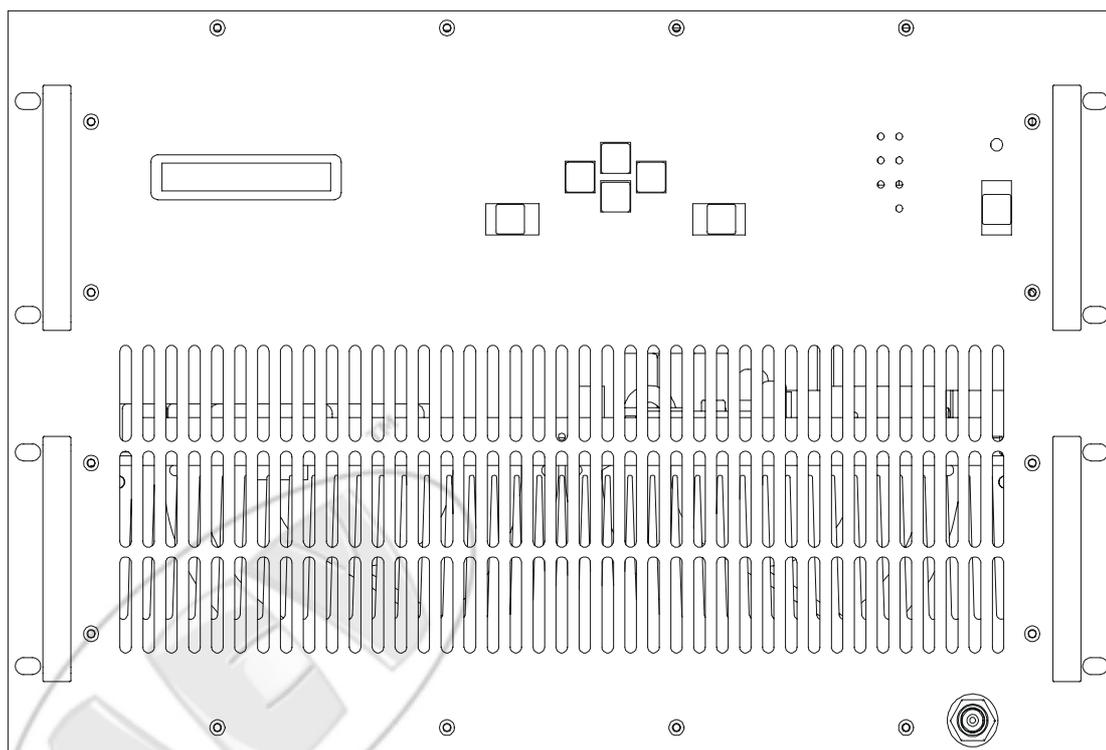




- SIRIO 2000T -

2000 W FM POWER TRANSMITTER

USER AND MAINTENANCE MANUAL





Registrazione, Garanzia, Registration, Guarantee, Feedback

La garanzia è di 2 anni data fattura franco fabbrica. La garanzia non copre i guasti dovuti a negligenza, dovuti a cause naturali e i materiali soggetti ad usura nonche' la mano d'opera ed il trasporto. La garanzia decade in caso di manomissione dell'apparato.

The equipment is warranted for a period of 2 years from the date of invoice (ex-works). The warranty does not cover faults provoked by carelessness, natural causes and parts subject to wear. In addition, the cost of labour and shipment is not covered. The warranty will be voided if the equipment is mishandled.

Feedback

AEV è molto interessata ai Vostri commenti sui prodotti. I Vostri suggerimenti ci saranno utili per la realizzazione di nuove apparecchiature e dei manuali, questo sarà di grande utilità anche per Voi! Se lo desiderate potete inviarci qualsiasi tipo di informazione sui prodotti e noi saremo ben lieti di leggerle. Le informazioni possono essere inviate tramite E-mail all' indirizzo: service@aev.net, o per posta all'AEV SERVICE.

AEV welcomes your comments on our products. Your suggestions may be extremely useful to develop new equipment and manuals and this will be of benefit to you too! Let us have your comments on our products and we will be pleased to read them. Send your information by e-mail to the following address: service@aev.net, or send a letter to the AEV SERVICE Department.

Technical Support

Se avete la necessità di avere spiegazioni tecniche, contattate l'AEV SERVICE e preparateVi per essere chiari nella descrizione del Vostro problema. Scrivetevi il numero di matricola del Vostro apparato che potete trovare sulla targhetta AEV attaccata al dispositivo, in quanto questa è la prima informazione che dovete fornire.
Telefono: 39+051+6634711 Fax: 39+051+6634700

If you require technical support, contact AEV SERVICE giving a clear and concise account of your specific problem. Quote the serial number of your equipment by referring to the AEV nameplate attached to the equipment itself as this is the most important piece of information to be provided.

Telephone: 39+051+6634711 Fax: 39+051+6634700

Factory Service and Repairs

In caso di problemi che dovessero insorgere all'installazione dell'apparato, vi raccomandiamo di verificare attentamente le spiegazioni contenute in questo manuale e la corretta installazione. Se non siete ancora in grado di risolvere il problema, contattate il supporto tecnico AEV SERVICE, per avere chiarimenti. Se il problema è semplice può essere sufficiente una spiegazione telefonica. In caso di spedizione all'AEV dell'apparecchio, per riparazione o manutenzione, lo stesso può essere accettato dal SERVICE AEV solo dopo che Vi è stato comunicato il numero di autorizzazione al rientro RMA. Questo numero deve essere inserito nella documentazione di spedizione. Vi raccomandiamo inoltre di allegare all'apparato una spiegazione dettagliata del difetto riscontrato o del tipo di manutenzione richiesta ed eventualmente il nome della persona con cui si è parlato all'AEV SERVICE. AEV non accetterà materiale in riparazione con oneri di trasporto a proprio carico, in questo caso il materiale sarà rifiutato.

If problems arise while the equipment is being installed, consult this manual and check that the installation is being carried out properly. If the problems still cannot be solved, call the AEV SERVICE Department for further information. If the problem is a minor one we can a telephone call will probably suffice. If, on the other hand, the equipment is to be shipped to AEV for service or repairs, the AEV SERVICE Dept. will accept it only if the RMA return authorisation number has been provided. This number must be included in the shipping documents. We also recommend providing a detailed description of the fault which has occurred, the type of service needed and (if required) the name of the employee at the AEV SERVICE Dept. you have spoken to. No repairs will be made if the cost of shipment is charged to AEV. In this case, we will not accept the delivery.

Shipping Instruction

In caso di spedizione dell'apparecchiatura all'AEV, utilizzate esclusivamente l'imballo originale poichè solo in questo caso avrete la certezza che l'apparecchiatura non subirà shock nel trasporto. Se non avete conservato l'imballo originale vi consigliamo di richiederne un'altro. Se volete spedirci l'apparato con un imballo diverso, abbiate cura di effettuare un doppio imballo, tra i due interponete del materiale morbido, questo serve ad assorbire i colpi che vengono ricevuti durante il trasporto. Riportate sul pacco in rosso la parola: FRAGILE. Ricordate che il numero RMA deve essere visibile anche sul pacco, in caso contrario non verrà accettato.

When shipping the equipment to AEV, use the original package in order to be certain that it will be fully protected during handling. If you need the original package, call us for a new one. If you ship the equipment in a different packing container, take care to provide a double package by interposing padding material between the two containers in order to fully protect the equipment during shipment. The package should be marked "FRAGILE" in red. Remember that the RMA number must be clearly visible on the package. If it is not, the equipment will not be accepted.

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Technical and operational explanations: Maurizio Panicara



AVVERTENZE

ATTENZIONE, leggere attentamente le avvertenze contenute nel seguente paragrafo in quanto forniscono importanti indicazioni riguardanti la sicurezza, l'installazione, l'uso e la manutenzione dell'apparato.

Il non adempimento delle norme o degli avvertimenti specifici riportati in questo manuale **viola le norme di sicurezza di disegno, costruzione e uso di questo apparato.**

AEV S.p.A. declina ogni responsabilità nel caso non venga rispettata anche solo una parte delle seguenti prescrizioni.

AEV S.p.A. declina ogni responsabilità nel caso l'utilizzatore finale rivenda il prodotto. L'impiego è rivolto a personale in grado di potere utilizzare questo apparato e si **presuppone che lo stesso sia conoscenza delle seguenti prescrizioni.**

- Conservare con cura questo manuale per ogni ulteriore consultazione, esso deve essere custodito nelle vicinanze dell'apparato stesso e di facile rintracciabilità.
- Dopo aver tolto l'imballo assicurarsi dell'integrità dell'apparato.
- Evitare shock meccanici che possano danneggiare l'apparato.
- Gli elementi dell'imballo (sacchetti di plastica, polistirolo, chiodi, ecc.) non devono essere lasciati alla portata dei bambini in quanto **potenziali fonti di pericolo.**
- Evitare di utilizzare l'apparecchiatura in luoghi dove sia presente una temperatura non compresa nell'intervallo ammesso dalle caratteristiche tecniche dichiarate.
- Prima di collegare l'apparato accertarsi che i dati di targa siano rispondenti a quelli della rete di distribuzione elettrica (la targa è posta sul contenitore dell'apparato).
- Non rimuovere per alcun motivo la targhetta adesiva applicata sull'apparecchio contenente i dati essenziali di macchina e la matricola.
- Per il collegamento alla rete di alimentazione utilizzare esclusivamente il cavo di rete venduto insieme all'apparato.
- Questo apparato dovrà essere destinato all'uso per il quale è stato espressamente concepito.
- Ogni altro uso dell'apparato è da considerarsi improprio e quindi **potenzialmente pericoloso** a persone, animali o cose. Il costruttore **non può essere considerato responsabile** per eventuali danni derivanti da **usi impropri, erronei ed irragionevoli.**
- L'uso di qualsiasi apparato elettrico comporta l'osservanza di alcune regole fondamentali. In particolare:

- Non toccare l'apparato con parti del corpo bagnate e/o umide.

L'apparato non deve essere esposto a urti e/o spruzzi d'acqua.

Non usare l'apparato nelle vicinanze di fonti di calore intenso ed in presenza di materiali esplosivi.

Non tentare di introdurre alcun oggetto estraneo all'interno dell'apparato.

Non permettere che l'apparato sia usato da bambini e/o da personale impreparato.

• Prima di effettuare qualsiasi operazione di pulizia e/o manutenzione esterna, disinserite l'apparato dalla rete di alimentazione elettrica ed attendere almeno 2 secondi come prescritto dalle normative che regolamentano la sicurezza.

SAFETY PRECAUTIONS

IMPORTANT: Carefully read this paragraph as it contains important instructions concerning operator safety and directions regarding the installation, operation and maintenance of the equipment.

Failure to observe the safety instructions and information given in this manual **constitutes an infringement of the safety rules and design specifications provided for this piece of equipment.**

AEV S.p.A. declines all responsibility if any one of the safety rules given herein is not observed.

AEV S.p.A. declines all responsibility if the end-user resells the product.

The equipment is to be used by people capable of operating it in a trouble-free manner and it is assumed that they are aware of the following safety rules.

- Keep this manual with the utmost care and close at hand so that it can be consulted whenever needed.
- After unpacking the equipment, check it for condition.
- Avoid banging the equipment.
- The packing material (plastic bags, polystyrene, nails, etc.) must never be left within the reach of the children, as **these items are potential sources of danger.**
- Do not use the equipment in places where the temperature is not within the recommended range, as specified by the manufacturer.
- Before connecting the equipment, make sure the nameplate specifications correspond to the mains electricity supply (the nameplate is located on the equipment enclosure).
- Do not remove the sticker from the equipment as it contains important specifications and the relevant serial number.
- To join the equipment to the mains supply, use the power cord purchased with the equipment.
- The equipment must be used only for the purpose it was designed for.
- Abuse or misuse of the equipment is **extremely dangerous** for people, pets and property. The manufacturer declines all responsibility for damage and injury resulting from **improper use and mishandling.**
- Certain basic safety rules must be observed when using electrical equipment, in particular:

Never touch the equipment with wet and/or damp hands or other parts of the body.

- Keep the equipment away from drops of water or sprinkling systems.

Never use the equipment near high heat sources or explosive material.

Do not introduce any extraneous matter into the equipment.

- Do not allow children or untrained people to use the equipment.

• Before cleaning or servicing the equipment outside, disconnect it from the supply and wait at least 2 seconds before working on it, as recommended by current safety regulations.

• In the event of faults and/or improper operation, turn off the equipment, shut off the electrical power and call your dealer.





Electronic Broadcast Equipment

- In caso di guasto e/o di anomalo funzionamento dell'apparato è obbligo spegnerlo, disconnettere l'alimentazione, non manometterlo e rivolgersi al rivenditore.
 - Non tentare di fare alcun tipo di riparazione e/o regolazione che preveda la rimozione di coperchi o l'estrazione di schede.
 - La rottura del fusibile interno all'alimentatore è sintomo di un guasto generale dell'alimentatore stesso; la sua sostituzione non è consentita se non da personale specializzato e autorizzato. Si consiglia di rivolgersi direttamente al rivenditore.
 - Per eventuali riparazioni rivolgersi direttamente al rivenditore e richiedere che vengano utilizzati ricambi originali. Il mancato rispetto di quanto sopra **può compromettere la sicurezza dell'apparato**.
 - L'apparato deve essere collegato alla rete di alimentazione munita di linea di terra regolamentare ed efficiente.
 - L'esecuzione dell'impianto elettrico deve essere conforme alle norme C.E.I. 64-8 "Norme degli impianti elettrici negli edifici civili".
 - In fase di installazione è tassativo prevedere uno spazio libero intorno all'apparecchio di almeno 1 cm per garantire un'adeguata areazione.
- N.B. L'apparato è costruito a regola d'arte. L'affidabilità elettrica e meccanica sarà mantenuta efficiente se verrà fatto un uso corretto dell'apparato e rispettate le prescrizioni di manutenzione ove previste.**

- Do not attempt to make repairs and/or adjustments when covers/guards or circuit boards are to be removed.
 - Blown fuses inside the power supply indicate that there may be a fault in the power supply itself. The fuses must be replaced by qualified and authorised persons. It is advisable to call your nearest dealer.
 - Call your dealer for any repairs and be certain original spare parts are used. **Failure to observe this rule may adversely affect the safety level of your equipment.**
 - The equipment is to be connected to the mains supply and provided with adequate and efficient earth conductors.
 - The electrical wiring must be done in compliance with current electrical codes CEI 64-8 "Electrical specification for domestic buildings".
 - When installing, leave a clearance of at least 1 cm around the equipment to allow air to pass freely.
- NOTE. This piece of equipment has been manufactured to the highest standards of workmanship. It must be used properly and serviced as recommended to ensure long-term dependable operation.**





SICHERHEITSSINWEISE

ACHTUNG! Die im folgenden Abschnitt beschriebenen Hinweise mit Sorgfalt lesen, da sie wichtige Informationen über die Sicherheit, die Installation, die Bedienung und die Wartung enthalten.

Die Nichterfüllung der Vorschriften oder der spezifischen Warnungen, die in diesem Handbuch enthalten sind, verletzt die Zeichnungs-, Herstellungs- und Bedienungssicherheitsnormen dieses Gerätes. AEV S.p.A. lehnt jegliche Verantwortung ab, auch wenn nur ein Teil der folgenden Vorschriften nicht erfüllt wird.

Nur Fachpersonal kann das Gerät benutzen und es wird vorausgesetzt, daß das zuständige Personal von diesen Vorschriften Kenntnis hat.

- Das vorliegende Handbuch soll für ein evtl. künftiges Nachschlagen mit Sorgfalt aufbewahrt werden; es soll sich in der Nähe des Gerätes befinden und soll leicht auffindbar sein.
- Nach der Entfernung der Verpackung, die Vollständigkeit des Gerätes prüfen. Falls einige Zweifel bestehen, verwenden Sie das Gerätes prüfen. Falls einige Zweifel bestehen, verwenden Sie das Gerät nicht und wenden Sie sich an den Händler.
- Mechanische Schocks vermeiden, die das Gerät beschädigen könnten.
- Das Verpackungsmaterial (Plastiktüte, Polystyrol, Nägel, u.s.w.) soll nicht in der Reichweite von Kindern verlassen werden, da es eine potentielle Gefahrquelle darstellt.
- Das Gerät soll nicht in Umgebungen verwendet werden, wo die Temperatur nicht innerhalb des Bereichs liegt, der gemäß den angegebenen technischen Merkmalen zugelassen ist.
- Vor dem Anschluß des Gerätes prüfen ob die Schilddaten den Daten der elektrischen Versorgung entsprechen (das Schild ist auf dem Gerätegehäuse angebracht).
- Das Klebschild auf dem Gerät, das die wichtigsten Daten der Maschine und die Seriennr. zeigt, soll nie entfernt werden.
- Für den Anschluß an das Versorgungsnetz kann nur das mitgelieferte Kabel verwendet werden.
- Das vorliegende Gerät kann nur für die Benutzung verwendet werden, für die das Gerät ausdrücklich ausgelegt wurde.
- Jegliche andere Benutzung ist als unsachgemäß zu verstehen und deshalb ist für Personen, Tiere oder Gegenstände potentiell gefährlich.
- Die Verwendung eines elektrischen Gerätes sieht die Einhaltung einiger Grundnormen vor, wie:

- Das Gerät nicht mit feuchten oder nassen Händen oder Wasserspritzern ausgesetzt werden

Das Gerät soll nicht in der Nähe von Wärmequellen und wo Explosivstoffe vorhanden sind, verwendet werden. Kein fremder Gegenstand in das Gerät einsetzen

Das Gerät soll nicht von Kindern und/oder unfähiges ohne Überwachung verwendet werden.

- Vor Reinigungs- und/oder Wartungsarbeiten soll das Gerät von der elektrischen Versorgung durch die Entfernung des Versorgungskabels ausgeschaltet werden und soll man 2 sek. abwarten, wie von den Sicherheitsnormen vorgeschrieben.
- Falls eine Störung oder eine Fehlfunktion des Gerätes vorhanden sind, sollen das Gerät und das Versorgungskabel vom Netz ausgeschaltet und keinen Eingriff an das Gerät durchgeführt werden.



PRECAUTIONS

ATTENTION, lire toutes les instructions données dans ce paragraphe car elles concernent la sécurité, l'installation, l'emploi et l'entretien.

Ne pas accomplir les règles et les précautions spécifiques données dans ce manuel est une violation des règles de sécurité de dessin, de construction et d'emploi de cet appareil.

AEV S.p.A. décline toute responsabilité si on ne suit pas même seulement une partie de ces précautions.

AEV S.p.A. décline toute responsabilité si l'utilisateur final revend le produit.

L'emploi s'adresse à un personnel qui est en mesure d'utiliser cet appareil et qui connaît les précautions suivantes.

- Garder soigneusement ce manuel pour toute autre consultation. Il doit être gardé près de l'appareil ou dans un lieu où on peut le trouver avec facilité.
- Après avoir enlevé l'emballage il faut s'assurer de l'intégrité de l'appareil. Si on a quelques doutes ne pas utiliser l'appareil et s'adresser au détaillant.
- Éviter des shocks mécaniques qui peuvent endommager l'appareil.
- Les éléments de l'emballage (les sachets de plastique, le polystyrène, les clous, etc.) ne doivent pas être laissés à la portée des enfants car ils peuvent être un danger pour eux.
- Éviter l'utilisation de l'appareil dans des lieux où il n'y a pas une température qui est dans l'intervalle admis par les caractéristiques techniques déclarées.
- Avant de connecter l'appareil vérifier que les données de la plaque correspondent à celles du réseau de distribution électrique (la plaque est située sur le conteneur de l'appareil).
- Ne jamais enlever (pour n'importe quelle raison) la plaque adhésive qui se trouve sur l'appareil et qui contient les données essentielles de la machine et la matricule.
- Pour la connexion au réseau d'alimentation utiliser seulement le câble de réseau qui est vendu avec l'appareil.
- Cet appareil devra être utilisé seulement pour l'usage dont il a été conçu.
- Tout autre usage doit être considéré impropre et donc potentiellement dangereux pour les personnes, les animaux et les choses. Le constructeur n'est pas responsable pour les dommages qui dérivent des usages impropres, erronés et irraisonnés.
- L'usage d'un appareil électrique prévoit l'observation de quelques règles fondamentales. En particulier:
 - Ne pas toucher l'appareil avec vos parties du corps nues et/ou humides.

L'appareil ne doit pas être exposé à stillation et/ou aux jets d'eau.

- Ne pas utiliser l'appareil près des sources d'une forte chaleur et en présence d'explosifs.

Ne pas chercher à introduire des objets étrangers dans l'appareil.

Ne pas permettre que l'appareil soit utilisé par des enfants et/ou par des incapables sans surveillance.

- Avant de faire n'importe quelle opération de nettoyage et/ou d'entretien, débrancher l'appareil du réseau d'alimentation électrique en enlevant le cordon de réseau et attendre au moins 2 secondes, en suivant ainsi les normes qui régularisent la sécurité.



