test Set, who is fitted with this instrument, adjusted to read measure Harmonic Distortion) at Receiver's stereo baseband output (BNC connector). Connect Baseband Tone Generator to stereo baseband input at transmitter, as before. Adjust it to produce 0 dBm signal level at frequencies indicated in (18), sequentially.

18.- Perform an Harmonic Distortion test at 50Hz, 60 Hz, 400 Hz, 1 KHz, 5 KHz, 10KHz, 50 KHz & 100 KHz. Check that Harmonic Distortion keeps below or assumes the values indicated in system's Technical Specifications. Log these results.

19.- De-energize transmitter, receiver and instruments. Disassemble the test arrangement. Pack again transmitter and receiver (take care not to change any setting in both equipments) and send it to the correspondent stations.

20.- To install Transmitter and Receiver at its respective stations, first install the antenna system: yagis, log-periodics or parabolic antennas at both stations, each aiming to the opposite station; that is, transmitter antenna located at the required height in the tower, aiming approximately to Receiver Station, and with transmission line completely installed. Check system for VSWR and put it ready to connect. The same with Receiver Antenna system, this aimed approximately to transmitter station. Check it also for VSWR, after installation is finished. Be sure to protect all outdoors connectors with rubber & plastic tape, and silicon compound, avoiding any humidity condensation or water penetration inside, at both stations.

21.- Mount transmitter into its correspondent rack, and make all definitive connections, including antenna system (previously checked), AC & audio. The same for receiver equipment at receiving station.

22.- It's very convenient to have a private two-ways communication system present when dealing with these system installations. A couple of CB or VHF (check it for interference) handie-talkies will work fine for this purpose. Four in the same frequency are still better: two for outdoors (tower men) and two for indoors.

23.- Energize transmitter at Transmitter station. Energize receiver at Receiver station. Set transmitter for stereo transmission (flat response, not pre-emphasized) and set receiver to the same condition. Connect a 1 KHz Test Tone Generator to the transmitter's baseband input.

Adjust its level for 75 KHz deviation (100% modulation). Set transmitter at full 10 watts transmitted power. Check reflected power to verify antenna conditions. Disable mute circuit at receiver. Read the value of received signal, if any. If there is some signal present, 1 KHz test tone will be heard through the monitor speaker, and some indication will be read in receiver's Display. This is the best case. Taking into account the type of antenna who is installed at both sites (more or less narrow pattern), first loose horizontal locks and slowly move transmitter antenna horizontally in both directions: left and rightwise, searching for a maximum indication in receiver's meter (taking care not to confuse with the side lobes). Once maximum deflection is obtained, fasten antenna horizontal locks and loose the vertical ones, then moving slowly antenna up and downwards, once maximum deflection is obtained (hearing the tone all the time) at receiver's Display. Once transmitter antenna is properly oriented, unlock the horizontal movement of receiving antenna and perform the same operation. At this point, is possible that receiver's Display reading is quite high, and receiver can begin to saturate. If reading is approaching to this value, insert a line attenuator to decrease this reading about 50% and then continue moving antenna, always looking for the maximum point, first in horizontal, lock horizontal, then in vertical direction, locking vertical. Having both antenna systems properly oriented, remove input attenuator from receiver's antenna input, reconnecting antenna and watching the new reading at Receiver Display. This should show an appreciable increase in Received Field Strength. Continue optimizing the orientation process until nominal signal value is reached, as calculated in introductory Chapter I in this Manual. If it's not indeed, and obtained field strength value differs in more than ± 1 dB from theoretical value, the conclussion is that they are some facts or factors about the path, the terrain, or the antennas, that are not well calculated, because these calculations performs in a quite effective fashion.

24.- Once Transmitter and Receiver antennas are properly oriented, de-energize transmitter. Disconnect receiving antenna from receiver and connect the input of a Spectrum Analyzer to the antenna system, via the corresponding adapter cable. Watch for any interference in the selected or adjacent frequency channels, verifying that is no possibility of interference over the transmitted RF signal. If there is some spurious signal occupying the assigned channel, proceed to make a photo of the analyzer's screen and go to the government correspondent authorities to investigate and detect the spurious signal, or to perform a change of assigned frequency.

25.- Keeping the Spectrum Analyzer connected to antenna system at receiver end, energize transmitter again, and check the presence of spurious signals and harmonics incoming from the link transmitter additionally to the main received signal, measuring, if any, the amplitude of such spurious signals. Report the appearing of such signals directly to OMB Laboratories for making the necessary corrections. Perform such measurement with an instrument able to reach the 2 GHz frequency band.

26.- If there is no harmonic or spurious troubles, disconnect Spectrum Analyzer from receiving antenna and connect the antenna to the receiver input, restoring the system to normal service condition. If abnormal conditions such as frequent fadings are observed during the exploitation period of this system, please contact OMB Laboratories in order to perform a more detailed analysis including a recording of the receiver's AGC during the most critical months of the year, etc.

5.2.- Operation and Maintenance:

MT-MR Platinum system is quite easy to operate, since it is manufactured for use in unattended repeater stations. Its monitoring capabilities enables it to be throughly checked without any difficulty. About its maintenance, the most critical point to be checked periodically is the cooling axial blowers, who should be replaced each three or four years of continuous work, independent of its operating condition (It’s life time is about five years). General frequency response and distortion measurements should be run each six months, to guarantee that system is in perfect operational condition. Inspection of received signal strength should be carried monthly, to assure that both antenna systems are in good condition. Transmitter's power output should also be checked monthly, and system frequency check should be performed each six months, taking three readings, morning, noon and night and making the average of frequency drift, if any.

Both equipments should be kept clean and free of dust, dirtiness, moisture and any external agressive agents, such as contaminated environments or so. Remember the temperature specifications of this system and do not attempt to violate these conditions.

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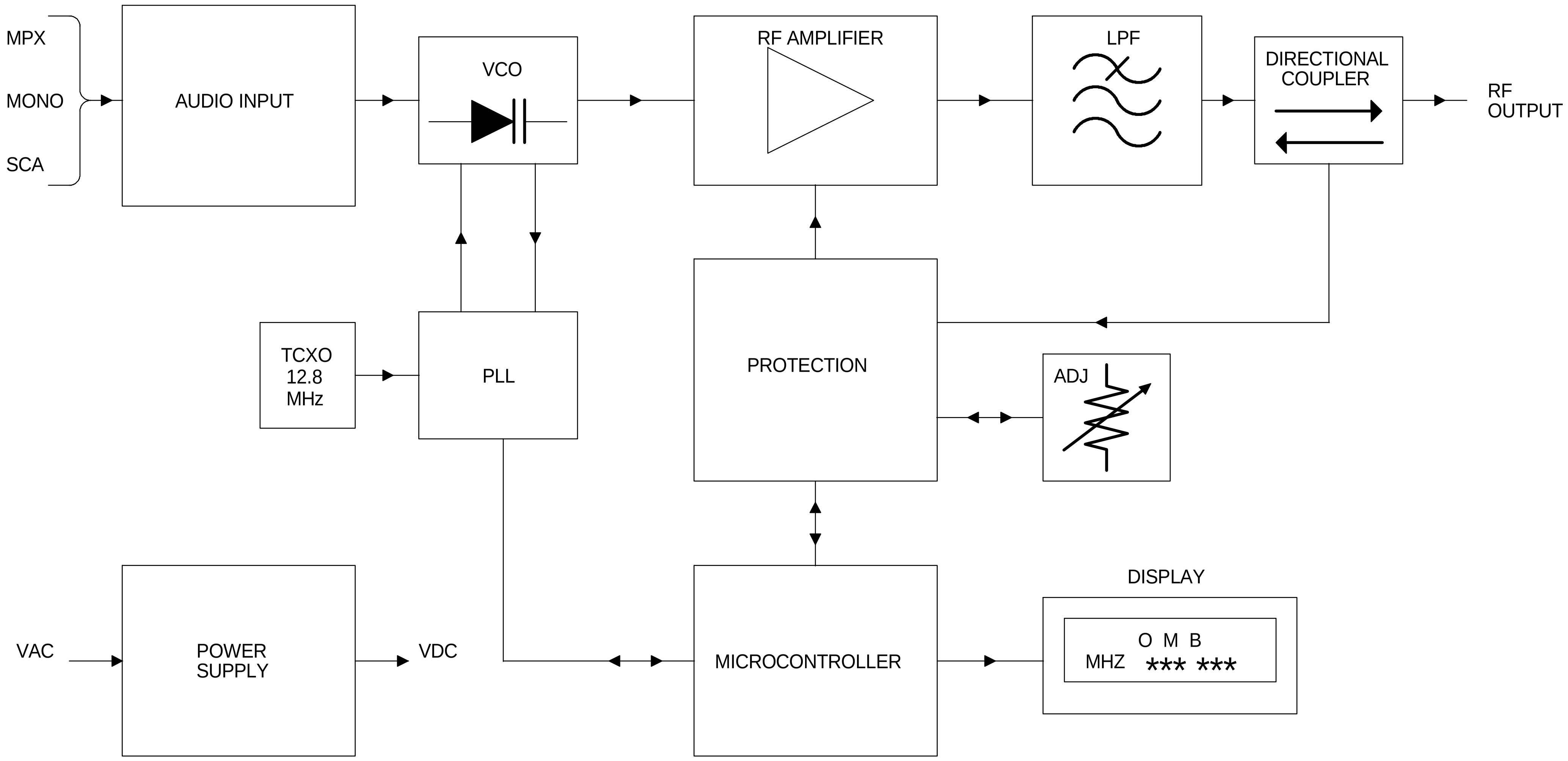
MT-MR PLATINUM

POINT TO POINT RADIO RELAY SYSTEM

chapter VI
LISTS OF PARTS AND COMPONENTS. SCHEMATICS.



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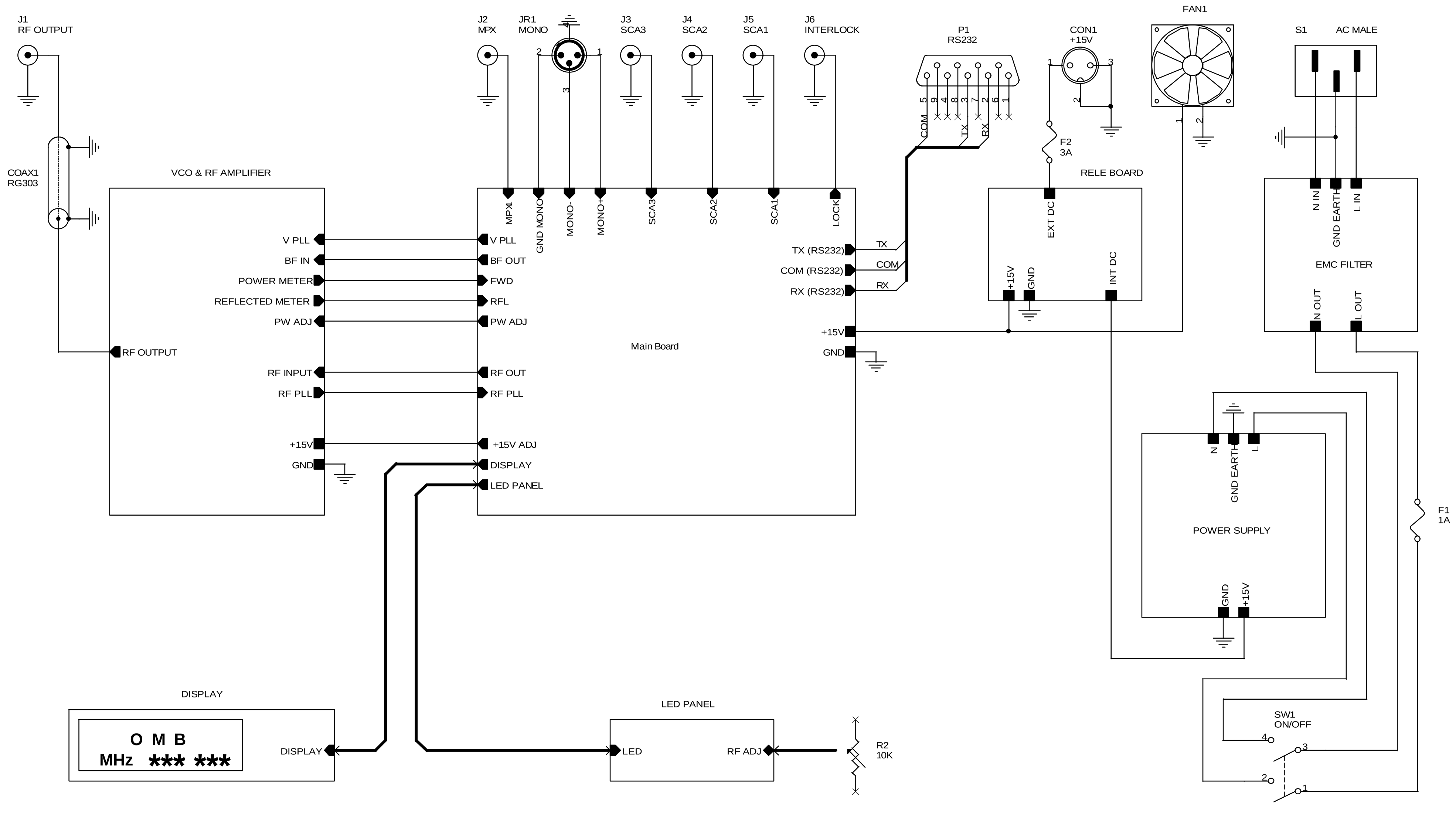

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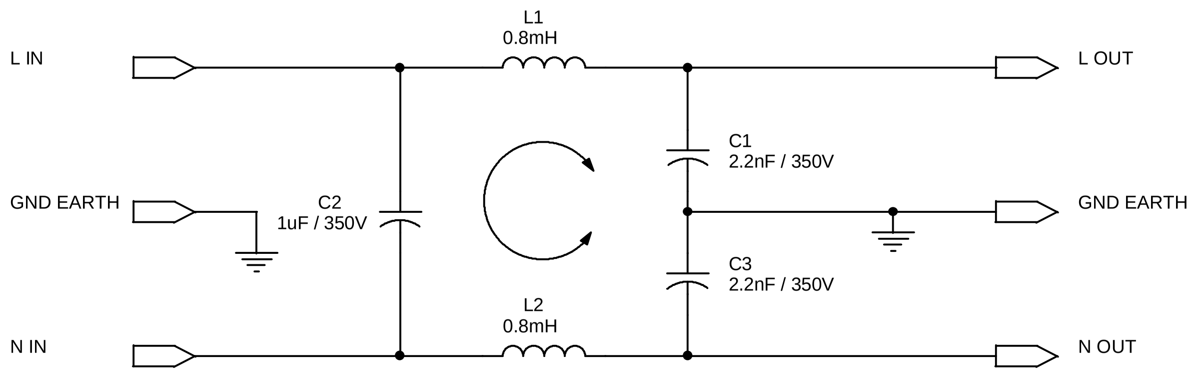
Date: Thursday, July 24, 2003	Sheet 1 of 1	



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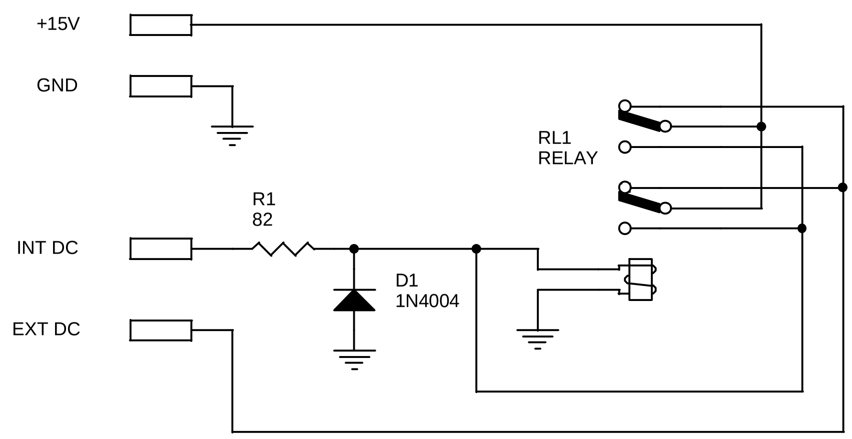
Date: Friday, May 17, 2002	Sheet 1 of 1	



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Size A	Document Number Mod. EXTRLY1		Rev 1.0
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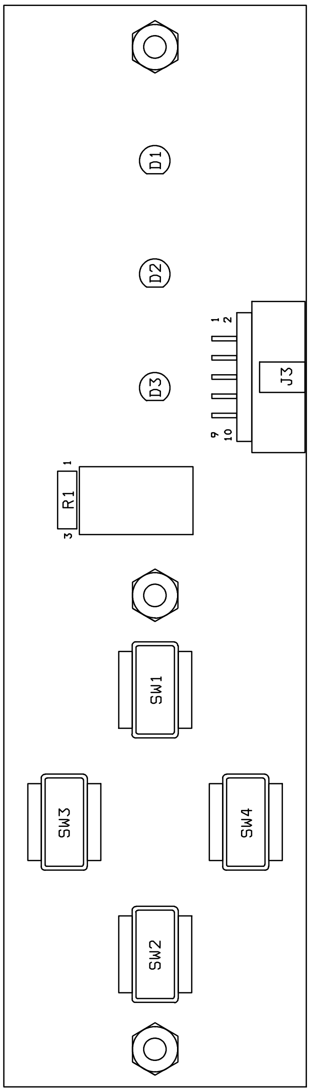

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Standards				
Scale:	Title: MT Platinum Front panel			Drawing nr:
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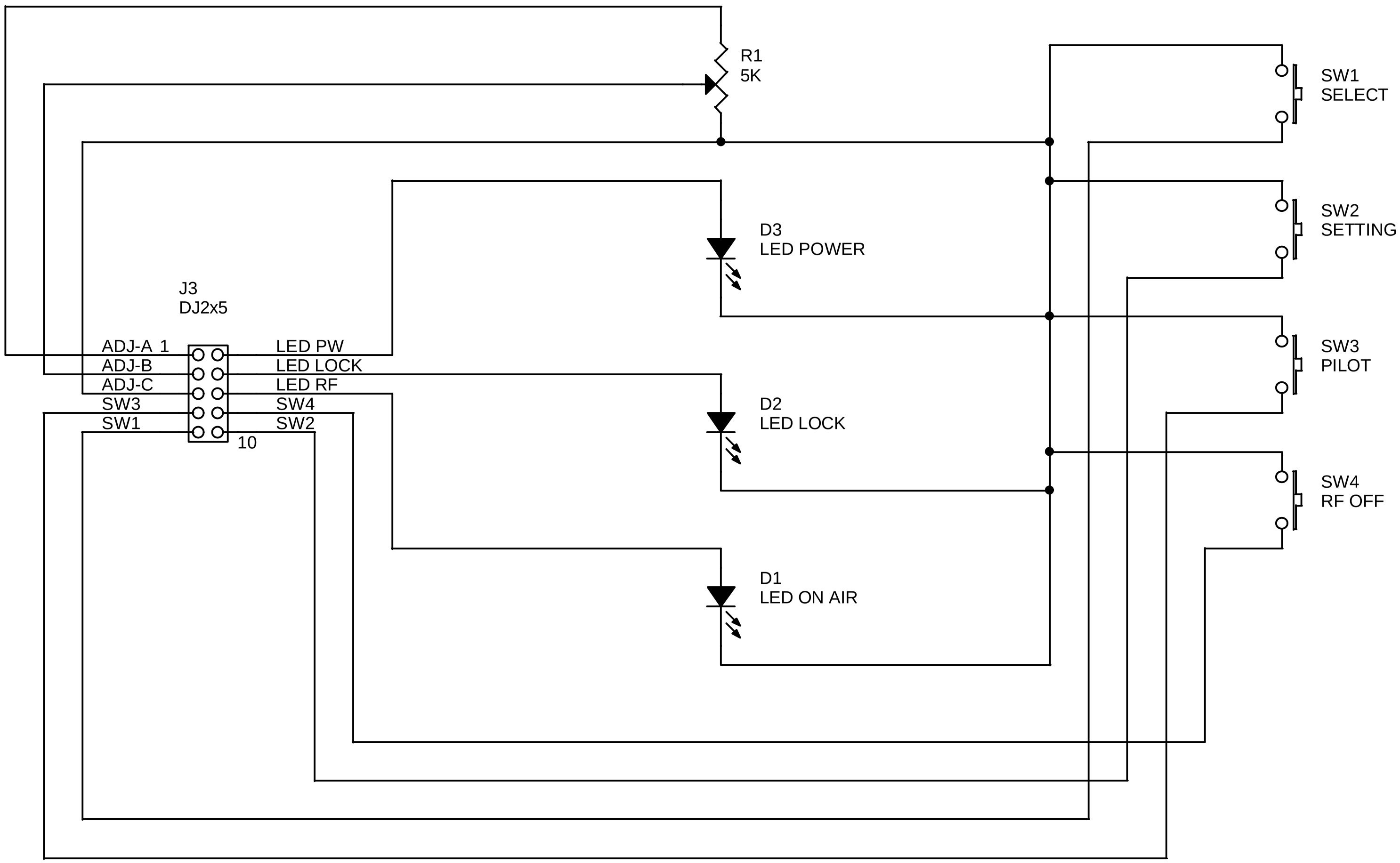
				Replaced with:



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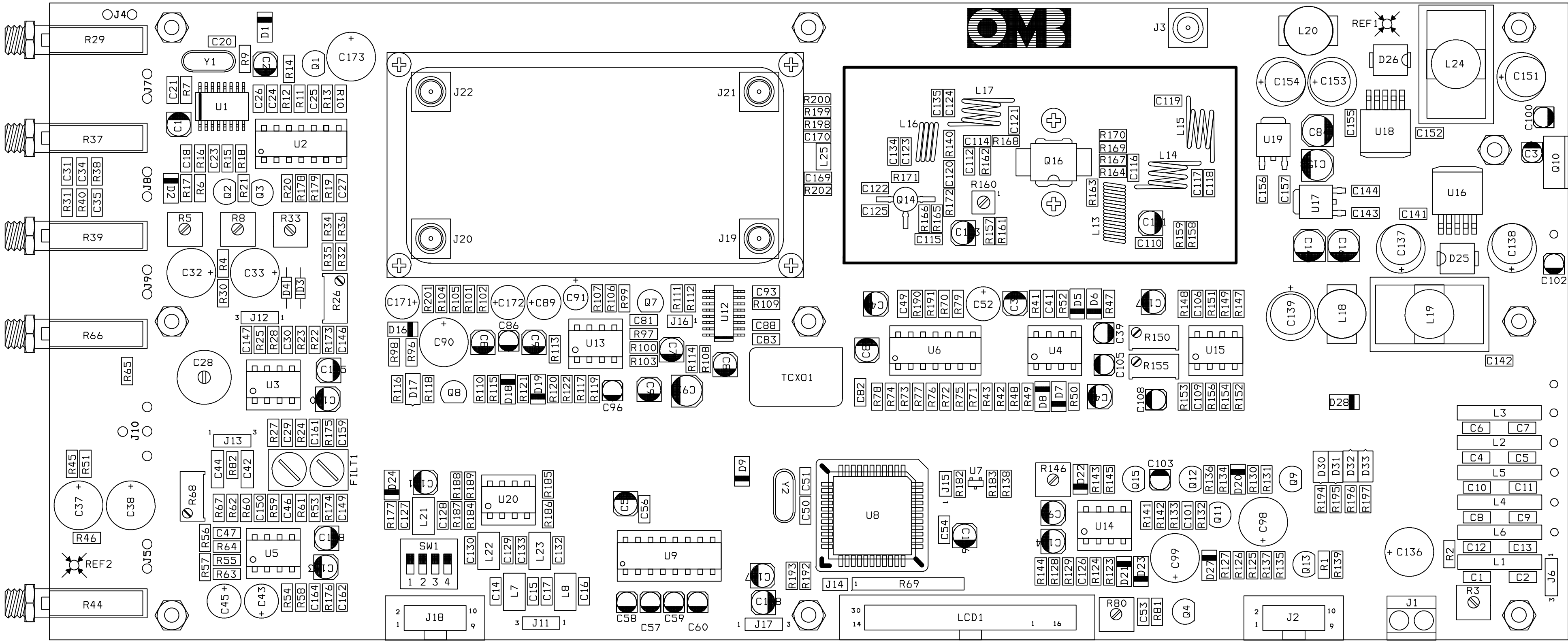
Title: Front Panel			
Size: A	Document Number: Mod. MT PLATINUM		Rev
Date: Friday, July 25, 2003		Sheet 1	of 1

OMB

Part List Schematic : MT PLATINUM FRONT PANEL

Rif.	Value	Remarks	Description	Code
R1	5K	1/4W	Multi Turn Cermet Trimmer Resistor Panel Mount	
D1	LED ON AIR	GREEN	Light Emitting Diode	
D2	LED LOCK	GREEN	Light Emitting Diode	
D3	LED POWER	YELLOW	Light Emitting Diode	
J3	DJ2x5		Male PCB Mounting Header	
SW1	SELECT		Push Button Switcher	
SW2	SETTING		Push Button Switcher	
SW3	PILOT		Push Button Switcher	
SW4	RF OFF		Push Button Switcher	



	Date	Name	Signature:
Drawn	25/07/03	OMB Eng. Dpt.	
Checked			
Standards			

OMB Sistemas Electrónicos S.A.

Scale:

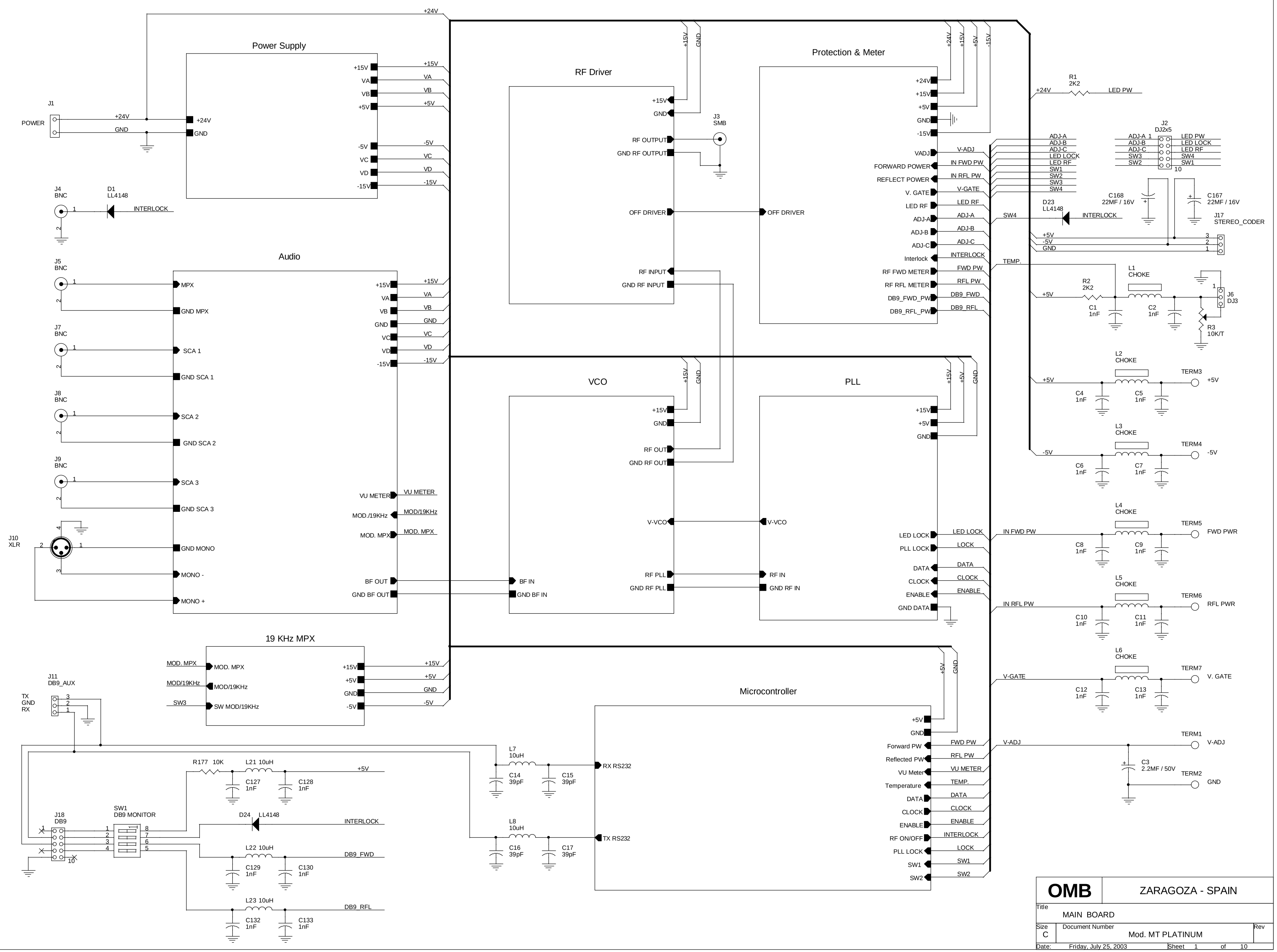
Title: MT Platinum

Main board

Drawing nr:

Replace:

Replaced with:



