



A total of 8 main operational functions are performed by the circuitry assembled on the module 4456. Please refer to the module 4456 block diagram.

### **3.10.1.1 Module 4456 – CIM3347 - Power Factor Corrector, PFC**

The PFC circuit is a power supply built according with the “boost regulator in continuous mode (CCM)” topology. Under the CCM topology, is possible guarantee a power factor,  $\cos\phi$  above than 0.9. The PFC circuit is composed by a full diode bridge that performs a full-wave rectification on the AC signal, which than is routed to the boost inductor. The voltage is so boosted up to +385V. The power factor correction is obtained by the switching a MOSFET transistor, which controls the electrical current into the capacitors that are components of the output rectification filter. The switching operation is performed at the frequency of 100MHz.

#### **3.10.1.1.1. CIM3427 - PFC Control unit**

The PFC switching operation is controlled by a bit stream. This control's bit stream is generated by an integrated circuit with 2 loops that are self-protected against short circuits. The function of this control is to keep stable the +385V voltage at the PFC's output.

#### **3.10.1.2 CIM3447 – Full Bridge - +32 Volts Fixed**

The full bridge circuitry is also located at the PCB CIM 3447 as part of the module 4456. This circuit is designed to step down the +385V to +32V keeping the same power rate, meaning it enable the voltage to delivery more electrical current. The full bridge topology is favorable to high power management operations. The circuit has 4 transistors technology IGBT, (Insulated Bipolar Gate Transistor). Via a step down high current transformer, the high voltage, 100 kHz, pulses are reduced down to +32V, in sequence than rectified and filtered, becoming the +32 FIXED voltage.

#### **3.10.1.3 +15 Volts Direct**

The +15V Direct is a linear power supply circuit located at the PCB CIM 3447. A power transformer is directly connected to the 208 VAC mains. From this power supply is extracted:

- (A) +15VDC voltage that feeds the SCU (CIM 3297) exclusively,
- (B) +18VDC routed to the control of the PFC circuit, located at CIM 3447
- (C) +15VDC routed to the full bridge control, located also at the CIM 3447.

#### **3.10.1.4 Full Bridge Control and Output Voltage Reading**

The PCB CIM 3429, functionally associated to the CIM 3447, is in charge to generate the pulses that will control the full bridge circuitry. On this PCB is located the trim pot TPO-1 that adjust the +32V. On this PCB is also located the trim pot TPO-2 that adjust the over current protection. A third function is the voltage sensor reading circuit, which can be adjusted by the trim pot TPO-3. The output of this sensor is routed to the SCU, PCB CIM 3297.



### 3.10.1.5 Shut Down

When an abnormal failure situation occurs inside the exciter drawer, the SCU generate a SHUT DOWN command that is a +5V direct connected to the pin # 1 at the connector CON-5 located at the PCB CIM 3429. Since this voltage is present, the switching pulses will be inhibit and as consequence, all the DC output available at the sub-module 4456 will be disabled and be no longer available, exception for the +15Vdc DIRECT, that feeds the SCU.

*IMPORTANT: On maintenance situation the module 4456 the automatic operation, AUT, can be turned on a manual MAN, operation by changing the position of the jump CON-3. The SHUT DOWN command as a protection it is always set as 0V at the PCB CIM 3297.*

### 3.10.1.6 Re-powering the Transmitter ON

Considering the UHF exciter drawer the +32V ON/OFF associated to the sub-module 4456 is used exclusively to feed the 75W RF pallet amplifiers, sub-module 4451.

From the +32V FIXED output, derives the +32V ON/OFF which is controlled by the SCU via the re-power up command. During normal conditions the re-power up command send a +5V voltage to the pin #2 at the connector CON-5 located at the PCB CIM 3429, part of the sub-module 4456. At the presence of this command, one transistor will be saturated and as consequence, the +32V ON/OFF out put will be enabled.

The re-power up +5V command will always be present as an output from the PCB CIM 3297.

### 3.10.1.7 Buck Converters

There are 3 buck converters located at the sub-module 4456. The +32V FIXED feeds these 3 circuits simultaneously, responsible for the following DC voltages:

- +2.5V @ 5A – PCB CIM 3460.
- +5V @ 5A – PCB CIM 3459.
- +15V @ 2A and -15V @ 200mA – CIM 3461

### 3.10.1.8 Module 4456 – Technical Specifications

FEATURE	SPECIFICATION
GENERAL	
INPUT AC VOLTAGE	180 TO 260VAC
SWITCHING FREQUENCY	PFC = 100kHz FULL BRIDGE = 100kHz
LINE REGULATION	BETTER THAN 2% FOR ALL OUTPUTS
OUTPUT NOMINAL VOLTAGES AND CURRENTS	+32V / 2A +32V RESTARTED / 15A +15V / 2A -15V / 200mA +5V / 5A +2.5V / 5A
RISSLE	BETTER THAN 250mV
LOAD REGULATION	BETTER THAN 2% FOR ALL OUTPUTS
EFFICIENCY	BETTER THAN 80%
OUTPUT OVERCURRENT LIMIT	30% UPPER NOMINAL VALUE
SHUTDOWN VOLTAGE	HIGH LEVEL: > 0.7 TO 5Vdc LOW LEVEL: < 0.7Vdc

### 3.11. PCB CIM3297 – Subordinate Control Unit (SCU) on Module 4456

The module 4456 is equipped with its own control unit. This control unit is assembled as the same of the master control unit MCU, both CIM3297, however the software that runs each one are not the same. The SCU is on constant two ways communication with the MCU.