- Keine Instandsetzungs- und/oder Einstellarbeit durchführen, die die Entfernung von Deckeln oder das Herausziehen von Karten vorsehen.
 - Das Brechen der Sicherung innerhalb des Netzteils ist ein Zeichen einer generellen Störung des Netzteils; das Netzteil kann nur von autorisiertem Personal ersetzt werden. Wir empfehlen, sich an den Händler zu wenden.
 - Für eine evtl. Instandsetzung von Original-Ersatzteilen fordern. Die Nichteinhaltung der o.g. Empfehlung könnte die Sicherheit des Gerätes beeinträchtigen.
 - Das Gerät soll an das Versorgungsnetz angeschlossen werden, die mit ordnungsgemässer und wirksamer Erdung ausgestattet werden soll.
 - Die Ausführung der elektrischen Anlage soll den CEI Normen 64-8 "Normen der elektrischen Anlagen für Zivilgebäuden" entsprechen.
 - Während der Installation ist es ausdrücklich, einen freien Raum von 1 cm um das Gerät vorzusehen, um eine ordnungsgemässe Belüftung gewährleisten zu können.
- N.B.: Das Gerät ist fachgerecht hergestellt. Die elektrische und mechanische Zuverlässigkeit wird erhalten, wenn das Gerät ordnungsgemäss benutzt wird und wenn die Wartungsvorschriften, falls vorgesehen, beobachtet werden.**

- Si on a une panne et / ou un mauvais fonctionnement de l'appareil, il faut l'éteindre, déconnecter l'alimentation, ne pas l'endommager et s'adresser au détaillant.
 - Ne pas chercher à faire une réparation et / ou une mise à point qui rend nécessaire le déplacement des couvercles ou l'extraction des fiches.
 - La rupture du fusible dans l'alimentation signifie qu'il y a une panne de l'alimentation même; son remplacement doit être fait seulement par le personnel autorisé. On conseille de s'adresser directement au détaillant.
 - Pour une réparation s'adresser au détaillant et exiger l'utilisation des pièces de rechange originales. Ne pas respecter ces normes peut compromettre la sécurité de l'appareil.
 - L'appareil doit être connecté au réseau d'alimentation qui a une ligne de terre réglementaire et fonctionnante.
 - L'exécution de l'installation électrique devra être conforme à la norme C.E.I 64-8 "Normes des installations électriques dans les édifices civils".
 - Quand on installe l'appareil on doit prévoir un espace libre autour de lui d'à peu près 1 cm pour garantir une bonne aération.
- N.B. L'appareil a été construit dans les règles de l'art. La fiabilité électrique et mécanique sera toujours efficace si on utilise correctement l'appareil et si on respecte les prescriptions d'entretien.**





WARNING!

**The currents and voltages in this equipment are dangerous!
Personnel must at all times observe safety regulation!**

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical and electronic circuits.

It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care.

AEV S.p.A. shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed.

WARNING!

Always disconnect power before opening covers, doors, enclosures, gates, panels or shields.

Always use grounding sticks and short out high voltage points before servicing.

Never make internal adjustments, perform maintenance or service when alone or when fatigued.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields.

Keep away from live circuits, know your equipment and don't take chances.

WARNING!

In case of emergency ensure that power has been disconnected





Electronic Broadcast Equipment

Treatment of electrical Shock

1, If victim is not responsive follow the A-B-C'S of basic life support.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

A AIRWAY

IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK,
PUSH FOREHEAD SACKF
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING.

B BREATHING

IF NOT BREATHING,
BEGIN ARTIFICIAL
BREATHING



TILT HEAD,PINCH NOSTRILS
MAKE AIRTIGHT SEAL,
4 QUICK FULL BREATHS
REMEMBER MOUTH TO MOUTH.
RESUSCITATION MUST BE
COMMENCED AS SOON AS POSSIBLE

C CIRCULATION

CHECK CAROTID PULSE



IF PULSE ABSENT
BEGIN ARTIFICIAL
CIRCULATION

DEPRESS STERNUM 1



APPROX. 80 SEC. : ONE RESCUE
2 QUICK BREATHS.

1/2" to 2"



APPROX. 60 SEC. : TWO RESCUERSO 5 COMPRESSIONS 1 BREATH

NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS

WHEN SECOND PERSON IS GIVING BREATH.

Call for medical assistance as soon as possible

2) If victim is responsive.

- Keep them warm.
- Keep them as quiet as possible,
- Loosen their clothing (a reclining position is recommended).



FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices, The following information is not intended to be a complete first-aid procedure, it is brief and is only to be used as a reference. it is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of electrical Burns

1) Extensive burned and broken skin.

- a. Cover area with clean sheet or cloth. (Cleanest available cloth article).
- b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve ointment.
- c. Treat victim for shock as required.
- d. Arrange transportation to a hospital as quickly as possible
- e. If arms or legs are affected keep them elevated.

o r

NOTE

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (half a glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs (Do not give alcohol).

2) Less severe burns - (1st & 2nd degree)

- a. Apply cool (not ice cold) compresses using the cleanest available cloth article,
- b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
- c. Apply clean dry dressing if necessary.
- d. Treat victim for shock as required.
- e. Arrange transportation to a hospital as quickly as possible.
- f. If arms or legs are affected keep them elevated.





SIRIO 2000T

87.5 ÷ 108 MHz FM 2000W TRANSMITTER

1. INTRODUCTION

SIRIO 2000T series transmitters are the result of a long experience gained by A.E.V. along years of producing FM broadcast equipment, transmitters, stl and stereo encoders.

These transmitters are specifically designed to comply with the latest international standards and the requirements of the most advanced broadcasters, meeting tighter specifications than usually required, but still at an affordable cost.

This transmitter produces an Hi-Fi-quality modulated signal, with a low residual noise and distortion. RF signal is free from spurious and harmonic components to an higher degree than required by CCIR, European, USA and most other national standards.

To obtain such an outstanding performances is mandatory to rely on qualified personnel to design the equipment, but also for the user to install and to verify the equipment layout of the radio station. I.e. the transmitter, the link with the studio, the power amplifier, the antennas, the cables and the connectors. Only following this kind of procedure will insure the best performances, likewise reliability and stability.

Transmitter must not be tampered with by unskilled personnel and our after-sale service is always available to customers for any technical problem. Before proceeding to installation, please make sure to carefully have read ALL PAGES of this manual and gained enough confidence with the equipment.

Our transmitters are very stable units, internal pre-settings or adjustments other than frequency and few other options are normally not required. In case, any work must be carried out by skilled personnel, with the proper instruments and documentation. Improper adjustments or tampering with the settings may harm the transmitter and/or jeopardize the guaranteed performances.

THIS EQUIPMENT COMPLIES WITH ALL RELEVANT **CE** EMI/EMC AND SAFETY REQUIREMENTS, ETSI EN300384, ETS300447 AND EN60215 STANDARDS.

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

———— **MAINS VOLTAGE MAY KILL** ————



2. GENERAL DESCRIPTION

SIRIO 2000T is a 2KW rated, direct-synthesis, high quality FM-modulated transmitter. Being digitally controlled, it is extensively programmable by front panel, on field or remotely, in every respect: frequency, power, channel sensitivity, preemphasis, functioning mode (mono, stereo, external mpx), clock, date and many other parameters, without adjusting or replacing any part. A powerful 3-levels password system allows a high degree of security and privacy as it may be required in different situations. The transmitter requires little or no maintenance and its simple modular layout allows easy testing and servicing.

As required by a number of specific national standards, our transmitters incorporate a state of the art low-pass audio filters on mono and stereo channels, and a sharp acting modulation limiter which is usually set for a peak deviation of 75 kHz. Its use should never be avoided. If required a different deviation, this can be obtained pre-setting. In any case the threshold shouldn't exceed a deviation higher than 150 kHz.

Output frequency is phase-locked to a temperature-compensated crystal oscillator, which insures superior precision and stability. A very low noise, low distortion VCO produces an harmonics-free and spurious-free signal. Each time the transmitter is turned on or the frequency is modified, a control circuit inhibits the presence of output power until the transmitter is locked on the programmed frequency.

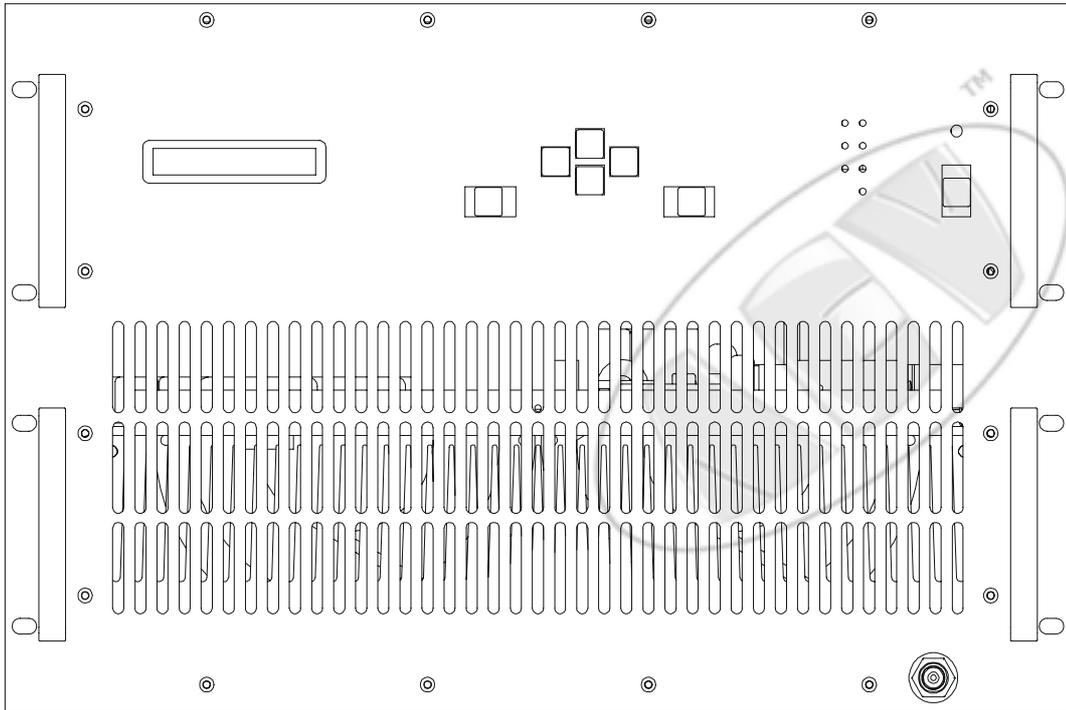
To lower the noise threshold, low-frequency inputs are fitted with balanced input circuitry. The input level is precisely adjustable over a wide range by means of a 0.5dB step variable attenuator. The transmitter has an auxiliary input, specifically designed for RDS and SCA encoders. A modulation output allows to control other transmitters (or STLs) with the same internally processed high-quality mpx signal.

The alphanumeric display and the keyboard allow an easy and accurate metering, adjustment and continuous monitoring of modulation levels, power, operation and other internal parameters. Such details may be externally available on the same RS232 I/O port that may be used to remotely check or control the transmitter. In addition to the serial I/O, some signals (RF power, On the air state, *Disable line*) are available on a parallel I/O socket for easy interfacing with others analog controllers or supervisory systems.

A top-quality stereo encoder may be factory installed as an option. This even later in the field requiring such an upgrade a minimum technical skill to be performed. The powerful internal software recognize the encoder presence and automatically enables the related functions.

The RF power amplifier employs a broadband design and has plenty of reserve: the output power is feedback controlled for increased stability to an higher level than the nominal. Allowed reflected power is limited to conservative level to prevent output stage degradation; direct power is accordingly reduced not to exceed the reflected power safety level. A sturdy telecom-grade high efficiency switch-mode power supply allows operations even in unstable and noisy mains environment.

The temperature alarm circuitry reduces the output power in case of high room or external temperature in order to remain anyway on the air, in spite of the adverse condition.



3. TECHNICAL FEATURES

3.1 FRONT PANEL COMMANDS AND SIGNALLING

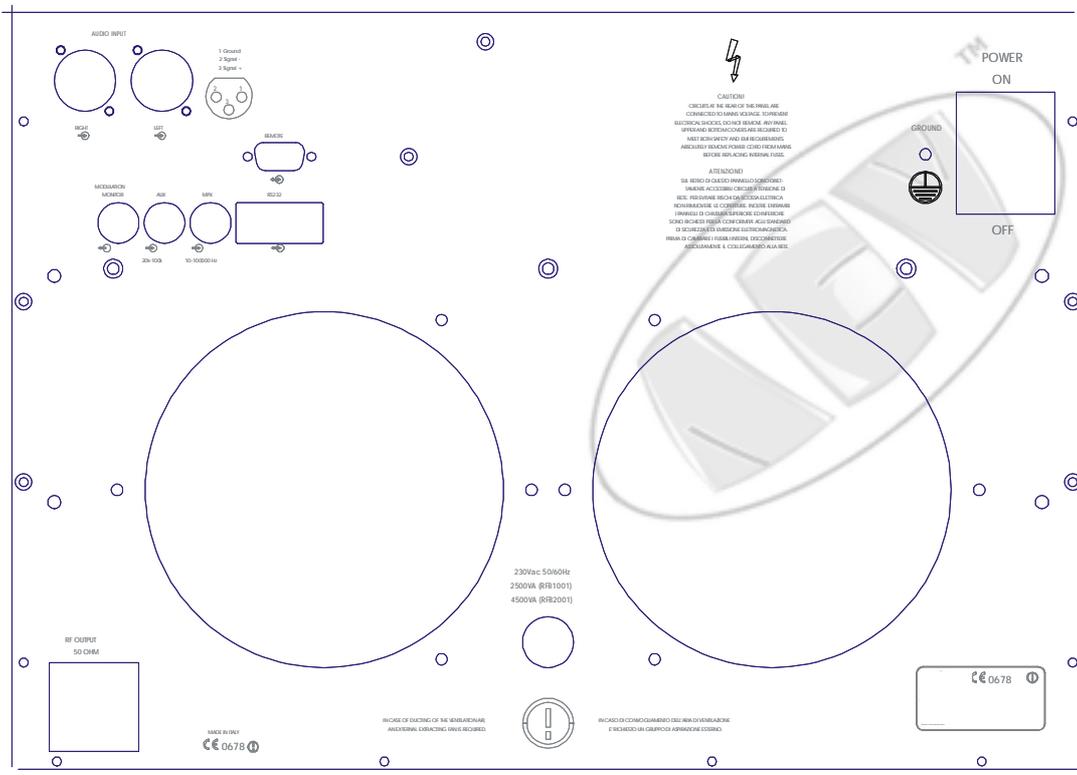
SIRIO 2000T front panel is simple and easy to control. The wide alphanumeric display and the control keyboard are self-explanatory and allow the menu-driven navigation through the various options.

Great care was taken in the design of the software to give a natural approach to the various controls and to allow operation and programming in every respect of the transmitter.

The password management, when used, hides some functions and prevents voluntary or involuntary tampering with the most critical options and data by unauthorised people.

The ON/stand-by key does not power off the transmitter, which is still locked on frequency and ready to transmit as soon as the key is pushed or a remote command is sent. Note that a mains failure won't change the st-by/ON status, the transmitter will restart in the same state it was, when line power will be back

Some leds, visible at a glance, indicate proper functioning or warning states.



3.2 REAR PANEL CONNECTORS

All transmitter inputs and outputs are located on the back panel.

- The audio channels input sockets on balanced female XLR-type connectors
- The wide-band external processed / stereo or composite signal input on a grounded unbalanced BNC connector
- The frequency limited (20k ÷ 100kHz) auxiliary channel input on a grounded, unbalanced BNC connector
- The LF modulation output for monitoring, RDS external synchronisation or re-broadcasting purpose, BNC-type
- The inverted wired RS232 DB9 female remote serial control port
- The remote parallel control port, DB9 male type
- The RF antenna connector, N-type
- The hot centre-pin on the "EXTERNAL" BNC input is physically in parallel with the signal + input (pin 3) on the mono/right channel XLR socket. For this reason both connectors cannot be used at the same time.

On the left side of the panel it is located the mains power switch, the power cord and an earth screw for system earthing in addition to the ground conductor on the cord. The power switch trips if an overcurrent condition should occur.

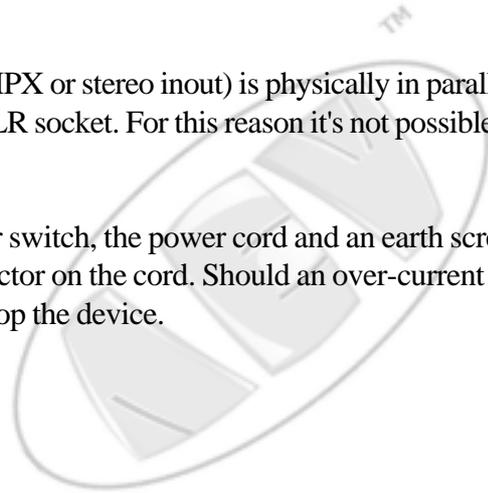
Please note that the transmitter is usually factory pre-set for 220-240 Vac nominal mains voltage. If required, 110-120 Vac range must be internally set on the mains transformer board.



Note that:

- The hot centre pin of the "EXTERNAL" BNC input (MPX or stereo inout) is physically in parallel to the "+ input" signal (pin 3) on the mono/right channel XLR socket. For this reason it's not possible to use both inputs at the same time.

On the left side of the panel are located the mains power switch, the power cord and an earth screw for a separated earthing system as well as the ground conductor on the cord. Should an over-current condition take place, the power switch would trip and stop the device.





4. TECHNICAL SPECIFICATIONS

- Frequency range: 87.5 ÷ 108 MHz
 - Modulation: FM, 75 kHz peak deviation:
 - 180k F3E mono
 - 256kF3E stereo
 - Steps :10/100 kHz
 - Frequency error: <200 Hz
 - Frequency drift:
 - <250 Hz in operating temperature
 - <100Hz/year
 - RF output power: 300 ÷ 2000W ± 0,5 dB
 - Max reflected power: 160W
 - Harmonic products RF: <-67 dB, -72dB
 - Spurious products RF: <-85 dB (- 95 dB)
 - RF output power impedance: 50 ohm
 - RF output power connector: 7/16"
 - Audio/Mpx input level: -3.5 ÷ +12.5dBm @ ± 75kHz deviation
 - Audio/Mpx input impedance: 10k ohm/600 ohm, balanced./unbalanced
 - Common mode input: >50 dB, >60dB tip. (20÷15000 Hz)
 - Audio input connectors: XLR female
 - Auxiliary/Mpx input level:
 - 12.5 ÷ +3.5dBm @±7.5 kHz dev.
 - 24 ÷ -8dBm @±2 kHz dev.
 - Aux channel input impedance: 10k ohm
 - Mpx and aux input connectors: BNC
 - Mpx output level: 0 ÷ +10 dBm @ ±75kHz dev.
 - Preenphasis time constant: 0/50/75 µs ±2%
 - S/N ratio, mono:
 - >70 dB, 73 tip. (30÷20000Hz)
 - >75 dB, 78 tip. (CCIR)
 - S/N ratio, stereo:
 - >66 dB, 68 tip. (30÷20000Hz)
 - Modulation distortion:
 - <0.05% 0.02% tip. @ 75kHz dev.
 - <0.2% 0.05% tip. @ 150kHz dev. (limiter threshold>150 kHz)
 - Stereo crosstalk:
 - >50 dB with ext. encoder
 - >60 dB (100÷5000 Hz)
 - >50 dB (30÷15000 Hz) with int. encoder
 - Audio channels frequency response: 30 Hz ÷ 15 kHz ±0.1dB
 - Out of band audio attenuation: >50 dB @ F≥19 kHz
 - Deviation limiter: adjustable betw. 0 > +7 dB
 - Mpx input frequency response: 10 Hz÷100kHz ±0.1dB
 - Aux input frequency response: 10÷ 100 kHz ±0.2dB
 - I/O liner: Disable RF, Forward power On-the-Air, Allarm. RS232 for monitoring control
 - Mains supply requirements:
 - 230 Vca ±15% 50/60 Hz
 - 4800 VA/3600W @ 2000 W output
 - Operating temperature range:
 - 0÷35° C recomm.
 - 10÷45 °C max.
 - Dimensions without handles:
 - 483 x 310 x 570 mm
 - rack std. 19" 7 u
 - Weight: ca. 47 Kg
- SYSTEM AND PROTECTION CONTROLS**
- Block against emission on spurious frequencies
 - Reflected power and over temperature
 - Modulation limiter



5. INSTALLATION AND USE

5.1 FOREWORD TO INSTALLATION

Although in most cases no special instruments are required, have only skilled personnel to install the transmitter. To make best use of the transmitter's capabilities and in order to prevent damages to the unit, always comply with the recommendations of this manual.

When in doubt, or if any technical problems should arise during the installation procedure, AEV S.P.A. strongly recommends the transmitter not be tampered with in any way by unskilled personnel and will be glad to supply qualified after-sale service.

SIRIO2000T has many features of an hi-fi equipment and should be installed and audio-wired with the same care, avoiding also earth loops, as much as it's possible. When these conditions are met, the transmitter performs superbly.

As a rule, the user should not have access to the inside of the transmitter for normal installation and use. Tampering with the factory settings not only voids the guarantee, but also might affect transmitter performances and/or cause costly damages.

Before proceeding, make sure that mains voltage corresponds to the factory-preset value (usually 220/240 Vac). In case it differs, jumpers must be internally set on the mains supply termination board of the transmitter as described further ahead on the manual. **This again must be done only by skilled technicians.**



WARNING !

NO ADJUSTMENT OR INTERNAL PRESETTING IS REQUIRED FOR NORMAL OPERATIONS. THE TRANSMITTER SHALL BE PROPERLY EARTHED AND BE OPERATED WITH ALL THE COVERS CLOSED TO PREVENT ELECTRICAL HAZARDS IN OPERATION AND FULLY COMPLY WITH CE EMI AND SAFETY REQUIREMENTS.

NEVER TOUCH THE INSIDE OF THE TRANSMITTER WITHOUT FIRST DISCONNECTING IT FROM THE MAINS. DANGEROUS AC, DC AND RADIO-FREQUENCY VOLTAGES ARE PRESENT INSIDE AND BECOME ACCESSIBLE WHEN THE COVERS ARE REMOVED.

———— MAINS VOLTAGE MAY KILL ————



5.2 PLACING THE TRANSMITTER

Install transmitter in a dry, sheltered but well-ventilated room free from dust, moisture, insects and vermin (mice). Place transmitter as close as possible to the antenna to prevent excessive power loss in the antenna cables. If this is not feasible, use lower loss antenna cables and electrical wiring of suitable cross-section.

Room size shall be such that the transmitter can be placed in an upright position and that technical personnel can easily carry out both routine or extraordinary maintenance. The minimum recommended size is 2.5m x 2m, and 2.2m high when there is no other broadcasting or support equipment nearby.

Operating temperature must be kept within $+10 \div +35$ °C. Higher temperatures up to $+45$ °C, although allowed, are not recommended since they will cause more stress and reduce the transmitter lifetime.

Thermal conditions cannot generally be met when the exhaust cooling air is not ducted outside but stays into the room. This is even truer if more than one transmitter is installed in the same location. An efficient ventilation system is thus required in the room. Air exchange in the room shall have a minimum flow-rate of 500 metres cubed per hour, or more.