OMB | ZARAGOZA - SPAIN

Title: MAIN BOARD

Size: C | Document Number: Mod. MT PLATINUM | Rev

Date: Friday, July 25, 2003 | Sheet 1 of 10

OMB

Part List Schematic : MT PLATINUM MAIN BOARD

Rif.	Value	Remarks	Description	Code
C1	1nF		SMD Multilayer Ceramic Capacitor	
C2	1nF		SMD Multilayer Ceramic Capacitor	
C3	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C4	1nF		SMD Multilayer Ceramic Capacitor	
C5	1nF		SMD Multilayer Ceramic Capacitor	
C6	1nF		SMD Multilayer Ceramic Capacitor	
C7	1nF		SMD Multilayer Ceramic Capacitor	
C8	1nF		SMD Multilayer Ceramic Capacitor	
C9	1nF		SMD Multilayer Ceramic Capacitor	
C10	1nF		SMD Multilayer Ceramic Capacitor	
C11	1nF		SMD Multilayer Ceramic Capacitor	
C12	1nF		SMD Multilayer Ceramic Capacitor	
C13	1nF		SMD Multilayer Ceramic Capacitor	
C14	39pF		SMD Multilayer Ceramic Capacitor	
C15	39pF		SMD Multilayer Ceramic Capacitor	
C16	39pF		SMD Multilayer Ceramic Capacitor	
C17	39pF		SMD Multilayer Ceramic Capacitor	
C18	220pF		SMD Multilayer Ceramic Capacitor	
C19	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C20	47pF		SMD Multilayer Ceramic Capacitor	
C21	47pF		SMD Multilayer Ceramic Capacitor	
C22	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C23	0.1MF		SMD Multilayer Ceramic Capacitor	
C24	1nF		SMD Multilayer Ceramic Capacitor	
C25	0.1MF		SMD Multilayer Ceramic Capacitor	
C26	0.1MF		SMD Multilayer Ceramic Capacitor	
C27	0.1MF		SMD Multilayer Ceramic Capacitor	
C28	60pF		Trimmer Polyethylene Film Capacitor	
C29	10pF		SMD Multilayer Ceramic Capacitor	
C30	22pF		SMD Multilayer Ceramic Capacitor	
C31	470pF		SMD Multilayer Ceramic Capacitor	
C32	220MF / 35V		Aluminium Electrolytic Capacitor	
C33	1000MF / 25V		Aluminium Electrolytic Capacitor	
C34	470pF		SMD Multilayer Ceramic Capacitor	
C35	470pF		SMD Multilayer Ceramic Capacitor	
C36	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C37	470MF / 25V		Aluminium Electrolytic Capacitor	
C38	470MF / 25V		Aluminium Electrolytic Capacitor	
C39	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C40	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C41	10pF		SMD Multilayer Ceramic Capacitor	
C42	4.7nF		Polyester Capacitor	
C43	100MF / 25V		Aluminium Electrolytic Capacitor	
C44	6.8nF		Polyester Capacitor	
C45	100MF / 25V		Aluminium Electrolytic Capacitor	
C46	47pF		SMD Multilayer Ceramic Capacitor	
C47	47pF		SMD Multilayer Ceramic Capacitor	
C48	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C49	0.1MF		SMD Multilayer Ceramic Capacitor	

OMB

Rif.	Value	Remarks	Description	Code
C50	33pF		SMD Multilayer Ceramic Capacitor	
C51	33pF		SMD Multilayer Ceramic Capacitor	
C52	100MF / 25V		SMD Aluminium Electrolytic Capacitor	
C53	0.1MF		SMD Multilayer Ceramic Capacitor	
C54	0.1MF		SMD Multilayer Ceramic Capacitor	
C55	1MF / 16V		Aluminium Electrolytic Capacitor	
C56	0.1MF		SMD Multilayer Ceramic Capacitor	
C57	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C58	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C59	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C60	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C79	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C80	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C81	0.1MF		SMD Multilayer Ceramic Capacitor	
C82	0.1MF		SMD Multilayer Ceramic Capacitor	
C83	1nF		SMD Multilayer Ceramic Capacitor	
C84	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C85	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C86	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C87	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C88	0.1MF		SMD Multilayer Ceramic Capacitor	
C89	100MF / 16V		Aluminium Electrolytic Capacitor	
C90	470MF / 25V		Aluminium Electrolytic Capacitor	
C91	NC		SMD Multilayer Ceramic Capacitor	
C92	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C93	1nF		SMD Multilayer Ceramic Capacitor	
C94	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C95	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C96	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C97	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C98	470MF / 35V		Aluminium Electrolytic Capacitor	
C99	470MF / 35V		Aluminium Electrolytic Capacitor	
C100	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C101	0.1MF		SMD Multilayer Ceramic Capacitor	
C102	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C103	4.7MF / 25V		SMD Aluminium Electrolytic Capacitor	
C104	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C105	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C106	0.1MF		SMD Multilayer Ceramic Capacitor	
C107	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C108	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C109	0.1MF		SMD Multilayer Ceramic Capacitor	
C110	NC			
C111	NC			
C112	NC			
C113	NC			
C114	NC			
C115	NC			
C116	NC			
C117	NC			
C118	NC			
C119	NC			
C120	NC			

Rif.	Value	Remarks	Description	Code
C121	NC			
C122	NC			
C123	NC			
C124	NC			
C125	NC			
C126	0.1MF		SMD Multilayer Ceramic Capacitor	
C127	1nF		SMD Multilayer Ceramic Capacitor	
C128	1nF		SMD Multilayer Ceramic Capacitor	
C129	1nF		SMD Multilayer Ceramic Capacitor	
C130	1nF		SMD Multilayer Ceramic Capacitor	
C131	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C132	1nF		SMD Multilayer Ceramic Capacitor	
C133	1nF		SMD Multilayer Ceramic Capacitor	
C134	NC		SMD Multilayer Ceramic Capacitor	
C135	NC		SMD Multilayer Ceramic Capacitor	
C136	1000MF / 35V		Aluminium Electrolytic Capacitor	
C137	100MF /35V		Aluminium Electrolytic Capacitor	
C138	1000MF / 25V		Aluminium Electrolytic Capacitor	
C139	100MF /35V		Aluminium Electrolytic Capacitor	
C140	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C141	0.1MF		SMD Multilayer Ceramic Capacitor	
C142	0.1MF		SMD Multilayer Ceramic Capacitor	
C143	0.1MF		SMD Multilayer Ceramic Capacitor	
C144	0.1MF		SMD Multilayer Ceramic Capacitor	
C145	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C146	0.1MF		SMD Multilayer Ceramic Capacitor	
C147	0.1MF		SMD Multilayer Ceramic Capacitor	
C148	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C149	0.1MF		SMD Multilayer Ceramic Capacitor	
C150	0.1MF		SMD Multilayer Ceramic Capacitor	
C151	100MF /35V		Aluminium Electrolytic Capacitor	
C152	0.1MF		SMD Multilayer Ceramic Capacitor	
C153	1000MF / 25V		Aluminium Electrolytic Capacitor	
C154	100MF /35V		Aluminium Electrolytic Capacitor	
C155	0.1MF		SMD Multilayer Ceramic Capacitor	
C156	0.1MF		SMD Multilayer Ceramic Capacitor	
C157	0.1MF		SMD Multilayer Ceramic Capacitor	
C158	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C159	0.1MF		SMD Multilayer Ceramic Capacitor	
C160	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C161	0.1MF		SMD Multilayer Ceramic Capacitor	
C162	0.1MF		SMD Multilayer Ceramic Capacitor	
C163	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C164	0.1MF		SMD Multilayer Ceramic Capacitor	
C165	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C166	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C167	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C168	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C169	NC			
C170	22pF		SMD Multilayer Ceramic Capacitor	
C171	100MF / 16V		Aluminium Electrolytic Capacitor	
C172	NC			
C173	220MF / 35V		Aluminium Electrolytic Capacitor	

OMB

Rif.	Value	Remarks	Description	Code
L1	CHOKE		Suppression Choke	
L2	CHOKE		Suppression Choke	
L3	CHOKE		Suppression Choke	
L4	CHOKE		Suppression Choke	
L5	CHOKE		Suppression Choke	
L6	CHOKE		Suppression Choke	
L7	10uH		Ferrite Drum Cored Inductor	
L8	10uH		Ferrite Drum Cored Inductor	
L13	NC			
L14	NC			
L15	NC			
L16	NC			
L17	NC			
L18	10uH		Ferrite Drum Cored Inductor	
L19	220uH		Ferrite Drum Cored Inductor	
L20	10uH		Ferrite Drum Cored Inductor	
L21	10uH		Ferrite Drum Cored Inductor	
L22	10uH		Ferrite Drum Cored Inductor	
L23	10uH		Ferrite Drum Cored Inductor	
L24	100uH		Ferrite Drum Cored Inductor	
L25	56nH		Resistor 0	
R1	2K2	1/4W	SMD Thick Film Resistor	
R2	2K2	1/4W	SMD Thick Film Resistor	
R3	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R4	220K	1/4W	SMD Thick Film Resistor	
R5	20K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R6	1K2	1/4W	SMD Thick Film Resistor	
R7	2K2	1/4W	SMD Thick Film Resistor	
R8	20K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R9	330	1/4W	SMD Thick Film Resistor	
R10	12K	1/4W	SMD Thick Film Resistor	
R11	470K	1/4W	SMD Thick Film Resistor	
R12	6K8	1/4W	SMD Thick Film Resistor	
R13	1K	1/4W	SMD Thick Film Resistor	
R14	47	1/4W	SMD Thick Film Resistor	
R15	27K	1/4W	SMD Thick Film Resistor	
R16	47K	1/4W	SMD Thick Film Resistor	
R17	47K	1/4W	SMD Thick Film Resistor	
R18	27K	1/4W	SMD Thick Film Resistor	
R19	27K	1/4W	SMD Thick Film Resistor	
R20	47K	1/4W	SMD Thick Film Resistor	
R21	27K	1/4W	SMD Thick Film Resistor	
R22	27K	1/4W	SMD Thick Film Resistor	
R23	47K	1/4W	SMD Thick Film Resistor	
R24	12K	1/4W	SMD Thick Film Resistor	
R25	47K	1/4W	SMD Thick Film Resistor	
R26	5K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R27	27K	1/4W	SMD Thick Film Resistor	
R28	47K	1/4W	SMD Thick Film Resistor	
R29	1K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R30	10K	1/4W	SMD Thick Film Resistor	

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Rif.	Value	Remarks	Description	Code
R31	12K	1/4W	SMD Thick Film Resistor	
R32	1K2	1/4W	SMD Thick Film Resistor	
R33	200/T	1/4W	Cermet Skeleton Trimmer Resistor	
R34	3K9	1/4W	SMD Thick Film Resistor	
R35	1K2	1/4W	SMD Thick Film Resistor	
R36	3K9	1/4W	SMD Thick Film Resistor	
R37	1K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R38	12K	1/4W	SMD Thick Film Resistor	
R39	1K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R40	12K	1/4W	SMD Thick Film Resistor	
R41	33	1/4W	SMD Thick Film Resistor	
R42	220K	1/4W	SMD Thick Film Resistor	
R43	100K	1/4W	SMD Thick Film Resistor	
R44	1K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R45	4K7	1/4W	SMD Thick Film Resistor	
R46	10K	1/4W	SMD Thick Film Resistor	
R47	560K	1/4W	SMD Thick Film Resistor	
R48	100K	1/4W	SMD Thick Film Resistor	
R49	100K	1/4W	SMD Thick Film Resistor	
R50	33	1/4W	SMD Thick Film Resistor	
R51	NC			
R52	560K	1/4W	SMD Thick Film Resistor	
R53	10K	1/4W	SMD Thick Film Resistor	
R54	4K7	1/4W	SMD Thick Film Resistor	
R55	10K	1/4W	SMD Thick Film Resistor	
R56	1K2	1/4W	SMD Thick Film Resistor	
R57	1K2	1/4W	SMD Thick Film Resistor	
R58	10K	1/4W	SMD Thick Film Resistor	
R59	10K	1/4W	SMD Thick Film Resistor	
R60	10K	1/4W	SMD Thick Film Resistor	
R61	3K9	1/4W	SMD Thick Film Resistor	
R62	3K9	1/4W	SMD Thick Film Resistor	
R63	4K7	1/4W	SMD Thick Film Resistor	
R64	10K	1/4W	SMD Thick Film Resistor	
R65	2K2	1/4W	SMD Thick Film Resistor	
R66	10K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R67	4K7	1/4W	SMD Thick Film Resistor	
R68	10K/V	1/4W	Multi Turn Cermet Trimmer Resistor	
R69	10K	1/4W	SMD Thick Film Resistor	
R70	1K	1/4W	SMD Thick Film Resistor	
R71	10K	1/4W	SMD Thick Film Resistor	
R72	10K	1/4W	SMD Thick Film Resistor	
R73	10K	1/4W	SMD Thick Film Resistor	
R74	10K	1/4W	SMD Thick Film Resistor	
R75	NC	1/4W	SMD Thick Film Resistor	
R76	NC	1/4W	SMD Thick Film Resistor	
R77	NC	1/4W	SMD Thick Film Resistor	
R78	10K	1/4W	SMD Thick Film Resistor	
R79	1K5	1/4W	SMD Thick Film Resistor	
R80	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R81	1K2	1/4W	SMD Thick Film Resistor	
R82	100	1/4W	SMD Thick Film Resistor	
R96	56K	1/4W	SMD Thick Film Resistor	

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Rif.	Value	Remarks	Description	Code
R97	10K	1/4W	SMD Thick Film Resistor	
R98	18K	1/4W	SMD Thick Film Resistor	
R99	330	1/4W	SMD Thick Film Resistor	
R100	4K7	1/4W	SMD Thick Film Resistor	
R101	220	1/4W	SMD Thick Film Resistor	
R102	100	1/4W	SMD Thick Film Resistor	
R103	560	1/4W	SMD Thick Film Resistor	
R104	18	1/4W	SMD Thick Film Resistor	
R105	0	1/4W	SMD Thick Film Resistor	
R106	3K9	1/4W	SMD Thick Film Resistor	
R107	220	1/4W	SMD Thick Film Resistor	
R108	3K9	1/4W	SMD Thick Film Resistor	
R109	100	1/4W	SMD Thick Film Resistor	
R110	47K	1/4W	SMD Thick Film Resistor	
R111	47K	1/4W	SMD Thick Film Resistor	
R112	47K	1/4W	SMD Thick Film Resistor	
R113	100	1/4W	SMD Thick Film Resistor	
R114	47K	1/4W	SMD Thick Film Resistor	
R115	47K	1/4W	SMD Thick Film Resistor	
R116	470	1/4W	SMD Thick Film Resistor	
R117	47K	1/4W	SMD Thick Film Resistor	
R118	470	1/4W	SMD Thick Film Resistor	
R119	100K	1/4W	SMD Thick Film Resistor	
R120	560	1/4W	SMD Thick Film Resistor	
R121	1K	1/4W	SMD Thick Film Resistor	
R122	220K	1/4W	SMD Thick Film Resistor	
R123	100K	1/4W	SMD Thick Film Resistor	
R124	47K	1/4W	SMD Thick Film Resistor	
R125	100	1/4W	SMD Thick Film Resistor	
R126	100	1/4W	SMD Thick Film Resistor	
R127	33	1/4W	SMD Thick Film Resistor	
R128	47K	1/4W	SMD Thick Film Resistor	
R129	47K	1/4W	SMD Thick Film Resistor	
R130	4K7	1/4W	SMD Thick Film Resistor	
R131	47K	1/4W	SMD Thick Film Resistor	
R132	47K	1/4W	SMD Thick Film Resistor	
R133	47K	1/4W	SMD Thick Film Resistor	
R134	12K	1/4W	SMD Thick Film Resistor	
R135	47K	1/4W	SMD Thick Film Resistor	
R136	47K	1/4W	SMD Thick Film Resistor	
R137	47K	1/4W	SMD Thick Film Resistor	
R138	6K8	1/4W	SMD Thick Film Resistor	
R139	2K2	1/4W	SMD Thick Film Resistor	
R140	NC	1/4W	SMD Thick Film Resistor	
R141	1K8	1/4W	SMD Thick Film Resistor	
R142	100	1/4W	SMD Thick Film Resistor	
R143	27K	1/4W	SMD Thick Film Resistor	
R144	100	1/4W	SMD Thick Film Resistor	
R145	100K	1/4W	SMD Thick Film Resistor	
R146	5K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R147	12K	1/4W	SMD Thick Film Resistor	
R148	10K	1/4W	SMD Thick Film Resistor	
R149	1K2	1/4W	SMD Thick Film Resistor	

Rif.	Value	Remarks	Description	Code
R150	50K/V	1/4W	Multi Turn Cermet Trimmer Resistor	
R151	12K	1/4W	SMD Thick Film Resistor	
R152	12K	1/4W	SMD Thick Film Resistor	
R153	10K	1/4W	SMD Thick Film Resistor	
R154	8K2	1/4W	SMD Thick Film Resistor	
R155	50K/V	1/4W	Multi Turn Cermet Trimmer Resistor	
R156	27K	1/4W	SMD Thick Film Resistor	
R157	NC			
R158	NC			
R159	NC			
R160	NC			
R161	NC			
R162	NC			
R163	NC			
R164	NC			
R165	NC			
R166	NC			
R167	NC			
R168	NC			
R169	NC			
R170	NC			
R171	NC			
R172	NC			
R173	33	1/4W	SMD Thick Film Resistor	
R174	33	1/4W	SMD Thick Film Resistor	
R175	33	1/4W	SMD Thick Film Resistor	
R176	33	1/4W	SMD Thick Film Resistor	
R177	10K	1/4W	SMD Thick Film Resistor	
R178	470	1/4W	SMD Thick Film Resistor	
R179	470	1/4W	SMD Thick Film Resistor	
R182	6K8	1/4W	SMD Thick Film Resistor	
R183	6K8	1/4W	SMD Thick Film Resistor	
R184	100	1/4W	SMD Thick Film Resistor	
R185	10K	1/4W	SMD Thick Film Resistor	
R186	10K	1/4W	SMD Thick Film Resistor	
R187	100	1/4W	SMD Thick Film Resistor	
R188	10K	1/4W	SMD Thick Film Resistor	
R189	10K	1/4W	SMD Thick Film Resistor	
R190	6K8	1/4W	SMD Thick Film Resistor	
R191	6K8	1/4W	SMD Thick Film Resistor	
R192	6K8	1/4W	SMD Thick Film Resistor	
R193	6K8	1/4W	SMD Thick Film Resistor	
R194	1K2	1/4W	SMD Thick Film Resistor	
R195	390	1/4W	SMD Thick Film Resistor	
R196	390	1/4W	SMD Thick Film Resistor	
R197	1K2	1/4W	SMD Thick Film Resistor	
R198	18	1/4W	SMD Thick Film Resistor	
R199	18	1/4W	SMD Thick Film Resistor	
R200	18	1/4W	SMD Thick Film Resistor	
R201	0	1/4W	SMD Thick Film Resistor	
R202	100	1/4W	SMD Thick Film Resistor	
D1	LL4148		SMD Low Power Signal Diode	

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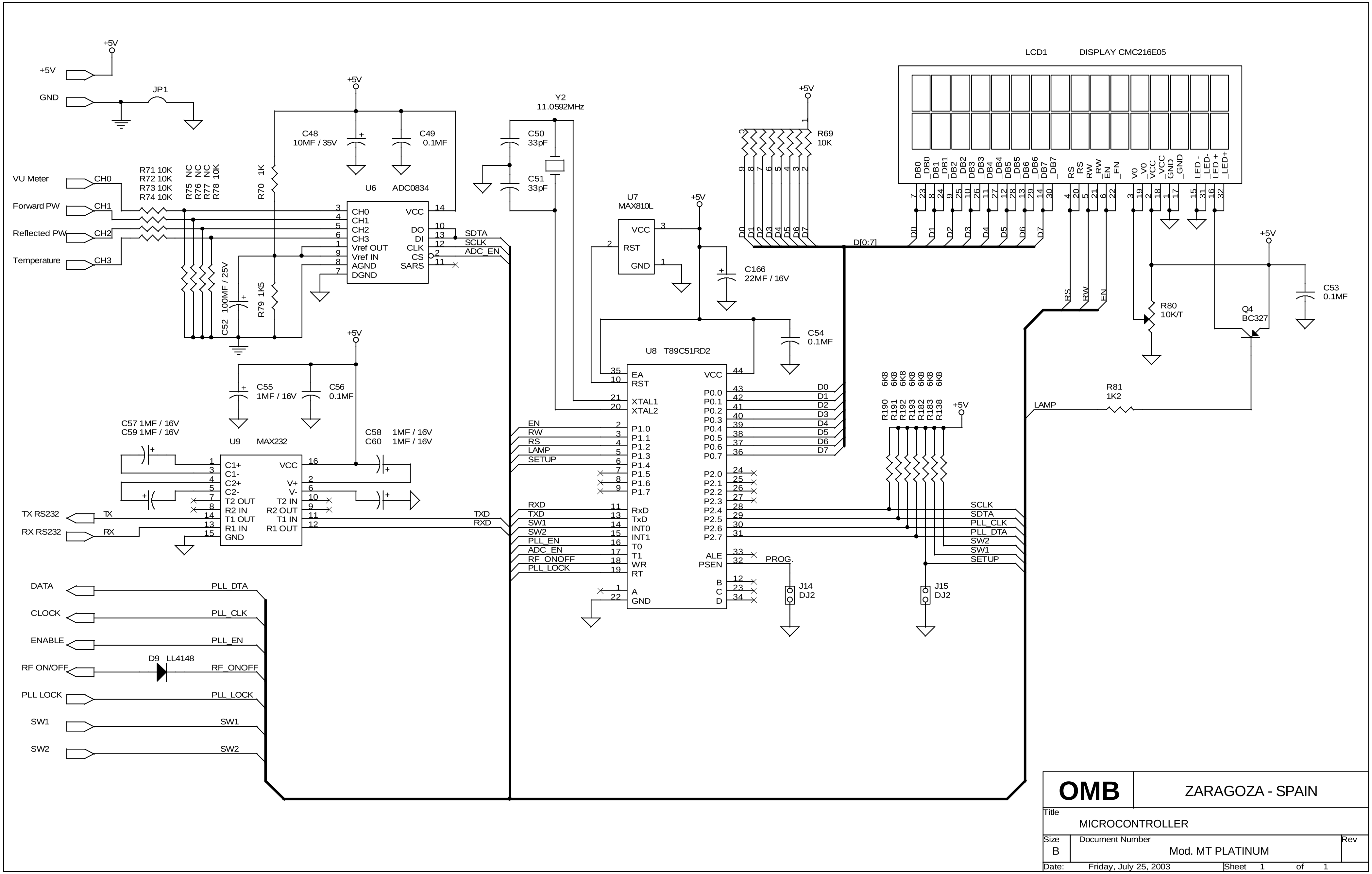
Rif.	Value	Remarks	Description	Code
D2	LL4148		SMD Low Power Signal Diode	
D3	BAT43		Diode Schottky	
D4	BAT43		Diode Schottky	
D5	LL4148		SMD Low Power Signal Diode	
D6	3V3		SMD Diode Zener	
D7	LL4148		SMD Low Power Signal Diode	
D8	LL4148		SMD Low Power Signal Diode	
D9	LL4148		SMD Low Power Signal Diode	
D16	LL4148		SMD Low Power Signal Diode	
D17	LED	GREEN	SMD Light Emitting Diode	
D18	LL4148		SMD Low Power Signal Diode	
D19	5V1		SMD Diode Zener	
D20	LL4148		SMD Low Power Signal Diode	
D21	LL4148		SMD Low Power Signal Diode	
D22	15V		SMD Diode Zener	
D23	LL4148		SMD Low Power Signal Diode	
D24	LL4148		SMD Low Power Signal Diode	
D25	MBRS340		SMD Switching High Speed Diode	
D26	MBRS340		SMD Switching High Speed Diode	
D27	15V		SMD Diode Zener	
D28	LL4148		SMD Low Power Signal Diode	
D30	LED	YELLOW	SMD Light Emitting Diode	
D31	LED	YELLOW	SMD Light Emitting Diode	
D32	LED	YELLOW	SMD Light Emitting Diode	
D33	LED	YELLOW	SMD Light Emitting Diode	
Q1	BC337		Low Power Bipolar Transistor	
Q2	BC327		Low Power Bipolar Transistor	
Q3	BC337		Low Power Bipolar Transistor	
Q4	BC327		Low Power Bipolar Transistor	
Q7	BC327		Low Power Bipolar Transistor	
Q8	BC327		Low Power Bipolar Transistor	
Q9	BC337		Low Power Bipolar Transistor	
Q10	BDX53		Medium Power Bipolar Transistor	
Q11	BC327		Low Power Bipolar Transistor	
Q12	BC337		Low Power Bipolar Transistor	
Q13	BC327		Low Power Bipolar Transistor	
Q14	NC			
Q15	BC337		Low Power Bipolar Transistor	
Q16	NC			
U1	SAA6579T		Special Function Integrated Circuit	
U2	CD4066		Analogue Switcher	
U3	OP275		Operational Amplifier	
U4	LM358		Operational Amplifier	
U5	LF353		Operational Amplifier	
U6	ADC0834		A/D Converter	
U7	MAX810L		Special Function Integrated Circuit	
U8	T89C51RD2		Microprocessor	
U9	MAX232		Special Function Integrated Circuit	
U12	LMX1501		Special Function Integrated Circuit	
U13	LM358		Operational Amplifier	
U14	LM358		Operational Amplifier	

OMB

Rif.	Value	Remarks	Description	Code
U15	LM358		Operational Amplifier	
U16	LM2576/S15		Fixed Voltage Regulator	
U17	MC78M05CDT		Fixed Voltage Regulator	
U18	LM2575/S15		Fixed Voltage Regulator	
U19	MC79M05CDT		Fixed Voltage Regulator	
U20	LM358		Operational Amplifier	
Y1	2.888 MHz		Quartz Crystal	
Y2	11.0592MHz		Quartz Crystal	
TCXO1	MHz 12.800		Crystal Oscillator Module	
FILT1	FILTER 19KHz		Ferrite Drum Cored Inductor	
J1	POWER		PCB Mounting Terminal Block	
J2	DJ2x5		Male PCB Mounting Header	
J3	NC			
J4	NC			
J5	NC			
J6	DJ3		PCB Pin Strip Header	
J7	NC			
J8	NC			
J9	NC			
J10	XLR			
J11	DB9_AUX		PCB Pin Strip Header	
J12	DJ3		PCB Pin Strip Header	
J13	DJ3		PCB Pin Strip Header	
J14	DJ2		PCB Pin Strip Header	
J15	DJ2		PCB Pin Strip Header	
J16	TEST Fref.			
J17	DC_CODER		PCB Pin Strip Header	
J18	DB9		Male PCB Mounting Header	
J19	NC			
J20	NC			
J21	NC			
J22	NC			
LCD1	DISPLAY		Male PCB Mounting Header	
SW1	DB9 MONITOR		Microswitcher	



LCD1 DISPLAY CMC216E05
U6 ADC0834
U7 MAX810L
U8 T89C51RD2
U9 MAX232
Y2 11.0592MHz
C48 10MF / 35V
C49 0.1MF
C50 33pF
C51 33pF
C52 100MF / 25V
C53 0.1MF
C54 0.1MF
C55 1MF / 16V
C56 0.1MF
C57 1MF / 16V
C59 1MF / 16V
C58 1MF / 16V
C60 1MF / 16V
C166 22MF / 16V
R69 10K
R70 1K
R79 1K5
R80 10K/T
R81 1K2
R71 10K
R72 10K
R73 10K
R74 10K
R75 NC
R76 NC
R77 NC
R78 10K
R190 R191 R192 R193 R182 R183 R138 6K8
Q4 BC327
D9 LL4148
JP1
J14 DJ2
J15 DJ2
+5V
GND
VU Meter
Forward PW
Reflected PW
Temperature
TX RS232
RX RS232
DATA
CLOCK
ENABLE
RF ON/OFF
PLL LOCK
SW1
SW2
PLL_DTA
PLL_CLK
PLL_EN
RF_ONOFF
PLL_LOCK
SDTA
SCLK
ADC_EN
LAMP
SETUP
PROG.
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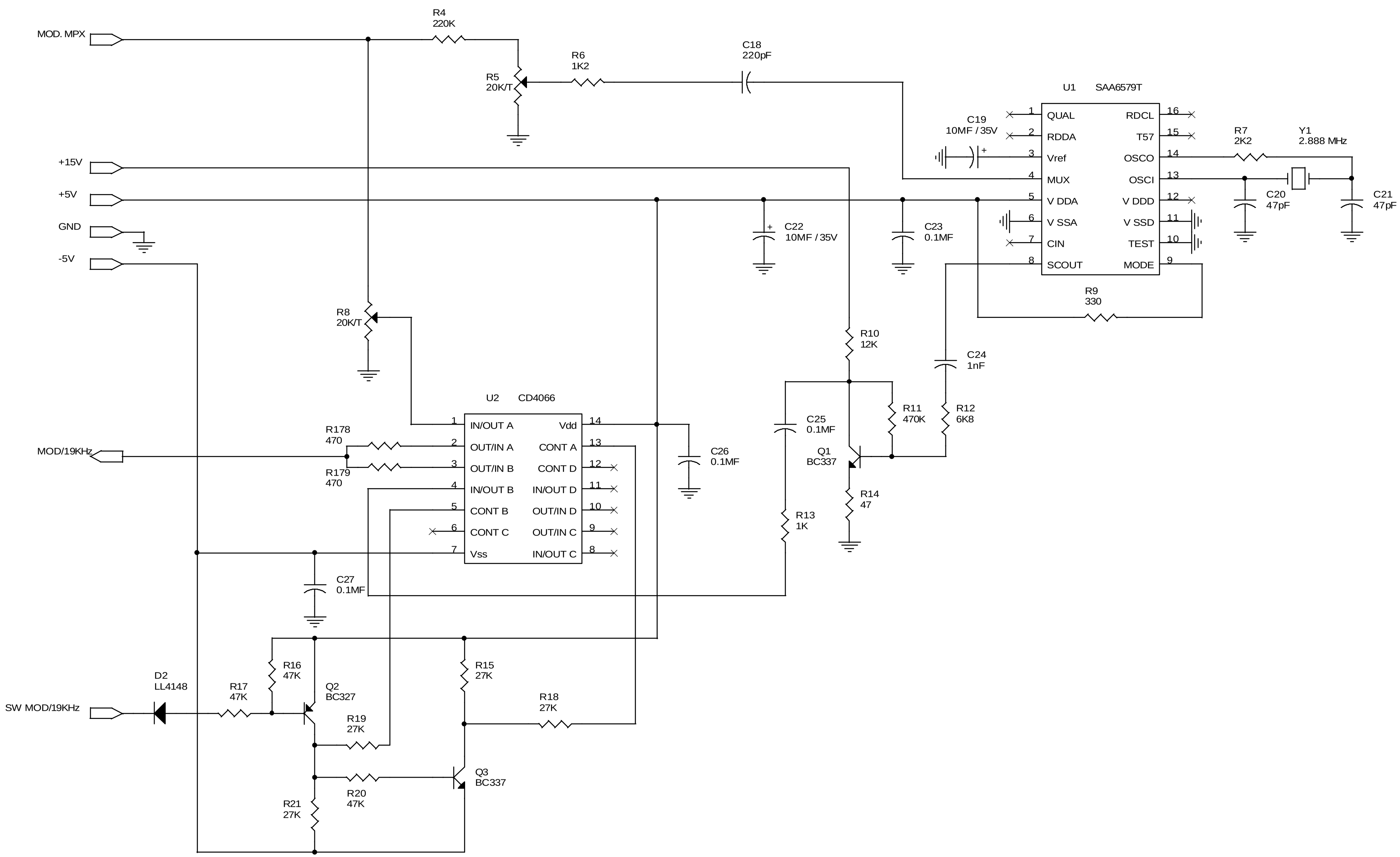
Size B
Document Number
Mod. MT PLATINUM
Rev
Date: Friday, July 25, 2003
Sheet 1 of 1