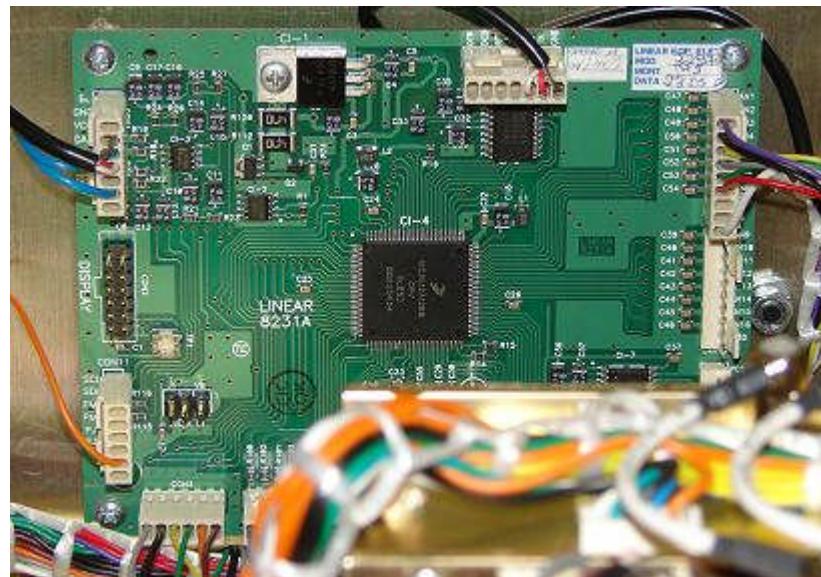


Fig.3.14: SCU assembled at the exciter drawer GV4456 – module 4456

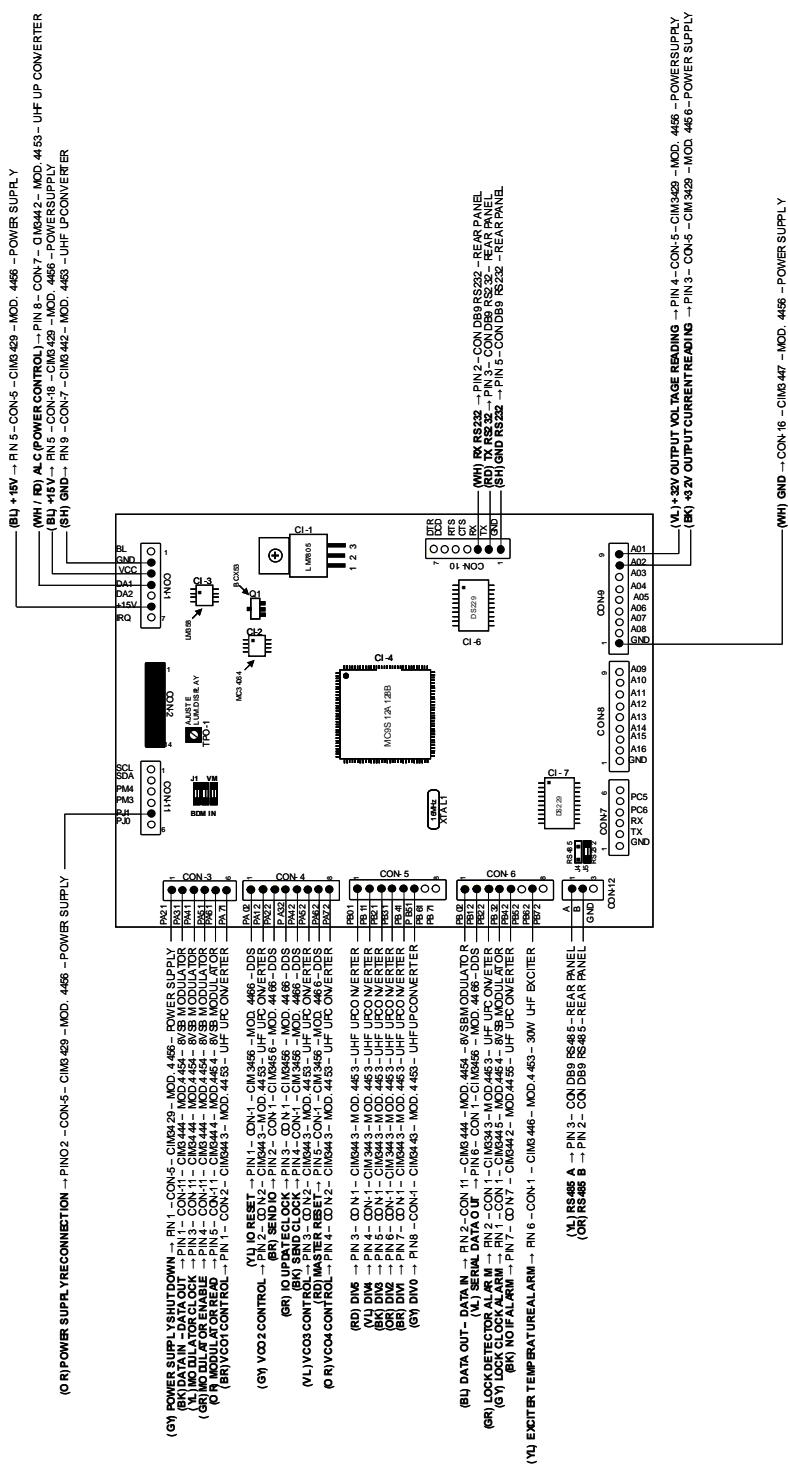


Fig. 3.15: Pin-To-pin recognition from PCB CIM 3297, SCU version



Assemble on the PCB CIM 3297 on the 20W UHF ATSC exciter drawer, module 4456, are the following controlling functions:

### 3.11.1. Digital Control

The CI-4, (MC9S12A128B) is the microcontroller that manages all the sub-modules assemble on the module 4452. CI-4 is factory pre-programmed, carrying an assigned number and software version. Regarding to the UHF exciter, the software number is AT1002 version 1.0, when available further upgrades will be issued as new version numbers.

**IMPORTANT:** In the case of substitution of the microcontroller, on this PCB (CIM 3297) on the exciter UHF drawer, it is mandatory to correctly inform to the factory the software number and its version. These numbers are printed on the case of the component.

### 3.11.2. Analog Readings

As shown on Figure 10, to the connector CON-9 on the PCB CIM 3297, at the UHF exciter drawer, is directed analogs information referred to the power supply sub-module 4456 on the following parameters:

- +32Volt output.
- Current consumption at the same output.

From the connector CON-9 these readings feed the microcontroller CI-4, from where those are digitalized and processed. By software decision, the microcontroller sets the nominal value for these readings always +4V, meaning, to all nominal values the +4V will be assigned, and will be available at the CON-9. These values are transferred to the main LCD display on the MCU.

Several reference points are spread over the power supply sub-module 4456, delivering respective readings on voltage and current. By each one of these points there are trim pots. During the pre-adjust procedures, these trim pots should be adjusted to set +4V on the designated reference point. This +4V adjusted voltage will be read by the PCB CIM 3297. For instance: When +32V is reached, the voltage at pin #4, at the connector CON-18 at CIM 3429 should be adjusted to +4V, by trimming the trim pot TPO-3. The same voltage (+4V) is than transferred to the CIM 3297, at pin #1 at the connector CON-9. See session 3.1.6, sub-module 4456 description for more details.