If the transmitter is fitted in a rack system, the back door of the rack cannot usually be fixed in place. When a completely closed assembly is needed, a suitable ventilation extraction unit must be used. To aid air ducting in such cases, an optional flange may be retrofitted on the ventilation outlet to which a duct can be attached to convey hot air outside. Remember that SIRIO2000T internal fans are low-pressure units and some sort of external air extraction blower is than imperative on the exhaust air duct.

Vents in the walls and any other openings shall be fitted with a metal grating to keep rodents out, and with a dust filter. Make absolutely certain that no water can pass through the vents or the air exhaust duct or antenna-cable grommet, and that the floor cannot be flooded during heavy rainfall. If not prevented by a proper air filtering, insects may be conveyed in the internal heatsink, there accumulating on it and finally obstructing it, causing overtemperature alarm.

Even moisture and/or dust, when contained in the air or in the room in excessive quantity, may cause condensation to build-up in the amplifier. When the system is periodically switched on and off, this might trigger some destructive electric arcs and short circuits causing a damage that is not covered by the guarantee.



5.3 WIRING INTO THE MAINS

The transmitter is powered by a single-phase line. Mains capacity must be at least 4.8kVA and the nominal voltage is 230Vac. *In some countries, where 115Vac is the standard, this voltage must be internally set at factory, or in place by skilled people, before installation. When both the the mains voltages are available, always prefer the higher one to decrease the power loss on the mains line.*

The transmitter is now working in the pre-set mode, delivers power and can be accessed to be programmed or simply to monitor its functions through the keyboard and the front panel display.

The first request at the turn-on will be entering the password for the required level of authorisation/security. The transmitter is factory pre-set with the first 2 levels disabled: this will permit to to set most of the operating parameters, including power, frequency, input levels, clock and date. Some more critical parameters will require the upper 3rd level: be sure to know if you need this access.

In case the passwords are disabled as factory preset, repeatedly press "ESCAPE" key to access to keyboard functions



WARNING!

THE TRANSMITTER WILL ALWAYS TURN-ON IN THE SAME STATE AS IT WAS IN THE LAST TIME IT WAS TURNED OFF FROM MAINS, I.E. POWER, FREQUENCY AND EVEN ON OR STAND-BY CONDITION. WHEN YOU TURN ON THE REAR PANEL MAINS SWITCH, EVEN IF THE TRANSMITTER IS JUST FACTORY DELIVERED, BE READY FOR THIS EVENT.



5.4 SYSTEM CONNECTION

- 1) Connect the 7/16-type output connector, marked "RFOUT" to the antenna or to a following RF amplifier with any top-grade 50-ohm shielded cable of suitable power handling.
Low-attenuation type cable must be used for antenna connection, we suggest Celflex or similar 1/2" cable. To avoid mechanical stress on the output connector, big sized cables must be connected with smaller section pig-tails.
- 2) Connect the LF inputs as required for operation and detailed in the following chapters for various situations. If needed wire the serial and/or parallel remote control I/O ports as required, or skip this step to a subsequent moment.
- 3) Turn off the mains rear switch and connect the transmitter to the mains and to the ground system.
- 4) Before turning on the transmitter to an antenna, set if possible frequency and power and check on a dummy load in order to avoid system problems at the first turn-on of the equipment. Refer to the appropriate programming section. of this manual for the procedure, if not known.
- 5) Turn on the mains switch, then turn on the front panel on/stand-by switch to operate the transmitter and check that:
 - All leds and the display briefly light on and off for the initial check.
 - The yellow "STAND-BY" led turns off, while the "ON" green led on the cap of the stand-by switch, turns on.
 - The green "Local" led must light up immediately and the upper green "Lock" led must also light up after some seconds, when the frequency is locked.
 - When locked the RF power will rapidly increase to the pre-set level in a mild ramped mode.
 - When the preset power is reached, the "On the air" led will light completely, if the power is set >50W. Till that moment it will turn off and on, signalling that the RF power is on but not correct.

While the power supply regulator accepts a wide input voltage range (190 ÷ 250 Vac), operations in the around of lower edge must be avoided, especially if the lines drops at load. In fact, if the line drops more than 10 volt at full load, the low line sense circuitry may trigger an oscillating turn-on/turn-off cycle, which is potentially very dangerous. In such cases an external line stabiliser is inevitably required.

To allow nominal 115V mains operation (100 ÷ 130 Vac), some jumpers must be properly set in the input transformer terminal board, inside the transmitter. To do that, the power cord must be disconnected from the mains, the top cover must be removed and the transformer voltage terminals must be accessed.



- 6) The first task to manage when turning on the transmitter as factory delivered is to enter the passwords. At least the 3rd (the highest) level must be **immediately** changed: if any unauthorised people change it, or if you lose it, there is no way to recover it and the transmitter may become unmanageable. **Access to the transmitter will require factory reprogramming or change of the internal CPU.** For this reason be sure to write down and keep it **immediately** in a secure place: **remember there is no way to read the password** after you have programmed and confirmed it. For practically any parameters that may require some setting in the field, the 2nd level password is enough and may be used for any standard service requirement. The main purpose of the existence of the 3rd level is a security assurance for the user in case he loses control on the lower password levels and wants to gain it back.
- 7) If not already done, adjust frequency and RF power as required, and check reflected power on the transmitter display. To this aim search for the RF power menu and read the corresponding value of direct and reflected output power. For proper operation, the reflected power reading should typically be less than 10% of the direct power value and 100W max at rated out (5%). Any higher reading may indicate that the antenna or the system are not properly connected or functioning.
- 8) Check and/or set clock and data and all transmission parameters as required, i.e. channel sensitivity and deviation, mono/stereo, preemphasis etc. Refer to the appropriate section of the manual.

5.5 LF CONNECTION AND PRESETS

LF wiring and impedance selection

SIRIO2000T supports balanced or unbalanced audio signals and allows selectable input impedance.

The inputs are basically balanced and have 600/10k ohm resistive impedance, with factory pre-set for 10k ohm. They can be connected to the balanced output of a professional mixer or to the unbalanced one of a cheaper unit without any appreciable degradation.

Change of the input impedance, if required, is one of the very few hardware pre-sets. For this purpose you must remove the upper cover. **To avoid any risk, remove mains connection** before doing it. With a #16 Phillips remove screws that hold the cover. Be sure to put them all back in place again when finishing the work in order to maintain EMI/EMC and safety compliance.

Pre-set of input impedance is easily done by accordingly selecting the jumpers JP1 and JP2, easily located on the input board just on the rear of the input connectors, as shown in the drawing. Impedance selection is silk-screened on the component mask of the board.

LF audio mono or stereo inputs are “XLR” female connectors. They should be connected to the output of the mixing table, or to any audio-processor that drives it, with a balanced coaxial cable connected to pin 3 (+) and pin 2 (-). The cable shield, connected to the ground through of the driving equipment, has to be connected to pin 1.



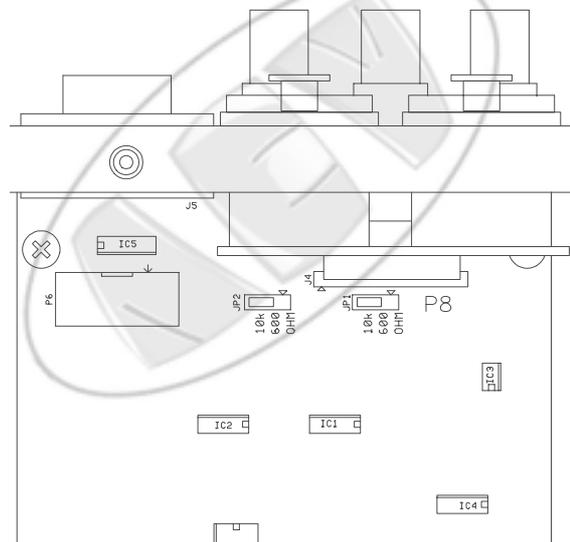
In case of unbalanced drive, input pin 2 shall be short-circuited with ground and shield on pin 1, while the signal shall be available on pin 3. Higher impedance selection, in this case, will be 5 kohm instead of 10 kohm.

With balanced drivings signals, the connecting canles to the audio source may be far longer than 100-m.

Mpx or an externally processed signal, usually an unbalanced one, can be connected to the female BNC connector, marked "MPX", which is internally parallel wired to the "RIGHT" channel connector: for this reason it is not possible to connect signals to these two connectors at the same time. Higher impedance position is 5 kohm in this case too.

If the distance exceeds several tens of metres, use 75-ohm (RG59) or 92-ohm (RG62) cables.

The auxiliary-channel connector is also of the grounded BNC female type. Use 50-ohm (RG58) or 75-ohm (RG59) cables for the connection to the driver. The same applies to the monitor "MODULATION" output, if needed.



Pre-emphasis setting

Low frequency mono and stereo channel signals have to be adequately "pre-emphasised". Standard preemphasis time constant is 50 and 75 μ s, the former being usually factory pre-set. Check whether this is correct for your country (it is usually correct for any European country and most of the Pacific and South American areas). It is not correct for USA standards, which requires 75 μ s.

If above correction is needed, simply set it on the "mode" FCC frame of the transmitter menu, which also includes mono/stereo operation and frequency. See appropriate section further ahead on in this manual.

LF input level range, setting and requirements

In the following paragraph we will refer to 0 dBm as the audio signal which produces 1mW on 600 ohm, i.e. a 775 mVrms / 2200 mVpp sine. Irrespective of the impedance and the non-sinus form of the signal, we will continue to assume 0 dBm as a LF signal whose peak is + (or -) 1100 mV.



In the same way, when talking about modulation, we will generally assume 0 dB as the signal which produces 100% maximum allowed modulation, i.e. 75 kHz deviation.

There is no absolute worldwide standard regarding *LF peak level* as modulation signal for a transmitter, nor for the mean deviation. Many broadcasters use 0 or +6 dBm as LF peak level for 100% modulation, USA often uses +10 dBm.

Many European countries specify +6dBm for 40 kHz deviation (which is assumed to be a "mean" modulation). This allows 5.5 dB headroom to 75 kHz (max) deviation, i.e. +11.5 dBm for 100% modulation.

An higher level minimizes system and ambient noise but a too high level may over-stress the input circuitry of the transmitter, reducing the dynamic distortion-free range over the nominal level (headroom). It may also be costly to produce a broad signal with the required quality.

For this reason AEV S.P.A. recommends, whenever possible, to adopt +6 ÷ +11.5 dBm as nominal peak level for audio modulation purpose.

SIRIO2000T transmitter series allows to set a "variabile" LF level on the main channel/s ranging -3.5 ÷ +12.5 dBm to be set for 100% modulation, with almost no difference in modulation performances, if high quality signal is provided. Even at the higher level, at least +6 dB headroom is additionally allowed: i.e. up to 150 kHz deviation, with no distortion. Obviously this deviation is not allowed by any broadcast standard and the limiter threshold in this case should be set at its maximum to permit undistorted performance.

The auxiliary channel's level ranges -12 ÷ +4 dBm to produce 10% modulation, i.e. 7.5kHz deviation. Consequently typical input levels for an SCA-type signal (10% max. admissible deviation) are $0.2 \div 1.0 V_{\text{rms}} / 566 \div 2830 \text{ mV}_{\text{pp}}$, when the input is set between -11.5 and +2.5 dB. All the same, an RDS-type signal could be accommodated in the $0.052 \div 0.33 V_{\text{rms}} / 150 \div 930 \text{ mV}_{\text{pp}}$ level range, to produce the standard peak deviation of 2 kHz, as above. In case a higher deviation is required for RDS (some broadcast authorities set it to 3 or even 4 kHz deviation instead of the standard 2kHz) a higher signal level preset sensitivity of the auxiliary input, is needed.

Regulating the nominal input level for 0dB modulation on the transmitter is an easy task. From the proper menu field you can see the variation in real-time, while the input level is being adjusted, in 0,5dB steps. The modulation is reported in kHz as absolute deviation, and in dB with reference to 75kHz.

In this field, the reported deviation includes any other auxiliary signal as pilot tone, when in stereo, and RDS or SCA signals, if used at the moment. To measure only the audio input channel signal, go to the Left/Right level menu.

The auxiliary channel level is equally easy to set, being measured as sensitivity in dB and as deviation in kHz. Remember that, in this case, 0dB corresponds to 7.5kHz deviation, i.e. 10% max allowed total standard modulation. In this way the typical level for RDS is -11.5dB for 2kHz deviation. This menu field accounts only for deviation due to auxiliary signal. To see the added effect on the total deviation, go to the MPX menu.

Due to the peculiar characteristics of the RDS signal and the measuring sampling, the reading is slow to stabilise in case of sudden level variations and tends sometimes to slightly flicker in few tenths of a dB. Allow enough time to stabilize and take the higher deviation reported as the right one.



The transmitter's internal limiter is peak-clipping type; this means that as soon as it cuts in, modulation distortion increases sharply. For this reason, the modulation signal should be kept under control to prevent intervention of the limiter. Anyway, do not over-estimate this problem: occasional action of the limiter is mostly unperceivable.

The cut-in limiter threshold, when enabled, is factory pre-set to +2.5 dB (100 kHz peak value). It may be set from 0 dB (75 kHz) up to +7.1 dB (170 kHz). This threshold value is mostly specified in the various national standards, and tolerance to short over-modulating peaks varies from country to country. Some countries do not permit the user to disable the limiter or change the level. Some countries do not allow the user to disable the limiter or change its threshold. Note that the limiter action begins slightly after the pre-set level, with no action at all till that. The difference between the threshold level and hard clipping is some 0.5dB.

In any case, the modulation peak value that is internationally admitted for FM is 75 kHz for peaks that are not extremely short. For this reason, the limiter's cut-in threshold should never be too high. It is highly recommended to use an external multi-band limiter to optimise modulation, with higher tolerance for any audio-signal peaks. Such devices momentarily reduce the amplifier circuits' gain if the threshold is exceeded and prevent severe, significant distortion.

Any external compressor, limiter or audio meter must be frequency compensated with the same time constant of the pre-emphasis to modulate or monitor deviation properly.

Therefore, as much as is possible, the audio level shall be constantly and correctly monitored and adjusted to prevent the internal limiter from cutting in. Done it, on the other hand the audio level should be as high as it is possible, to achieve the best signal/noise ratio, and presence effect, on reception.

The tendency to over-process audio signals is common in a number of local broadcasting stations: if an amount of processing is advisable, and we recommend using a top grade one, do not to compress the signal too much, as this impairs the original dynamics.

The audio response of the SIRIO2000T transmitter is extremely flat, without any perceivable loss on low and high audio frequency: for this reason large frequency alterations of the audio signal supplied by using a so-called "frequency equaliser" are not advisable. An increase of the low and high frequency contents of the audio signal by more than a few dB might cause general degradation of modulation dynamics and improper functioning of the limiter.



RS232 port

The RS232 port manages only Tx, Rx and Return data signals, with no handshake. Being the signals "*inverted wired*", you only need a simple serial cable of the pin-to-pin type, directly wired to the suitable connectors - usually female DB9 or DB25 - which must be connected to a PC port. Besides, you need a male connector - DB9 type - to be wired to the transmitter end.

Parallel REMOTE port

This port accommodates some lines for simple direct control/monitor on a DB9 male connector. They are:

- Pin 1, 5, 8 *Ground*.
- Pin 2, *On The Air*: a +12V/10k Ω signals that the transmitter delivers, substantial RF power,
- Pin 3, *Direct power*: a signal proportional to direct power is present, with a pseudo square law. Range is 0-5Vdc / 1k Ω impedance. With SIRIO 2000T a 5V stands for 2000W.
- Pin 6, *RF enable*: a shorted circuit to ground disables RF. output \approx +10V/1mA.
- Pin 7, *Alarm*: logic low signal means alarm. Correct functioning is signalled by +12V/10k Ω . Maximum current sinking capability <10mA.





5.6 OPERATION

Mono Broadcasting, from a monophonic audio source through main mono channel:

- 1) Wire the "right" (or mono) input connector to the corresponding audio source as described in the "system connection" section. No connection to the "left" channel input is needed. The signal runs through the channel processor and is 15-kHz filtered and pre-emphasised.
- 2) Select the "MODE" command menu (cf. relevant section on the manual) and select "MONOR" operating mode. Confirm or change also 50 or 75 μ s pre emphasis as required.

Mono Broadcasting, from a stereophonic audio source through the optional internal stereo-encoder:

- 1) Wire both the "left" and "right" input connector to the corresponding audio source as required for stereo transmission. The audio signals will run through the channel processors and will be 15-kHz filtered and pre-emphasised on both channels. The internal stereo-encoder will blend the stereo input source to transmit in mono. In this case the transmitter is already pre set for stereo operation if needed, simply reversing transmission mode to "stereo", inside the aforementioned.
- 2) Select the "MODE" command menu and select "MONO L+R" operating mode. Confirm or change also 50 or 75 μ s preemphasis as required.

Note that it is possible, acting on the internal stereo-encoder, to blend the left and right channel or select only one of them, without changing the modulation sensitivity. Refer to the stereo-encoder description to do that.

Mono or Stereo Broadcasting from a Radio-Link Receiver or an External Encoder:

- 1) In this case, the signal is already multiplexed and pre-emphasised. Use the "MPX" input. The signal skips the coding and filtering stages and therefore is not pre-emphasised.
- 2) Select the "MODE" command menu and select the "EXT MPX" operating mode. While it is anyway advisable to select the proper preemphasis time-constant as required in your country, in this position this selection is not influent.

Stereo Broadcasting from a stereophonic audio source through the optional internal stereo-encoder:

- 1) Wire the XLR-type modulation input connectors, marked "Left" (channel) and "Right" (channel), to the output of the two channels from the mixer or stereo source. They will be internally 15-kHz filtered and pre-emphasised signal.



- 2) Select the "MODE" command menu and select the "STEREO" operating mode. Confirm or change 50 or 75 μ s preemphasis as required.

Operation with a RDS or SCA Encoder:

- 1) Wire the BNC-type "Aux" connector to the output of the RDS or SCA Encoder. If the internal optional stereo-encoder is used, wire the "MODULATION" BNC output to the pilot-tone synchronisation input of the RDS encoder, if present.
- 2) Select the "AUX" command menu and push "ENTER" to vary the channel sensitivity. Adjust both transmitter sensitivity and/or the level of the external generator for the deviation required, as explained in the previous manual sections. Consider that 0dB modulation reading (not the input level) in this field means 10% total modulation or 7.5kHz deviation, i.e. the standard pre-setting for a SCA auxiliary channel. In the case of RDS, a reading of -11.5dB or 2kHz is the correct value of modulation.
- 3) Total modulation and deviation can be read on the "MPX" display field, plus any other composite signal available present.

Modulation Adjustment with broadcast signal:

Check the overall modulation level for adequacy, as follows:

- 1) Select the display menu field "MPX": the total modulation will be displayed, both in dB and as deviation in kHz. An analog moving bar and a digital peak reading are contemporary shown.
- 2) Send a pseudo constant level musical signal to the modulator input, check the measure hovers in the around of 0 dBm (or the chosen value, i.e. +6dB) and moves a bit higher during signal peaks only, and by no more than 1 or 2 dB. For any other reading, adjust the mixer's "MASTER" volume until the above conditions are obtained.
The red "Limiter" alarm LED should not or rarely light up, as this would indicate distortion.

If the limiter is set just above 75 kHz, the red LED will light up above 0dB (or chosen level) and the modulation measured will never show a much greater value. Factory pre-set is 100 kHz (+2.5 dB).

Check of Pilot tone on Stereophonic Transmission:

In case of internal stereo-encoder, no allowance is externally provided to change the pilot tone level, which is would internally pre-set for 9-10% of modulation, i.e. -21 \div -20dB or 7 \div 7.5kHz corresponding to the standard deviation of . In case the stereo multiplex signal it is provided by a separate external stereo-encoder, it must be measured in absence of audio modulation and any other auxiliary signal as below:



- 1) Disconnect any signal from the external stereo-encoder input and any RDS or SCA signal.
- 2) Select the display menu field "MPX" and check the pilot tone, which must be now the only signal available. The standard level is that previously stated, i.e. 9-10% or $-21 \div -20\text{dB}$, and may be adjusted accordingly on the external stereo-encoder to suit the request.
- 3) Reconnect any previously disconnected signal as done.

Very low power level transmission:

SIRIO2000T transmitter is not recommended as a very low power unit. Do not use at less than 250W, never below 100 Watt. Although rare, with specific power and frequency combinations (usually at less than 20 Watt), some sub-harmonic and/or spurious signals may be generated, and the power level stability is anyway not good as it is at higher power level. Moreover, it may be dangerous to use a transmitter which may generate a very higher power if improperly set in a lower power tailored antenna/filters environment.

If low power level transmission is imperative, adjust it very carefully and also pre-set the maximum output power which may be adjusted by main regulation: the software permits to adjust the max RF output level (cfr. relevant section in the manual). Carefully check with a spectrum analyser that the transmitter is working properly at and just below the operating power.

The installation of the transmitter is thereby completed. Many other monitoring and control facilities are provided by the internal display and software, and are remotely accessible. Navigation through the menu driven software is suggested and encouraged to gain confidence with the options: no extensive training is needed for the most common options. Nevertheless some options are hidden for security purposes and always require the password. Read the relevant section of the manual to know all possible functions which are adjustable.

AEV S.P.A. reminds you that we are always available for further informations or to tackle any specific problem You may encounter.



WARNING!

OPERATION WITHOUT THE ANTENNA OR WITH A FAULTY ANTENNA CONNECTION MAY CAUSE DEGRADATION AND POSSIBLE DESTRUCTION OF THE FINAL STAGE. THIS FAILURE IS NOT COVERED BY THE GUARANTEE.



6. COMMANDS AND PROGRAMMING

The transmitter allows exhaustive control of all transmission parameters and complete programmability and monitoring facilities through the various software controls via the front panel keyboard and display. The same functions are remotely addressable with a proper software, which is not included as a standard option.

For a description of remote capability see the proper section on the manual. In this section we will examine the front panel menu-driven operational capability.

6.1 PASSWORD ORGANIZATION

The password organisation is set in 3 security levels, each having its own password. An higher level permits to change also the lower levels authorisations and passwords.