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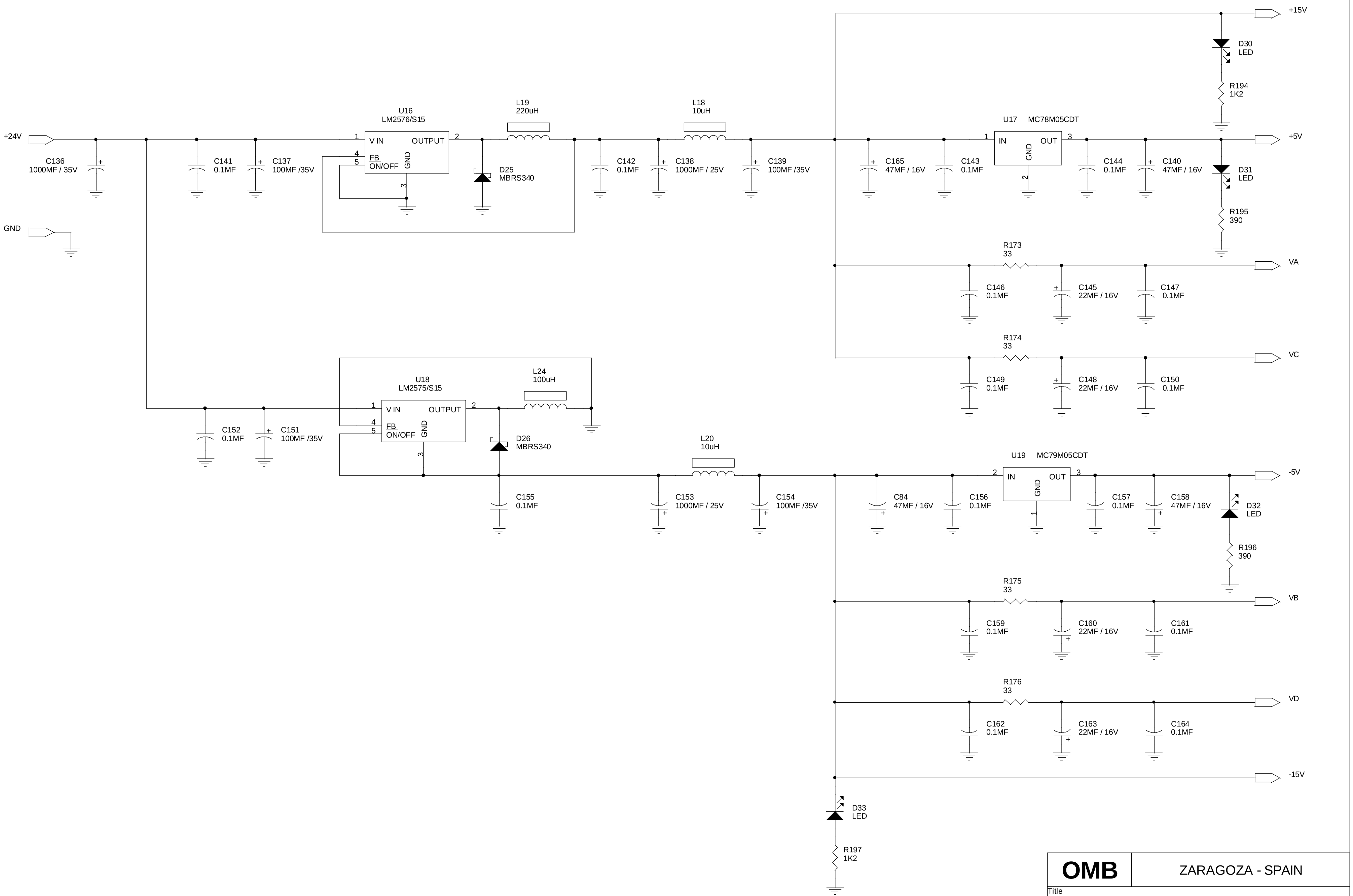
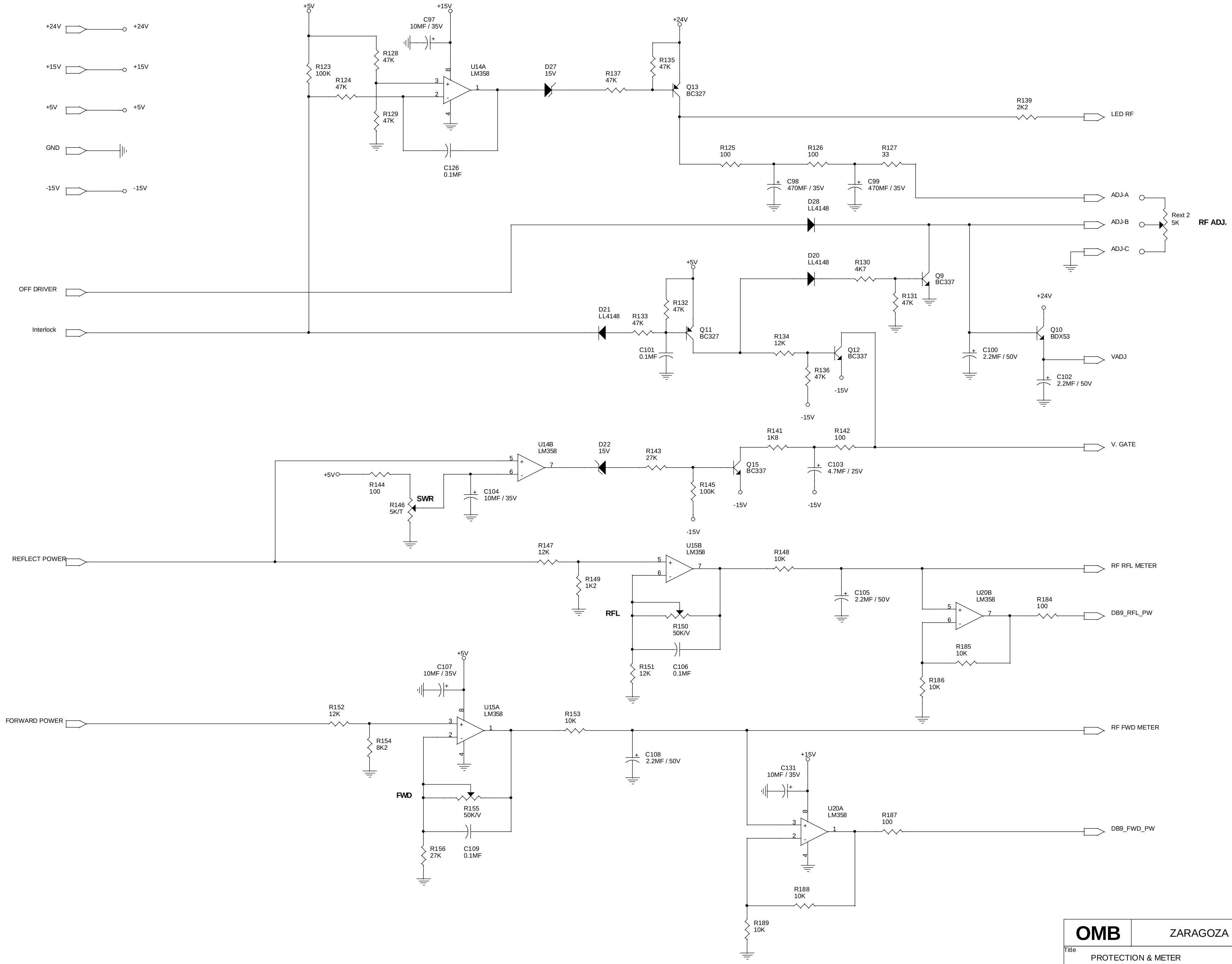
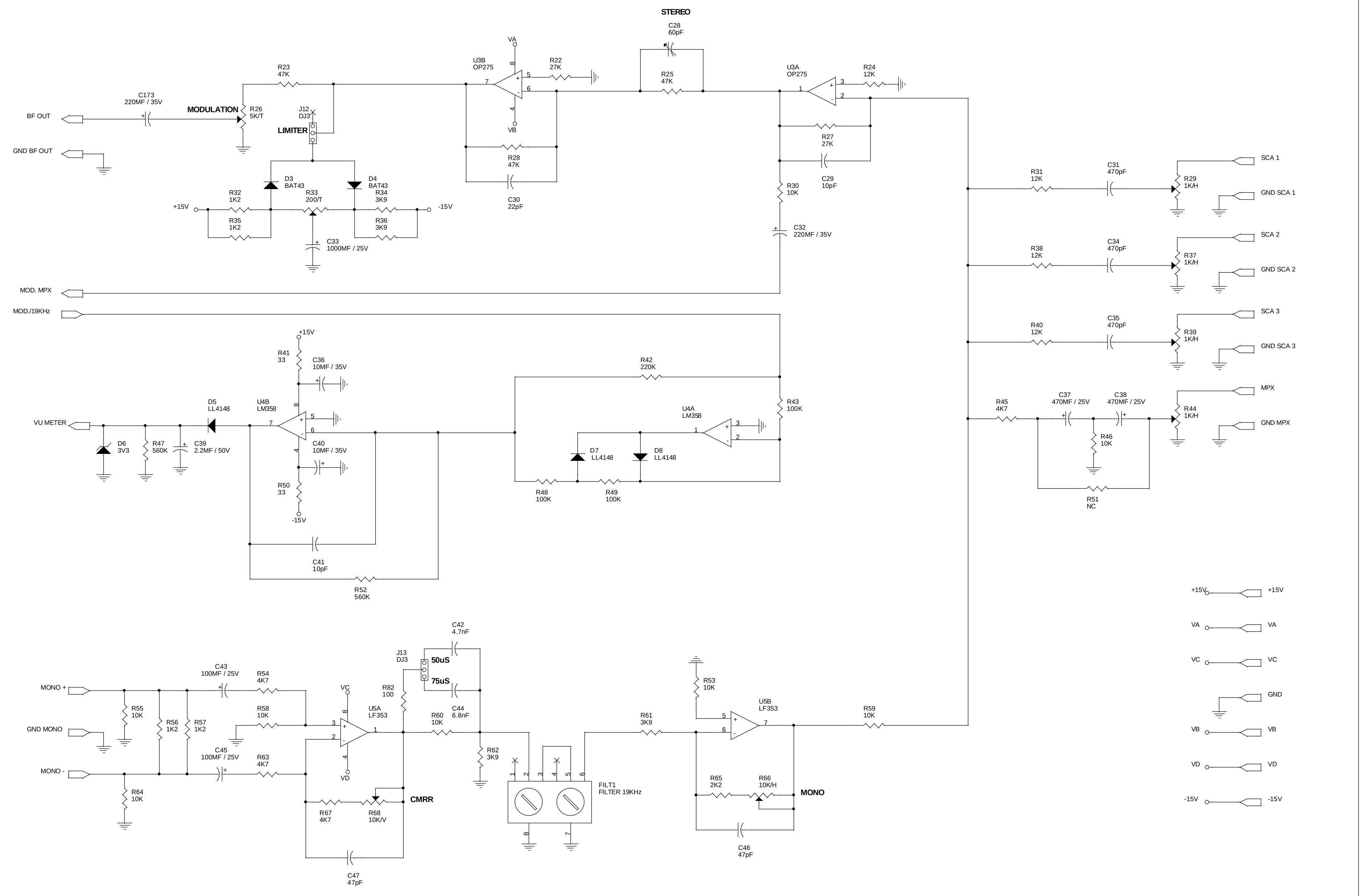
Date: Friday, July 25, 2003	Sheet 1 of 1



OMB	ZARAGOZA - SPAIN
Title	POWER SUPPLY
Size A3	Document Number: Mod. MT PLATINUM — Rev
Date: Friday, July 25, 2003	Sheet 1 of 10



OMB	ZARAGOZA - SPAIN
Title	PROTECTION & METER
Size C	Document Number: Mod. ST DIG-PM — Rev 1.0
Date: Friday, July 25, 2003	Sheet 1 of 1



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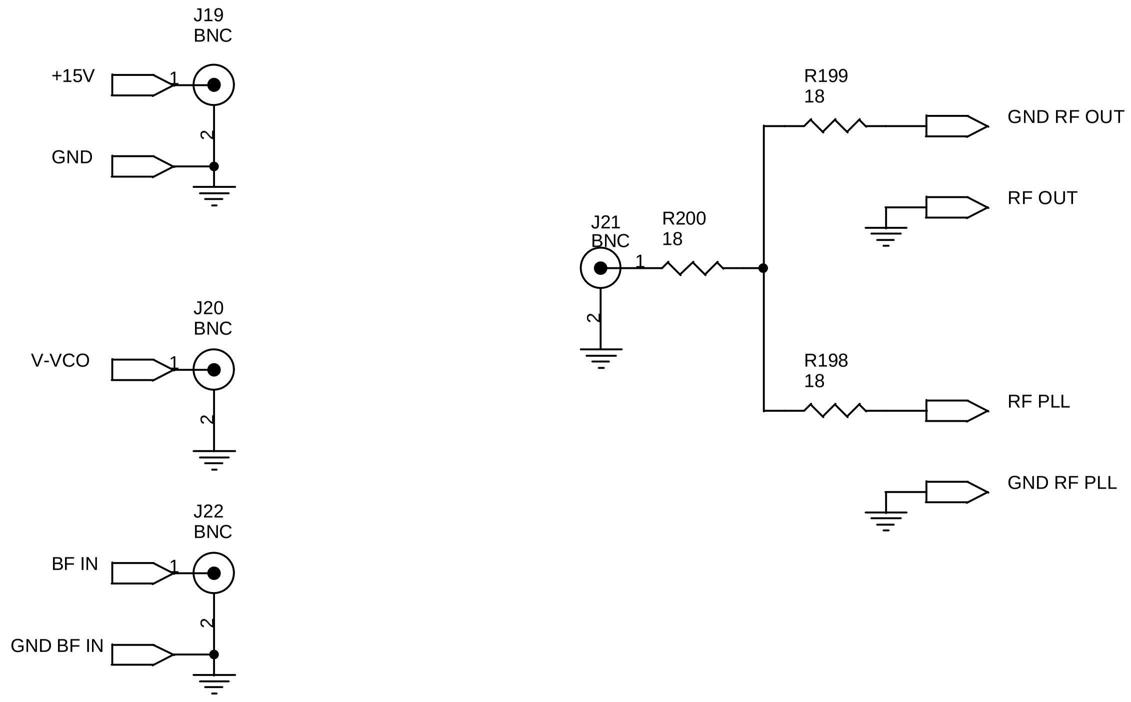
Size C	Document Number Mod. MT PLATINUM	Rev
Date: Friday, July 25, 2003	Sheet 4 of 10	



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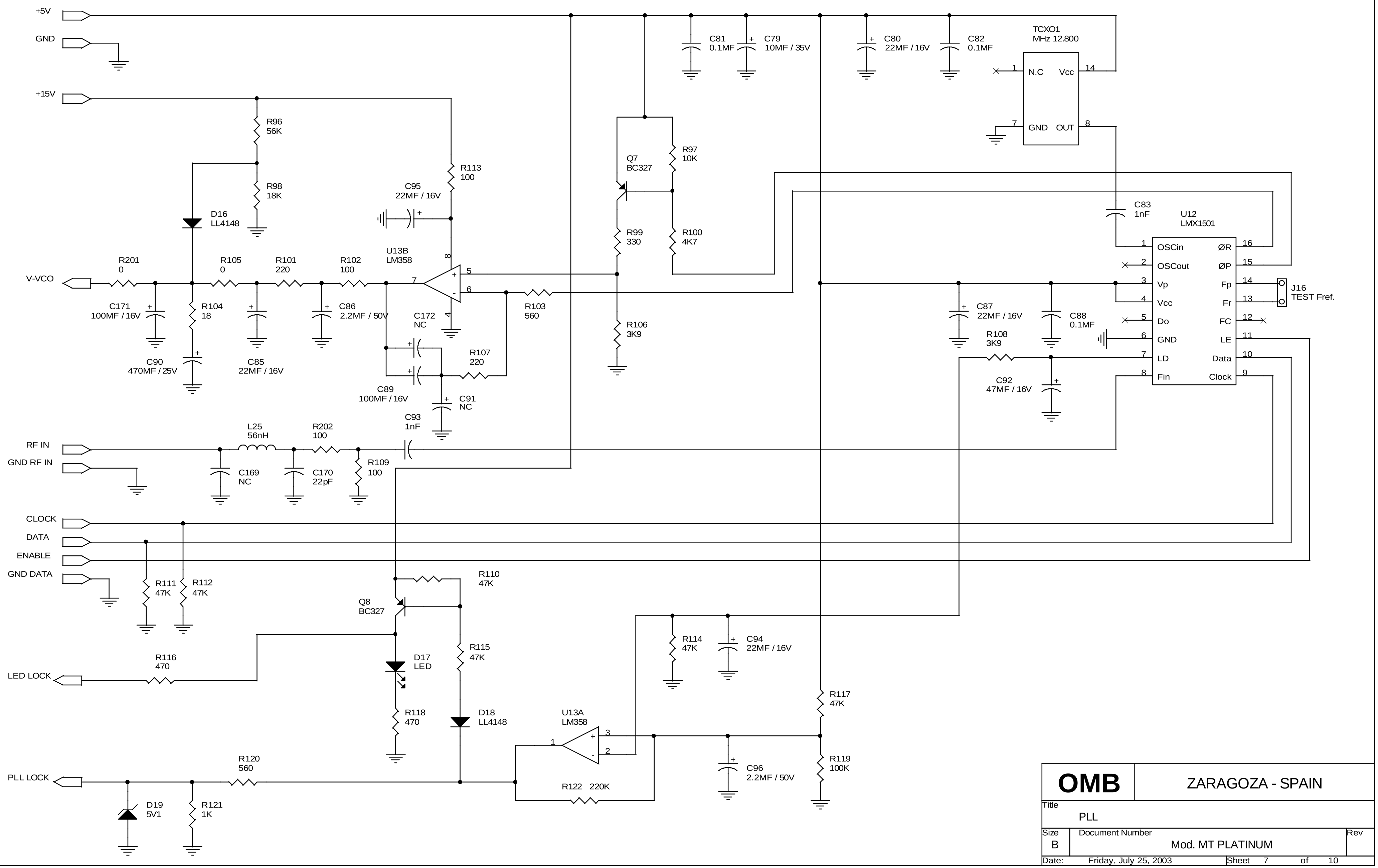
Title: VCO				
Size: A	Document Number: Mod. MT PLATINUM			Rev
Date: Friday, July 25, 2003		Sheet 6	of 10	



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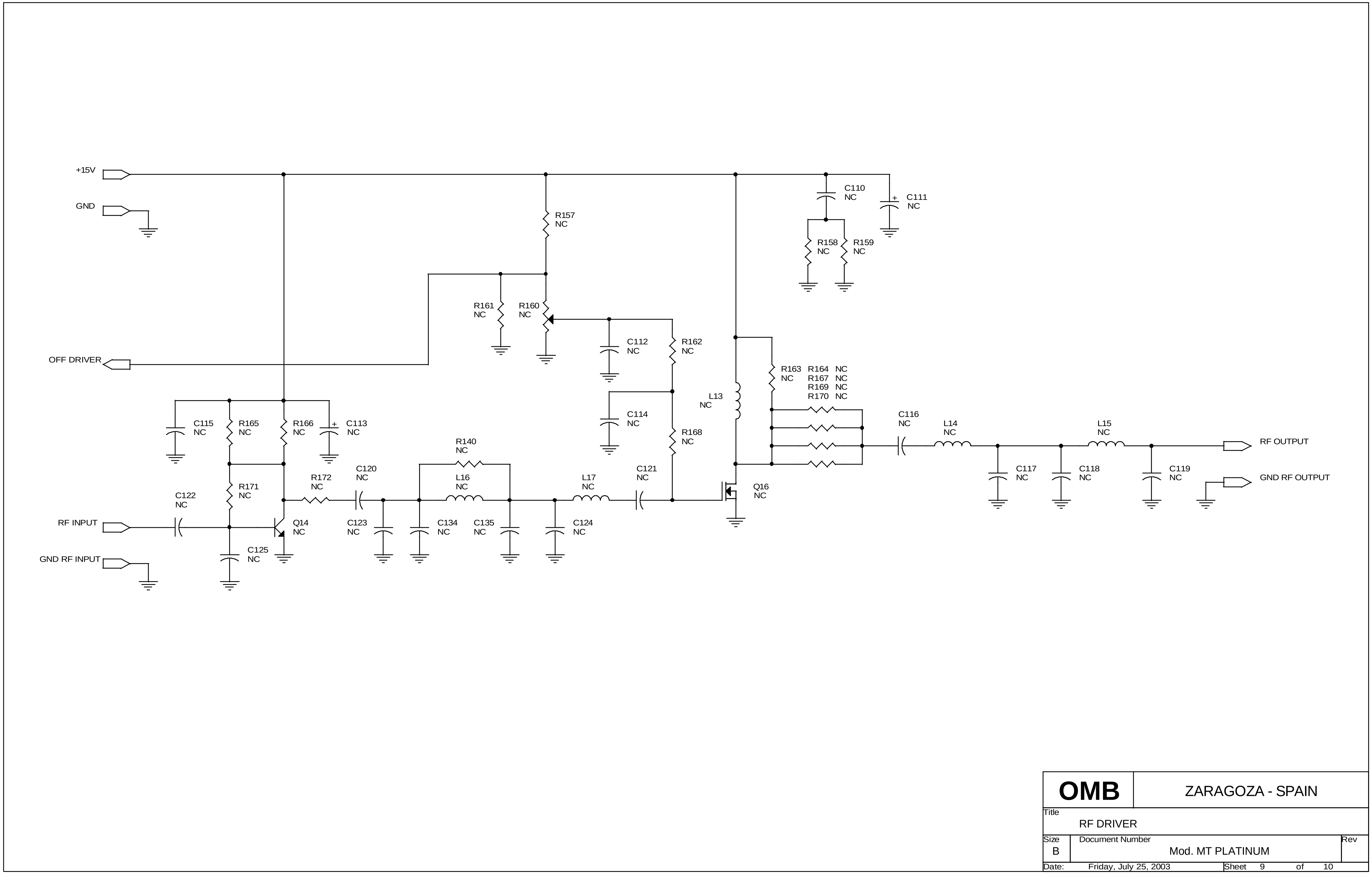
Size: B	Document Number: Mod. MT PLATINUM	Rev
Date: Friday, July 25, 2003	Sheet 7 of 10	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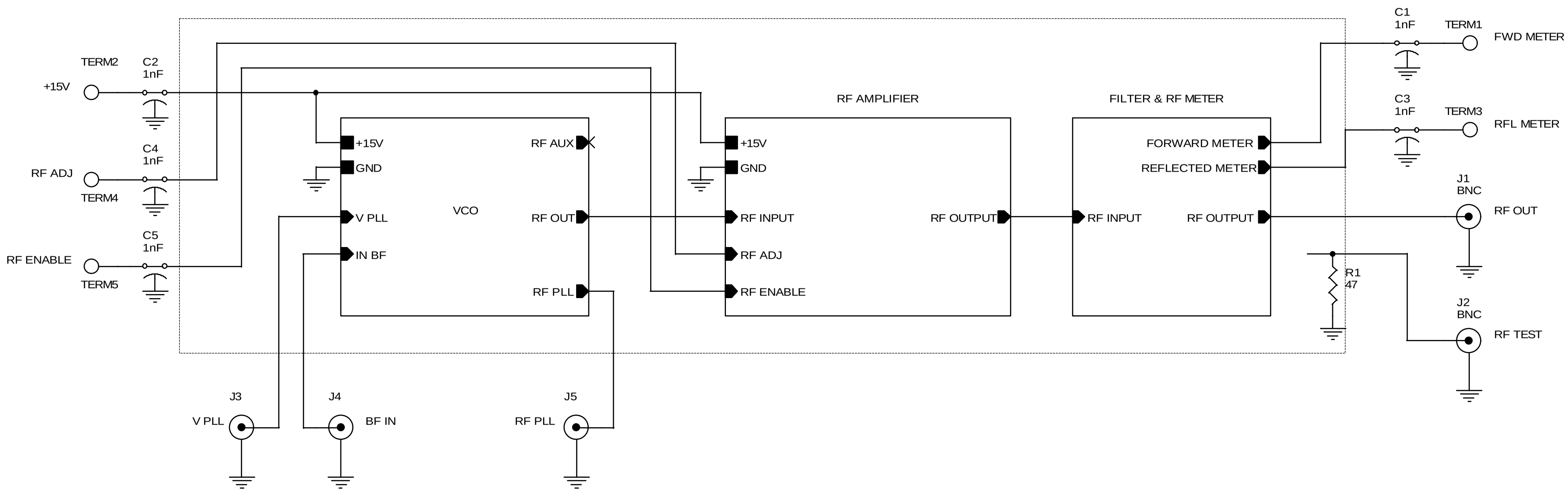
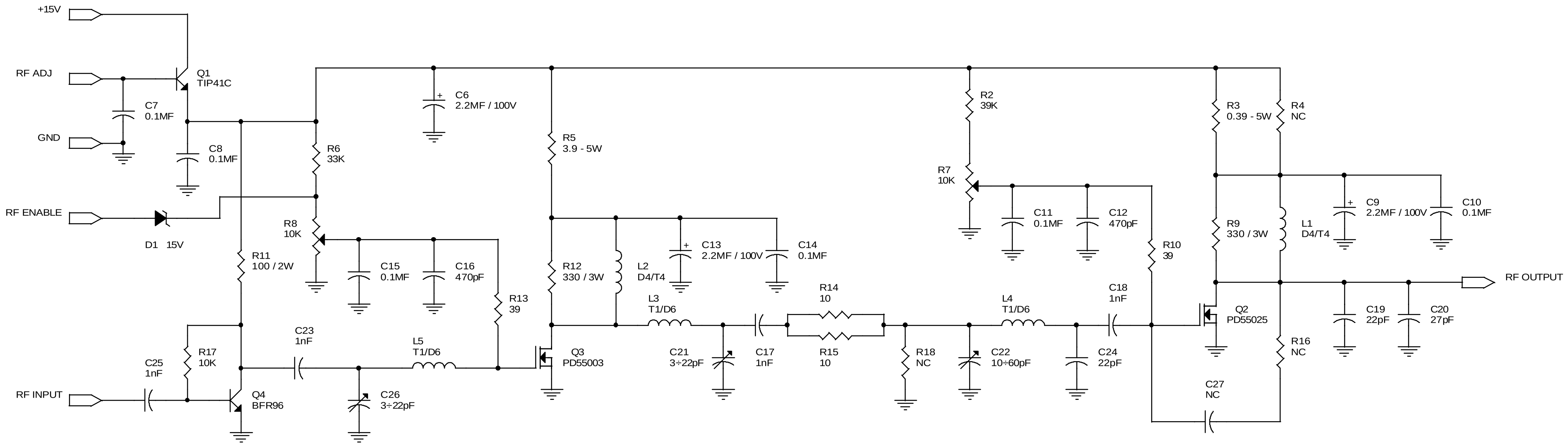
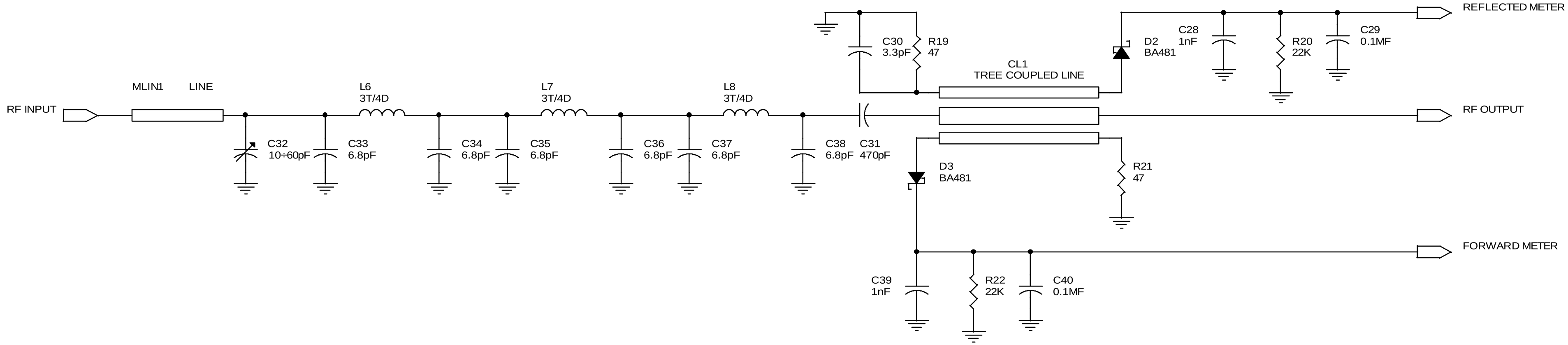
GND
OFF DRIVER
RF INPUT
GND RF INPUT
C115 NC
R165 NC
R166 NC
C113 NC
C122 NC
R171 NC
C125 NC
Q14 NC
R172 NC
C120 NC
C123 NC
R140 NC
L16 NC
C134 NC
C135 NC
L17 NC
C124 NC
C121 NC
R157 NC
R161 NC
R160 NC
C112 NC
R162 NC
C114 NC
R168 NC
C110 NC
C111 NC
R158 NC
R159 NC
L13 NC
Q16 NC
R163 NC
R164 NC
R167 NC
R169 NC
R170 NC
C116 NC
L14 NC
L15 NC
C117 NC
C118 NC
C119 NC
RF OUTPUT
GND RF OUTPUT
OMB
ZARAGOZA - SPAIN
Title
RF DRIVER
Size
B
Document Number
Mod. MT PLATINUM
Rev
Date: Friday, July 25, 2003
Sheet 9 of 10



OMB	ZARAGOZA - SPAIN		
Title: RF AMPLIFIER 400MHz 10W			
Size: B	Document Number: Mod. FM400-10-C		Rev: 1.0
Date: Thursday, July 24, 2003	Sheet 1 of 4		



OMB	ZARAGOZA - SPAIN		
Title: RF AMPLIFIER			
Size: B	Document Number: Mod. FM400-10-C		Rev: 1.0
Date: Thursday, July 24, 2003	Sheet 2 of 4		



OMB	ZARAGOZA - SPAIN		
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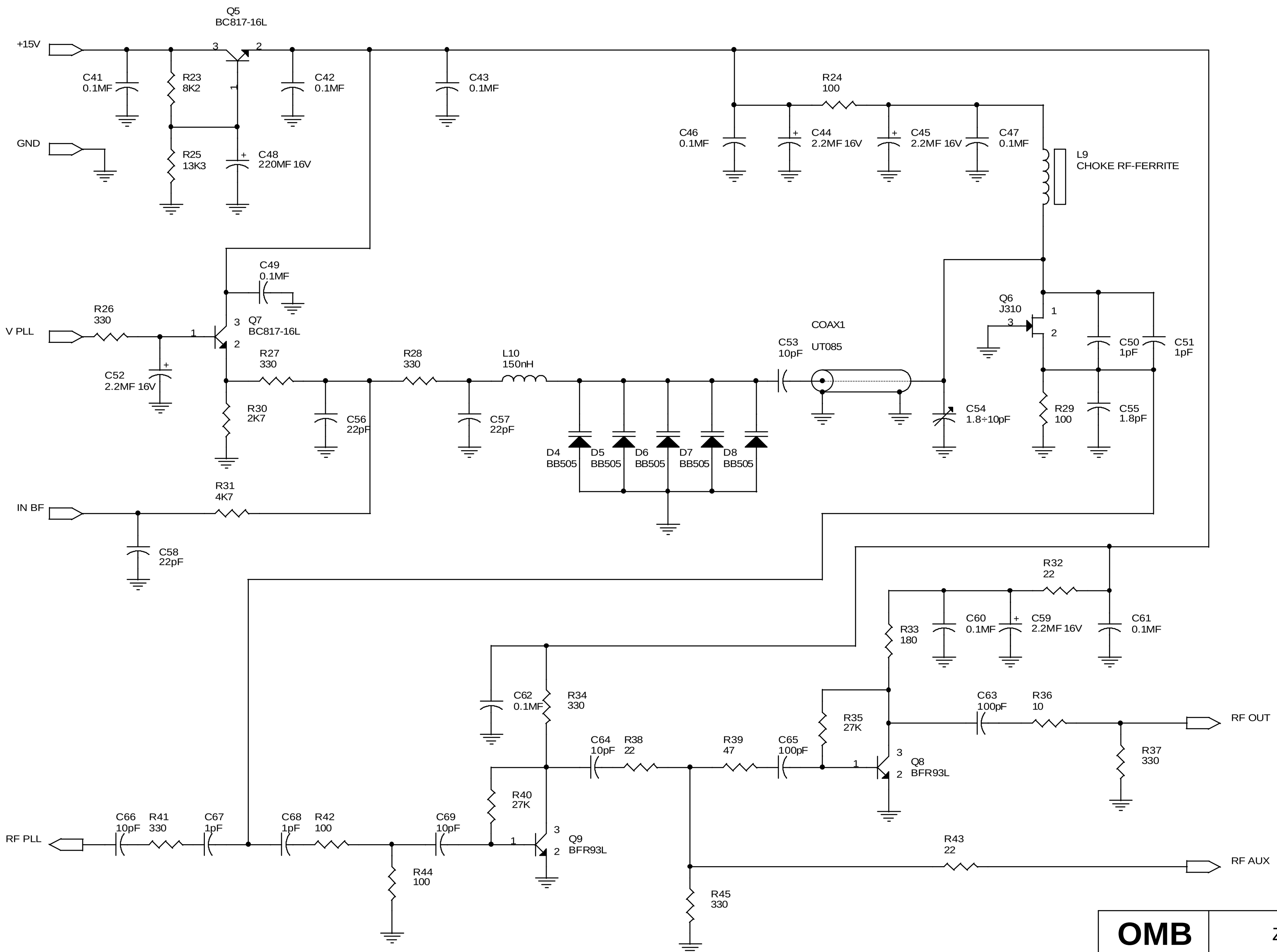
Size: B	Document Number: Mod. FM400-10-C		Rev: 1.0
Date: Thursday, July 24, 2003		Sheet 3 of 4	



OMB	ZARAGOZA - SPAIN		
Title	Voltage Control Oscillator 400MHz		
Size B	Document Number Mod. VCOUV099A		Rev 1.0
Date: Thursday, July 24, 2003	Sheet 4 of 4		

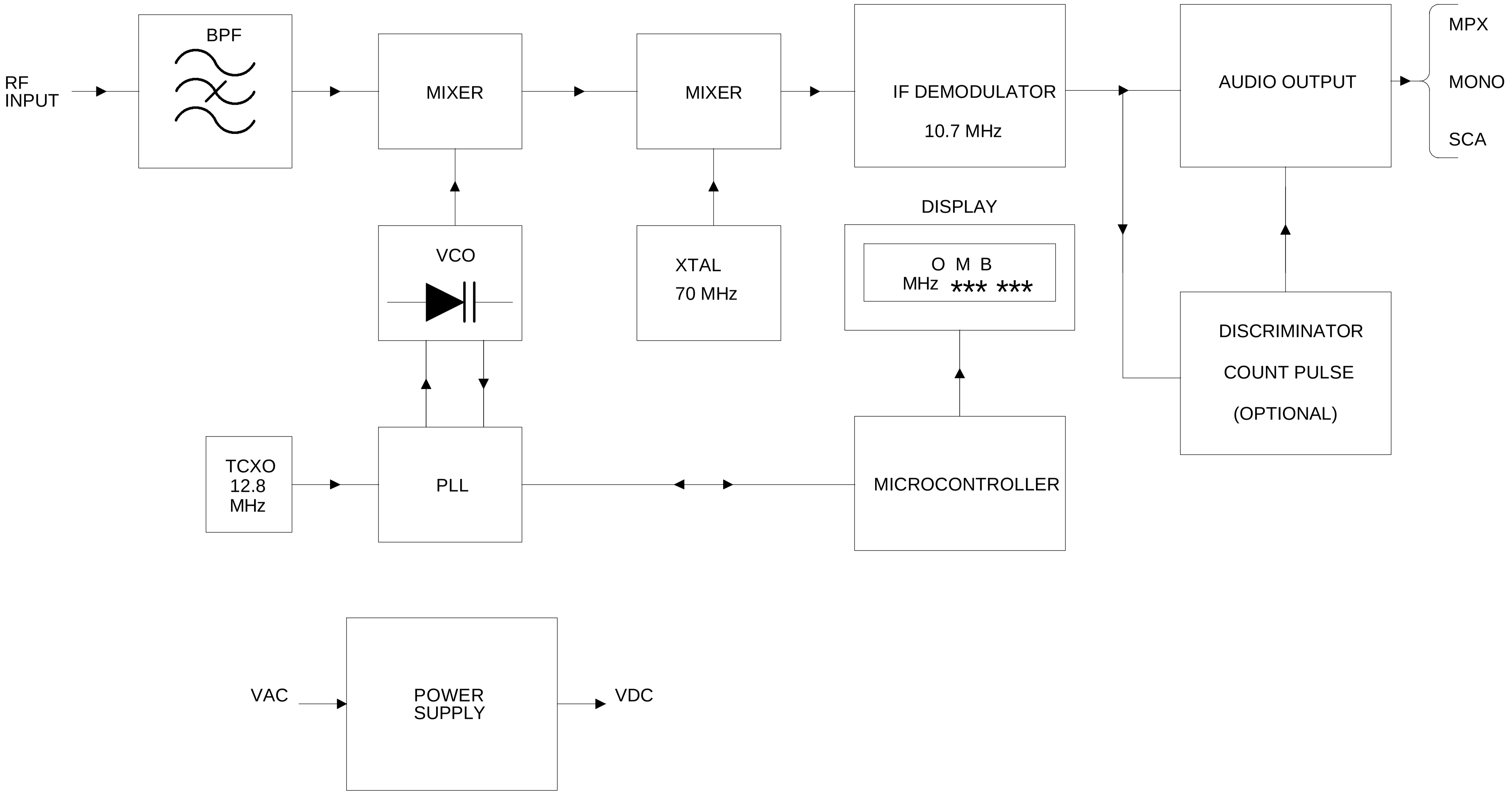
Part List Schematic : RFAMP 400MHz 10W

Rif.	Value	Remarks	Description	Code
C1	1nF		Ceramic Lead Through Capacitor	
C2	1nF		Ceramic Lead Through Capacitor	
C3	1nF		Ceramic Lead Through Capacitor	
C4	1nF		Ceramic Lead Through Capacitor	
C5	1nF		Ceramic Lead Through Capacitor	
C6	2.2MF / 100V		Aluminium Electrolytic Capacitor	
C7	0.1MF		Multilayer Ceramic Capacitor	
C8	0.1MF		Multilayer Ceramic Capacitor	
C9	2.2MF / 100V		Aluminium Electrolytic Capacitor	
C10	0.1MF		Multilayer Ceramic Capacitor	
C11	0.1MF		Multilayer Ceramic Capacitor	
C12	470pF		Ceramic Disc Capacitor NPO	
C13	2.2MF / 100V		Aluminium Electrolytic Capacitor	
C14	0.1MF		Multilayer Ceramic Capacitor	
C15	0.1MF		Multilayer Ceramic Capacitor	
C16	470pF		Ceramic Disc Capacitor NPO	
C17	1nF		Ceramic Disc Capacitor NPO	
C18	1nF		Ceramic Disc Capacitor NPO	
C19	22pF		Ceramic Disc Capacitor NPO	
C20	27pF		Ceramic Disc Capacitor NPO	
C21	3÷22pF		Trimmer Polyethylene Film Capacitor	
C22	10÷60pF		Trimmer Polyethylene Film Capacitor	
C23	1nF		Ceramic Disc Capacitor NPO	
C24	22pF		Ceramic Disc Capacitor NPO	
C25	1nF		Ceramic Disc Capacitor NPO	
C26	3÷22pF		Trimmer Polyethylene Film Capacitor	
C27	NC			
C28	1nF		Ceramic Disc Capacitor NPO	
C29	0.1MF		Multilayer Ceramic Capacitor	
C30	3.3pF		Ceramic Disc Capacitor NPO	
C31	470pF		Ceramic Disc Capacitor NPO	
C32	10÷60pF		Trimmer Polyethylene Film Capacitor	
C33	6.8pF		Ceramic Disc Capacitor NPO	
C34	6.8pF		Ceramic Disc Capacitor NPO	
C35	6.8pF		Ceramic Disc Capacitor NPO	
C36	6.8pF		Ceramic Disc Capacitor NPO	
C37	6.8pF		Ceramic Disc Capacitor NPO	
C38	6.8pF		Ceramic Disc Capacitor NPO	
C39	1nF		Ceramic Disc Capacitor NPO	
C40	0.1MF		Multilayer Ceramic Capacitor	
C41	0.1MF		SMD Multilayer Ceramic Capacitor	
C42	0.1MF		SMD Multilayer Ceramic Capacitor	
C43	0.1MF		SMD Multilayer Ceramic Capacitor	
C44	2.2MF 16V		SMD Aluminium Electrolytic Capacitor	
C45	2.2MF 16V		SMD Aluminium Electrolytic Capacitor	
C46	0.1MF		SMD Multilayer Ceramic Capacitor	
C47	0.1MF		SMD Multilayer Ceramic Capacitor	
C48	220MF 16V		Aluminium Electrolytic Capacitor	
C49	0.1MF		SMD Multilayer Ceramic Capacitor	

Rif.	Value	Remarks	Description	Code
C50	1pF		SMD Multilayer Ceramic Capacitor	
C51	1pF		SMD Multilayer Ceramic Capacitor	
C52	2.2MF 16V		SMD Aluminium Electrolytic Capacitor	
C53	10pF		SMD Multilayer Ceramic Capacitor	
C54	1.8÷10pF		Trimmer Ceramic Capacitor	
C55	1.8pF		Ceramic Disc Capacitor NPO	
C56	22pF		Ceramic Disc Capacitor NPO	
C57	22pF		Ceramic Disc Capacitor NPO	
C58	22pF		Ceramic Disc Capacitor NPO	
C59	2.2MF 16V		SMD Aluminium Electrolytic Capacitor	
C60	0.1MF		SMD Multilayer Ceramic Capacitor	
C61	0.1MF		SMD Multilayer Ceramic Capacitor	
C62	0.1MF		SMD Multilayer Ceramic Capacitor	
C63	100pF		SMD Multilayer Ceramic Capacitor	
C64	10pF		SMD Multilayer Ceramic Capacitor	
C65	100pF		SMD Multilayer Ceramic Capacitor	
C66	10pF		SMD Multilayer Ceramic Capacitor	
C67	1pF		SMD Multilayer Ceramic Capacitor	
C68	1pF		SMD Multilayer Ceramic Capacitor	
C69	10pF		SMD Multilayer Ceramic Capacitor	
L1	D4/T4		Enamelled Copper Wire	
L2	D4/T4		Enamelled Copper Wire	
L3	T1/D6		Enamelled Copper Wire	
L4	T1/D6		Enamelled Copper Wire	
L5	T1/D6		Enamelled Copper Wire	
L6	3T/4D		Enamelled Copper Wire	
L7	3T/4D		Enamelled Copper Wire	
L8	3T/4D		Enamelled Copper Wire	
L9	CHOKE RF		Suppression Choke	
L10	150nH		SMD Inductor	
R1	47	1/4W	Carbon Film Resistor	
R2	39K	1/4W	Carbon Film Resistor	
R3	0.39 - 5W	1/4W	Ceramic Cased Wirewound Resistor	
R4	NC	1/4W	Carbon Film Resistor	
R5	3.9 - 5W	1/4W	Ceramic Cased Wirewound Resistor	
R6	33K	1/4W	Carbon Film Resistor	
R7	10K	1/4W	SMD Cermet Skeleton Trimmer Resistor	
R8	10K	1/4W	SMD Cermet Skeleton Trimmer Resistor	
R9	330 / 3W	1/4W	Metal Film Power Resistor	
R10	39	1/4W	Carbon Film Resistor	
R11	100 / 2W	1/4W	Metal Film Power Resistor	
R12	330 / 3W	1/4W	Metal Film Power Resistor	
R13	39	1/4W	Carbon Film Resistor	
R14	10	1/4W	Carbon Film Resistor	
R15	10	1/4W	Carbon Film Resistor	
R16	NC	1/4W	Carbon Film Resistor	
R17	10K	1/4W	Carbon Film Resistor	
R18	NC	1/4W	Carbon Film Resistor	
R19	47	1/4W	Carbon Film Resistor	
R20	22K	1/4W	Carbon Film Resistor	
R21	47	1/4W	Carbon Film Resistor	

OMB

Rif.	Value	Remarks	Description	Code
R22	22K	1/4W	Carbon Film Resistor	
R23	8K2	1/4W	SMD Thick Film Resistor	
R24	100	1/4W	SMD Thick Film Resistor	
R25	13K3	1/4W	SMD Thick Film Resistor	
R26	330	1/4W	SMD Thick Film Resistor	
R27	330	1/4W	SMD Thick Film Resistor	
R28	330	1/4W	SMD Thick Film Resistor	
R29	100	1/4W	SMD Thick Film Resistor	
R30	2K7	1/4W	SMD Thick Film Resistor	
R31	4K7	1/4W	SMD Thick Film Resistor	
R32	22	1/4W	SMD Thick Film Resistor	
R33	180	1/4W	SMD Thick Film Resistor	
R34	330	1/4W	SMD Thick Film Resistor	
R35	27K	1/4W	SMD Thick Film Resistor	
R36	10	1/4W	SMD Thick Film Resistor	
R37	330	1/4W	SMD Thick Film Resistor	
R38	22	1/4W	SMD Thick Film Resistor	
R39	47	1/4W	SMD Thick Film Resistor	
R40	27K	1/4W	SMD Thick Film Resistor	
R41	330	1/4W	SMD Thick Film Resistor	
R42	100	1/4W	SMD Thick Film Resistor	
R43	22	1/4W	SMD Thick Film Resistor	
R44	100	1/4W	SMD Thick Film Resistor	
R45	330	1/4W	SMD Thick Film Resistor	
D1	15V	1/2W	Diode Zener	
D2	BA481		Diode Schottky	
D3	BA481		Diode Schottky	
D4	BB505		SMD Tuning Diode	
D5	BB505		SMD Tuning Diode	
D6	BB505		SMD Tuning Diode	
D7	BB505		SMD Tuning Diode	
D8	BB505		SMD Tuning Diode	
Q1	TIP41C		Medium Power Bipolar Transistor	
Q2	PD55025		LDMOS	
Q3	PD55003		LDMOS	
Q4	BFR96		RF Bipolar Transistor	
Q5	BC817-16L		SMD Low Power Bipolar Transistor	
Q6	J310		JFET	
Q7	BC817-16L		SMD Low Power Bipolar Transistor	
Q8	BFR93L		SMD RF Bipolar Transistor	
Q9	BFR93L		SMD RF Bipolar Transistor	
COAX1	UT085		Coaxial Cable	
J1	SMB		SMB Panel Connector - 50 Ohm	
J2	SMB		SMB Panel Connector - 50 Ohm	
J3	V PLL		SMB Panel Connector - 50 Ohm	
J4	BF IN		SMB Panel Connector - 50 Ohm	
J5	RF PLL		SMB Panel Connector - 50 Ohm	
MLIN1	LINE		Microstrip Line	



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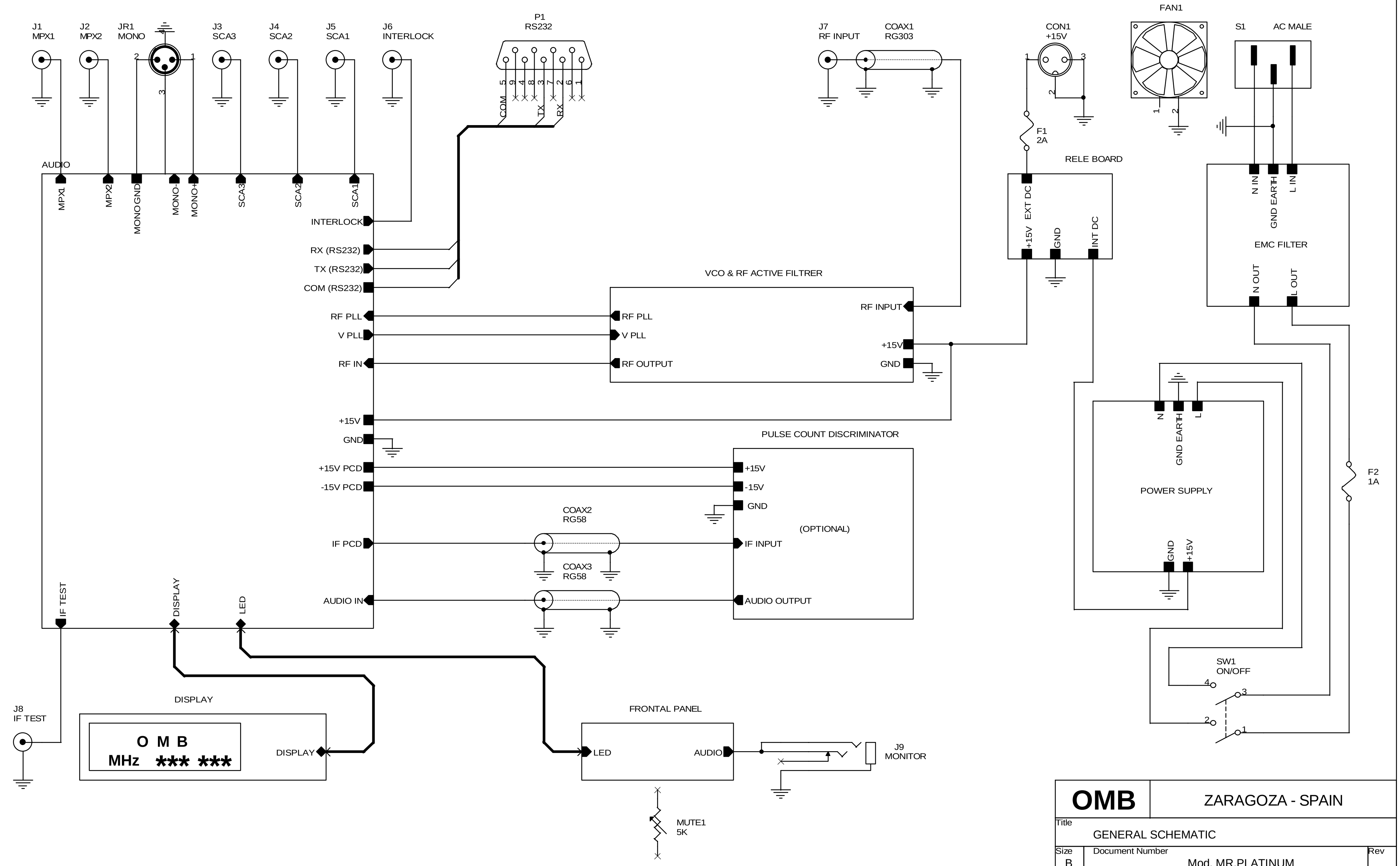
Size A3	Document Number	Mod. MR.PLATINUM	Rev
Date:	Friday, July 25, 2003	Sheet 1	of 1



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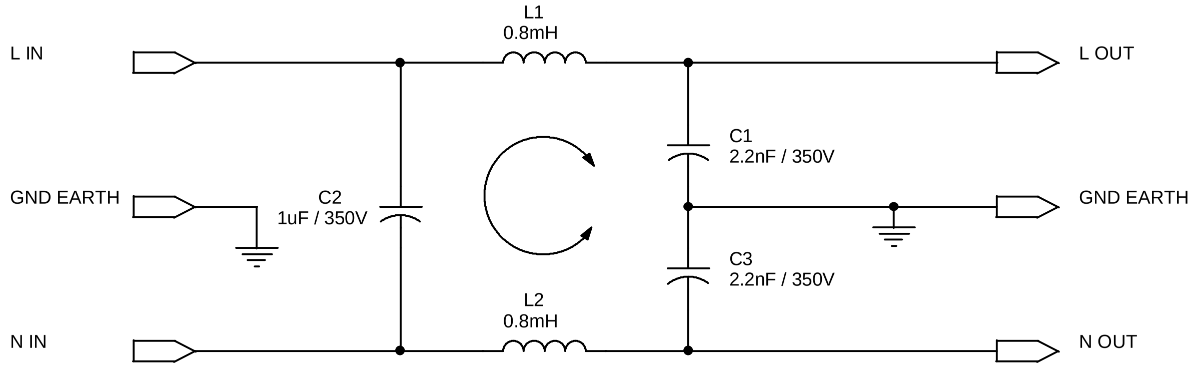
Size: B	Document Number: Mod. MR.PLATINUM — Rev
Date: Friday, July 25, 2003	Sheet 1 of 13



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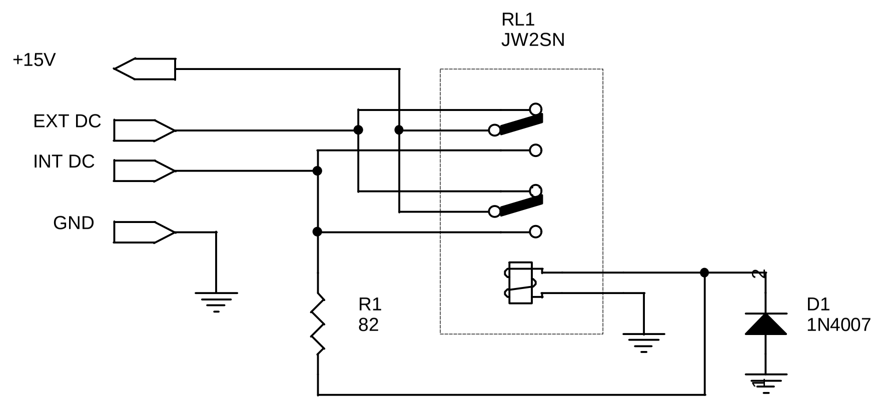
Size A	Document Number Mod. EMC-02			Rev 1.0
Date:	Friday, May 17, 2002	Sheet 1	of 1	



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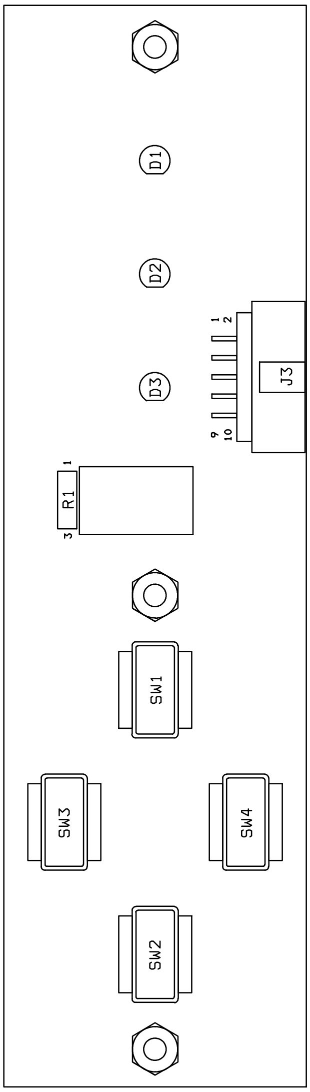
Size: A	Document Number: Mod. RELE99A — Rev: 1.0
Date: Friday, July 25, 2003	Sheet 1 of 1



	Date	Name	Signature:	Sistemas Electrónicos S.A.
Drawn	25/07/03	OMB Eng. Dpt.		
Checked				
Standards				
Scale:	Title: MR Platinum Front panel			Drawing nr:
				Replace:
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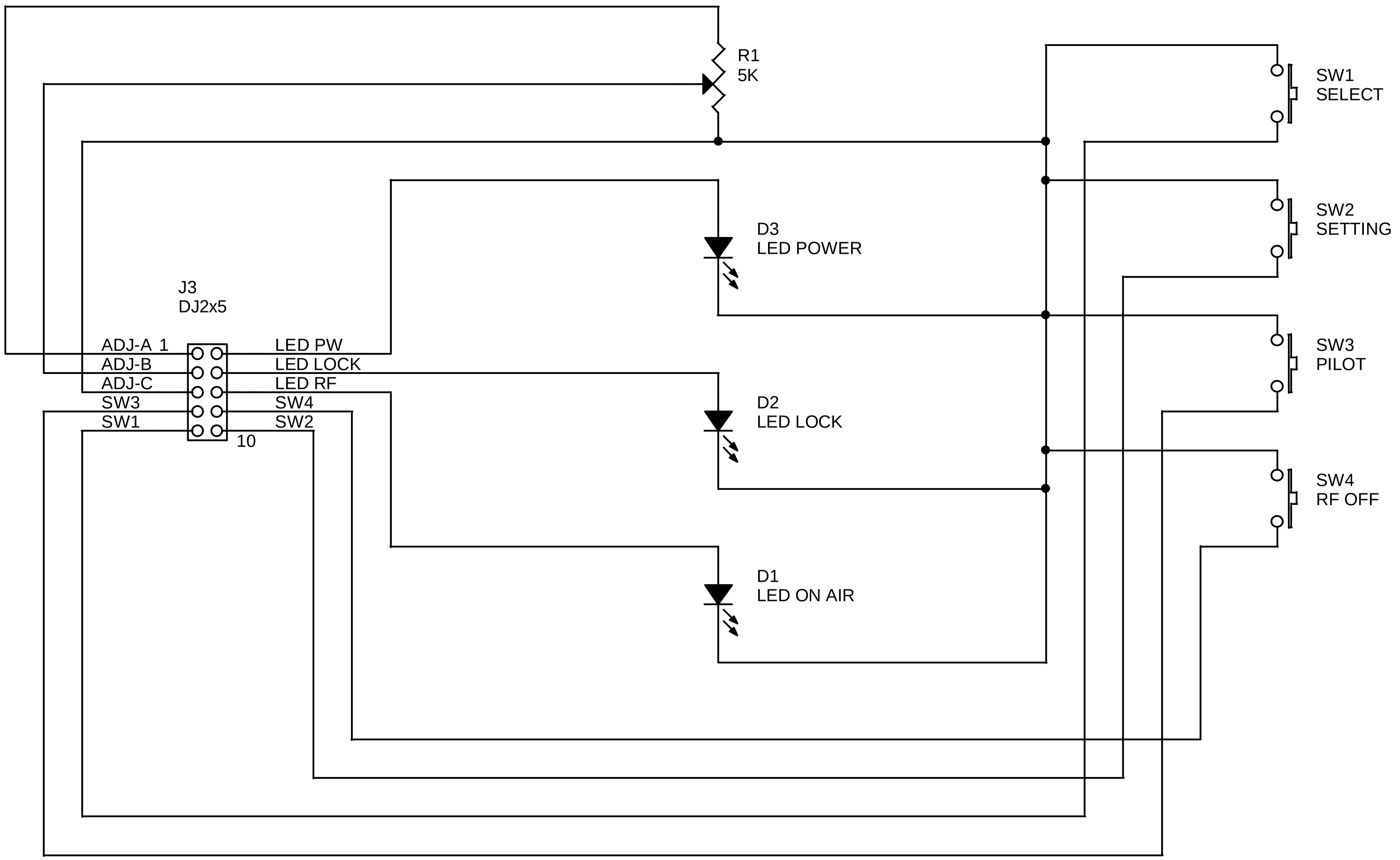
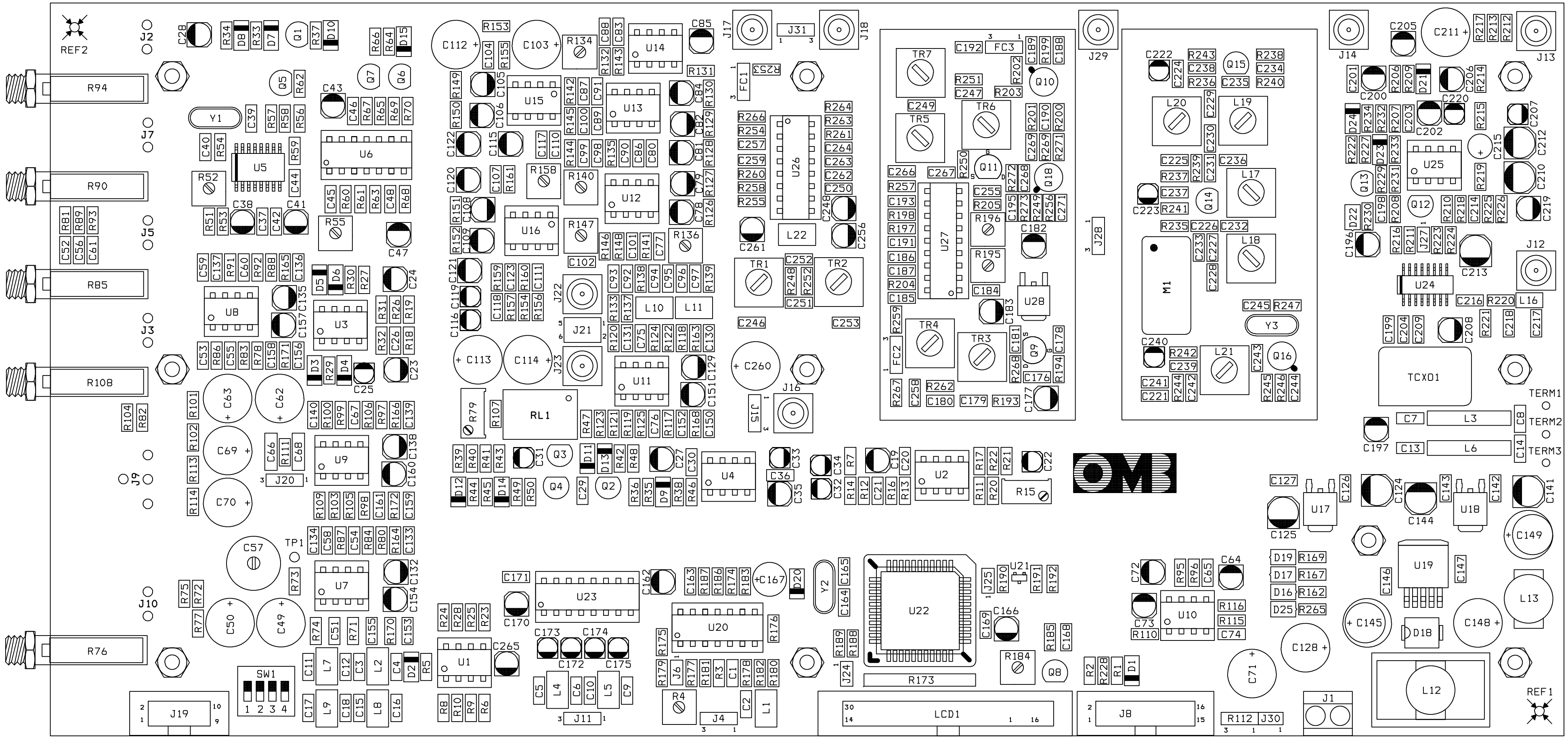


OMB	ZARAGOZA - SPAIN		
Title: Frontal Panel			
Size: A	Document Number: Mod. MR PLATINUM		Rev
Date: Friday, July 25, 2003		Sheet 1	of 1

OMB

Part List Schematic : MR PLATINUM LINK RECEIVER FRONT PANEL

Rif.	Value	Remarks	Description	Code
R1	5K	1/4W	Multi Turn Cermet Trimmer Resistor Panel Mount	
D1	LED ON AIR	GREEN	Light Emitting Diode	
D2	LED LOCK	GREEN	Light Emitting Diode	
D3	LED POWER	YELLOW	Light Emitting Diode	
J3	DJ2x5		Male PCB Mounting Header	
SW1	SELECT		Push Button Switcher	
SW2	SETTING		Push Button Switcher	
SW3	PILOT		Push Button Switcher	
SW4	RF OFF		Push Button Switcher	



	Date	Name	Signature:
Drawn	25/07/03	OMB Eng. Dpt.	
Checked			
Standards			

Sistemas Electrónicos S.A.