Each password is composed by 4 alphanumeric characters, including extended capital and lower case ones and several special symbols. We suggest using a wide range of characters as the security level raises, so as to increase the possible combinations. No password is ever shown: it is always masked by dummy characters as "...." or "*****". Nevertheless it may be always changed with the higher level authorisation. Here is the purpose of each level:

Level 1: Lower security level. It is needed to access to most of the monitoring and control menu fields, not permitting to alter or programming any operating parameter. It is factory pre-set to "off" state by default, enabling the user navigation through the transmitter's monitoring menu information. AEV S.P.A. suggest leaving it in its state if a high privacy level is not needed. If set to "on" it will show the default menu field #00 (c.r. menu tree), requiring password for any other information or pre-set. Failure to insert a correct password of any level will prohibit any other access to the commands for the time-out length (usually 3 minutes). No change of the functioning mode is done in case of incorrect password input. No information is available on the display regarding the transmitter functioning.

Level 2: Service level. This password is needed for any functioning set-up as frequency and power, sensitivities, clock and date etc. Its use is reserved to service technicians who need a wide access to the transmitter presets and functions. While the default factory state is "off", AEV S.P.A. suggests changing the default state and password immediately at the first power on, to prevent unauthorised people from tampering with the transmitter commands, if the default word is known or the state is set to "off".



Level 3: Highest security level. It is always "on" by default and resets anyway to "on" after the display time-out, for security purpose. Its knowledge is deserved only to a **very few** individuals and must be immediately entered after set up and kept in a safe place: **there is no way to read it** after you have set it and confirmed into the transmitter.

This password must be **immediately** changed at the first pre-set of the transmitter: if any unauthorised people tamper with it or you lose it, there is no way to recover or change it. If you do not know the correct word the transmitter may become unmanageable.

Access to the transmitter will then require factory reprogramming or changing of the internal CPU.

For any parameters that may require some setting in the field, the 2nd level password is enough and may be used for any standard service requirement. The main purpose of the existence of the 3rd level is a security assurance for the user if he loses control on the lower level password.

Only very few critical parameters, like limiter permission or control require this password, as in some countries this functions are not allowed to be freely chosen.

6.2 FACTORY DEFAULT PASSWORDS

These are the factory default password:

Level 1:	P001
Level 2:	P002
Level 3:	ABCD

According to what previously said, be sure to change at least the 3rd, and possibly the 2nd level, as soon as you receive and turn on the transmitter.

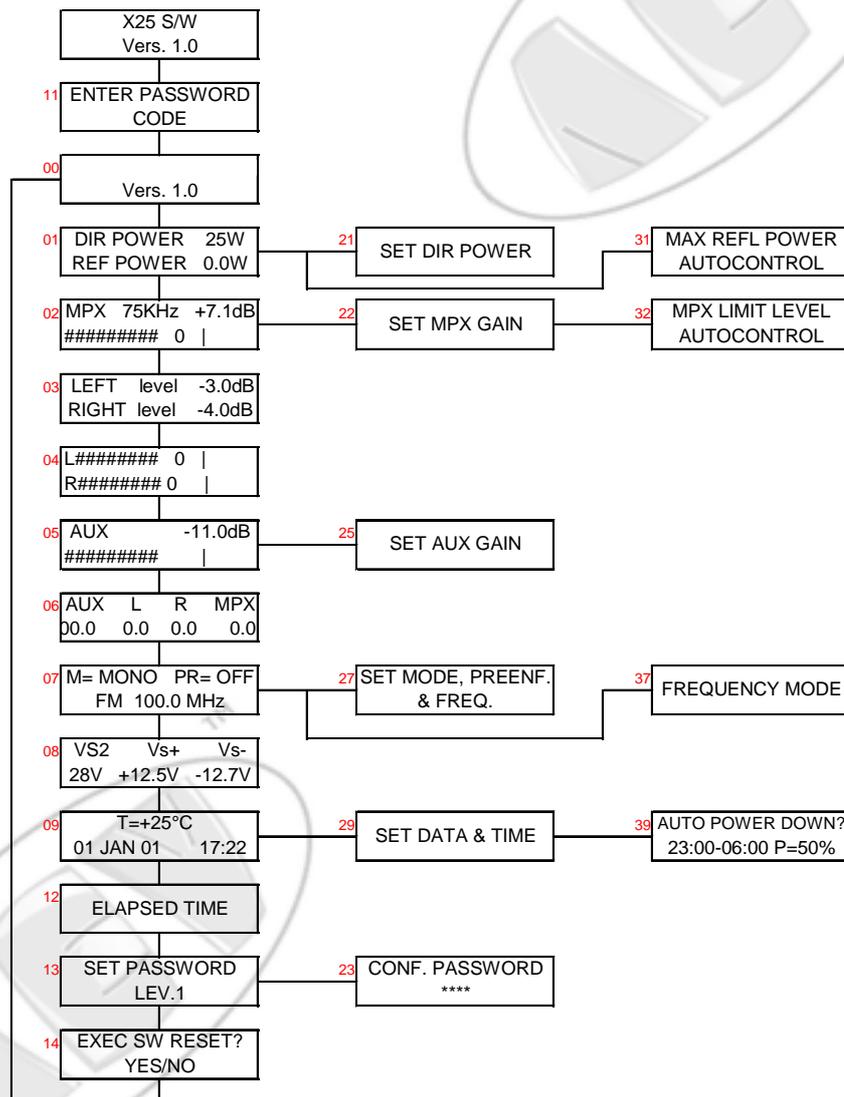
For security purpose the 3rd level password may be factory changed from the default value before the transmitter is shipped, in consequence of a specific customer request.



6.3 MENU AND COMMANDS DESCRIPTION

The hierarchical tree of the menu is depicted in the following table, with a small number near the left side of each field for easy reference. In the following pages we will examine each menu field and option.

All of the first column fields require the first level password authorisation to be navigated. Similarly all the second column fields require the second level authorisation, as some in the third column. The third level is required only by some functions in this last column.





Navigation through the menu fields is straight forward and natural, with the direction keys: The "up" and "down" keys scroll the fields vertically, while the "left" and "right" keys scroll the menu horizontally. Moving to the right may be prohibited by the password permission, while returning to left is always possible.

The "enter" key changes from scrolling to programming mode, if allowed in the field.

Another push on the "enter" key will confirm the input data. When in program mode, the up and down keys will change the character, while the left and right key will move the cursor on the field. Pushing on the "escape" key will abort the input while repeated escape commands will reset the menu field to the default one (#00).

A local input time-out will automatically escape the command mode resetting input data if this are not confirmed within 60 seconds.

Few minutes of experiments will give the most users confidence with control keys and menus, making them able to access and manage all main features of the transmitter.

In any case, it is impossible to discover hidden functions without the proper password permission.

Start menu

The start menu field is the unnumbered one on the top of the menu tree. It is shown only when the transmitter is turned on from the mains or when a reset is sent via software or hardware. The display will show the software version and the initialization step, when all the leds and the display will be turned on and off for a short while, for testing purposes. Any subsequent key input will turn this menu field to the next, which requests a valid password code.

Menu #11: Initial Password

ENTER PASSWORD

.....

This field requests to input a valid password code. When the input is confirmed by the "enter" key, the word will be compared with the memorised passwords table and, if recognised, the corresponding security level will be allowed. If the password is incorrect or the input is terminated by an "escape", the password will be signalled as invalid and the security level allowed will be that one in memory, i.e. 0 (no permission at all), 1 or 2.

If the security level is already "off" for the 1st and the 2nd level factory pre-set, as there is no need to input any password to freely navigate in the menu tree and to set the main operating parameters.

When the password is recognized as valid and the corresponding level is displayed, press on escape key will turn on the default menu field #00.



Menu #00: Default Message

```
AEV BOLOGNA -I TALY
X25 SW rev. 1.0
```

This field shows the default message and the software release. It is the field that will be initially displayed or to which pressing repeatedly you can get back, after the "escape" key.

If authorised by the 3rd level permission, going to the command mode and by pushing "enter", will change the first row of this field with a custom 20 characters long message e.g. the following organisation name:

```
NORTH-WEST RADIO
X25 SW rev. 1.0
```

Menu #01: Direct & Reflected Power

```
Dir Power: 2002 W
Ref Power: 26 W
```

This field shows the direct and reflected power actually delivered.

Going to the command mode, with the 2nd level password authorisation, will allow to set a new direct RF output power. See menu #21.

Menu #02: Multiplex Signal Level (Output Modulation)

```
MPX 75.0kHz + 0.0dB
##### 0|
```

This field shows the present peak modulation in dB referred to 75kHz and as deviation in kHz. A pseudo-analog moving bar will contemporary change according to the modulation, leaving a peak mark at its end for 1 or 2 seconds. A vertical bar (|) on this line marks the 0dB position.

Command mode, with the 2nd level password authorization, permits to set the LF input channel sensitivity. See menu #22.

Right key instead permits to access to limiter setup and threshold. See menu #32.



Menu #03: Left & Right Signal Level in dB

```
LEFT level - 3.0dB  
RIGHT level - 4.5dB
```

This field shows the present left and right peak modulation in dB, referred to 75kHz dev.

The reading is adequately accurate with real audio signals. Some steady state test tone especially at very low audio frequency may beat with the discrete ADC conversion sometimes producing reading uncertainty (*aliasing*). In this case the MPX level reading will anyway produce correct overall modulation measure.

Menu #04: Left & Right Signal Level as analog moving bar

```
L##### 0 |  
R##### 0 |
```

This field shows the present left and right peak modulation as two moving bars. A vertical line marks 0dB position and the same considerations as in the previous menu are still valid.

Menu #05: Auxiliary Signal Level Modulation (SCA, or RDS)

```
AUX 2.0kHz -11.2dB  
#####0 |
```

This deviation field shows the present modulation due to an auxiliary SCA or RDS signal in kHz, and a peak level expressed in dB referred to 7.5kHz 10% of max peak modulation. Usual level for SCA signal is instead, higher and typically 0dB (7.5kHz). The standard modulation of the RDS usual level is "kHz i.e.: - 11,5 dB.

Command mode, with the 2nd level password authorization, allows to set auxiliary input channel sensitivity. See menu #25.



Menu #06: Aux, Left, Right and Mpx level in dB

AUX	L	R	MPX
-11.2	-3.0	-4.5	+0.0

This field summarizes all together the present modulation in dB of the auxiliary, left, right and multiplex signal as seen in their own menu fields - AUX - L - R - MPX

Menu #08: Internal Voltages

Vs2	Vs+	Vs-
+20.2V	+12.4V	-12.9V

This field shows the internal regulated voltages. In SIRIO2000T Vs2 is comprised between +18 and +22V, depending on factory adjustment. Vs+ is $+12.5 \pm 0.3V$, Vs- is $-13.0V (+1/-3V)$. A marked difference from these values, may indicate anomalies.

Menu #09: Temperature, Data and Clock

T(A/H):	+30°C	+40°C
01 JAN 02	17: 22: 10	

This field shows the internal temperature, the present data and clock. To set data and clock it is required to go to the command mode, with the 2nd level password authorisation. See menu #29.

Two temperature sensors read the room (A) and the output stage heatsink (H) temperature. The room temperature is really that of the exhaust ventilation air and it is taken just behind the front panel. It is usually 2-3 °C higher than the external temperature at full output power: i.e. nearly +47 °C assuming an external temperature of +45 °C (the maximum allowed).

The heatsink temperature is usually 10 to 13 °C higher than the room temperature @ full power.

Being the maximum allowed temperature limit +45 °C, the transmitter progressively reduces its output power when the ambient temperature is reported higher than 55 °C or the heatsink is higher than 65 °C. There is a 5 °C overtemperature range in which the equipment is allowed to work at reduced performance. Besides, the equipment may reliably work in an ambient which is even 10 °C higher than the maximum nominal range, at less than maximum output power or for reduced lengths of time.

Consider that the higher the ambient temperature, the lower the MTBF. As rule of thumb the life is halved each 10 °C the temperature is increased. Assuming 10 years operating life at +25 °C, which is not unrealistic, it may become 2.5 years at +45 °C.



Menu #12: Elapsed Time

```
ELAPSED TIME  
000356 HOURS
```

This field shows the elapsed time and whether the transmitter is on the air (or in stand-by with the mains applied). There is no way to change the reading.

Menu #13: Password Management

```
PASSWORD LEVEL X  
code=**** status=OFF
```

This field shows the password status and allows the user to change the code and/or the status in command mode, when in possession of the necessary level authorisation for that level or an higher one. No code is ever shown and no access is permitted to a level higher than current authorisation.

If the password is unknown, lost or if it was changed by mistake, it is possible to change the level status and code if holding the higher password. In this case the lower level passwords can be changed and confirmed; no possibility instead to know what it was the old password. This means that it is always possible to change the 1st or 2nd level passwords, even if they are unknown, if respectively the 2nd or 3rd level password are correctly entered.

If the password or the status is changed, it is always required to confirm the correct password for that level. In case a lower password permission is actually entered in regard to the needed action, it is possible to input the higher level passwords or performing a software reset, if permitted, or turning off and on the mains voltage through the rear mains switch or an external switch.

The 3rd level authorisation, when set, will stay valid until a display time-out is performed, i.e. usually 3 minutes after the last command. Navigating through the menu or performing some action will extend the time-out.

If the password status is set as "ON" for the level 1, a hung-up follows after the time-out. This is intentional to prevent unauthorised people from browsing the transmitter parameter. Transmitter performance will be unaffected by this condition. Any attempt to access the transmitter will cause the password request: if an invalid password is entered, it needs to wait for the time-out to permit a new attempt or to remove the mains power from the transmitter, so causing an hardware reset. Even in this case, the first request will be still that to input a valid password.

**Menu #14: Software Reset**

```
EXEC SOFTWARE RESET?  
NO
```

This field performs a software reset if knowing at least the level 1 password. The main purpose of this reset is to input a new password level; its action is similar to turning off and on the mains to the transmitter. A software reset will lead to a small interruption of the RF output power which will be re-established in 1-2 seconds, while lock on frequency will not be lost. No transmission or sensitivity parameter is lost in consequence of software or hardware reset.

To execute a software reset the "ENTER" key must be pressed twice

Menu #21: Output Power Set

```
Dir Power: 1990 W  
Ref Power: 25 W
```

This field derives from #01, in command mode. The direct power value blinks selecting it with left and right arrows and the field acts pressing the enter key; the up and down keys are used to set the numeric value. The output power will vary in real time. Confirming the final value with an "enter", will write the new setting in the memory of the transmitter. Escaping will instead abort the change. A local time-out will automatically delete the input if the input itself not confirmed in 30s from the last change.

Menu #22: Multiplex, Left & Right Input Level Set

```
MPX 75.0kHz + 0.0dB  
Nom. input = + 6.0dBm
```

This field in command mode, with the 2nd level password authorisation, serves to set LF input channels sensitivity, i.e. multiplex, left and right channel. Keep in mind that the multiplex and the right signals share the same channel and the sensitivity is set to the same value for both right (or multiplex) and left channels, with a differential error <0.2dB at any level. Allowed range is -3.5 ÷ +12.5 dBm.

The first line of the display shows the modulation, while the bottom line shows the required input level for a 100% modulation. Of course, increasing the nominal input level will accordingly decrease the modulation, if the modulation signal amplitude is kept constant.



Menu #23: Password Confirmation

```
CONFIRM PASSWORD
.....
```

This field is displayed when password code or mode is changed on menu #13. It requires to input the same password as in the current level which has to be changed. Failure to do it will produce the following message:

```
INVALID PASSWORD!
.....
```

This display stops input mode for 5 second and then permits to exit (and possibly to try again) with the escape key.

Menu #25: Auxiliary channel Input Level Set

```
AUX 2.0kHz -11.2dB
Nom. input = +0.0dBm
```

This field in command mode, with the 2nd level password authorisation, allows to set the auxiliary channels input sensitivity. Allowed range is -12 ÷ +4 dBm to produce 10% modulation, i.e. 7.5kHz deviation or 0dB in the upper line of the display.

Menu #27: Mode, Preemphasis and Frequency Set

```
STEREO PR=50us
FM 102.43 MHz
```

In this field it is possible to set the transmission "modes" (MONOR, STEREO, MONOL+R, EXT MPX), the preemphasis time-constant (0, 25, 50 & 75 μ s) and the frequency in step of 10 or 100kHz as pre-set on menu #37. The access to this last menu is performed directly from the main frequency menu #07, pressing the "right" key.

Left and right keys change the input fields while the up and down keys, after having selected with "enter" change the various options or increase/decrease the frequency. To confirm the displayed value, another press of "enter" key is required

**Menu #29: Date and Time Set**

```
T(A/H): +30°C +36°C  
01 JAN 02 17:22:10
```

This field is the command mode display of menu #09 with the 2nd level password authorisation and allows to set date and time.

As in the previous menu, the left and right keys change the input fields while the up and down keys increase/decrease now the date and time.

Menu #31: Maximum Reflected Power Set

```
Refl. Pw Limit 87 W  
Auto Control OFF
```

This field permits to set the maximum reflected power level. Default value is nearly 90W and in any case this power is hardware limited to 100/120W for security reason.

Auto Control on the lower line is not yet operative and could be absent in some software release.

Menu #32: Limiter Set

```
MPX Limit + 7.1dB  
Auto Control OFF
```

This field, with the 2nd level authorisation, permits to set the limiter action. The right/left keys toggle the limiter on and off. The up/down keys vary the threshold level.

Auto Control on the lower line is not operative in some software release. When it is, it will dynamically reduce the input sensitivity to allow distortionless limiting if pre-set to ON. Even in this case it will be wise not to exceed the limiter threshold to avoid a "pumping" effect on the modulation.



Menu #37: Frequency mode

FREQUENCY MODE
100kHz / STEP

This field, with the 3rd level authorisation, allow to set the frequency step variation between 100 and 10kHz.

Menu #39: Power-down setup

AUTO POWER-DOWN OFF
23: 00--06: 00 P=50%

This field, with the 2nd level authorisation, allow to preset the "power-down" mode.

If this mode is on, the output power will be automatically decreased to the pre-set percentage in the time period set in the bottom line. The scaled power is approximate, and must be tested and/or adjusted before final setup, if critical.





7. SERVICE AND MAINTENANCE

Since SIRIO2000T is forced-air cooled by an internal low-pressure fan, it is subject to clogging by dust.

It is therefore recommended not to install the transmitter in excessively dusty environments but to choose clean ones. Place transmitter above floor level on a stable stand/rack to insure a good ventilation. Depending on the local situation, in complex cases is suggested to internally clean the equipment with a soft brush or compressed air at some fixed time intervals, i.e. between 6 and 12 months.

Because of the high-quality materials used in their manufacture, out of the above cases if SIRIO 2000T is installed as set forth as per “INSTALLATION AND USE,” it will not require any special maintenance for quite a long time.

After a few years of continuous service, it is recommended the transmitter is sent back to the factory or to a specialised laboratory, where its characteristics can be checked and some re-calibration can be done, when needed.

It is especially important that the power supply be over-hauled when the transmitter have been working at high temperatures, over 30 / 35 °C.

Never change the internal calibrations to avoid altering the transmitter declared performances.





8. GUARANTEE

Like all AEV S.P.A.'s solid state equipment, this transmitter carries a one-year guarantee on all the components with the exclusion of the final RF power transistors which may be damaged by faulty output connections.

This guarantee is null and voids if the transmitter is tampered with, or if failure is due to improper use, wrong installation or external causes, such as mains overvoltage, lightning or excessive moisture in the environment.

This guarantee covers work done exclusively in our laboratories and in those of our agreed representatives.

The goods shall be delivered carriage prepaid to the laboratory and shall be returned freight forward.

This guarantee does not cover any consequential damage due to non-operation or faulty operation.



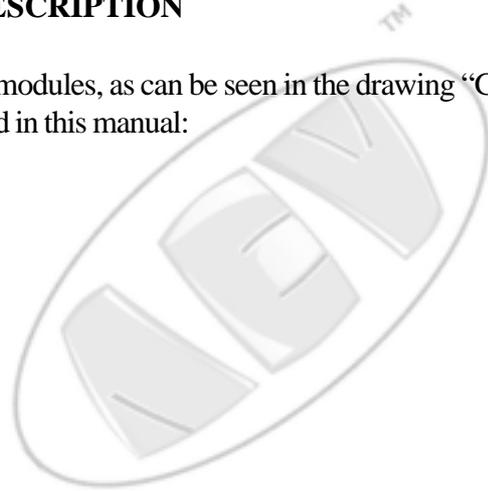


9. SERVICE MANUAL

9.1 INTERNAL DESCRIPTION

SIRIO2000T transmitter is made with several internal modules, as can be seen in the drawing “General view” and in the "General wiring diagram", both comprised in this manual:

- The CPU controller and display board
- The LF and RF control main-board
- The stereo-encoder module (optional)
- The FM synthesiser module
- The RF driver amplifier
- The RF power amplifier array
- The main regulated power supply
- The auxiliary regulated power supply



For the detailed description of each module on the following pages, always refer to the corresponding electrical diagram, in a following section of this manual.



WARNING!

THIS SECTION IS ONLY AIMED TO GENERAL EXPLANATION, REFERENCE AND SERVICE PURPOSE BY SKILLED PERSONNEL. AS EXPLAINED IN THE PREVIOUS SECTIONS, INTERNAL ADJUSTMENTS ARE NOT REQUIRED DURING NORMAL OPERATION. TAMPERING WITH INTERNAL SETTINGS VOIDS THE WARRANTY, MAY HARM THE TRANSMITTER AND JEOPARDIZE THE GUARANTEED PERFORMANCE. COMPONENT VALUES SHOWN MAY VARY FOR PRODUCTION REQUIREMENTS.

DUE TO THE TECHNOLOGY USED, MOST MODULES AND ESPECIALLY THOSE IN SMD ARE NOT DESIGNED TO BE REPAIRED AND IN CASE OF FAILURE THEY MUST BE REPLACED WITH BRAND NEW ONES.



THE CPU CONTROLLER AND DISPLAY

This circuit board is fundamentally simple. It contains the CPU, the keyboard and few other circuits that we will briefly discuss.