Scale:

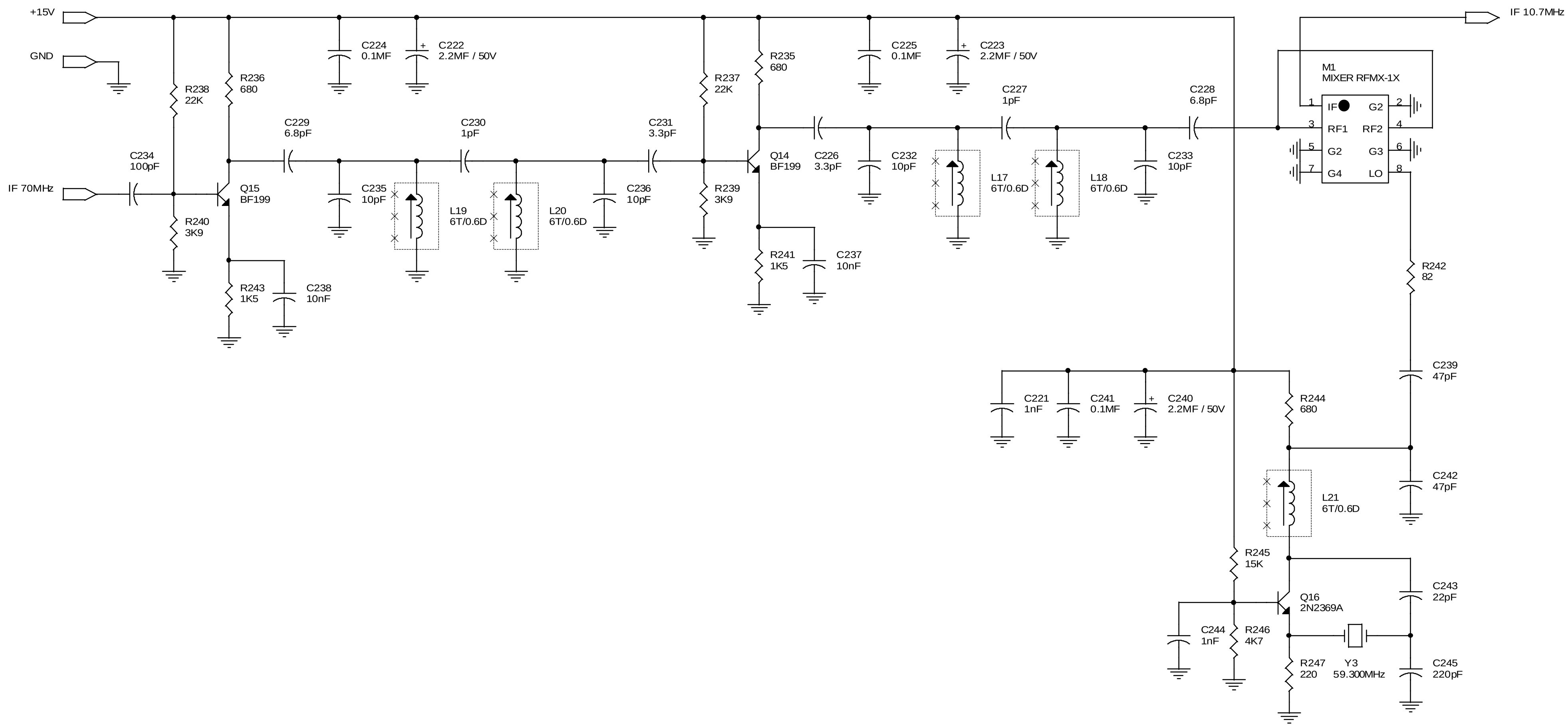
Title: MR Platinum

Main board

Drawing nr:

Replace:

Replaced with:



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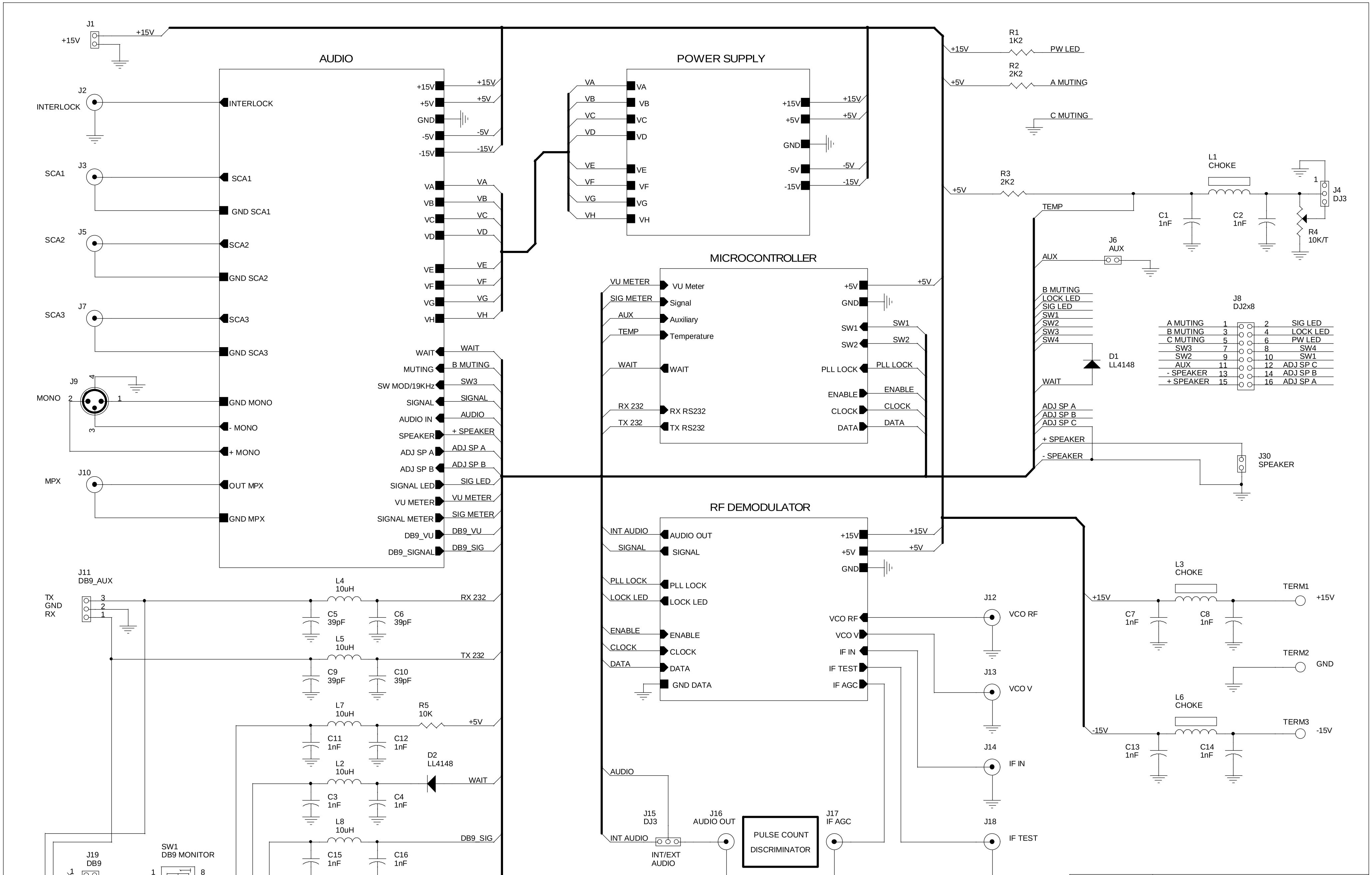
Size: B	Document Number: Mod. MR PLATINUM		Rev
Date: Friday, July 25, 2003	Sheet 0	of 15	

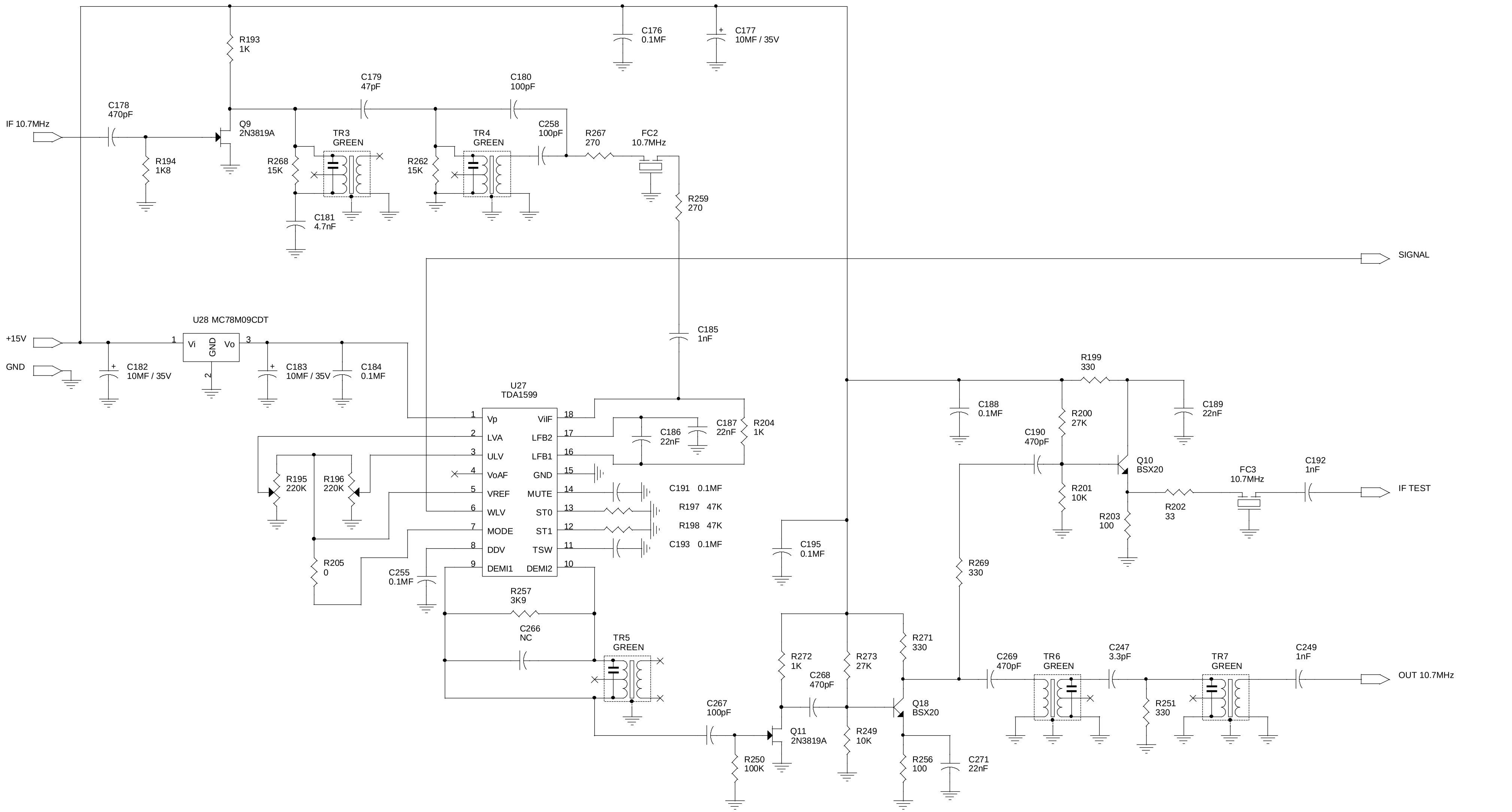


OMB — ZARAGOZA - SPAIN

Title: MOTHER BOARD

Size: A3 | Document Number: Mod. MR PLATINUM | Rev

Date: Friday, July 25, 2003 | Sheet 1 of 16



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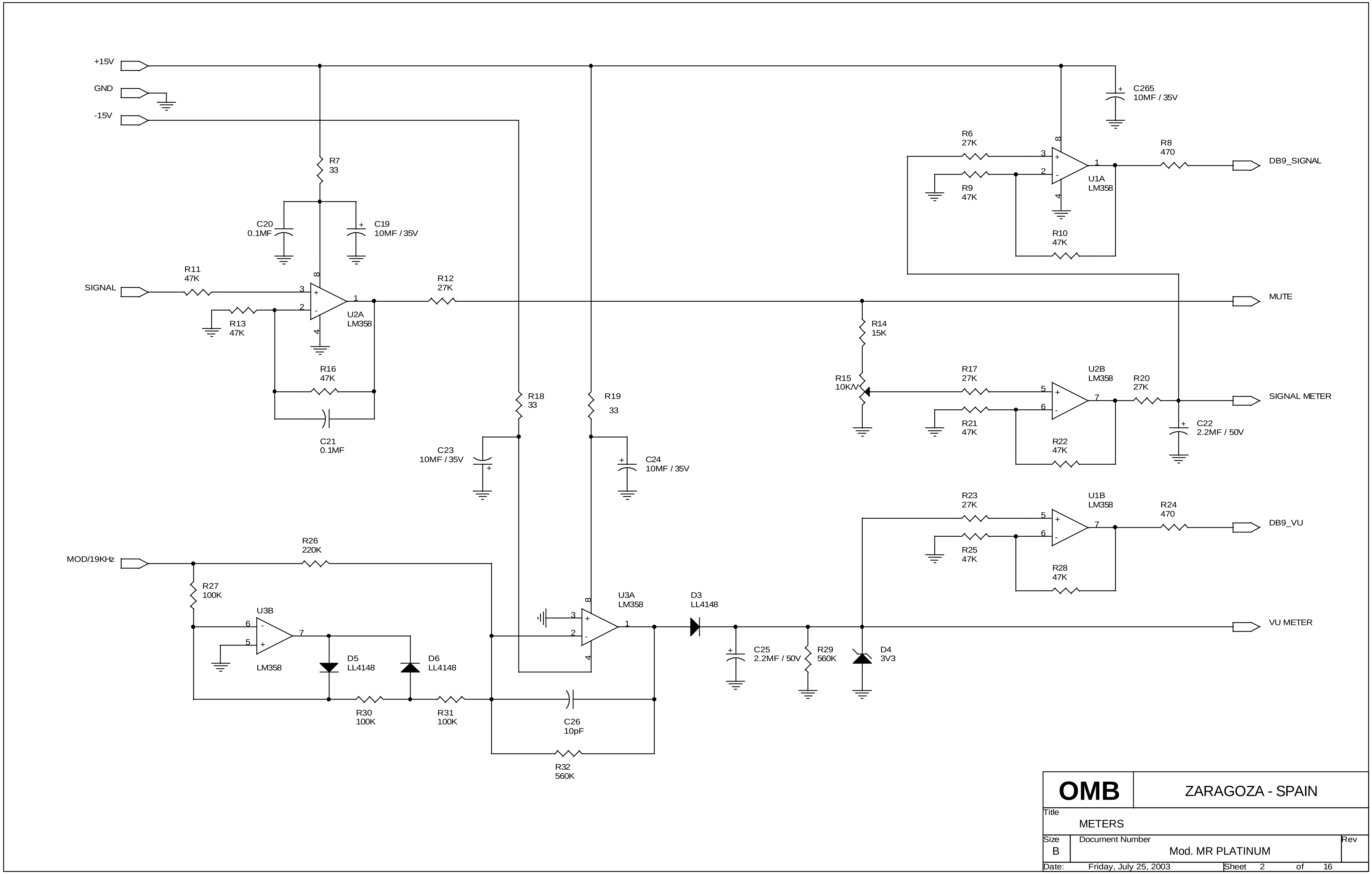
Size A3	Document Number: Mod. MR PLATINUM	Rev
Date: Friday, July 25, 2003	Sheet 1 of 1	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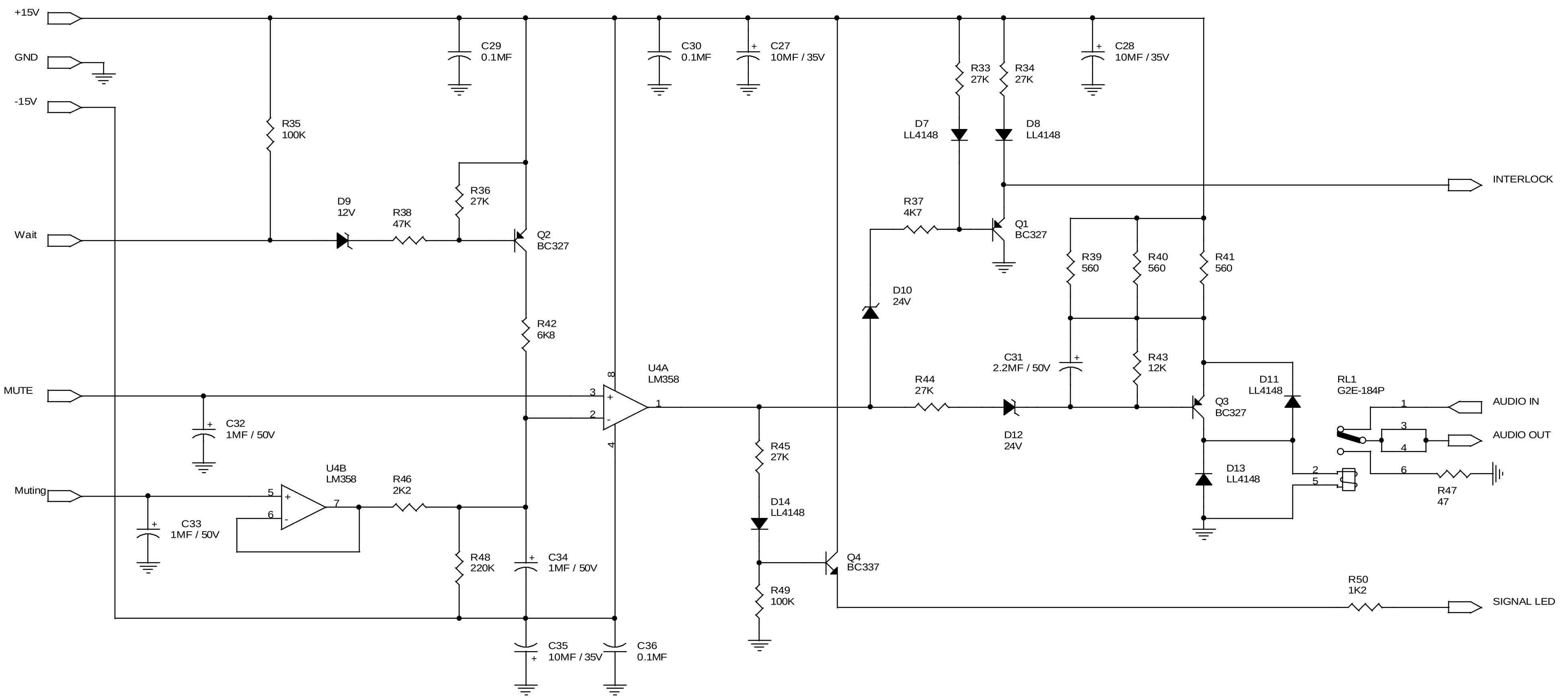
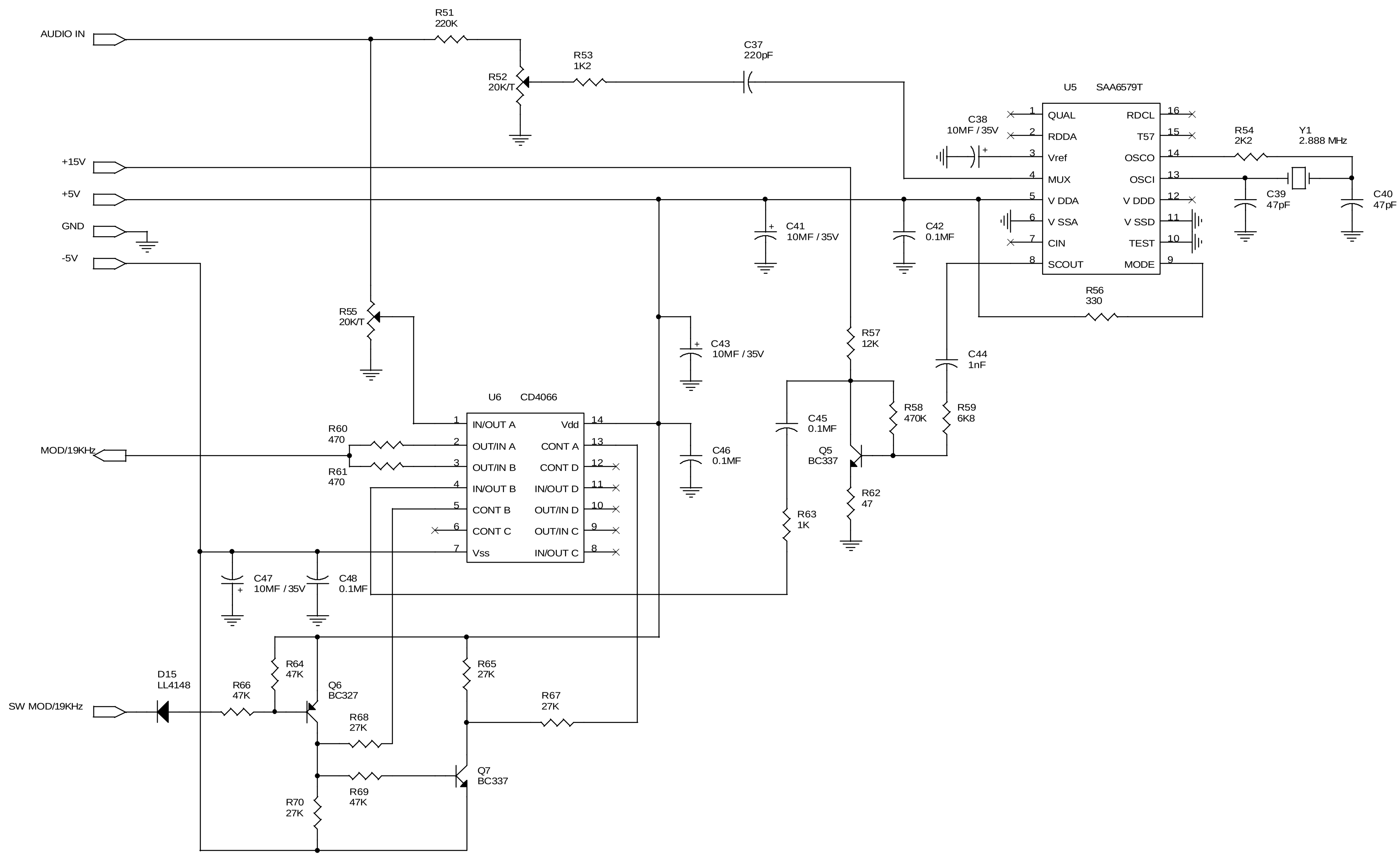
GND
-15V
SIGNAL
MOD/19KHz
R7
33
C20
0.1MF
C19
10MF / 35V
R11
47K
R13
47K
U2A
LM358
R12
27K
R16
47K
C21
0.1MF
R18
33
R19
33
C23
10MF / 35V
C24
10MF / 35V
R26
220K
R27
100K
U3B
LM358
D5
LL4148
D6
LL4148
R30
100K
R31
100K
C26
10pF
R32
560K
U3A
LM358
D3
LL4148
C25
2.2MF / 50V
R29
560K
D4
3V3
C265
10MF / 35V
R6
27K
R9
47K
U1A
LM358
R10
47K
R8
470
DB9_SIGNAL
MUTE
R14
15K
R15
10K/V
R17
27K
R21
47K
U2B
LM358
R22
47K
R20
27K
C22
2.2MF / 50V
SIGNAL METER
R23
27K
R25
47K
U1B
LM358
R28
47K
R24
470
DB9_VU
VU METER
OMB
ZARAGOZA - SPAIN
Title
METERS
Size
B
Document Number
Mod. MR PLATINUM
Rev
Date:
Friday, July 25, 2003
Sheet 2 of 16



OMB	ZARAGOZA - SPAIN		
Title: MUTE			
Size: B	Document Number: Mod. MR PLATINUM		Rev
Date: Friday, July 25, 2003		Sheet 3	of 16



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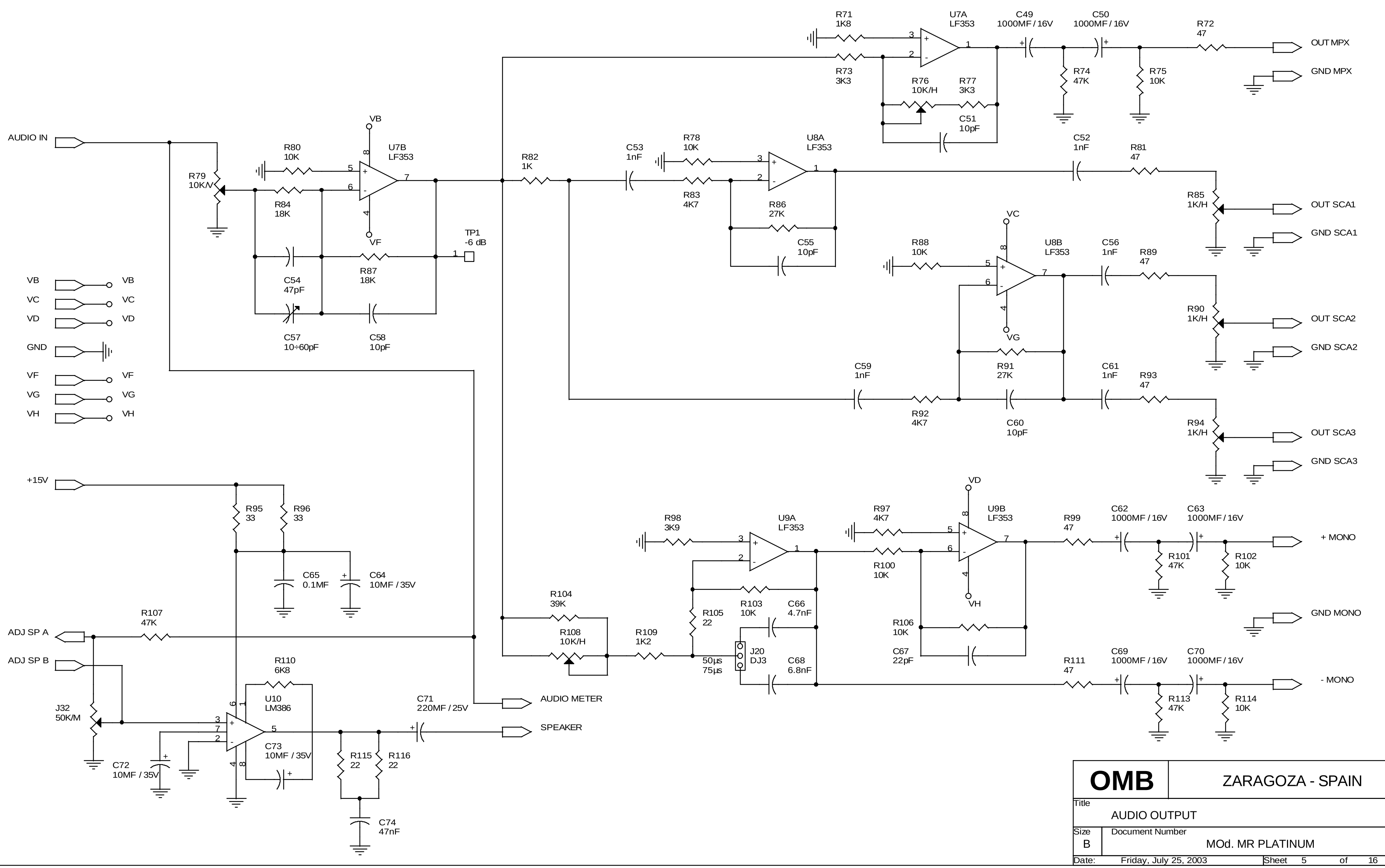
Title	19KHz MPX			
Size B	Document Number Mod. MR PLATINUM			Rev
Date: Friday, July 25, 2003	Sheet 4	of 16		



OMB	ZARAGOZA - SPAIN		
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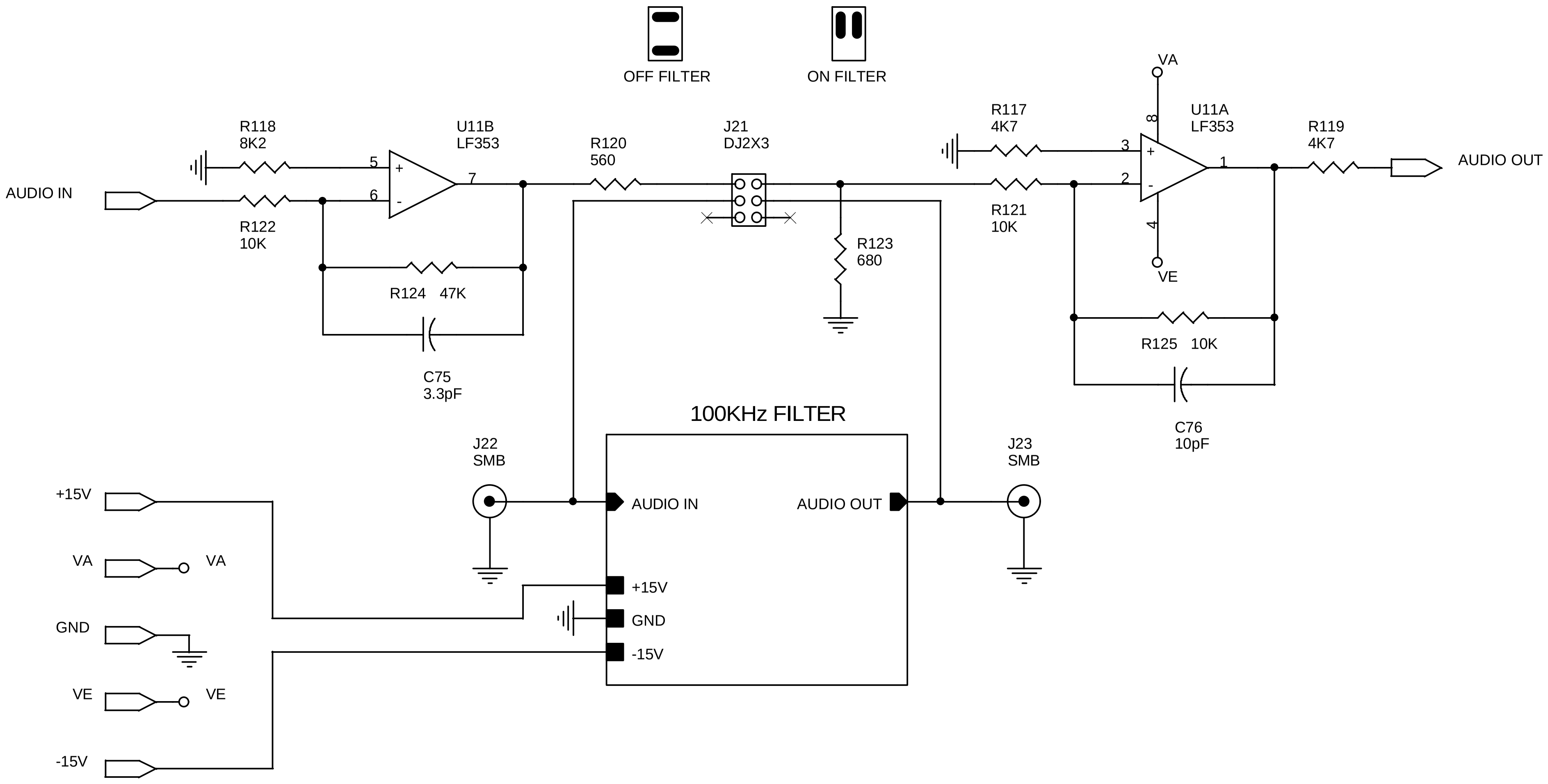
Size B	Document Number MOd. MR PLATINUM		Rev
Date: Friday, July 25, 2003		Sheet 5	of 16



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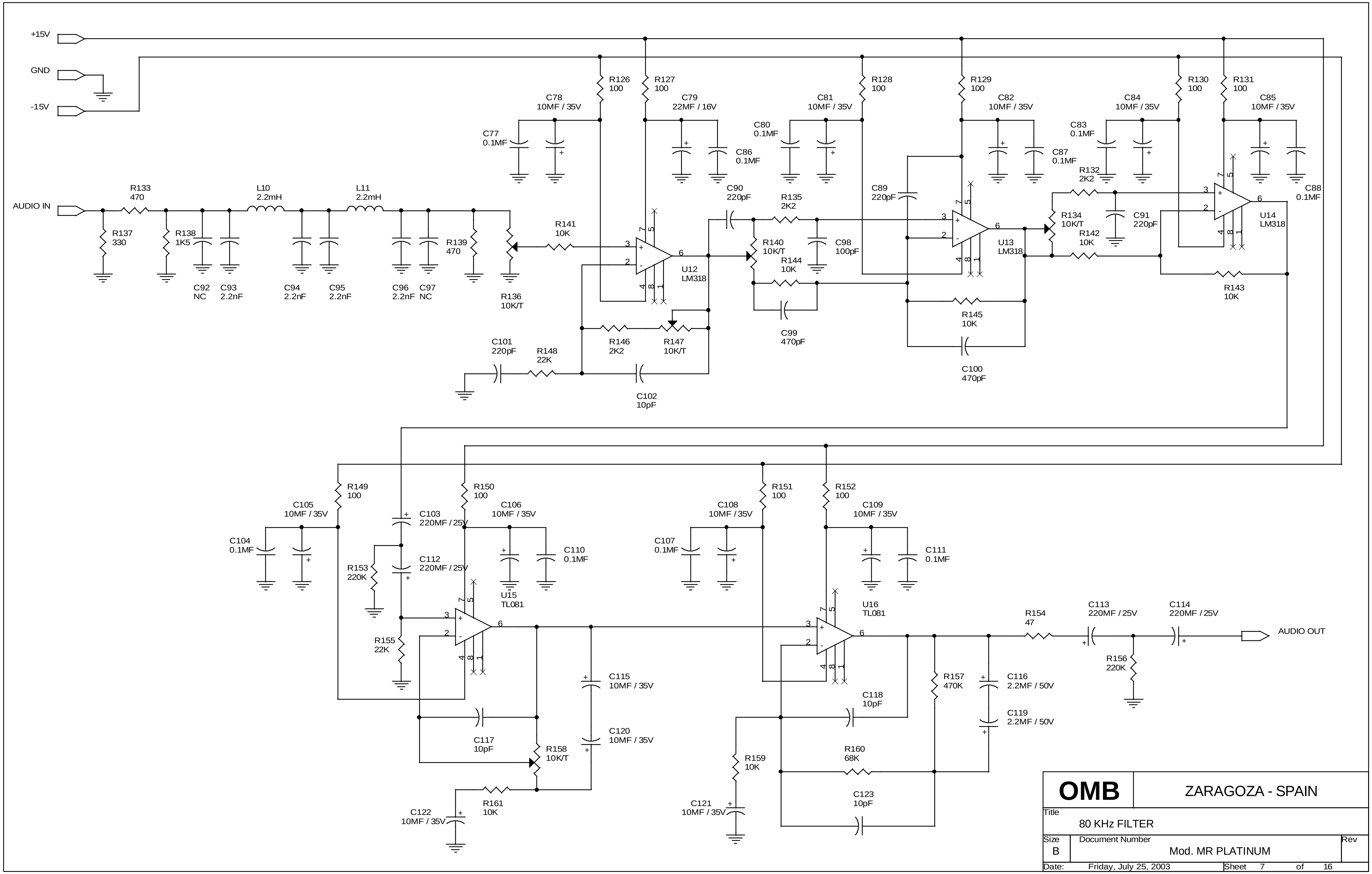
Title: BUFFER & FILTER		
Size: A	Document Number: Mod. MR PLATINUM	Rev
Date: Friday, July 25, 2003	Sheet 6 of 16	



+15V
GND
-15V
AUDIO IN
R133 470
R137 330
R138 1K5
C92 NC
C93 2.2nF
L10 2.2mH
C94 2.2nF
C95 2.2nF
L11 2.2mH
C96 2.2nF
C97 NC
R139 470
R136 10K/T
R141 10K
R126 100
R127 100
C78 10MF / 35V
C77 0.1MF
C79 22MF / 16V
C86 0.1MF
U12 LM318
R146 2K2
R147 10K/T
C101 220pF
R148 22K
C102 10pF
C90 220pF
R135 2K2
R140 10K/T
R144 10K
C98 100pF
C99 470pF
R128 100
C81 10MF / 35V
C80 0.1MF
R129 100
C82 10MF / 35V
C87 0.1MF
C89 220pF
U13 LM318
R145 10K
C100 470pF
C83 0.1MF
C84 10MF / 35V
R132 2K2
R134 10K/T
C91 220pF
R142 10K
R130 100
R131 100
C85 10MF / 35V
C88 0.1MF
U14 LM318
R143 10K
R149 100
C105 10MF / 35V
C104 0.1MF
C103 220MF / 25V
C112 220MF / 25V
R153 220K
R155 22K
R150 100
C106 10MF / 35V
C110 0.1MF
U15 TL081
C117 10pF
R158 10K/T
R161 10K
C122 10MF / 35V
C115 10MF / 35V
C120 10MF / 35V
R151 100
C108 10MF / 35V
C107 0.1MF
R152 100
C109 10MF / 35V
C111 0.1MF
U16 TL081
C118 10pF
R159 10K
C121 10MF / 35V
R160 68K
C123 10pF
R157 470K
C116 2.2MF / 50V
C119 2.2MF / 50V
R154 47
C113 220MF / 25V
C114 220MF / 25V
R156 220K
AUDIO OUT
OMB
ZARAGOZA - SPAIN
Title
80 KHz FILTER
Size B
Document Number
Mod. MR PLATINUM
Rev
Date: Friday, July 25, 2003
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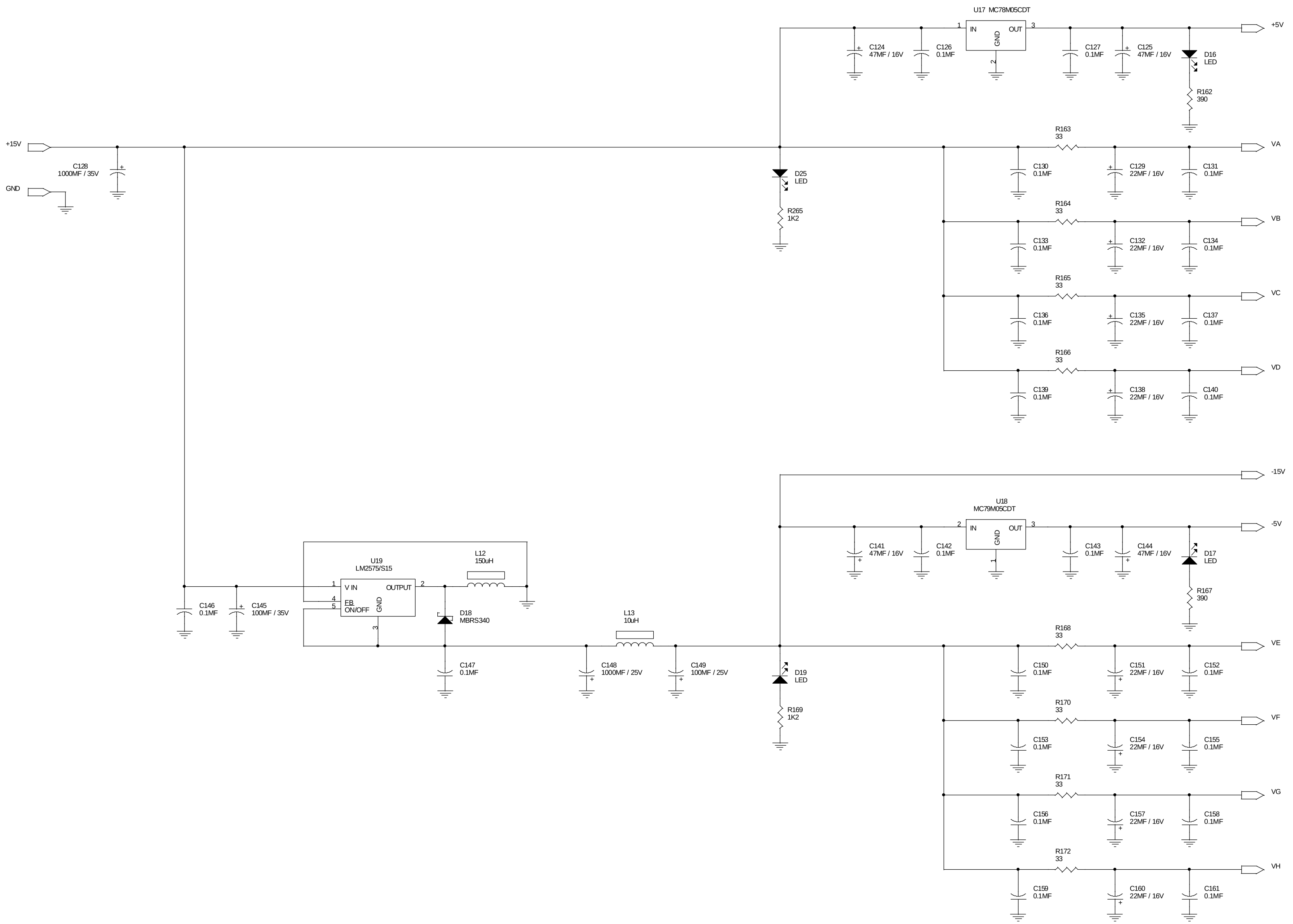

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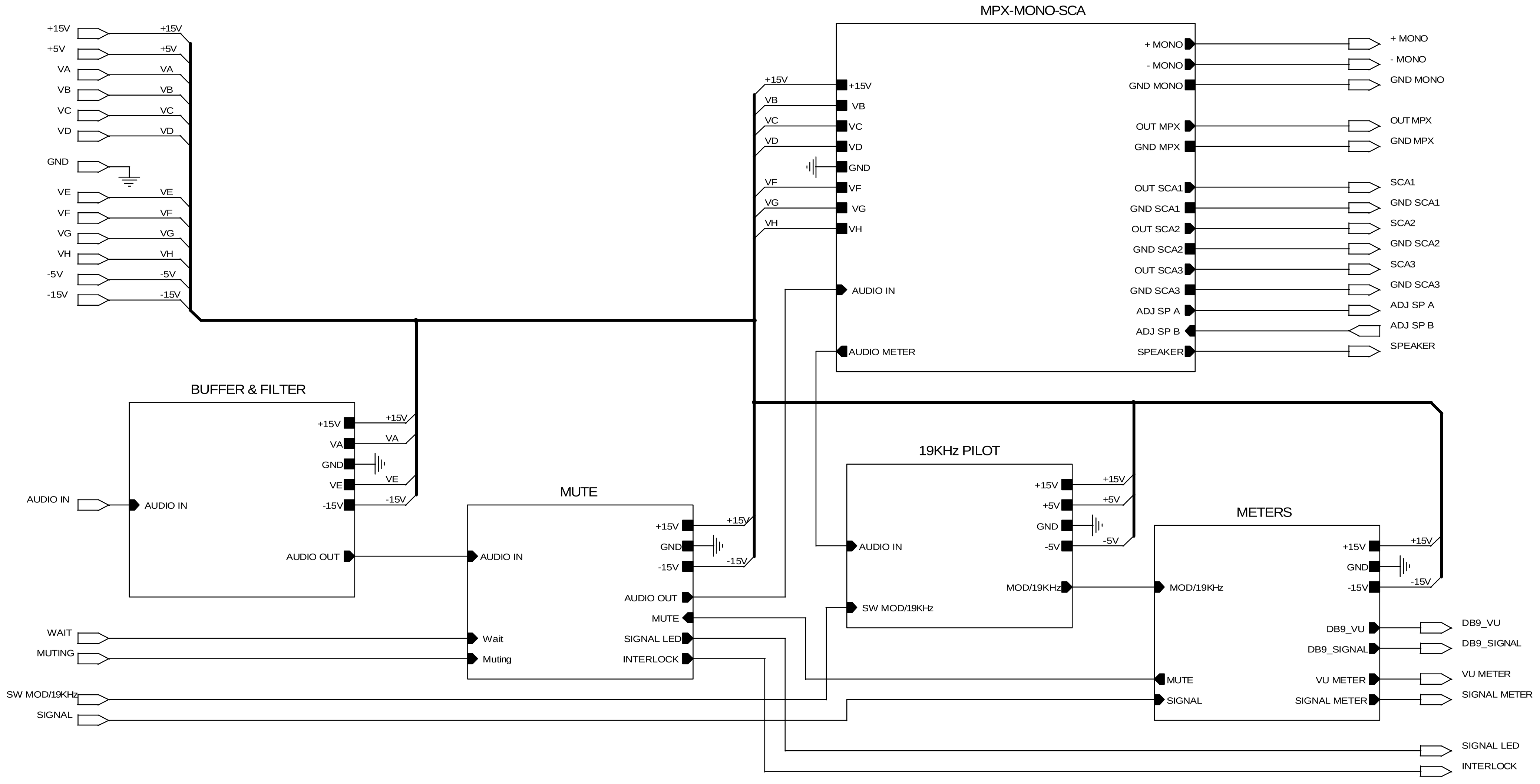
Size C	Document Number	Mod. MR PLATINUM	Rev
Date:	Friday, July 25, 2003	Sheet 8	of 16



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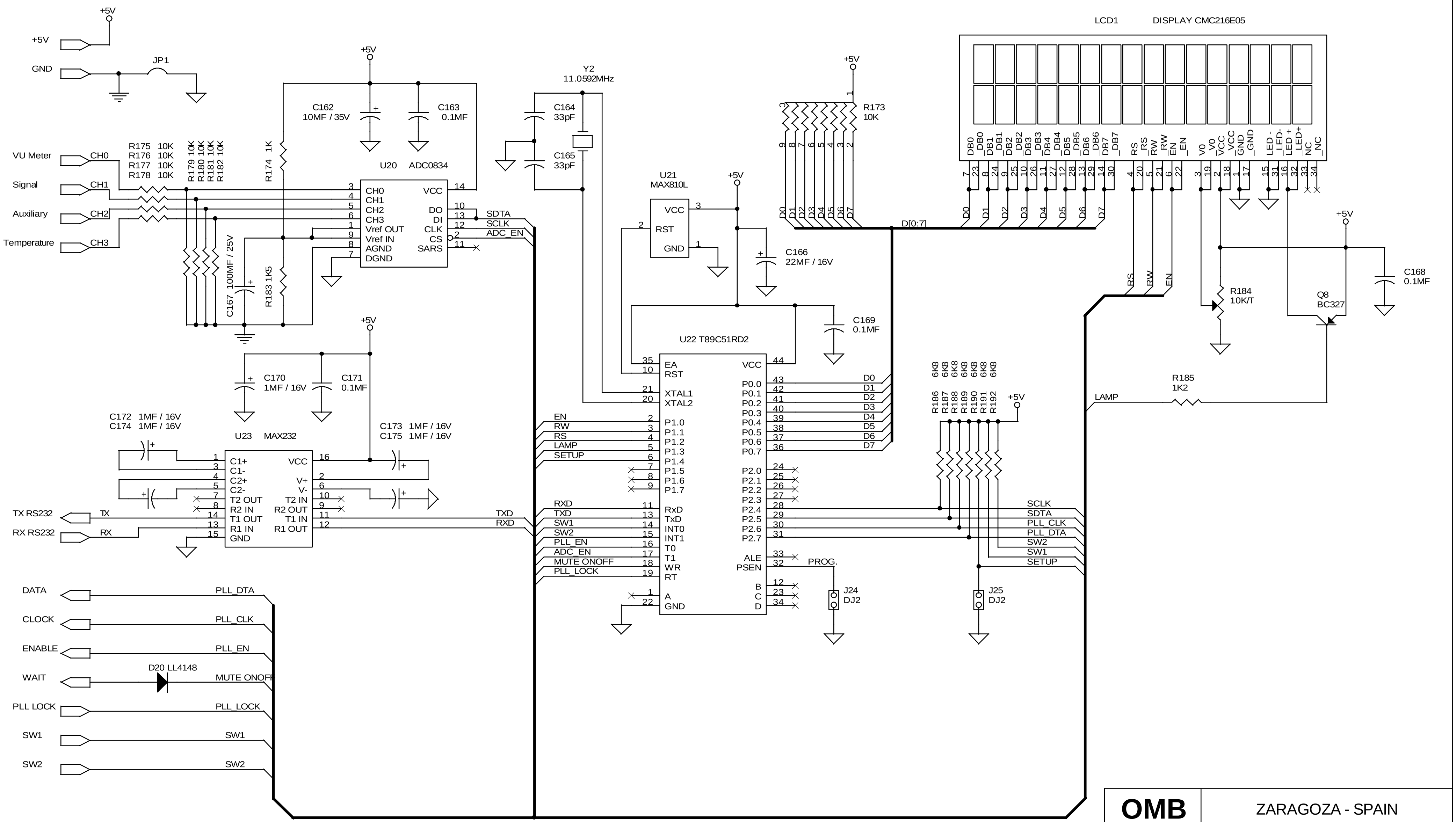
Title: AUDIO			
Size: B	Document Number: MOd. MR PLATINUM		Rev
Date: Friday, July 25, 2003	Sheet 10 of 16		



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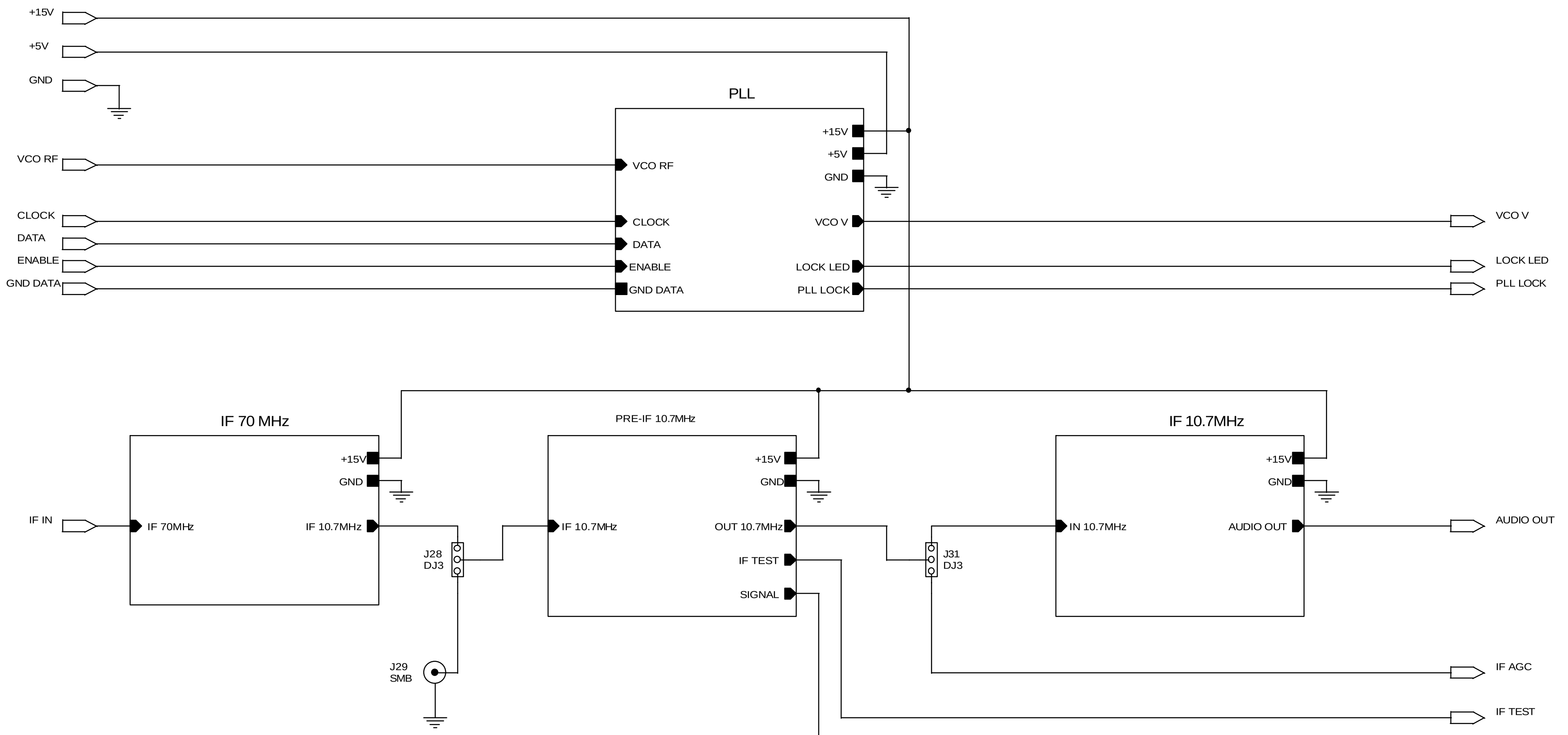
Size: B	Document Number: Mod. MR PLATINUM		Rev
Date: Friday, July 25, 2003	Sheet 11 of 16		



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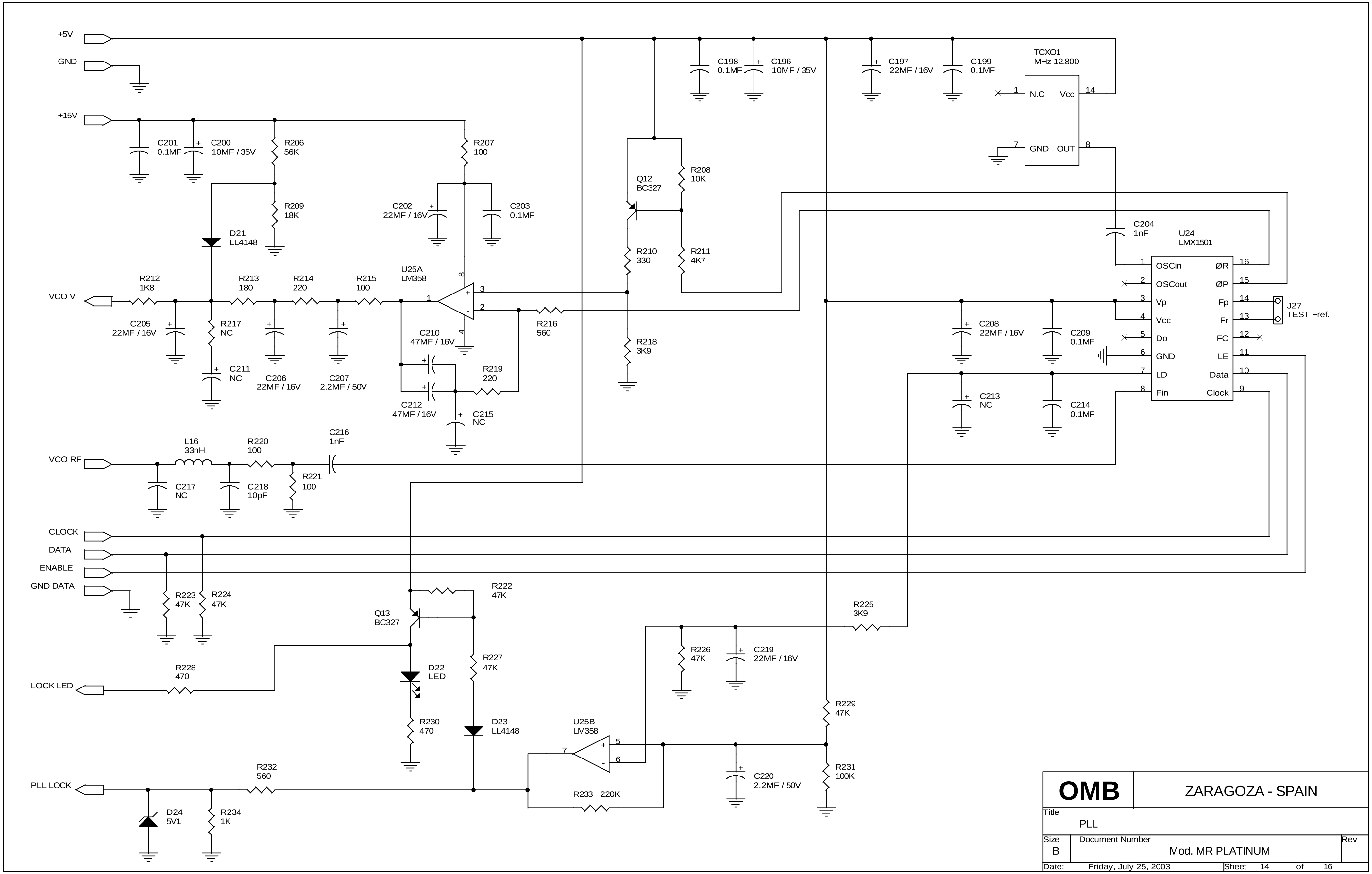
Size: B	Document Number: Mod. MR PLATINUM — Rev
Date: Friday, July 25, 2003	Sheet 12 of 16