The CPU has 3 digital 8-bit ports and an analog one. This latter is the interface with the analog signals that must be measured in the transmitter. A fast peak rectifier built around IC4 drives one of these analog lines. All audio or lf modulation plus some steady state signals are multiplexed to its input by IC3, so requiring only one peak rectifier and this way increasing the number of the analog channels. One analog channel reads the internal temperature through the TR3 sensor, while a second temperature input is performed by the line AN3, for the heatsink temperature sensing.

The simple specialised IC6 performs clock and date functions as a stand-alone unit, backed-up by a battery which keeps circuit active for a long time when power is off.

The keyboard switch array is sequentially scanned one hundred times in a second to determine if a key was pushed. IC5, a serial to parallel converter, drives the front-panel leds and the display backlighting with TR2.

The alphanumeric display is a separate module connected to the board through a small flat-cable. Eleven digital lines from the CPU drive this module. The internal board trimmer RT1 regulates the LCD contrast and may be used to regulate it with different situations. A separate power supply current for the backlight leds is derived by R41 and R42: these resistors become quite hot when the display is full on and their heat somehow influences the internal temperature read by TR3.

No other regulation is provided on the board. The precision of the measurements is guaranteed by a design that involves low tolerance components and the by ad adequate reference voltage source, IC1.





THE LF AND RF CONTROL AND PROCESS MAIN-BOARD

This is the most complex board in the transmitter and supports the LF input processing, with level adjustment, audio-pass filtering and limiting. It also includes the RF control section and the I/O interfaces and interconnecting the various transmitter modules with flat-cables.

Its electrical diagram is splitted in two sheets for clarity purpose and we shall examine in sequence.

In the first diagram are located the I/O interfaces, both the audio and the digital ports, and the analog RF control. Let's start to briefly consider each block diagram.

In the upper left side of the diagram are located the audio channels amplifier/buffers made with 6 op-amp sections of IC1 and IC2. Two impedance selector jumpers for the audio channels lead the pack and a network made by resistors and diodes protects the inputs from occasional static discharges, as required for CE compliance. Four unity-gain active buffers follow, and then two balanced to unbalanced signal converters, which drive the electronic attenuator visible in the 2nd sheet.

The last op-amp in IC2 (d) amplifies the auxiliary channel input with a -0.1 dB upper corner band $\gg 200$ kHz and drives the third channel of the electronic attenuator.

On the lower left of the diagram are the RS232 interface (IC5) and the parallel remote I/O active interface with its protection network, built around TR1, TR2 and TR3. A wired or pull-up makes the logic levels $< 1V$ as 0 and 10-12V for 1.

On the lower right section of the diagram it is located the RF power controller.

The RF direct and reflected power signals samples coming from the output directional coupler are amplified by IC3 in two symmetrical circuits.

The direct-power control circuit, built around IC4a, continuously drives the RF output stage gain, varying the supply voltage to the RF driver transistor and the regulated voltage of the output transistor. The reflected-power limiting circuit IC4b only acts on the same loop when the IC3b output voltage is greater than the threshold set by the voltage on the R49/R50 network. A third and fourth section of IC4 filters and buffers the signal coming from the CPU and set the reference level for the output power loop. TR4 disables the RF output when the synthesiser is not locked.

In the upper right section of the sheet is shown the control bus connector to the CPU, which carries the digital control lines on the lower pins and the analog lines on the upper ones. From this connector comes the power supply too. Only +12.5V and -12.5V are used in the board.

Let's now go to the second sheet of this diagram.

Beginning from the upper left side, we find IC8, which forms a 3-channel digitally controlled attenuator. It separately manages left, right and auxiliary channels, while the external multiplex signal is processed in the same channel as the right one. Three buffers/amplifier follow each channel: IC7a, IC8a and IC12a. The output of the first two amplifiers drive the pre-emphasis stages, whose time constants can be digitally set at 0, 50 and 75 μs , through the analog gates of IC9. A limiter stage follows, built around D8 and D9 diodes acting as clippers. By varying the limiter's reference voltage driven by the CPU through IC13a, the limiter threshold level $+V_l$ & $-V_l$ can be adjusted. RT4, if present, imposes a ceiling to the limiter.



The signal goes to the stereo-encoder circuit's input sections if present. In the mean time, the signal on the mono right channel path is sent to a low-pass filter, consisting of the section built around IC10 and IC11, which attenuates the frequencies above 15 kHz for operation in mono.

The switch IC14 selects the signal issuing from the non-pre-emphasised input section through R124 or from the pre-emphasis-and-filter section through R128 or from the stereo-encoder through R131. IC12b buffers the chosen signal and mix it with that issuing from the auxiliary channel. When required, the diode D17 further limits the resulting total signal. The latter is then sent to the FM modulating/exciting circuit via IC12c buffer circuit and adjusted in level by RT6 as required. A separate section of IC12 separately buffers the modulation signal for monitoring purpose, and sends it to the modulation output connector. IC15 deserialise the digital signal sent by the CPU to control the transmission channels with IC14 and preemphasis action with IC9. Two output lines from IC15 are used to latch the remote output lines "Failure" and "On the air".

THE STEREO-ENCODER MODULE

The encoding circuit uses an 8-step switching technique, which ensures excellent performance with a relatively simple circuit. With this technique the first harmonics that are associated with the resulting stereo multiplex signal are the 7th and 9th (266 and 342 kHz); this simplifies the design of the low-pass filter on this signal.

The audio signal is filtered beyond 15 kHz by the two precision active low-pass filters built around IC1 ÷ IC4. It is then buffered by IC3d and IC4c and applied to the encoding circuit present in IC8. To remove higher order harmonic products, another higher frequency low-pass filter follows. Also this filter is made with highly precise active circuitry built around IC5 and IC6a, b. The latter section (c) of IC6 performs phase equalization. The four analog switches contained in IC7 allow to select the mono or the stereo-encoded signal and to slightly vary the encoder gain to adjust for the 90% audio modulation in stereo vs. 100% in mono. Two jumpers on BD1 are used to select either Left or Right or Left+Right channel for mono operation, with no output level change. As factory configured, both jumpers are installed, to mix Left and Right channel for "MONOL+R" operation.

Circuits IC10, IC11 supply the encoder's time base; IC9 synthesizes the 19kHz pilot frequency which is filtered and buffered by IC5a. A separate 1 Vpp output is provided on J2 to drive carrier synchronization on a possible external RDS generator.



THE SYNTHESISED OSCILLATOR

The frequency synthesizer is a classical phase-locked-loop circuit with 10-kHz step synthesis across the entire FM band.

The very low-noise fundamental-frequency VCO consists of a FET-oscillator transistor TR5, modulated by the varactor diode D4÷D7 which also set the operating frequency. The circuit is sensitivity compensated vs. carrier frequency variation so that its modulation gain varies less than 0.5 dB across the entire operating range.

Modulation distortion is typically lower than 0.03% with over 90 dB S/N ratio in mono mode within the 30 - 20,000 Hz band.

The RF signal is buffered and amplified by three cascaded transistors TR6 ÷ TR8, from which is derived the feedback signal to the PLL and the drive signal for the output RF stage. This latter one is composed by two small mosfet transistors TR9 and TR10 and delivers about 900 mW output level (+29 dBm) over the full FM range. To correctly operate, TR9 and TR10 require a gate bias voltage, which is factory pre-set by RT1.

The digital PLL circuit is entirely contained in IC2, whose frequency reference is derived from an highly precise temperature compensated oscillator (TCXO1) running at a frequency of 12.8 MHz.

To correctly operate on the chosen frequency, IC2 must be serially programmed with complex data. This task is performed by the transmitter CPU through 3 control lines.

IC1 also serves as a loop filtering from IC2 frequency comparator output to the varactor diodes and lock detection. Note that bias voltage is removed from output transistors through TR4 and TR3 to turn-off RF when the PLL is not locked on the right frequency. The control loop was designed to ensure that cross-talk added to stereo-composite signal is below -55 dB at 30 Hz and is virtually not influent at just slightly higher frequencies.

THE RF DRIVER AMPLIFIER

This stage is designed with one high gain mosfet RF power transistor, which has some 17 dB gain, in a broadband design.

A resistive input attenuator (R2, R3, R4) enhances matching with the previous stage and contributes to insulate the two stages. A broadband matching network feeds the transistor gate and the other one follows the transistor drain.

The available output power of this unit is well over 25W on the whole FM range, with 28V power supply. To limit that power up to nearly 20W, a lower power supply voltage is applied, usually 20V.



The transistor gate is biased by a zener network and a resistive trimmer which adjusts the idle current of the transistor. RT1 is usually set to provide some 200mA drain current, with +12Vdc control voltage applied and no RF input. Varying the control voltage towards a negative supply progressively disables the amplifier transistor, so it effectively acts as an AGC input.

The power management circuit, in a closed loop driven by the output sense circuitry, varies this voltage. This will accordingly vary the output power to obtain the pre-set value and cope with alarm and start-up conditions.

The low-pass section and the directional coupler circuit shown in the electrical diagram and allowed in the board for different applications (25W stand alone exciter) may be not present since those circuits are not needed for an enclosed driver.

THE RF POWER AMPLIFIER ARRAY

This stage is designed with four 500W amplifier modules, coupled with an input splitter and with an output combiner. A low-pass is incorporated in the latter, together with a directional coupler.

The whole assembly is contained in a fully screened box, which may be accessed from the bottom of the transmitter, only removing the bottom cover. A quick description of each stage follows.

The input RF power splitter

The purpose of this simple board is mainly to divide the input RF drive power in four identical signals, one for each power amplifier module, providing a good insulation between each output port (>20 dB, typ. 23 dB minimum on the whole FM band).

This is done by a Wilkinson type printed coupler, followed by the balancing resistor array R21 ÷ R24.

A directional coupler senses the input RF level and RT1 is regulated to provide the overdrive protection circuit trip at the right maximum input level. The board supports also the direct (or forward) and reflected detector sensitivity trimmers, whose input comes from the output board.

Two additional lines support the RF module bias (or AGC) line and the temperature sensing PTC thermistor on the heatsink.



The RF power amplifier modules

These modules are built around a couple of "Gemini type" Mos-fet transistors each one forming a 300W push-pull amplifier.

Discrete Wilkinson-type couplers are on both the input and the output module section, dividing and recombining the input and output signals, so providing a suitable insulation between the transistors.

A small balancing resistor R1 is mounted on the input splitter, while a much bigger resistor R14 is mounted in the output combiner.

A group of C, R and L RF decoupler and dampening components are mounted on the positive supply line of each amplifier, plus a small value resistor, R12 and R13, for possible separate current detection of each supply leg.

The gate bias is separately adjusted through R15 and R16 on each section. Do not tamper the factory bias preset values! The full power output of the 500 module actually exceeds 600W, to provide some room for coupling losses on the combining stages of higher power amplifiers, like it happens with SIRIO2000T.

The output RF power combiner, LPF and coupler

This module is symmetric to the input power splitter and is another printed Wilkinson coupler, whose power management capability is obviously much higher than the input board. In this case the power balancing resistors are high power devices, whose centre connection is referred to ground through an inductor, which purpose is to discharge static electricity on the antenna, up to a relevant amount of power.

The power combiner is followed by a printed low-pass filter, which attenuates the harmonic products generated by the amplifiers.

3 directional sample lines derive two rectified voltages proportional to the direct and reflected output power and a RF signal for external monitoring purposes.



THE MAIN POWER SUPPLY REGULATOR

This module gives an efficient regulation of the raw dc input, $140V \pm 15\%$ to the nominal lower one of 48V needed by the RF output power modules. Being the efficiency very high, only a little heat is produced in the regulation process. The current capability of the regulator is higher than requested, approaching some 70A @ 48V.

A control I/O connector on an upper daughter board, allows a remote control of the regulator by the transmitter controller, i.e. output on/stand-by, current and voltage monitoring, status prompting and alert.

The regulated voltage is dynamically varied by the ALC control with the output power, to maintain high efficiency at reduced power levels, proportionally decreasing the generated heat amount. The voltage varies in the range of 30 to 48V, the higher one being measurable only when the transmitter is set at the maximum output power.

A fast 80A semiconductor-grade protection fuse is screwed on the board: it may be fused by the crowbar protection in case of switching transistor damage. If this happens a first attempt to replace the fuse may be accomplished, after having verified the integrity of the power transistors. Usually something is broken so causing the fuse blow-up.

Reparation of this module in the field is very difficult if any component other than the fuse and/or a power transistor failed. It is strongly suggested to replace the module with a new one, and to send back the damaged one to the factory for inspection and a possible repair.





THE AUXILIARY POWER SUPPLY REGULATOR

Also this small power supply regulator is an high-efficiency, low-voltage switch-mode type. Its input is derived by the main nominally regulated +48V.

The main switch-mode regulator is built around IC1 which controls the conduction duty-cycle of its internal series-pass power MOSFET to obtain a 28.0 ± 0.1 V DC regulated voltage. The oscillation frequency is fixed, around 100 kHz.

L1 and C26/C27 form the main integration cell, which averages the pulsed voltage at IC1 output. A second filtering cell, L2, C28/C29 further removes high frequency noise contents from the main regulated output.

A 30V zener diode, D8, is in parallel with the main regulated output for safety purpose. Should the internal switch transistor fail short, D8 would break-down blowing the series input fuse on the board, avoiding more costly overvoltage damages to the rest of the transmitter. It is imperative not to exceed the nominal +28.0V (+0.1V max) on the main regulated output to avoid overstress on this component and consequent failure. Nevertheless in this transmitter the main regulated voltage is usually set to +20V and limited to 22-23V max, as needed by the RF driver amplifier to deliver 18 to 20W.

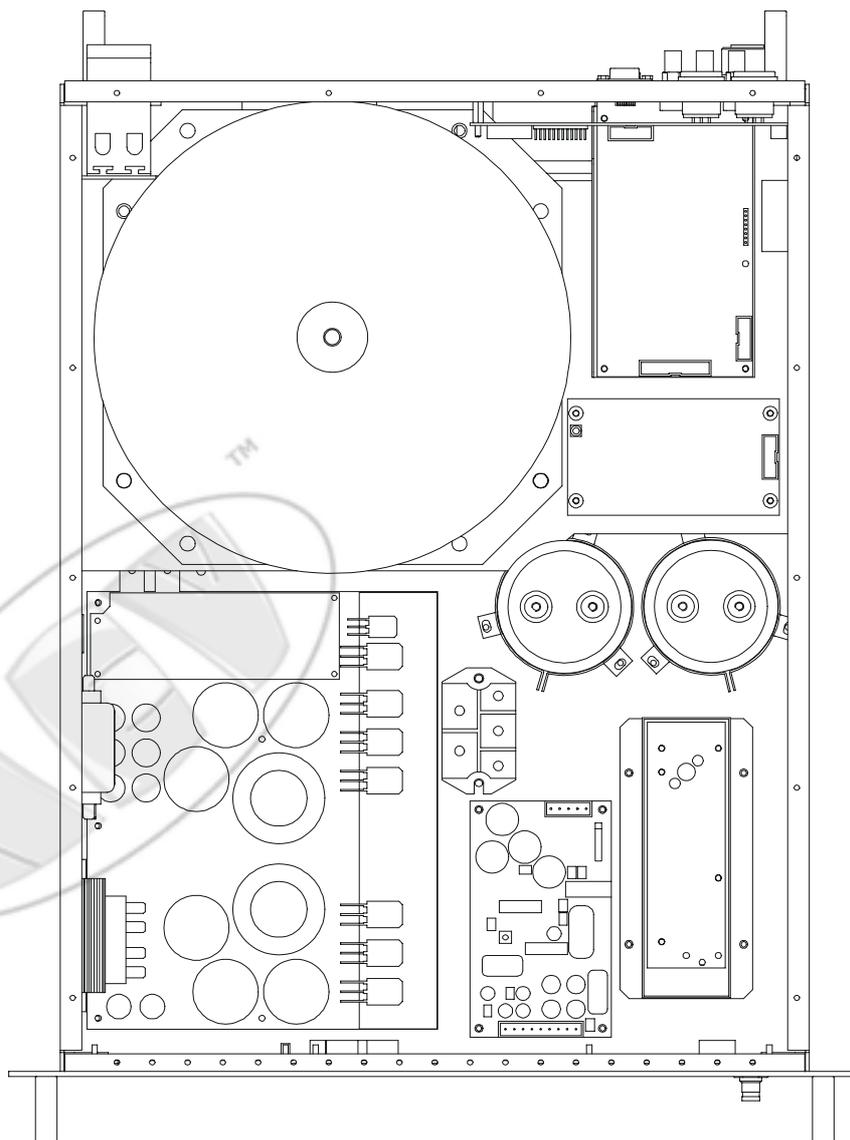
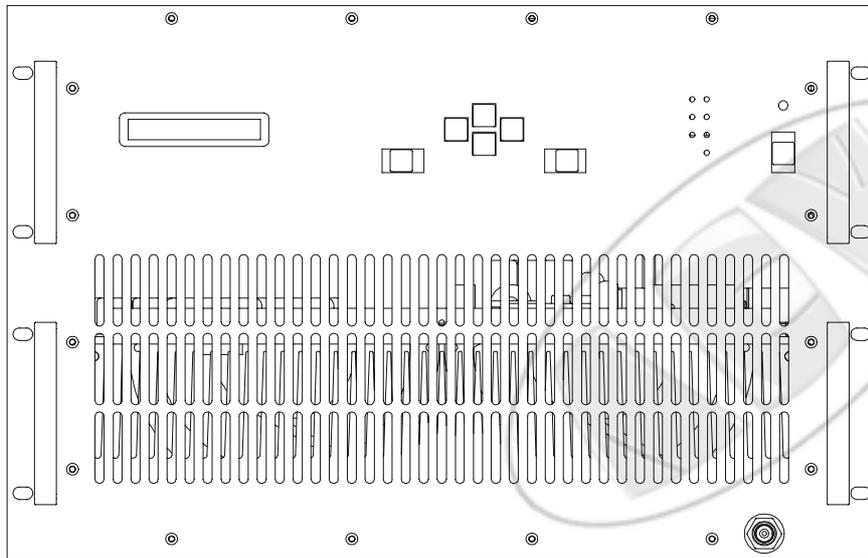
Another lower power switch-mode IC regulator derives the auxiliary regulated +12.5V voltage (± 0.5 V/0.5A, average) and a loosely regulated -12.5 ± 1 V.

The efficiency of the whole circuitry is very high and manages a substantial amount of power versus mains voltage changes, dissipating little energy, so keeping overall temperature low with no extensive heatsinking, required by conventional linear regulators.



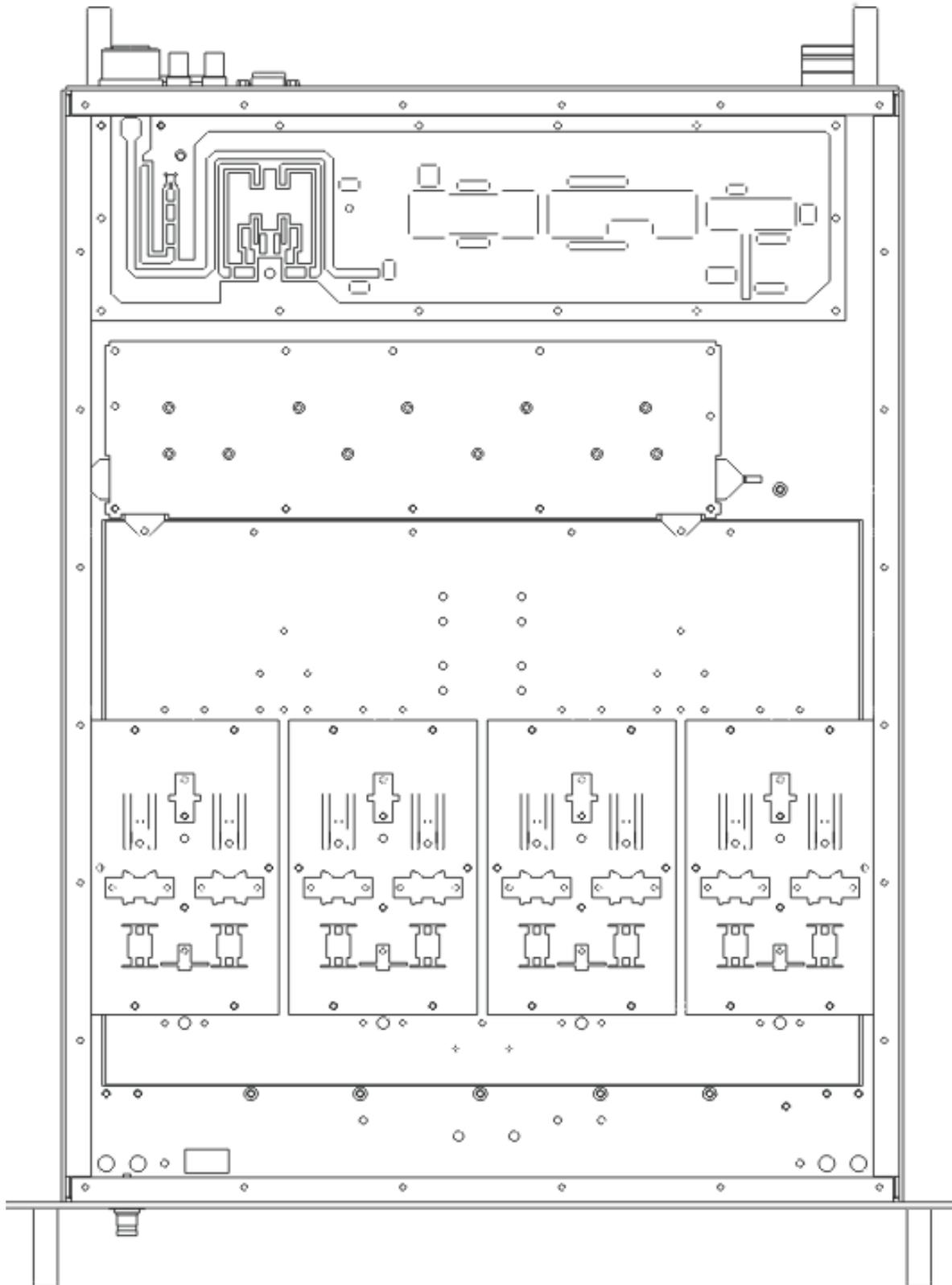


SIRIO 2000T TRANSMITTER - FRONT & TOP ASSEMBLY VIEW



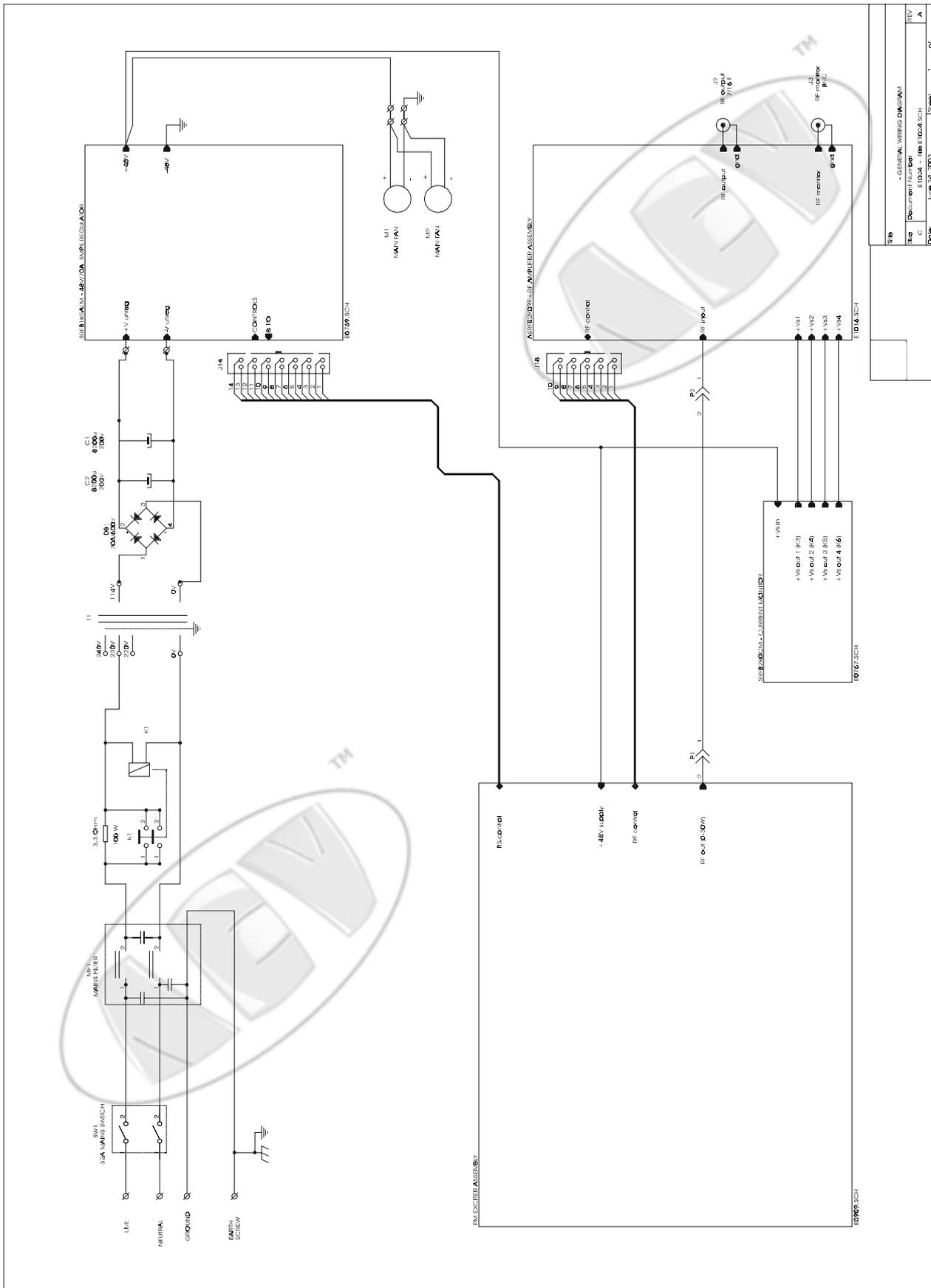


SIRIO 2000T TRANSMITTER - REAR INTERNAL VIEW





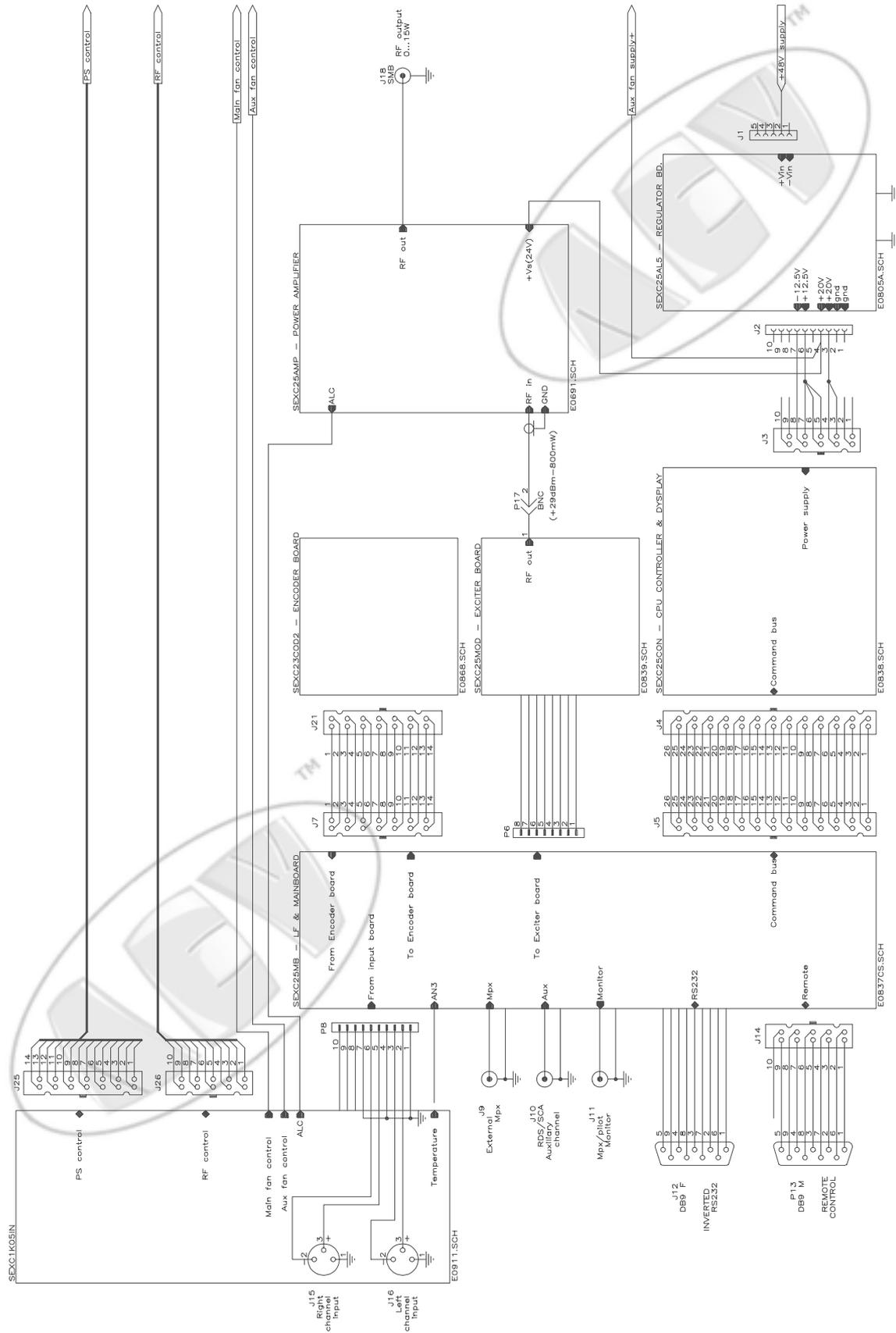
SIRIO2000T TRANSMITTER - GENERAL ELECTRICAL DIAGRAM



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Author	ELIQUA
Check	ELIQUA
Date	June 25, 2003
Sheet	1 of 1