+5V
GND
+15V
VCO V
VCO RF
CLOCK
DATA
ENABLE
GND DATA
LOCK LED
PLL LOCK
C201 0.1MF
C200 10MF / 35V
R206 56K
R207 100
R209 18K
D21 LL4148
C202 22MF / 16V
C203 0.1MF
R212 1K8
R213 180
R214 220
R215 100
U25A LM358
C205 22MF / 16V
R217 NC
C211 NC
C206 22MF / 16V
C207 2.2MF / 50V
C210 47MF / 16V
C212 47MF / 16V
R219 220
C215 NC
R216 560
Q12 BC327
R208 10K
R210 330
R211 4K7
R218 3K9
C198 0.1MF
C196 10MF / 35V
C197 22MF / 16V
C199 0.1MF
TCXO1 MHz 12.800
N.C
Vcc
GND
OUT
C204 1nF
U24 LMX1501
OSCin
OSCout
Vp
Vcc
Do
GND
LD
Fin
ØR
ØP
Fp
Fr
FC
LE
Data
Clock
J27 TEST Fref.
C208 22MF / 16V
C209 0.1MF
C213 NC
C214 0.1MF
L16 33nH
R220 100
C216 1nF
C217 NC
C218 10pF
R221 100
R223 47K
R224 47K
R222 47K
Q13 BC327
R227 47K
D22 LED
R228 470
R230 470
D23 LL4148
R225 3K9
R226 47K
C219 22MF / 16V
R229 47K
U25B LM358
R231 100K
C220 2.2MF / 50V
R232 560
R233 220K
D24 5V1
R234 1K
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ZARAGOZA - SPAIN
Title
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Size
B
Document Number
Mod. MR PLATINUM
Rev
Date: Friday, July 25, 2003
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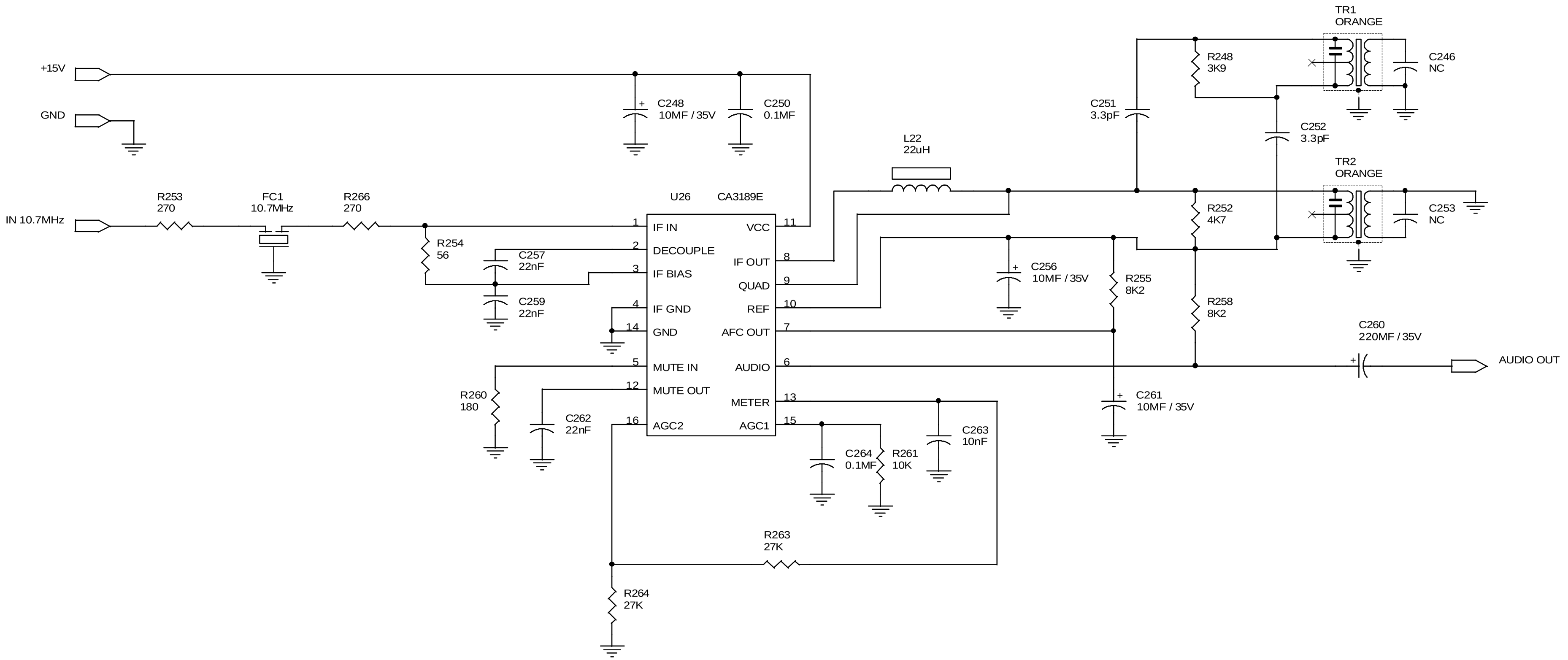

OMB	ZARAGOZA - SPAIN
Title: IF 10.7 MHz	
Size: B	Document Number: Mod. MR PLATINUM	Rev
Date: Friday, July 25, 2003	Sheet 16 of 16

Part List Schematic : Main Board MR PLATINUM

Rif.	Value	Remarks	Description	Code
C1	1nF		SMD Multilayer Ceramic Capacitor	
C2	1nF		SMD Multilayer Ceramic Capacitor	
C3	1nF		SMD Multilayer Ceramic Capacitor	
C4	1nF		SMD Multilayer Ceramic Capacitor	
C5	39pF		SMD Multilayer Ceramic Capacitor	
C6	39pF		SMD Multilayer Ceramic Capacitor	
C7	1nF		SMD Multilayer Ceramic Capacitor	
C8	1nF		SMD Multilayer Ceramic Capacitor	
C9	39pF		SMD Multilayer Ceramic Capacitor	
C10	39pF		SMD Multilayer Ceramic Capacitor	
C11	1nF		SMD Multilayer Ceramic Capacitor	
C12	1nF		SMD Multilayer Ceramic Capacitor	
C13	1nF		SMD Multilayer Ceramic Capacitor	
C14	1nF		SMD Multilayer Ceramic Capacitor	
C15	1nF		SMD Multilayer Ceramic Capacitor	
C16	1nF		SMD Multilayer Ceramic Capacitor	
C17	1nF		SMD Multilayer Ceramic Capacitor	
C18	1nF		SMD Multilayer Ceramic Capacitor	
C19	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C20	0.1MF		SMD Multilayer Ceramic Capacitor	
C21	0.1MF		SMD Multilayer Ceramic Capacitor	
C22	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C23	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C24	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C25	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C26	10pF		SMD Multilayer Ceramic Capacitor	
C27	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C28	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C29	0.1MF		SMD Multilayer Ceramic Capacitor	
C30	0.1MF		SMD Multilayer Ceramic Capacitor	
C31	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C32	1MF / 50V		SMD Aluminium Electrolytic Capacitor	
C33	1MF / 50V		SMD Aluminium Electrolytic Capacitor	
C34	1MF / 50V		SMD Aluminium Electrolytic Capacitor	
C35	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C36	0.1MF		SMD Multilayer Ceramic Capacitor	
C37	220pF		SMD Multilayer Ceramic Capacitor	
C38	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C39	47pF		SMD Multilayer Ceramic Capacitor	
C40	47pF		SMD Multilayer Ceramic Capacitor	
C41	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C42	0.1MF		SMD Multilayer Ceramic Capacitor	
C43	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C44	1nF		SMD Multilayer Ceramic Capacitor	
C45	0.1MF		SMD Multilayer Ceramic Capacitor	
C46	0.1MF		SMD Multilayer Ceramic Capacitor	
C47	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C48	0.1MF		SMD Multilayer Ceramic Capacitor	
C49	1000MF / 16V		Aluminium Electrolytic Capacitor	

Rif.	Value	Remarks	Description	Code
C50	1000MF / 16V		Aluminium Electrolytic Capacitor	
C51	10pF		SMD Multilayer Ceramic Capacitor	
C52	1nF		SMD Multilayer Ceramic Capacitor	
C53	1nF		SMD Multilayer Ceramic Capacitor	
C54	47pF		SMD Multilayer Ceramic Capacitor	
C55	10pF		SMD Multilayer Ceramic Capacitor	
C56	1nF		SMD Multilayer Ceramic Capacitor	
C57	10÷60pF		Trimmer Polyethylene Film Capacitor	
C58	10pF		SMD Multilayer Ceramic Capacitor	
C59	1nF		SMD Multilayer Ceramic Capacitor	
C60	10pF		SMD Multilayer Ceramic Capacitor	
C61	1nF		SMD Multilayer Ceramic Capacitor	
C62	1000MF / 16V		Aluminium Electrolytic Capacitor	
C63	1000MF / 16V		Aluminium Electrolytic Capacitor	
C64	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C65	0.1MF		SMD Multilayer Ceramic Capacitor	
C66	4.7nF		Polyester Capacitor	
C67	22pF		SMD Multilayer Ceramic Capacitor	
C68	6.8nF		Polyester Capacitor	
C69	1000MF / 16V		Aluminium Electrolytic Capacitor	
C70	1000MF / 16V		Aluminium Electrolytic Capacitor	
C71	220MF / 25V		Aluminium Electrolytic Capacitor	
C72	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C73	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C74	47nF		SMD Multilayer Ceramic Capacitor	
C75	3.3pF		SMD Multilayer Ceramic Capacitor	
C76	10pF		SMD Multilayer Ceramic Capacitor	
C77	0.1MF		SMD Multilayer Ceramic Capacitor	
C78	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C79	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C80	0.1MF		SMD Multilayer Ceramic Capacitor	
C81	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C82	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C83	0.1MF		SMD Multilayer Ceramic Capacitor	
C84	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C85	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C86	0.1MF		SMD Multilayer Ceramic Capacitor	
C87	0.1MF		SMD Multilayer Ceramic Capacitor	
C88	0.1MF		SMD Multilayer Ceramic Capacitor	
C89	220pF		SMD Multilayer Ceramic Capacitor	
C90	220pF		SMD Multilayer Ceramic Capacitor	
C91	220pF		SMD Multilayer Ceramic Capacitor	
C92	NC			
C93	2.2nF		SMD Multilayer Ceramic Capacitor	
C94	2.2nF		SMD Multilayer Ceramic Capacitor	
C95	2.2nF		SMD Multilayer Ceramic Capacitor	
C96	2.2nF		SMD Multilayer Ceramic Capacitor	
C97	NC			
C98	100pF		SMD Multilayer Ceramic Capacitor	
C99	470pF		SMD Multilayer Ceramic Capacitor	
C100	470pF		SMD Multilayer Ceramic Capacitor	
C101	220pF		SMD Multilayer Ceramic Capacitor	
C102	10pF		SMD Multilayer Ceramic Capacitor	

Rif.	Value	Remarks	Description	Code
C103	220MF / 25V		Aluminium Electrolytic Capacitor	
C104	0.1MF		SMD Multilayer Ceramic Capacitor	
C105	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C106	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C107	0.1MF		SMD Multilayer Ceramic Capacitor	
C108	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C109	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C110	0.1MF		SMD Multilayer Ceramic Capacitor	
C111	0.1MF		SMD Multilayer Ceramic Capacitor	
C112	220MF / 25V		Aluminium Electrolytic Capacitor	
C113	220MF / 25V		Aluminium Electrolytic Capacitor	
C114	220MF / 25V		Aluminium Electrolytic Capacitor	
C115	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C116	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C117	10pF		SMD Multilayer Ceramic Capacitor	
C118	10pF		SMD Multilayer Ceramic Capacitor	
C119	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C120	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C121	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C122	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C123	10pF		SMD Multilayer Ceramic Capacitor	
C124	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C125	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C126	0.1MF		SMD Multilayer Ceramic Capacitor	
C127	0.1MF		SMD Multilayer Ceramic Capacitor	
C128	1000MF / 35V		Aluminium Electrolytic Capacitor	
C129	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C130	0.1MF		SMD Multilayer Ceramic Capacitor	
C131	0.1MF		SMD Multilayer Ceramic Capacitor	
C132	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C133	0.1MF		SMD Multilayer Ceramic Capacitor	
C134	0.1MF		SMD Multilayer Ceramic Capacitor	
C135	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C136	0.1MF		SMD Multilayer Ceramic Capacitor	
C137	0.1MF		SMD Multilayer Ceramic Capacitor	
C138	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C139	0.1MF		SMD Multilayer Ceramic Capacitor	
C140	0.1MF		SMD Multilayer Ceramic Capacitor	
C141	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C142	0.1MF		SMD Multilayer Ceramic Capacitor	
C143	0.1MF		SMD Multilayer Ceramic Capacitor	
C144	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C145	100MF / 35V		Aluminium Electrolytic Capacitor	
C146	0.1MF		SMD Multilayer Ceramic Capacitor	
C147	0.1MF		SMD Multilayer Ceramic Capacitor	
C148	1000MF / 25V		Aluminium Electrolytic Capacitor	
C149	100MF / 25V		Aluminium Electrolytic Capacitor	
C150	0.1MF		SMD Multilayer Ceramic Capacitor	
C151	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C152	0.1MF		SMD Multilayer Ceramic Capacitor	
C153	0.1MF		SMD Multilayer Ceramic Capacitor	
C154	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C155	0.1MF		SMD Multilayer Ceramic Capacitor	

OMB

Rif.	Value	Remarks	Description	Code
C156	0.1MF		SMD Multilayer Ceramic Capacitor	
C157	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C158	0.1MF		SMD Multilayer Ceramic Capacitor	
C159	0.1MF		SMD Multilayer Ceramic Capacitor	
C160	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C161	0.1MF		SMD Multilayer Ceramic Capacitor	
C162	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C163	0.1MF		SMD Multilayer Ceramic Capacitor	
C164	33pF		SMD Multilayer Ceramic Capacitor	
C165	33pF		SMD Multilayer Ceramic Capacitor	
C166	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C167	100MF / 25V		Aluminium Electrolytic Capacitor	
C168	0.1MF		SMD Multilayer Ceramic Capacitor	
C169	0.1MF		SMD Multilayer Ceramic Capacitor	
C170	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C171	0.1MF		SMD Multilayer Ceramic Capacitor	
C172	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C173	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C174	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C175	1MF / 16V		SMD Aluminium Electrolytic Capacitor	
C176	0.1MF		SMD Multilayer Ceramic Capacitor	
C177	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C178	470pF		SMD Multilayer Ceramic Capacitor	
C179	47pF		SMD Multilayer Ceramic Capacitor	
C180	100pF		SMD Multilayer Ceramic Capacitor	
C181	4.7nF		SMD Multilayer Ceramic Capacitor	
C182	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C183	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C184	0.1MF		SMD Multilayer Ceramic Capacitor	
C185	1nF		SMD Multilayer Ceramic Capacitor	
C186	22nF		SMD Multilayer Ceramic Capacitor	
C187	22nF		SMD Multilayer Ceramic Capacitor	
C188	0.1MF		SMD Multilayer Ceramic Capacitor	
C189	22nF		SMD Multilayer Ceramic Capacitor	
C190	470pF		SMD Multilayer Ceramic Capacitor	
C191	0.1MF		SMD Multilayer Ceramic Capacitor	
C192	1nF		SMD Multilayer Ceramic Capacitor	
C193	0.1MF		SMD Multilayer Ceramic Capacitor	
C195	0.1MF		SMD Multilayer Ceramic Capacitor	
C196	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C197	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C198	0.1MF		SMD Multilayer Ceramic Capacitor	
C199	0.1MF		SMD Multilayer Ceramic Capacitor	
C200	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C201	0.1MF		SMD Multilayer Ceramic Capacitor	
C202	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C203	0.1MF		SMD Multilayer Ceramic Capacitor	
C204	1nF		SMD Multilayer Ceramic Capacitor	
C205	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C206	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C207	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C208	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C209	0.1MF		SMD Multilayer Ceramic Capacitor	

OMB

Rif.	Value	Remarks	Description	Code
C210	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C211	NC		SMD Multilayer Ceramic Capacitor	
C212	47MF / 16V		SMD Aluminium Electrolytic Capacitor	
C213	NC		SMD Multilayer Ceramic Capacitor	
C214	0.1MF		SMD Multilayer Ceramic Capacitor	
C215	NC		SMD Multilayer Ceramic Capacitor	
C216	1nF		SMD Multilayer Ceramic Capacitor	
C217	NC		SMD Multilayer Ceramic Capacitor	
C218	10pF		SMD Multilayer Ceramic Capacitor	
C219	22MF / 16V		SMD Aluminium Electrolytic Capacitor	
C220	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C221	1nF		SMD Multilayer Ceramic Capacitor	
C222	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C223	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C224	0.1MF		SMD Multilayer Ceramic Capacitor	
C225	0.1MF		SMD Multilayer Ceramic Capacitor	
C226	3.3pF		SMD Multilayer Ceramic Capacitor	
C227	1pF		SMD Multilayer Ceramic Capacitor	
C228	6.8pF		SMD Multilayer Ceramic Capacitor	
C229	6.8pF		SMD Multilayer Ceramic Capacitor	
C230	1pF		SMD Multilayer Ceramic Capacitor	
C231	3.3pF		SMD Multilayer Ceramic Capacitor	
C232	10pF		SMD Multilayer Ceramic Capacitor	
C233	10pF		SMD Multilayer Ceramic Capacitor	
C234	100pF		SMD Multilayer Ceramic Capacitor	
C235	10pF		SMD Multilayer Ceramic Capacitor	
C236	10pF		SMD Multilayer Ceramic Capacitor	
C237	10nF		SMD Multilayer Ceramic Capacitor	
C238	10nF		SMD Multilayer Ceramic Capacitor	
C239	47pF		SMD Multilayer Ceramic Capacitor	
C240	2.2MF / 50V		SMD Aluminium Electrolytic Capacitor	
C241	0.1MF		SMD Multilayer Ceramic Capacitor	
C242	47pF		SMD Multilayer Ceramic Capacitor	
C243	22pF		SMD Multilayer Ceramic Capacitor	
C244	1nF		SMD Multilayer Ceramic Capacitor	
C245	220pF		SMD Multilayer Ceramic Capacitor	
C246	NC		SMD Multilayer Ceramic Capacitor	
C247	3.3pF		SMD Multilayer Ceramic Capacitor	
C248	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C249	1nF		SMD Multilayer Ceramic Capacitor	
C250	0.1MF		SMD Multilayer Ceramic Capacitor	
C251	3.3pF		SMD Multilayer Ceramic Capacitor	
C252	3.3pF		SMD Multilayer Ceramic Capacitor	
C253	NC		SMD Multilayer Ceramic Capacitor	
C255	0.1MF		SMD Multilayer Ceramic Capacitor	
C256	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C257	22nF		SMD Multilayer Ceramic Capacitor	
C258	100pF		SMD Multilayer Ceramic Capacitor	
C259	22nF		SMD Multilayer Ceramic Capacitor	
C260	220MF / 35V		Aluminium Electrolytic Capacitor	
C261	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C262	22nF		SMD Multilayer Ceramic Capacitor	
C263	10nF		SMD Multilayer Ceramic Capacitor	

OMB

Rif.	Value	Remarks	Description	Code
C264	0.1MF		SMD Multilayer Ceramic Capacitor	
C265	10MF / 35V		SMD Aluminium Electrolytic Capacitor	
C266	NC		SMD Multilayer Ceramic Capacitor	
C267	100pF		SMD Multilayer Ceramic Capacitor	
C268	470pF		SMD Multilayer Ceramic Capacitor	
C269	470pF		SMD Multilayer Ceramic Capacitor	
C271	22nF		SMD Multilayer Ceramic Capacitor	
L1	CHOKE		Suppression Choke	
L2	10uH		Ferrite Drum Cored Inductor	
L3	CHOKE		Suppression Choke	
L4	10uH		Ferrite Drum Cored Inductor	
L5	10uH		Ferrite Drum Cored Inductor	
L6	CHOKE		Suppression Choke	
L7	10uH		Ferrite Drum Cored Inductor	
L8	10uH		Ferrite Drum Cored Inductor	
L9	10uH		Ferrite Drum Cored Inductor	
L10	2.2mH		Ferrite Drum Cored Inductor	
L11	2.2mH		Ferrite Drum Cored Inductor	
L12	150uH		Ferrite Drum Cored Inductor	
L13	10uH		Ferrite Drum Cored Inductor	
L16	33nH		Resistor 0	
L17	6T/0.6D		Ferrite Drum Cored Inductor	
L18	6T/0.6D		Ferrite Drum Cored Inductor	
L19	6T/0.6D		Ferrite Drum Cored Inductor	
L20	6T/0.6D		Ferrite Drum Cored Inductor	
L21	6T/0.6D		Ferrite Drum Cored Inductor	
L22	22uH		Ferrite Drum Cored Inductor	
R1	1K2	1/4W	SMD Thick Film Resistor	
R2	2K2	1/4W	SMD Thick Film Resistor	
R3	2K2	1/4W	SMD Thick Film Resistor	
R4	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R5	10K	1/4W	SMD Thick Film Resistor	
R6	27K	1/4W	SMD Thick Film Resistor	
R7	33	1/4W	SMD Thick Film Resistor	
R8	470	1/4W	SMD Thick Film Resistor	
R9	47K	1/4W	SMD Thick Film Resistor	
R10	47K	1/4W	SMD Thick Film Resistor	
R11	47K	1/4W	SMD Thick Film Resistor	
R12	27K	1/4W	SMD Thick Film Resistor	
R13	47K	1/4W	SMD Thick Film Resistor	
R14	15K	1/4W	SMD Thick Film Resistor	
R15	10K/V	1/4W	Multi Turn Cermet Trimmer Resistor	
R16	47K	1/4W	SMD Thick Film Resistor	
R17	27K	1/4W	SMD Thick Film Resistor	
R18	33	1/4W	SMD Thick Film Resistor	
R19	33	1/4W	SMD Thick Film Resistor	
R20	27K	1/4W	SMD Thick Film Resistor	
R21	47K	1/4W	SMD Thick Film Resistor	
R22	47K	1/4W	SMD Thick Film Resistor	
R23	27K	1/4W	SMD Thick Film Resistor	
R24	470	1/4W	SMD Thick Film Resistor	

OMB

Rif.	Value	Remarks	Description	Code
R25	47K	1/4W	SMD Thick Film Resistor	
R26	220K	1/4W	SMD Thick Film Resistor	
R27	100K	1/4W	SMD Thick Film Resistor	
R28	47K	1/4W	SMD Thick Film Resistor	
R29	560K	1/4W	SMD Thick Film Resistor	
R30	100K	1/4W	SMD Thick Film Resistor	
R31	100K	1/4W	SMD Thick Film Resistor	
R32	560K	1/4W	SMD Thick Film Resistor	
R33	27K	1/4W	SMD Thick Film Resistor	
R34	27K	1/4W	SMD Thick Film Resistor	
R35	100K	1/4W	SMD Thick Film Resistor	
R36	27K	1/4W	SMD Thick Film Resistor	
R37	4K7	1/4W	SMD Thick Film Resistor	
R38	47K	1/4W	SMD Thick Film Resistor	
R39	560	1/4W	SMD Thick Film Resistor	
R40	560	1/4W	SMD Thick Film Resistor	
R41	560	1/4W	SMD Thick Film Resistor	
R42	6K8	1/4W	SMD Thick Film Resistor	
R43	12K	1/4W	SMD Thick Film Resistor	
R44	27K	1/4W	SMD Thick Film Resistor	
R45	27K	1/4W	SMD Thick Film Resistor	
R46	2K2	1/4W	SMD Thick Film Resistor	
R47	47	1/4W	SMD Thick Film Resistor	
R48	220K	1/4W	SMD Thick Film Resistor	
R49	100K	1/4W	SMD Thick Film Resistor	
R50	1K2	1/4W	SMD Thick Film Resistor	
R51	220K	1/4W	SMD Thick Film Resistor	
R52	20K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R53	1K2	1/4W	SMD Thick Film Resistor	
R54	2K2	1/4W	SMD Thick Film Resistor	
R55	20K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R56	330	1/4W	SMD Thick Film Resistor	
R57	12K	1/4W	SMD Thick Film Resistor	
R58	470K	1/4W	SMD Thick Film Resistor	
R59	6K8	1/4W	SMD Thick Film Resistor	
R60	470	1/4W	SMD Thick Film Resistor	
R61	470	1/4W	SMD Thick Film Resistor	
R62	47	1/4W	SMD Thick Film Resistor	
R63	1K	1/4W	SMD Thick Film Resistor	
R64	47K	1/4W	SMD Thick Film Resistor	
R65	27K	1/4W	SMD Thick Film Resistor	
R66	47K	1/4W	SMD Thick Film Resistor	
R67	27K	1/4W	SMD Thick Film Resistor	
R68	27K	1/4W	SMD Thick Film Resistor	
R69	47K	1/4W	SMD Thick Film Resistor	
R70	27K	1/4W	SMD Thick Film Resistor	
R71	1K8	1/4W	SMD Thick Film Resistor	
R72	47	1/4W	SMD Thick Film Resistor	
R73	3K3	1/4W	SMD Thick Film Resistor	
R74	47K	1/4W	SMD Thick Film Resistor	
R75	10K	1/4W	SMD Thick Film Resistor	
R76	10K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R77	3K3	1/4W	SMD Thick Film Resistor	

Rif.	Value	Remarks	Description	Code
R78	10K	1/4W	SMD Thick Film Resistor	
R79	10K/V	1/4W	Multi Turn Cermet Trimmer Resistor	
R80	10K	1/4W	SMD Thick Film Resistor	
R81	47	1/4W	SMD Thick Film Resistor	
R82	1K	1/4W	SMD Thick Film Resistor	
R83	4K7	1/4W	SMD Thick Film Resistor	
R84	18K	1/4W	SMD Thick Film Resistor	
R85	1K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R86	27K	1/4W	SMD Thick Film Resistor	
R87	18K	1/4W	SMD Thick Film Resistor	
R88	10K	1/4W	SMD Thick Film Resistor	
R89	47	1/4W	SMD Thick Film Resistor	
R90	1K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R91	27K	1/4W	SMD Thick Film Resistor	
R92	4K7	1/4W	SMD Thick Film Resistor	
R93	47	1/4W	SMD Thick Film Resistor	
R94	1K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R95	33	1/4W	SMD Thick Film Resistor	
R96	33	1/4W	SMD Thick Film Resistor	
R97	4K7	1/4W	SMD Thick Film Resistor	
R98	3K9	1/4W	SMD Thick Film Resistor	
R99	47	1/4W	SMD Thick Film Resistor	
R100	10K	1/4W	SMD Thick Film Resistor	
R101	47K	1/4W	SMD Thick Film Resistor	
R102	10K	1/4W	SMD Thick Film Resistor	
R103	10K	1/4W	SMD Thick Film Resistor	
R104	39K	1/4W	SMD Thick Film Resistor	
R105	22	1/4W	SMD Thick Film Resistor	
R106	10K	1/4W	SMD Thick Film Resistor	
R107	47K	1/4W	SMD Thick Film Resistor	
R108	10K/H	1/4W	Multi Turn Cermet Trimmer Resistor	
R109	1K2	1/4W	SMD Thick Film Resistor	
R110	6K8	1/4W	SMD Thick Film Resistor	
R111	47	1/4W	SMD Thick Film Resistor	
R113	47K	1/4W	SMD Thick Film Resistor	
R114	10K	1/4W	SMD Thick Film Resistor	
R115	22	1/4W	SMD Thick Film Resistor	
R116	22	1/4W	SMD Thick Film Resistor	
R117	4K7	1/4W	SMD Thick Film Resistor	
R118	8K2	1/4W	SMD Thick Film Resistor	
R119	4K7	1/4W	SMD Thick Film Resistor	
R120	560	1/4W	SMD Thick Film Resistor	
R121	10K	1/4W	SMD Thick Film Resistor	
R122	10K	1/4W	SMD Thick Film Resistor	
R123	680	1/4W	SMD Thick Film Resistor	
R124	47K	1/4W	SMD Thick Film Resistor	
R125	10K	1/4W	SMD Thick Film Resistor	
R126	100	1/4W	SMD Thick Film Resistor	
R127	100	1/4W	SMD Thick Film Resistor	
R128	100	1/4W	SMD Thick Film Resistor	
R129	100	1/4W	SMD Thick Film Resistor	
R130	100	1/4W	SMD Thick Film Resistor	
R131	100	1/4W	SMD Thick Film Resistor	

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Rif.	Value	Remarks	Description	Code
R132	2K2	1/4W	SMD Thick Film Resistor	
R133	470	1/4W	SMD Thick Film Resistor	
R134	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R135	2K2	1/4W	SMD Thick Film Resistor	
R136	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R137	330	1/4W	SMD Thick Film Resistor	
R138	1K5	1/4W	SMD Thick Film Resistor	
R139	470	1/4W	SMD Thick Film Resistor	
R140	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R141	10K	1/4W	SMD Thick Film Resistor	
R142	10K	1/4W	SMD Thick Film Resistor	
R143	10K	1/4W	SMD Thick Film Resistor	
R144	10K	1/4W	SMD Thick Film Resistor	
R145	10K	1/4W	SMD Thick Film Resistor	
R146	2K2	1/4W	SMD Thick Film Resistor	
R147	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R148	22K	1/4W	SMD Thick Film Resistor	
R149	100	1/4W	SMD Thick Film Resistor	
R150	100	1/4W	SMD Thick Film Resistor	
R151	100	1/4W	SMD Thick Film Resistor	
R152	100	1/4W	SMD Thick Film Resistor	
R153	220K	1/4W	SMD Thick Film Resistor	
R154	47	1/4W	SMD Thick Film Resistor	
R155	22K	1/4W	SMD Thick Film Resistor	
R156	220K	1/4W	SMD Thick Film Resistor	
R157	470K	1/4W	SMD Thick Film Resistor	
R158	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	
R159	10K	1/4W	SMD Thick Film Resistor	
R160	68K	1/4W	SMD Thick Film Resistor	
R161	10K	1/4W	SMD Thick Film Resistor	
R162	390	1/4W	SMD Thick Film Resistor	
R163	33	1/4W	SMD Thick Film Resistor	
R164	33	1/4W	SMD Thick Film Resistor	
R165	33	1/4W	SMD Thick Film Resistor	
R166	33	1/4W	SMD Thick Film Resistor	
R167	390	1/4W	SMD Thick Film Resistor	
R168	33	1/4W	SMD Thick Film Resistor	
R169	1K2	1/4W	SMD Thick Film Resistor	
R170	33	1/4W	SMD Thick Film Resistor	
R171	33	1/4W	SMD Thick Film Resistor	
R172	33	1/4W	SMD Thick Film Resistor	
R173	10K	1/4W	SMD Thick Film Resistor	
R174	1K	1/4W	SMD Thick Film Resistor	
R175	10K	1/4W	SMD Thick Film Resistor	
R176	10K	1/4W	SMD Thick Film Resistor	
R177	10K	1/4W	SMD Thick Film Resistor	
R178	10K	1/4W	SMD Thick Film Resistor	
R179	10K	1/4W	SMD Thick Film Resistor	
R180	10K	1/4W	SMD Thick Film Resistor	
R181	10K	1/4W	SMD Thick Film Resistor	
R182	10K	1/4W	SMD Thick Film Resistor	
R183	1K5	1/4W	SMD Thick Film Resistor	
R184	10K/T	1/4W	Cermet Skeleton Trimmer Resistor	