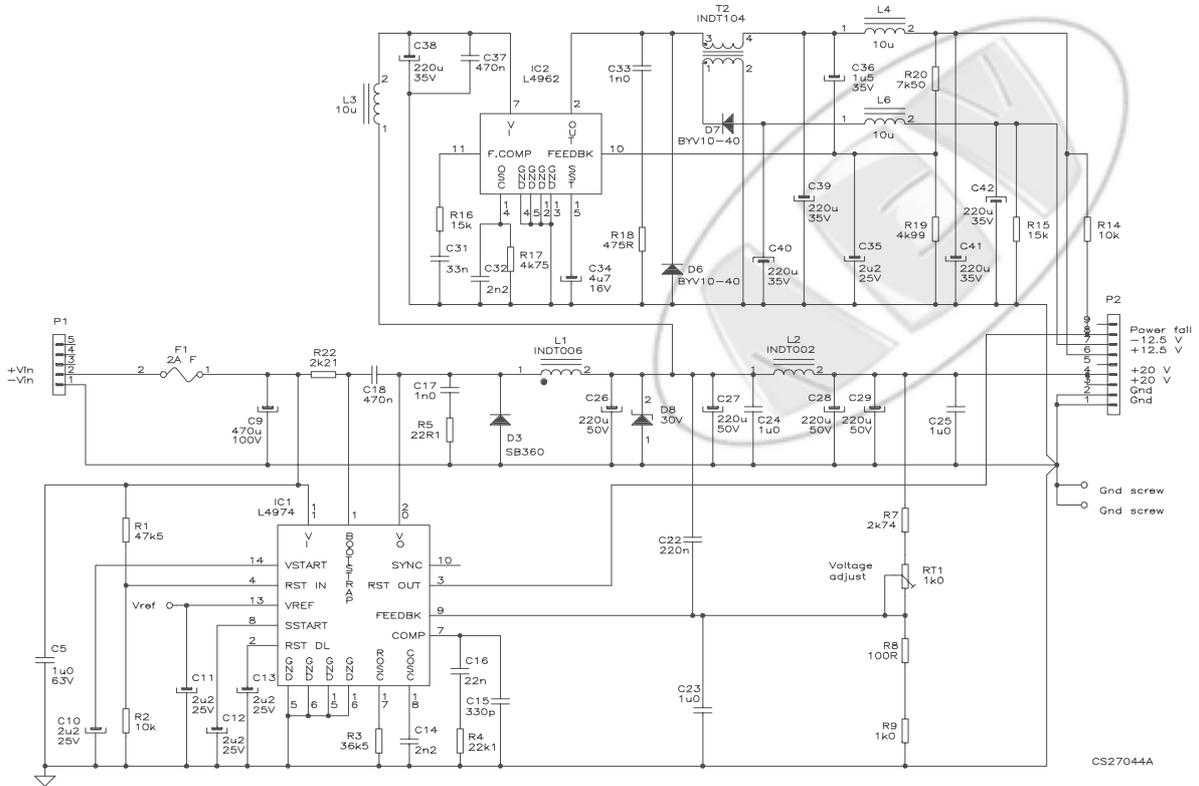


SIRIO 2000T TRANSMITTER - SIRIO ASSEMBLY ELECTRICAL DIAGRAM

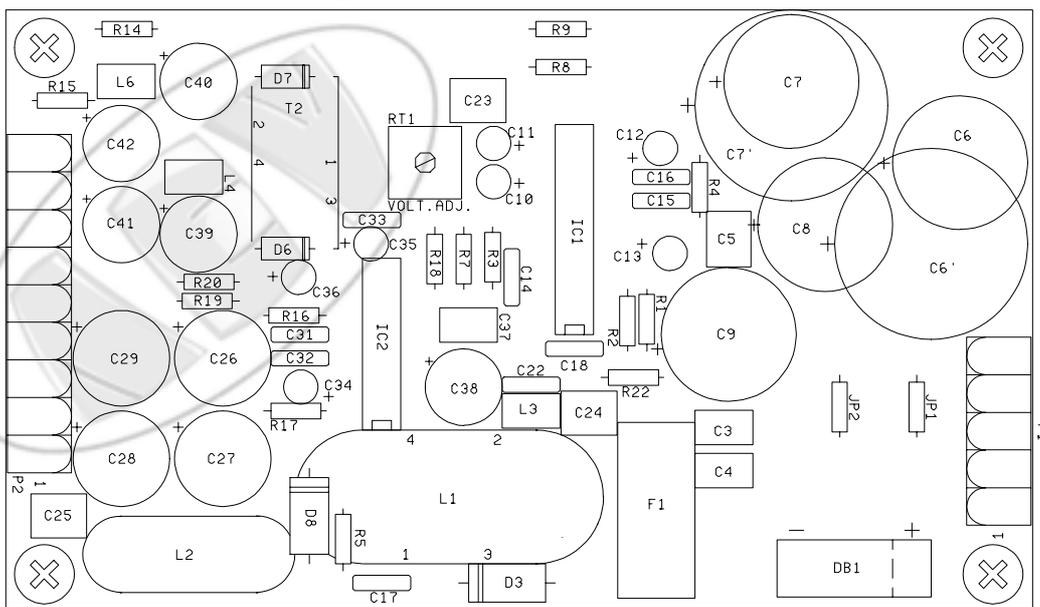




**SIRIO 25AL5 -- AUXILIARY POWER REGULATOR BOARD
ELECTRICAL DIAGRAM**

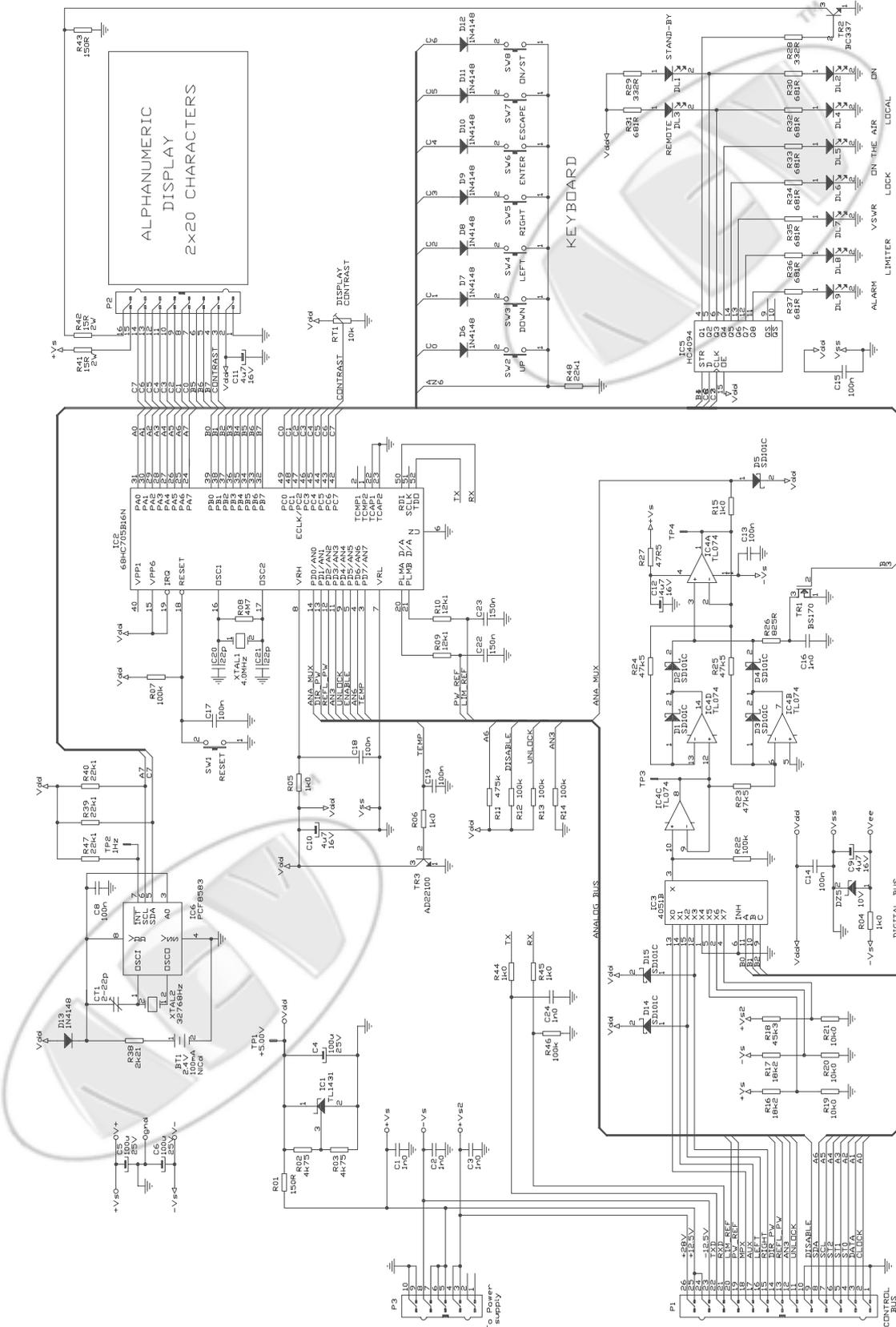


COMPONENT LAYOUT



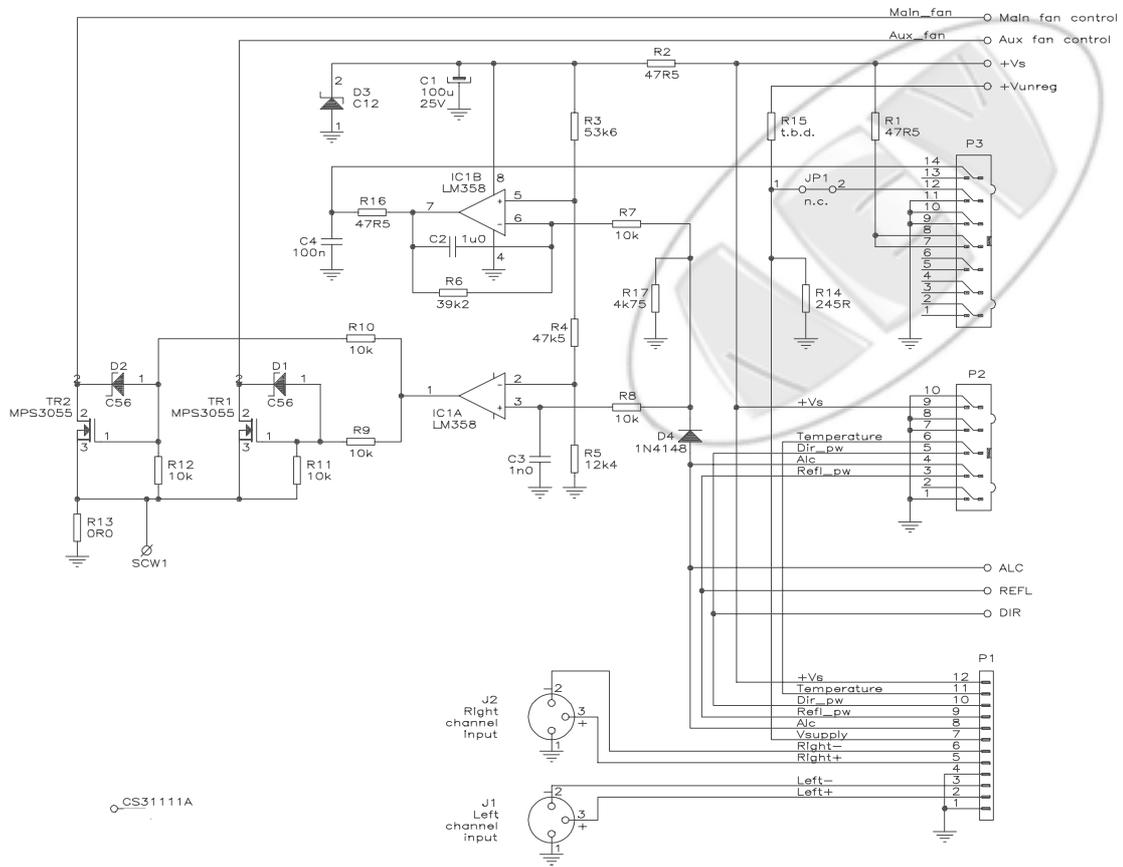


SIRIO 25CON -- CPU CONTROLLER & DISPLAY BOARD ELECTRICAL DIAGRAM

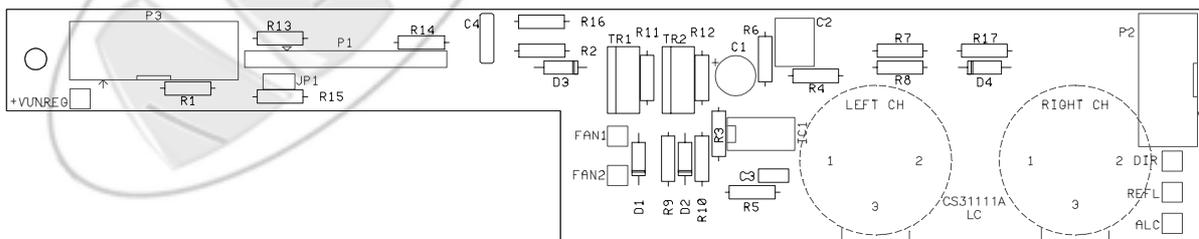




SIRIO 1K05IN - INPUT & INTERFACE BOARD ELECTRICAL DIAGRAM

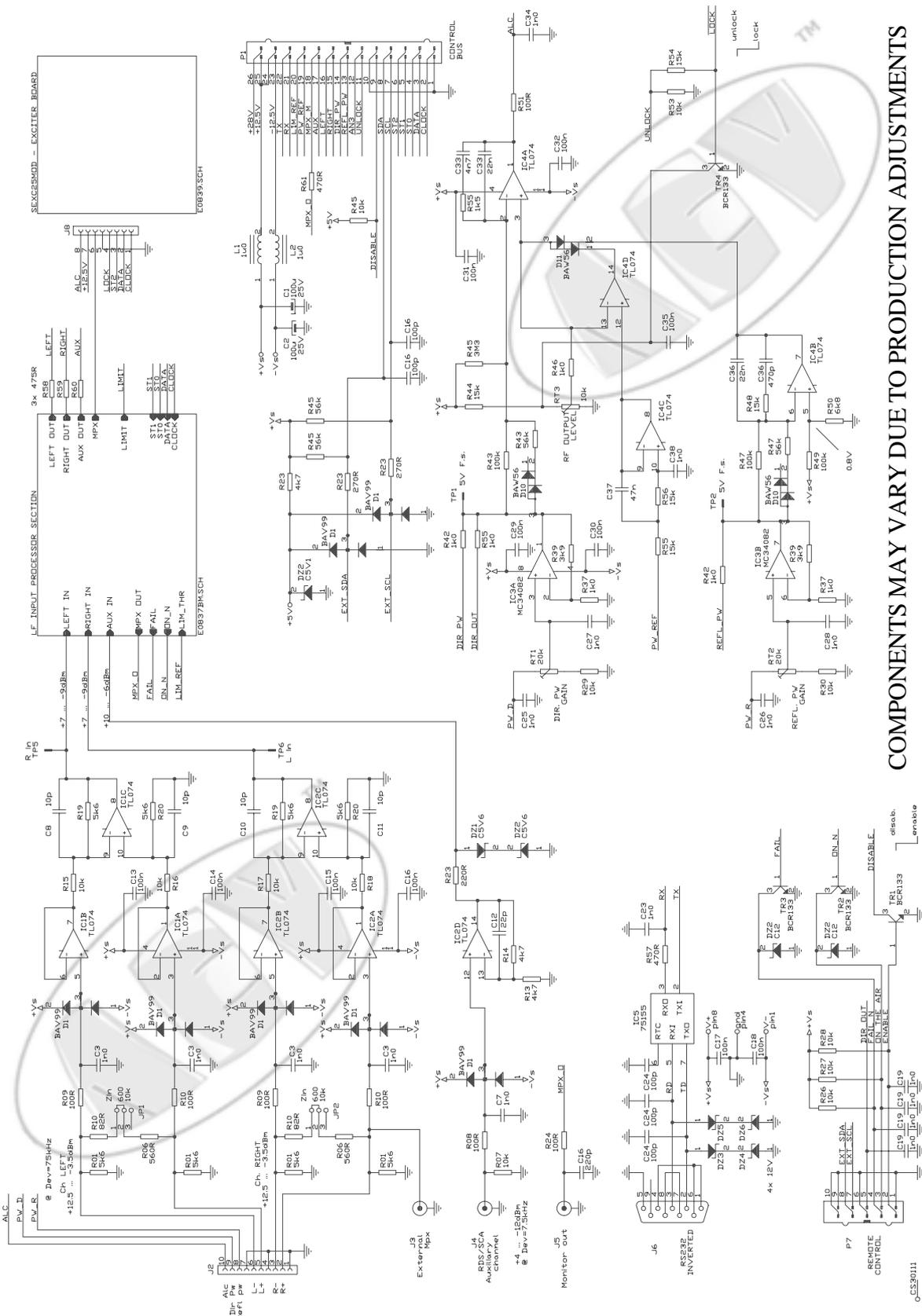


COMPONENT LAYOUT





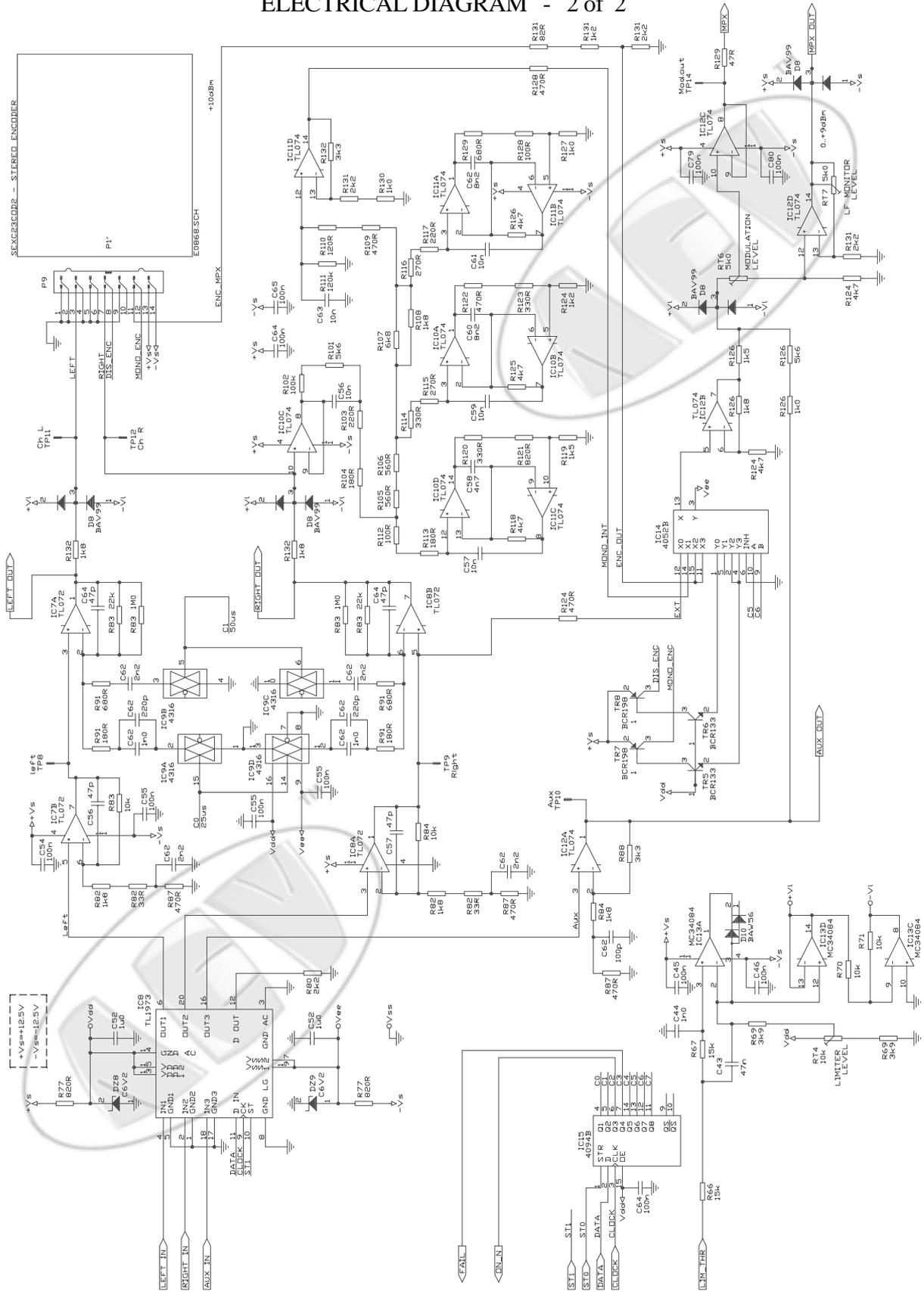
SIRIO 25MB - MAINBOARD / I/O & RF CONTROL SECTION ELECTRICAL DIAGRAM - 1 of 2



COMPONENTS MAY VARY DUE TO PRODUCTION ADJUSTMENTS

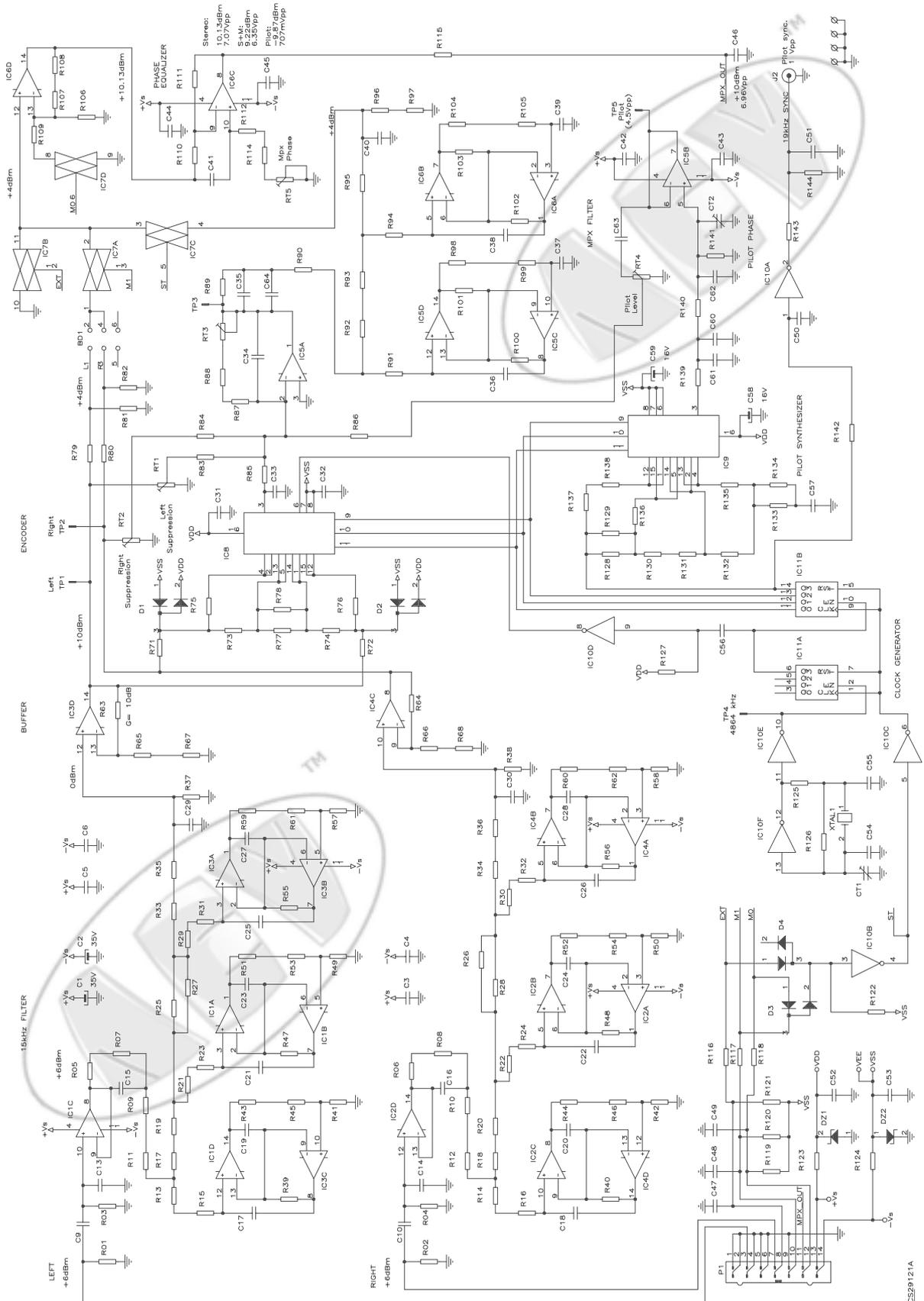


SIRIO 25MB - MAINBOARD / LF PROCESS SECTION ELECTRICAL DIAGRAM - 2 of 2



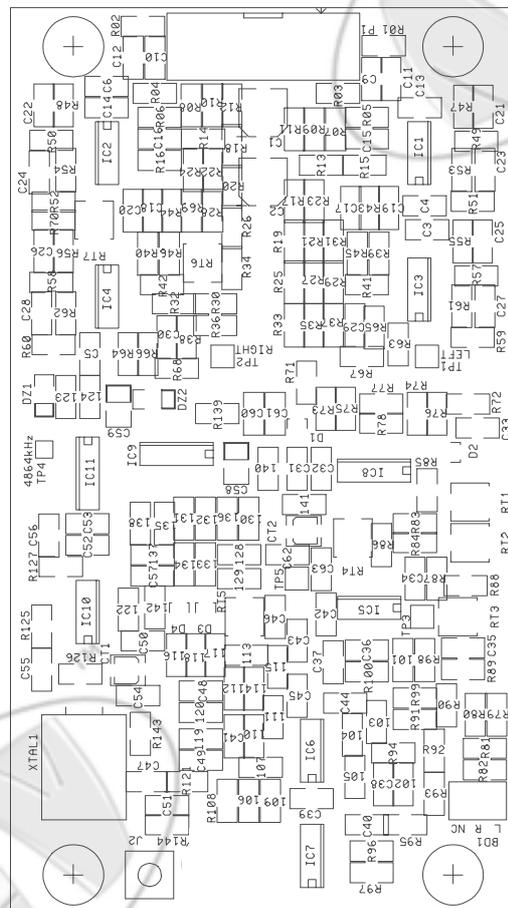


SIRIO 25COD2 - STEREO ENCODER BOARD - ELECTRICAL DIAGRAM



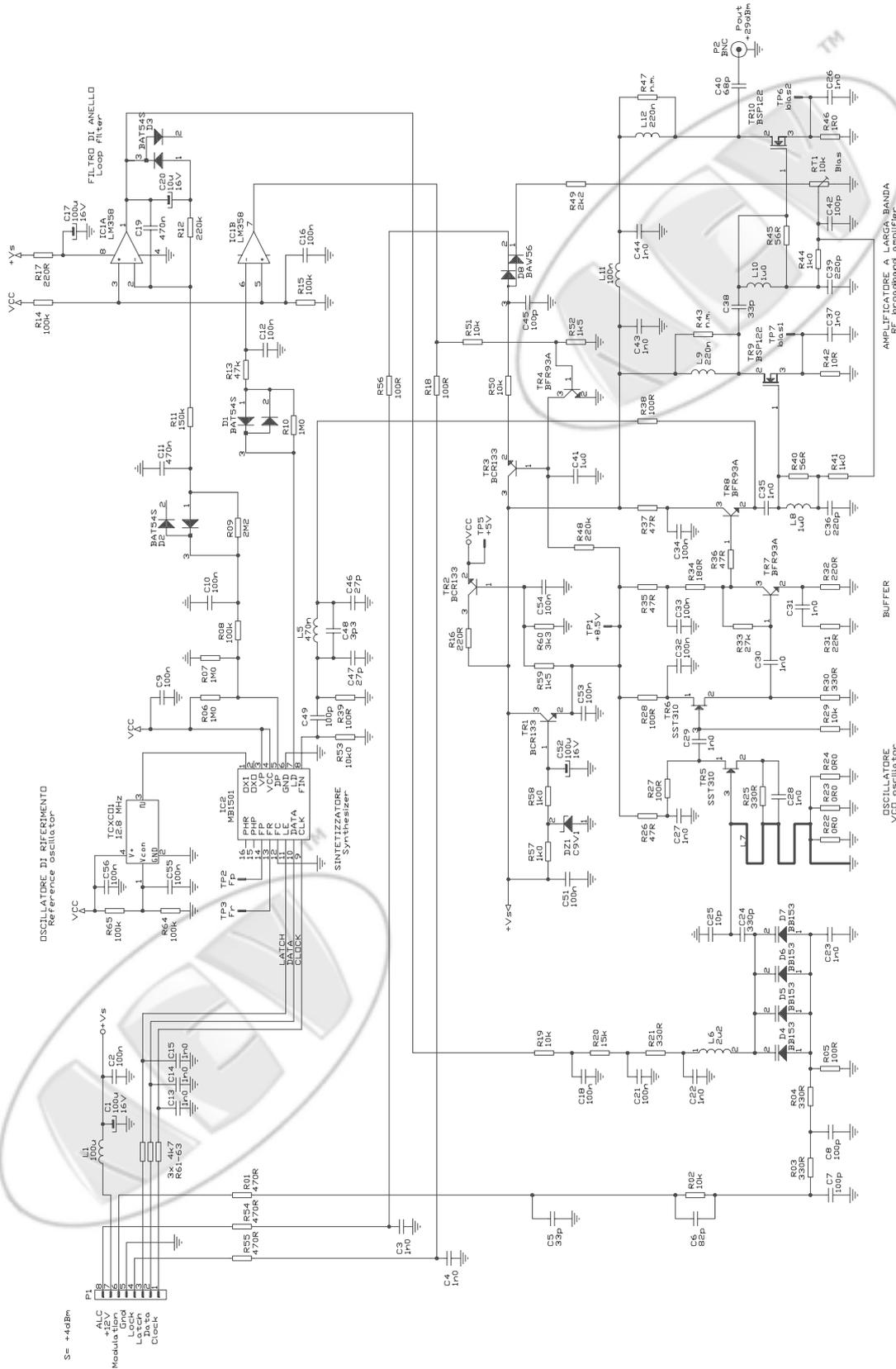


SIRIO 25COD2 - STEREO ENCODER BOARD COMPONENT LAYOUT





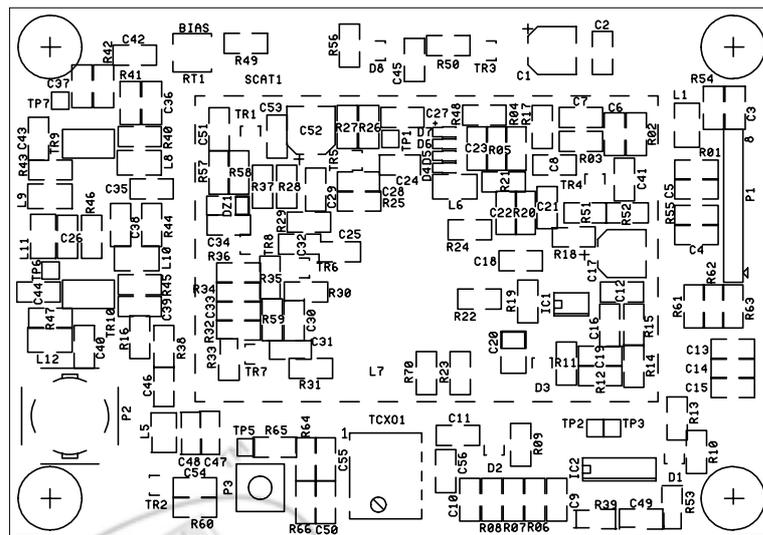
SIRIO 25MOD - FM SIRIOITER BOARD - ELECTRICAL DIAGRAM



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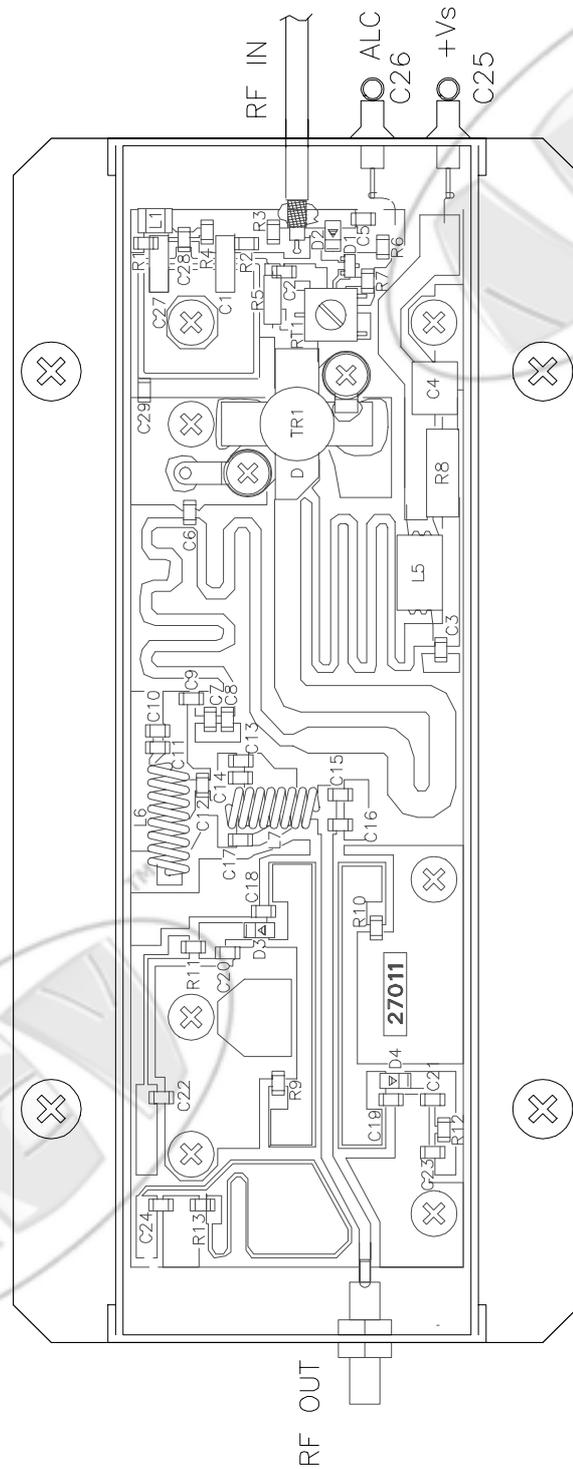


SIRIO25MOD - FM SIRIOITER BOARD COMPONENT LAYOUT



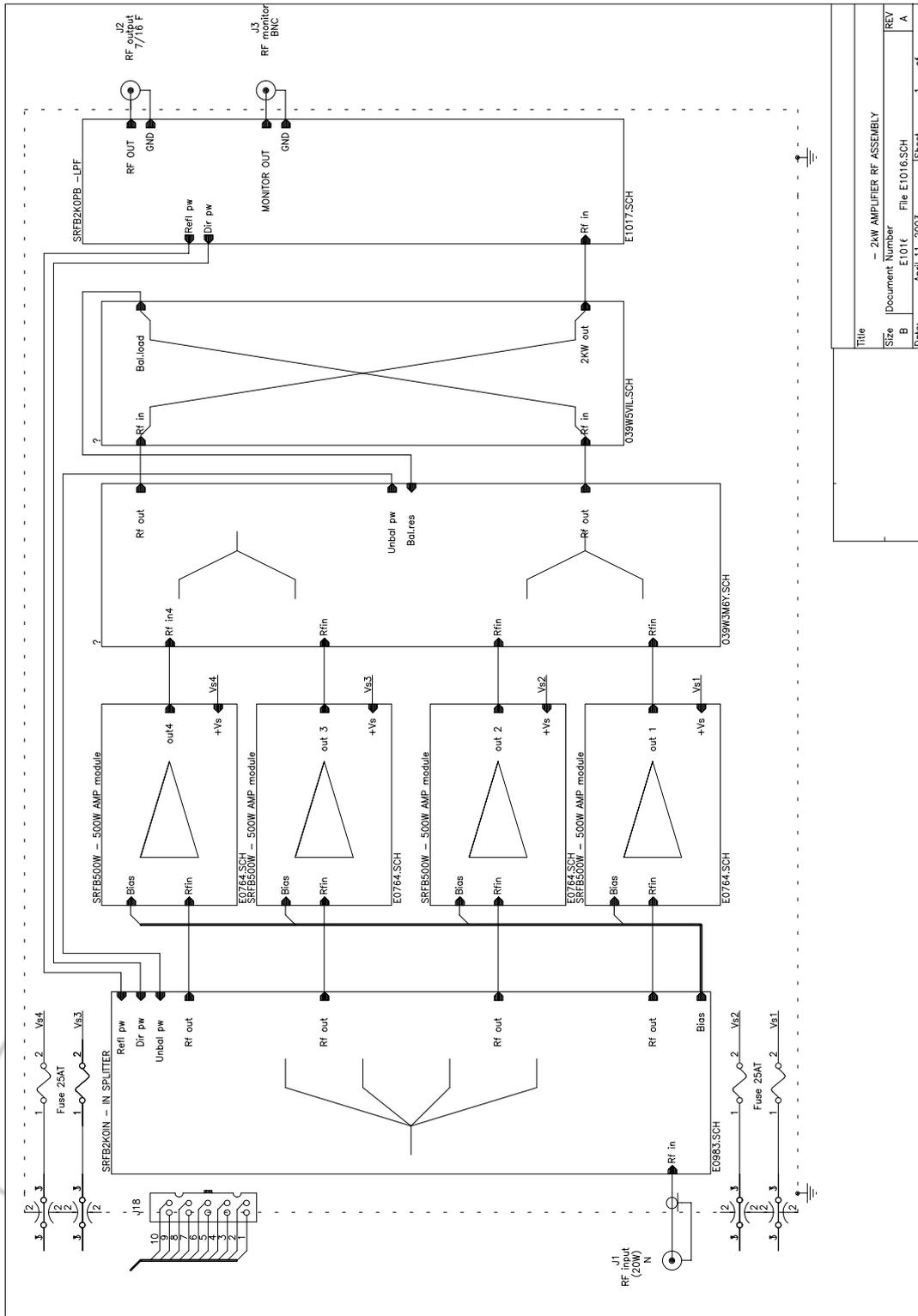


**ASSIRIO25AM5 - FM 25W POWER AMPLIFIER
COMPONENT LAYOUT**





ASRFB2K0RF - 2KW AMPLIFIER ASSEMBLY - ELECTRICAL DIAGRAM

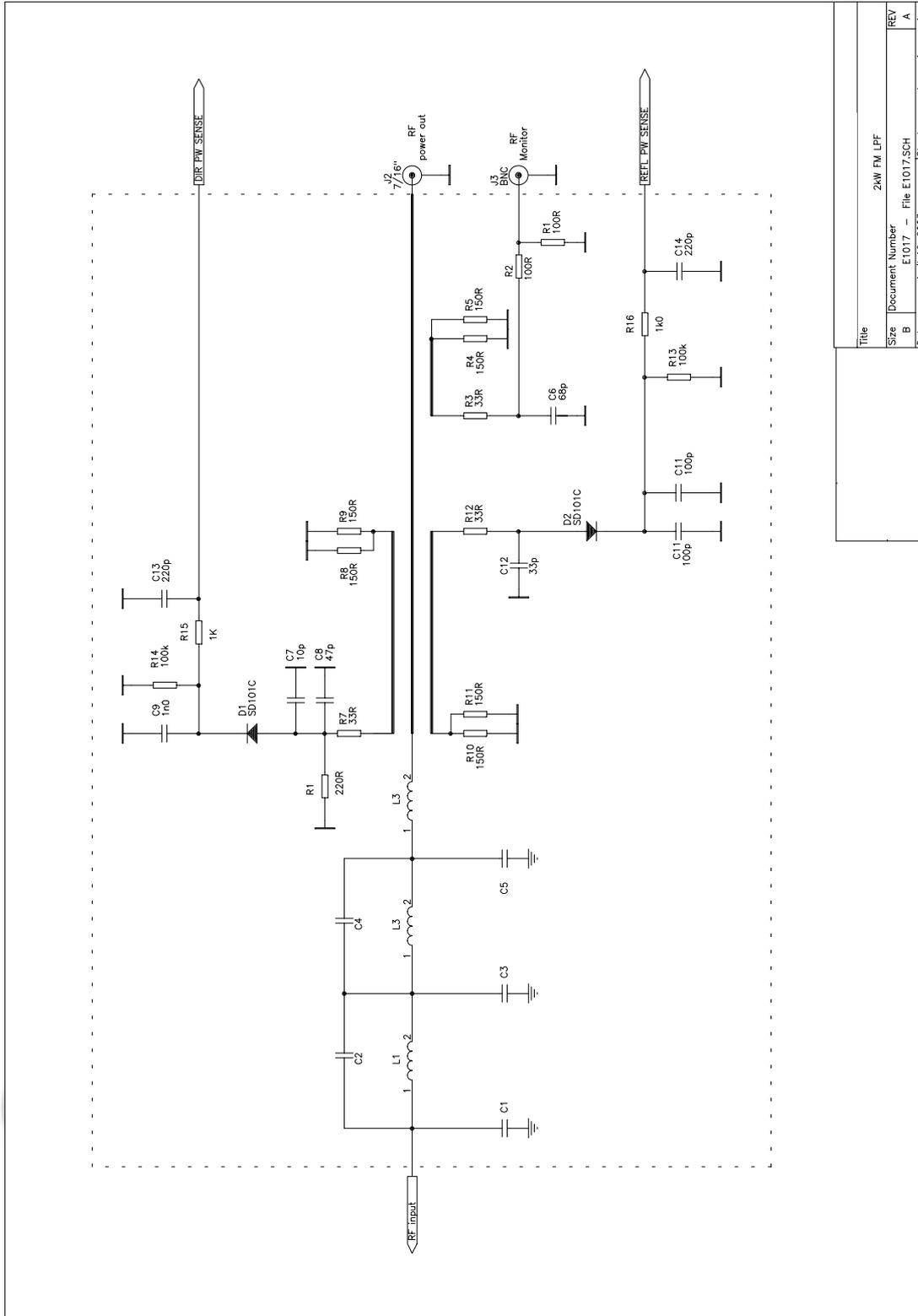


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Date:	April 11, 2003
Sheet	1 of
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SRFB1K0LP - 2-PORT RF OUTPUT COMBINER & LPF
ELECTRICAL DIAGRAM

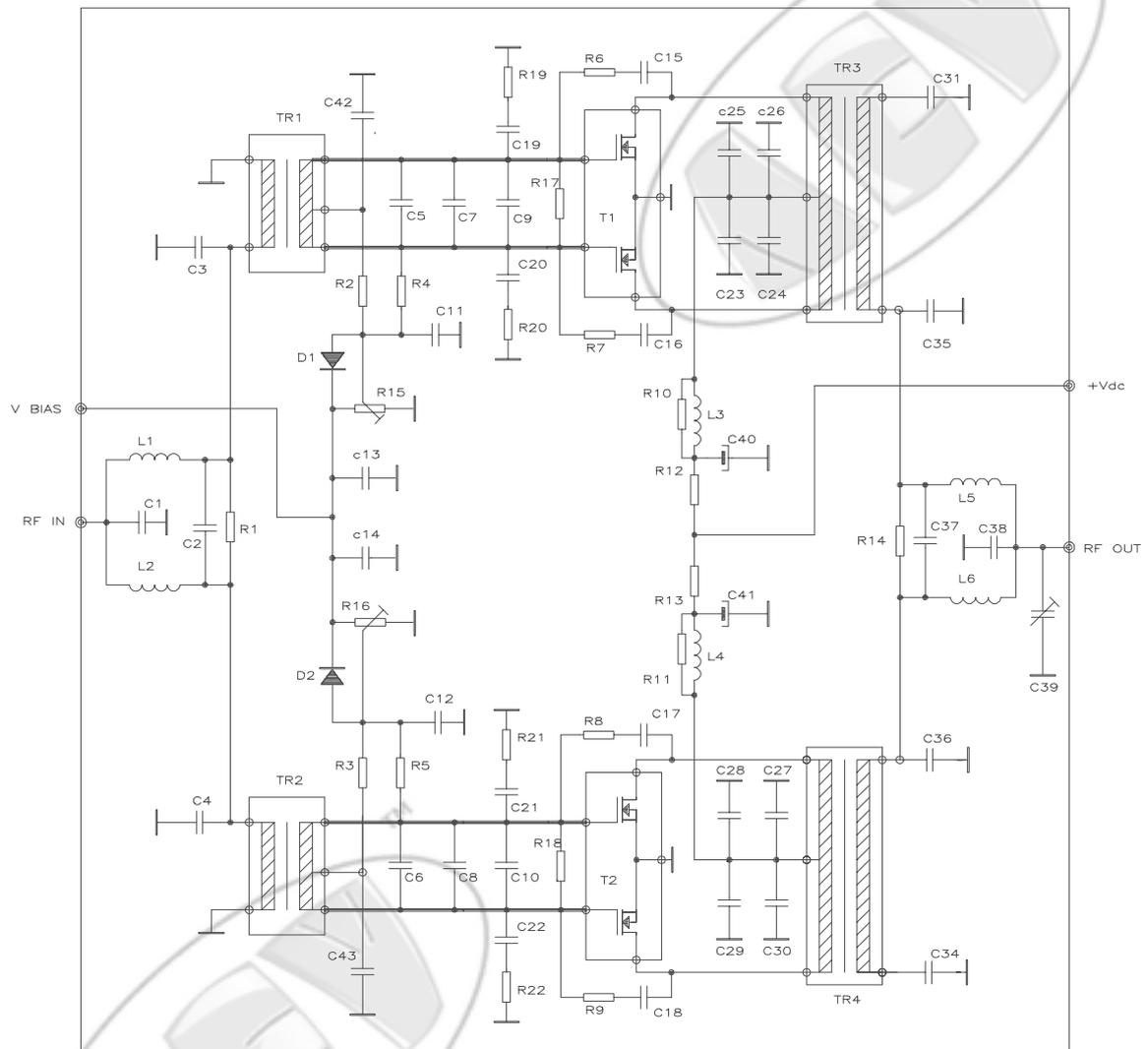


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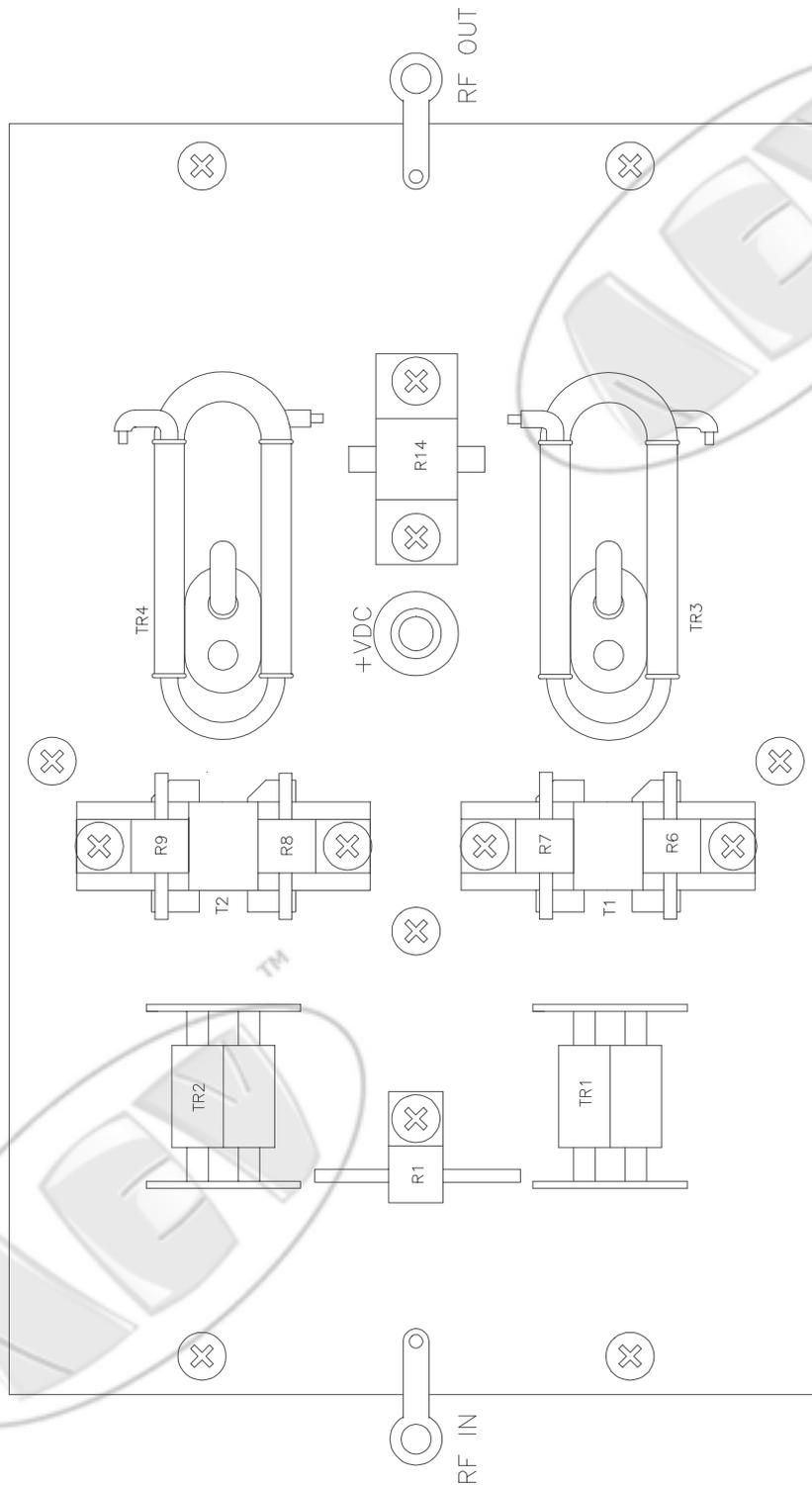


SRFB500W - 500W AMPLIFIER MODULE ELECTRICAL DIAGRAM



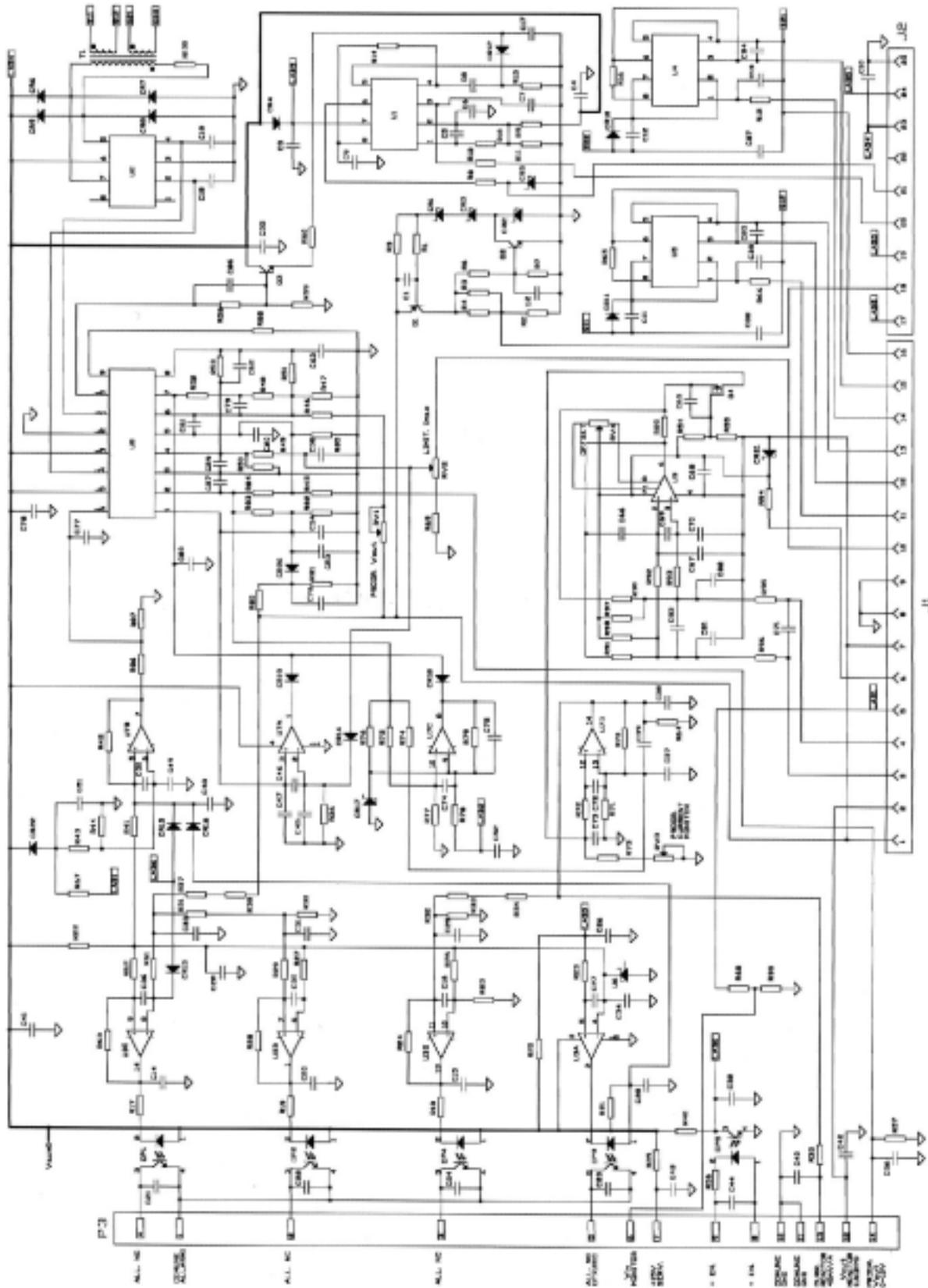


**SRFB500W - 500W AMPLIFIER MODULE
COMPONENT LAYOUT**



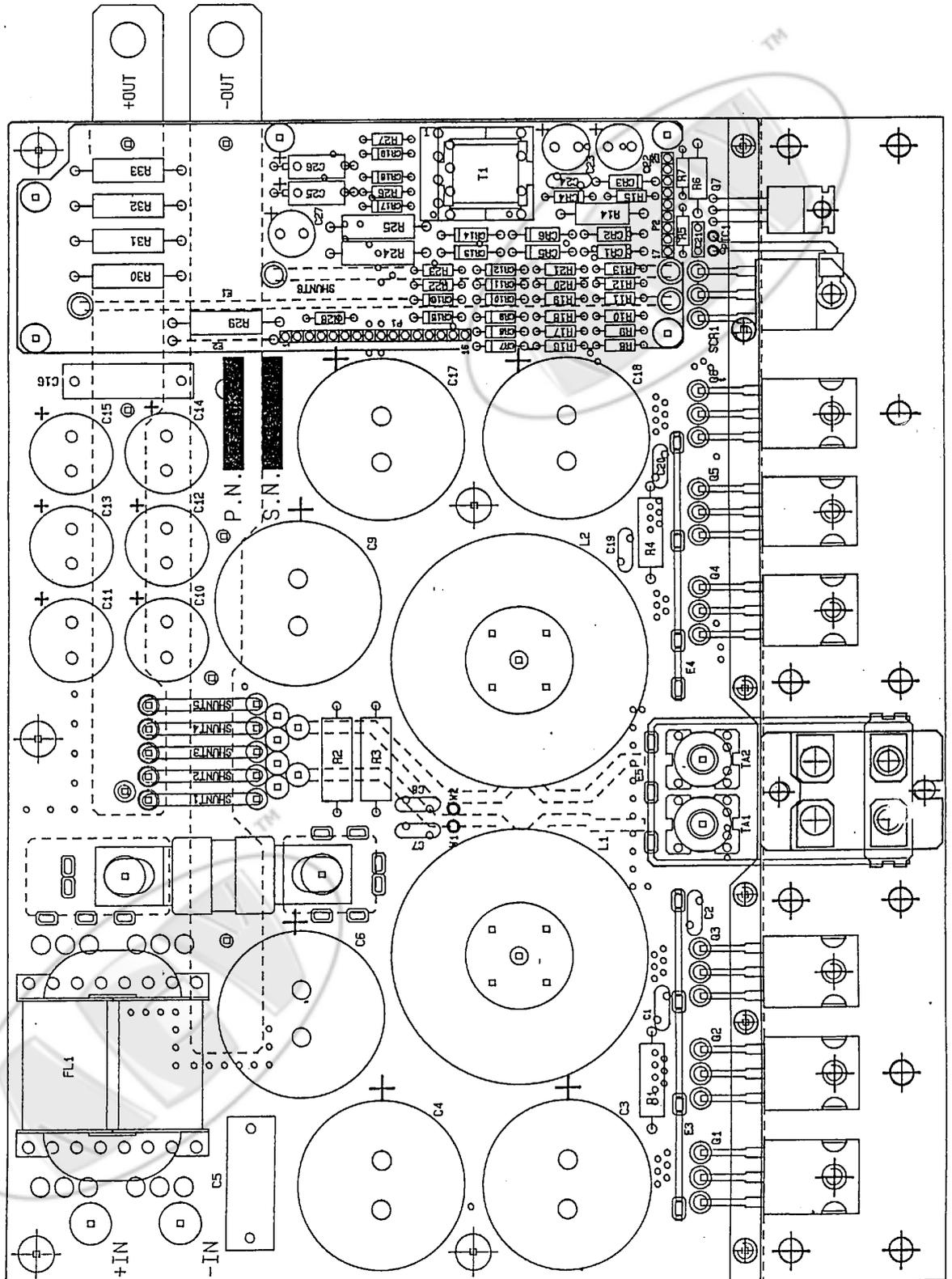


SRFB1K5ALM - 48V/70A SMPS REGULATOR ELECTRICAL DIAGRAM - CONTROL SECTION





SRFB1K5ALM - 48V/70A SMPS REGULATOR
COMPONENT LAYOUT - POWER SECTION





**SRFB1K5ALM - 48V/70A SMPS REGULATOR
COMPONENT LAYOUT - CONTROL SECTION**