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Rif.	Value	Remarks	Description	Code
R185	1K2	1/4W	SMD Thick Film Resistor	
R186	6K8	1/4W	SMD Thick Film Resistor	
R187	6K8	1/4W	SMD Thick Film Resistor	
R188	6K8	1/4W	SMD Thick Film Resistor	
R189	6K8	1/4W	SMD Thick Film Resistor	
R190	6K8	1/4W	SMD Thick Film Resistor	
R191	6K8	1/4W	SMD Thick Film Resistor	
R192	6K8	1/4W	SMD Thick Film Resistor	
R193	1K	1/4W	SMD Thick Film Resistor	
R194	1K8	1/4W	SMD Thick Film Resistor	
R195	220K	1/4W	SMD Thick Film Resistor	
R196	220K	1/4W	SMD Thick Film Resistor	
R197	47K	1/4W	SMD Thick Film Resistor	
R198	47K	1/4W	SMD Thick Film Resistor	
R199	330	1/4W	SMD Thick Film Resistor	
R200	27K	1/4W	SMD Thick Film Resistor	
R201	10K	1/4W	SMD Thick Film Resistor	
R202	33	1/4W	SMD Thick Film Resistor	
R203	100	1/4W	SMD Thick Film Resistor	
R204	1K	1/4W	SMD Thick Film Resistor	
R205	0	1/4W	SMD Thick Film Resistor	
R206	56K	1/4W	SMD Thick Film Resistor	
R207	100	1/4W	SMD Thick Film Resistor	
R208	10K	1/4W	SMD Thick Film Resistor	
R209	18K	1/4W	SMD Thick Film Resistor	
R210	330	1/4W	SMD Thick Film Resistor	
R211	4K7	1/4W	SMD Thick Film Resistor	
R212	1K8	1/4W	SMD Thick Film Resistor	
R213	180	1/4W	SMD Thick Film Resistor	
R214	220	1/4W	SMD Thick Film Resistor	
R215	100	1/4W	SMD Thick Film Resistor	
R216	560	1/4W	SMD Thick Film Resistor	
R217	NC			
R218	3K9	1/4W	SMD Thick Film Resistor	
R219	220	1/4W	SMD Thick Film Resistor	
R220	100	1/4W	SMD Thick Film Resistor	
R221	100	1/4W	SMD Thick Film Resistor	
R222	47K	1/4W	SMD Thick Film Resistor	
R223	47K	1/4W	SMD Thick Film Resistor	
R224	47K	1/4W	SMD Thick Film Resistor	
R225	3K9	1/4W	SMD Thick Film Resistor	
R226	47K	1/4W	SMD Thick Film Resistor	
R227	47K	1/4W	SMD Thick Film Resistor	
R228	470	1/4W	SMD Thick Film Resistor	
R229	47K	1/4W	SMD Thick Film Resistor	
R230	470	1/4W	SMD Thick Film Resistor	
R231	100K	1/4W	SMD Thick Film Resistor	
R232	560	1/4W	SMD Thick Film Resistor	
R233	220K	1/4W	SMD Thick Film Resistor	
R234	1K	1/4W	SMD Thick Film Resistor	
R235	680	1/4W	SMD Thick Film Resistor	
R236	680	1/4W	SMD Thick Film Resistor	
R237	22K	1/4W	SMD Thick Film Resistor	

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Rif.	Value	Remarks	Description	Code
R238	22K	1/4W	SMD Thick Film Resistor	
R239	3K9	1/4W	SMD Thick Film Resistor	
R240	3K9	1/4W	SMD Thick Film Resistor	
R241	1K5	1/4W	SMD Thick Film Resistor	
R242	82	1/4W	SMD Thick Film Resistor	
R243	1K5	1/4W	SMD Thick Film Resistor	
R244	680	1/4W	SMD Thick Film Resistor	
R245	15K	1/4W	SMD Thick Film Resistor	
R246	4K7	1/4W	SMD Thick Film Resistor	
R247	220	1/4W	SMD Thick Film Resistor	
R248	3K9	1/4W	SMD Thick Film Resistor	
R249	10K	1/4W	SMD Thick Film Resistor	
R250	100K	1/4W	SMD Thick Film Resistor	
R251	330	1/4W	SMD Thick Film Resistor	
R252	4K7	1/4W	SMD Thick Film Resistor	
R253	270	1/4W	SMD Thick Film Resistor	
R254	56	1/4W	SMD Thick Film Resistor	
R255	8K2	1/4W	SMD Thick Film Resistor	
R256	100	1/4W	SMD Thick Film Resistor	
R257	3K9	1/4W	SMD Thick Film Resistor	
R258	8K2	1/4W	SMD Thick Film Resistor	
R259	270	1/4W	SMD Thick Film Resistor	
R260	180	1/4W	SMD Thick Film Resistor	
R261	10K	1/4W	SMD Thick Film Resistor	
R262	15K	1/4W	SMD Thick Film Resistor	
R263	27K	1/4W	SMD Thick Film Resistor	
R264	27K	1/4W	SMD Thick Film Resistor	
R265	1K2	1/4W	SMD Thick Film Resistor	
R266	270	1/4W	SMD Thick Film Resistor	
R267	270	1/4W	SMD Thick Film Resistor	
R268	15K	1/4W	SMD Thick Film Resistor	
R269	330	1/4W	SMD Thick Film Resistor	
R271	330	1/4W	SMD Thick Film Resistor	
R272	1K	1/4W	SMD Thick Film Resistor	
R273	27K	1/4W	SMD Thick Film Resistor	
D1	LL4148		SMD Low Power Signal Diode	
D2	LL4148		SMD Low Power Signal Diode	
D3	LL4148		SMD Low Power Signal Diode	
D4	3V3		SMD Diode Zener	
D5	LL4148		SMD Low Power Signal Diode	
D6	LL4148		SMD Low Power Signal Diode	
D7	LL4148		SMD Low Power Signal Diode	
D8	LL4148		SMD Low Power Signal Diode	
D9	12V		SMD Diode Zener	
D10	24V		SMD Diode Zener	
D11	LL4148		SMD Low Power Signal Diode	
D12	24V		SMD Diode Zener	
D13	LL4148		SMD Low Power Signal Diode	
D14	LL4148		SMD Low Power Signal Diode	
D15	LL4148		SMD Low Power Signal Diode	
D16	LED	YELLOW	SMD Light Emitting Diode	
D17	LED	YELLOW	SMD Light Emitting Diode	

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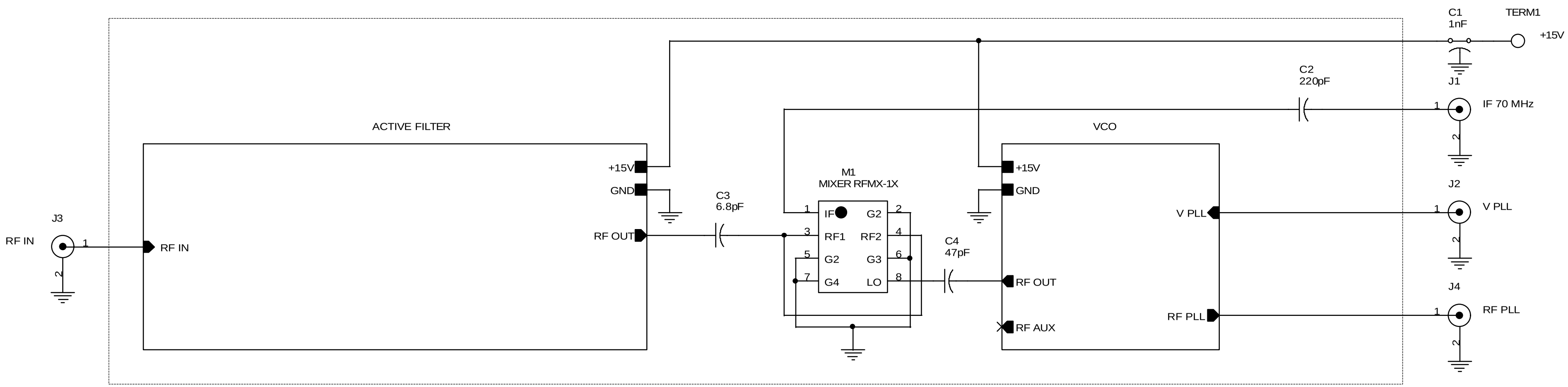
Rif.	Value	Remarks	Description	Code
D18	MBRS340		SMD Switching High Speed Diode	
D19	LED	YELLOW	SMD Light Emitting Diode	
D20	LL4148		SMD Low Power Signal Diode	
D21	LL4148		SMD Low Power Signal Diode	
D22	LED	GREEN	SMD Light Emitting Diode	
D23	LL4148		SMD Low Power Signal Diode	
D24	5V1		SMD Diode Zener	
D25	LED	YELLOW	SMD Light Emitting Diode	
Q1	BC327		Low Power Bipolar Transistor	
Q2	BC327		Low Power Bipolar Transistor	
Q3	BC327		Low Power Bipolar Transistor	
Q4	BC337		Low Power Bipolar Transistor	
Q5	BC337		Low Power Bipolar Transistor	
Q6	BC327		Low Power Bipolar Transistor	
Q7	BC337		Low Power Bipolar Transistor	
Q8	BC327		Low Power Bipolar Transistor	
Q9	2N3819A		JFET	
Q10	BSX20		RF Bipolar Transistor	
Q11	2N3819A		JFET	
Q12	BC327		Low Power Bipolar Transistor	
Q13	BC327		Low Power Bipolar Transistor	
Q14	BF199		RF Bipolar Transistor	
Q15	BF199		RF Bipolar Transistor	
Q16	2N2369A		RF Bipolar Transistor	
Q18	BSX20		RF Bipolar Transistor	
U1	LM358		Operational Amplifier	
U2	LM358		Operational Amplifier	
U3	LM358		Operational Amplifier	
U4	LM358		Operational Amplifier	
U5	SAA6579T			
U6	CD4066			
U7	LF353		Operational Amplifier	
U8	LF353		Operational Amplifier	
U9	LF353		Operational Amplifier	
U10	LM386			
U11	LF353		Operational Amplifier	
U12	LM318		Operational Amplifier	
U13	LM318		Operational Amplifier	
U14	LM318		Operational Amplifier	
U15	TL081		Operational Amplifier	
U16	TL081		Operational Amplifier	
U17	MC78M05CDT		Fixed Voltage Regulator	
U18	MC79M05CDT		Fixed Voltage Regulator	
U19	LM2575/S15		Fixed Voltage Regulator	
U20	ADC0834		A/D Converter	
U21	MAX810L		Special Function Integrated Circuit	
U22	T89C51RD2		Microprocessor	
U23	MAX232		Special Function Integrated Circuit	
U24	LMX1501		Special Function Integrated Circuit	
U25	LM358		Operational Amplifier	
U26	CA3189E		Special Function Integrated Circuit	

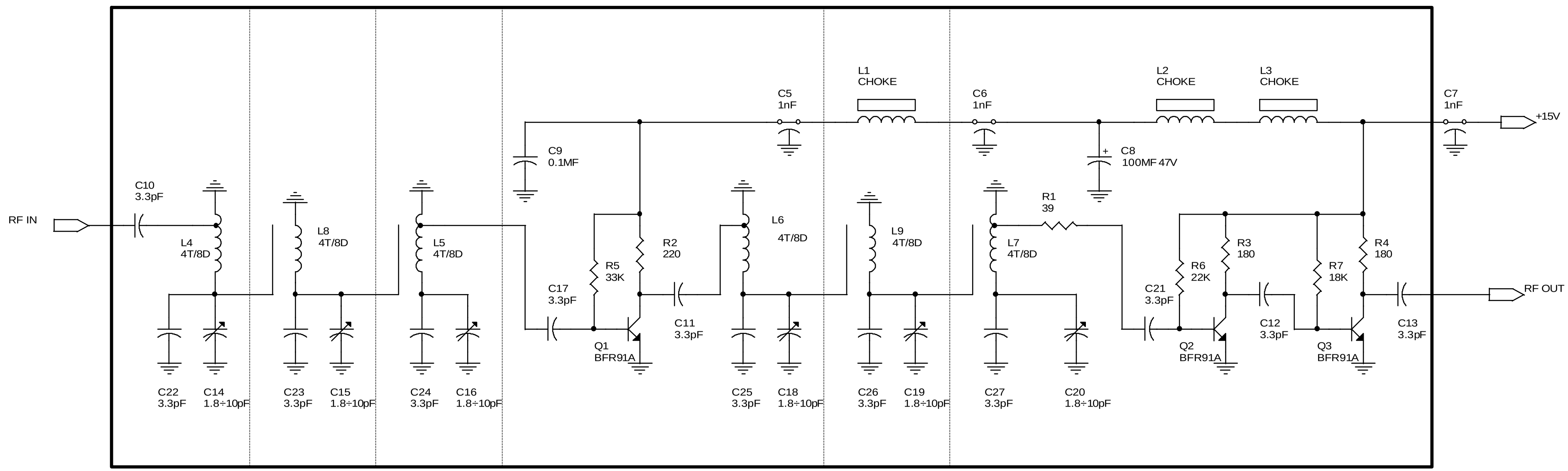
OMB

Rif.	Value	Remarks	Description	Code
U27	TDA1599		Special Function Integrated Circuit	
U28	MC78M09CDT		Fixed Voltage Regulator	
Y1	2.888 MHz		Quartz Crystal	
Y2	11.0592MHz		Quartz Crystal	
Y3	59.300MHz		Quartz Crystal	
TCXO1	MHz 12.800		Crystal Oscillator Module	
FC1	10.7MHz		Ceramic Filter	
FC2	10.7MHz		Ceramic Filter	
FC3	10.7MHz		Ceramic Filter	
J1	NC			
J2	NC			
J3	NC			
J4	DJ3		PCB Pin Strip Header	
J5	NC			
J6	AUX			
J7	NC			
J8	DJ2x8		Male PCB Mounting Header	
J9	NC			
J10	NC			
J11	DB9_AUX		PCB Pin Strip Header	
J12	VCO RF		SMB PCB Jack - 50 Ohm	
J13	VCO V		SMB PCB Jack - 50 Ohm	
J14	IF IN		SMB PCB Jack - 50 Ohm	
J15	DJ3		PCB Pin Strip Header	
J16	AUDIO OUT		SMB PCB Jack - 50 Ohm	
J17	IF AGC		SMB PCB Jack - 50 Ohm	
J18	IF TEST		SMB PCB Jack - 50 Ohm	
J19	DB9		Male PCB Mounting Header	
J20	DJ3		PCB Pin Strip Header	
J21	DJ2X3		PCB Pin Strip Header	
J22	SMB		SMB PCB Jack - 50 Ohm	
J23	SMB		SMB PCB Jack - 50 Ohm	
J24	DJ2		PCB Pin Strip Header	
J25	DJ2		PCB Pin Strip Header	
J27	TEST Fref.		SMB PCB Jack - 50 Ohm	
J28	DJ3		PCB Pin Strip Header	
J29	SMB		SMB PCB Jack - 50 Ohm	
J30	SPEAKER		PCB Pin Strip Header	
J31	DJ3		PCB Pin Strip Header	
J32	50K/M		PCB Pin Strip Header	
SW1	DB9 MONITOR		Microswitcher	
LCD1	DISPLAY		Male PCB Mounting Header	
M1	MIXER RFMX-1X		RF Mixer	
RL1	G2E-184P		PCB Relay	
TR1	ORANGE		RF Transformer	
TR2	ORANGE		RF Transformer	

Rif.	Value	Remarks	Description	Code
TR3	GREEN		RF Transformer	
TR4	GREEN		RF Transformer	
TR5	GREEN		RF Transformer	
TR6	GREEN		RF Transformer	
TR7	GREEN		RF Transformer	



OMB	ZARAGOZA - SPAIN
Title	VCO & ACTIVE FILTER 400 MHz
Size: B	Document Number: Mod. VCO & AFILTER — Rev 1.0
Date: Friday, July 25, 2003	Sheet 1 of 3



OMB	ZARAGOZA - SPAIN
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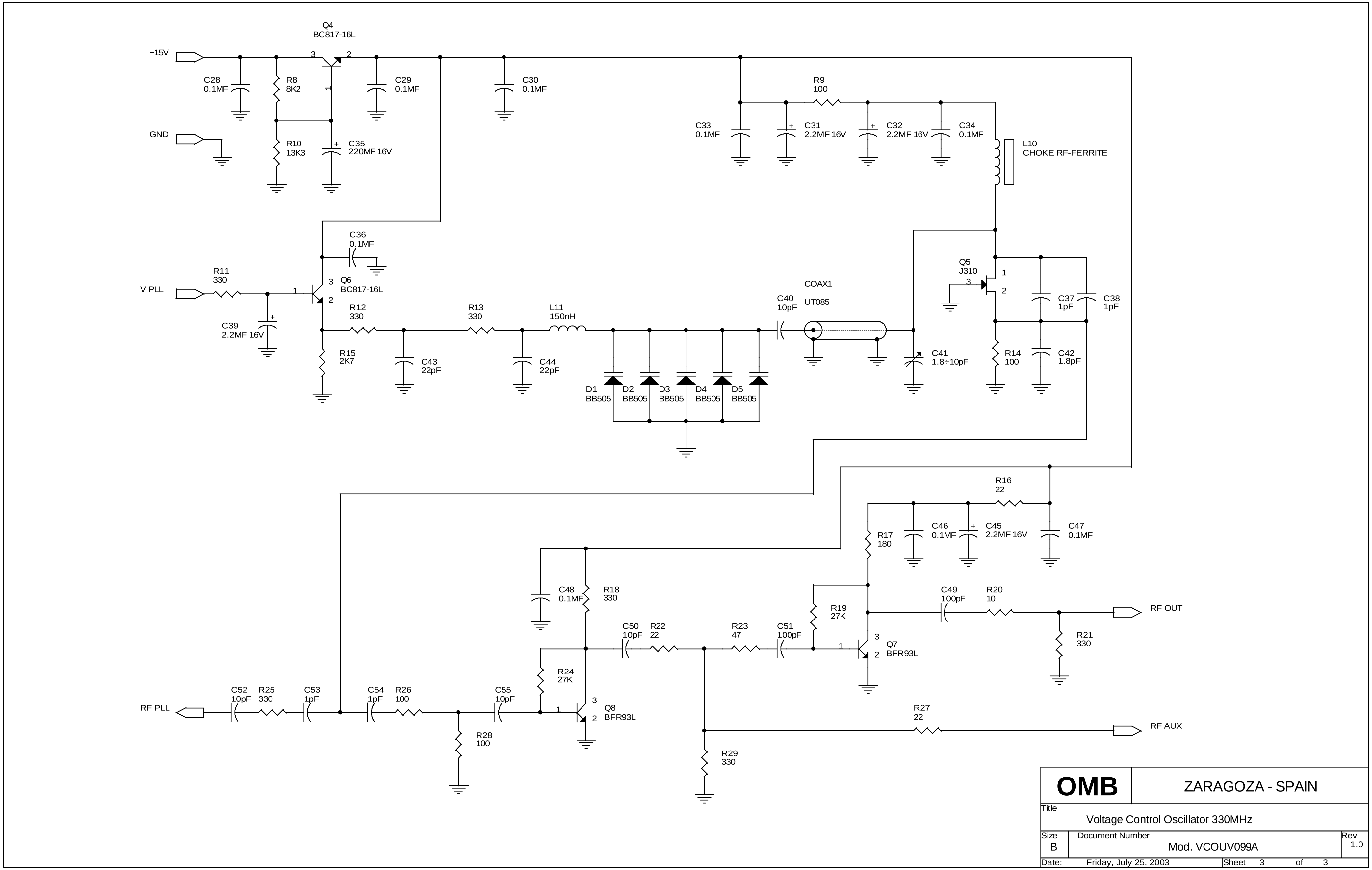
Size B	Document Number Mod. AFLT400 — Rev 1.0
Date: Friday, July 25, 2003	Sheet 2 of 3


+15V
Q4
BC817-16L
C28
0.1MF
R8
8K2
R10
13K3
C29
0.1MF
C35
220MF 16V
C30
0.1MF
GND
R9
100
C33
0.1MF
C31
2.2MF 16V
C32
2.2MF 16V
C34
0.1MF
L10
CHOKE RF-FERRITE
C36
0.1MF
R11
330
V PLL
Q6
BC817-16L
C39
2.2MF 16V
R12
330
R15
2K7
C43
22pF
R13
330
C44
22pF
L11
150nH
D1
BB505
D2
BB505
D3
BB505
D4
BB505
D5
BB505
C40
10pF
COAX1
UT085
C41
1.8÷10pF
Q5
J310
C37
1pF
C38
1pF
R14
100
C42
1.8pF
R16
22
C46
0.1MF
C45
2.2MF 16V
C47
0.1MF
R17
180
C48
0.1MF
R18
330
C49
100pF
R20
10
RF OUT
R19
27K
R21
330
C50
10pF
R22
22
R23
47
C51
100pF
Q7
BFR93L
R24
27K
RF PLL
C52
10pF
R25
330
C53
1pF
C54
1pF
R26
100
C55
10pF
Q8
BFR93L
R28
100
R27
22
RF AUX
R29
330
OMB
ZARAGOZA - SPAIN
Title
Voltage Control Oscillator 330MHz
Size
B
Document Number
Mod. VCOUV099A
Rev
1.0
Date:
Friday, July 25, 2003
Sheet 3 of 3

Part List Schematic : VCO & ACTIVE FILTER

Rif.	Value	Remarks	Description	Code
C1	1nF		Ceramic Lead Through Capacitor	
C2	220pF		Ceramic Disc Capacitor NPO	
C3	6.8pF		Ceramic Disc Capacitor NPO	
C4	47pF		Ceramic Disc Capacitor NPO	
C5	1nF		Ceramic Disc Capacitor NPO	
C6	1nF		Ceramic Disc Capacitor NPO	
C7	1nF		Ceramic Disc Capacitor NPO	
C8	100MF 47V		Aluminium Electrolytic Capacitor	
C9	0.1MF		Multilayer Ceramic Capacitor	
C10	3.3pF		Ceramic Disc Capacitor NPO	
C11	3.3pF		Ceramic Disc Capacitor NPO	
C12	3.3pF		Ceramic Disc Capacitor NPO	
C13	3.3pF		Ceramic Disc Capacitor NPO	
C14	1.8÷10pF		Trimmer Ceramic Capacitor	
C15	1.8÷10pF		Trimmer Ceramic Capacitor	
C16	1.8÷10pF		Trimmer Ceramic Capacitor	
C17	3.3pF		Ceramic Disc Capacitor NPO	
C18	1.8÷10pF		Trimmer Ceramic Capacitor	
C19	1.8÷10pF		Trimmer Ceramic Capacitor	
C20	1.8÷10pF		Trimmer Ceramic Capacitor	
C21	3.3pF		Ceramic Disc Capacitor NPO	
C22	3.3pF		Ceramic Disc Capacitor NPO	
C23	3.3pF		Ceramic Disc Capacitor NPO	
C24	3.3pF		Ceramic Disc Capacitor NPO	
C25	3.3pF		Ceramic Disc Capacitor NPO	
C26	3.3pF		Ceramic Disc Capacitor NPO	
C27	3.3pF		Ceramic Disc Capacitor NPO	
C28	0.1MF		SMD Multilayer Ceramic Capacitor	
C29	0.1MF		SMD Multilayer Ceramic Capacitor	
C30	0.1MF		SMD Multilayer Ceramic Capacitor	
C31	2.2MF 16V		SMD Multilayer Ceramic Capacitor	
C32	2.2MF 16V		SMD Multilayer Ceramic Capacitor	
C33	0.1MF		SMD Multilayer Ceramic Capacitor	
C34	0.1MF		SMD Multilayer Ceramic Capacitor	
C35	220MF 16V		SMD Aluminium Electrolytic Capacitor	
C36	0.1MF		SMD Multilayer Ceramic Capacitor	
C37	1pF		SMD Multilayer Ceramic Capacitor	
C38	1pF		SMD Multilayer Ceramic Capacitor	
C39	2.2MF 16V		SMD Aluminium Electrolytic Capacitor	
C40	10pF		SMD Multilayer Ceramic Capacitor	
C41	1.8÷10pF		Trimmer Ceramic Capacitor	
C42	1.8pF		SMD Multilayer Ceramic Capacitor	
C43	22pF		SMD Multilayer Ceramic Capacitor	
C44	22pF		SMD Multilayer Ceramic Capacitor	
C45	2.2MF 16V		SMD Aluminium Electrolytic Capacitor	
C46	0.1MF		SMD Multilayer Ceramic Capacitor	
C47	0.1MF		SMD Multilayer Ceramic Capacitor	
C48	0.1MF		SMD Multilayer Ceramic Capacitor	
C49	100pF		SMD Multilayer Ceramic Capacitor	

OMB

Rif.	Value	Remarks	Description	Code
C50	10pF		SMD Multilayer Ceramic Capacitor	
C51	100pF		SMD Multilayer Ceramic Capacitor	
C52	10pF		SMD Multilayer Ceramic Capacitor	
C53	1pF		SMD Multilayer Ceramic Capacitor	
C54	1pF		SMD Multilayer Ceramic Capacitor	
C55	10pF		SMD Multilayer Ceramic Capacitor	
L1	CHOKE		Suppression Choke	
L2	CHOKE		Suppression Choke	
L3	CHOKE		Suppression Choke	
L4	4T/8D		Tinned Copper Wire	
L5	4T/8D		Tinned Copper Wire	
L6	4T/8D		Tinned Copper Wire	
L7	4T/8D		Tinned Copper Wire	
L8	4T/8D		Tinned Copper Wire	
L9	4T/8D		Tinned Copper Wire	
L10	CHOKE		Suppression Choke	
L11	150nH		SMD Inductor	
R1	39		SMD Thick Film Resistor	
R2	220		SMD Thick Film Resistor	
R3	180		SMD Thick Film Resistor	
R4	180		SMD Thick Film Resistor	
R5	33K		SMD Thick Film Resistor	
R6	22K		SMD Thick Film Resistor	
R7	18K		SMD Thick Film Resistor	
R8	8K2		SMD Thick Film Resistor	
R9	100		SMD Thick Film Resistor	
R10	13K3		SMD Thick Film Resistor	
R11	330		SMD Thick Film Resistor	
R12	330		SMD Thick Film Resistor	
R13	330		SMD Thick Film Resistor	
R14	100		SMD Thick Film Resistor	
R15	2K7		SMD Thick Film Resistor	
R16	22		SMD Thick Film Resistor	
R17	180		SMD Thick Film Resistor	
R18	330		SMD Thick Film Resistor	
R19	27K		SMD Thick Film Resistor	
R20	10		SMD Thick Film Resistor	
R21	330		SMD Thick Film Resistor	
R22	22		SMD Thick Film Resistor	
R23	47		SMD Thick Film Resistor	
R24	27K		SMD Thick Film Resistor	
R25	330		SMD Thick Film Resistor	
R26	100		SMD Thick Film Resistor	
R27	22		SMD Thick Film Resistor	
R28	100		SMD Thick Film Resistor	
R29	330		SMD Thick Film Resistor	
D1	BB505		SMD Tuning Diode	
D2	BB505		SMD Tuning Diode	
D3	BB505		SMD Tuning Diode	
D4	BB505		SMD Tuning Diode	

OMB

Rif.	Value	Remarks	Description	Code
D5	BB505		SMD Tuning Diode	
Q1	BFR91A		SMD RF Bipolar Transistor	
Q2	BFR91A		SMD RF Bipolar Transistor	
Q3	BFR91A		SMD RF Bipolar Transistor	
Q4	BC817-16L		SMD Bipolar Transistor	
Q5	J310		JFET	
Q6	BC817-16L		SMD Bipolar Transistor	
Q7	BFR93L		SMD RF Bipolar Transistor	
Q8	BFR93L		SMD RF Bipolar Transistor	
M1	MIXER RFMX-1X		RF Mixer	
J1	IF 70 MHz		SMB PCB Jack - 50 Ohm	
J2	V PLL		SMB PCB Jack - 50 Ohm	
J3	RF IN		SMB PCB Jack - 50 Ohm	
J4	RF PLL		SMB PCB Jack - 50 Ohm	
COAX1	UT085		Coaxial Cable	

APPENDIX I. Measurements of polarization voltages and currents in the amplifying modules of MT PLATINUM transmitter depending on the working frequency.

Driver PD55003		
FREQUENCY	**POLARIZATION VOLTAGE [V]**	**CURRENT [A]**
200MHz	2.5 – 2.7	0.70
300MHz	2.5 – 2.7	0.75
400MHz	2.7 – 2.9	0.80
950MHz	3.3 – 3.5	0.82

Final stage PD55025			
FREQUENCY	**POLARIZATION VOLTAGE [V]**	**CURRENT @ 10W [A]**	**CURRENT @ 20W [A]**
200MHz	0.2 – 0.5	1.7 – 2.0	2.3 – 2.5
300MHz	0.3 – 0.6	1.8 – 2.2	2.6 – 2.7
400MHz	0.5 – 0.7	1.9 – 2.3	2.7 – 2.8
950MHz	0.7 – 0.9	1.9 – 2.4	NOT USED

In order to regulate the return, put a 25Ω load (or two 50Ω loads with a T, type N or BNC) and adjust the RFL instrument until you read the value offered by the wattmeter; with 2 – 3W of Reflected Power (≈10% of forward power) the protection regulator is adjusted at the intervention limit.