### 3.11.3. Alarms Detection

At any time a UHF exciter drawer internal alarm is set the its correspondent SCU (PCB CIM 3297) immediately reduces to 0V (zero) the “trellis” level delivered to the up-converter, sub-module 4453, as consequence, the RF power at the out put connector is reduced to 0 watts. See also session 3.11.6. RF power control. The alarms that are available at the UHF exciter drawer, and can be processed by the PCB CIM 3297 are the following:

Event	Location	Alarm set
• Drawer TEMPERATURE.	Sub-Module 4455	Above 149°F (+65°C)
• Phase Lock Loops.	Sub-Module 4453	Unlock
• 8VSB IF Signals (I/I') or (Q/Q').	Sub-Module 4454	Absence of any
• Master clock	Sub-Module 4454	Erratic



All alarms listed above, are available at the connector CON-6 at the PCB CIM 3297, as digital format. Normal operation is logic level 1, (or +5V). Alarm is set, meaning abnormal operation is logic level 0, (or 0V).

In the sequence of the alarm processing, from the connector CON-6 the signals are routed to the microcontroller CI-4. Throughout of serial interface RS485 these alarms information are routed and displayed on the LCD at the front panel of the MCU unit termed as "drawer's alarms".

### 3.11.4. Communication to 8VSB Modulator

The communication link between the SCU (CIM 3297), and the 8VSB modulator (sub-module 4454, is performed by a set of connections that together are termed "serial interface gates", SPI. These connections are present from the pin #2 up to the pin #5 at the connector CON-3 and also present at pin #1 at the connector CON-6. This communication link is needed to transfer information regarding dynamics parameters configuration, like; 8VSB signal pilot level.

### 3.11.5. Channel Programming, UHF/DTV/ATSC

The desired UHF channel programming is set directly on the exciter drawer, at the PCB CIM 3297. From the CIM 3297 data streams will be routed to the up-converter, sub-module 4453, and set the VCO, and set the PLL synthesizer division rate.

The UHF channel programming task is to decide which one out of 4 possible VCO's will be activated. The VCO is digitally enabled, meaning logic level 0 (or 0V) meaning enable, and logic level 1 (or +5V) meaning disable. This information is available at pin #3 at connector CON-3 (for VCO1) and at pins # 2, 6 and 8 at the connector CON-4 for (VCO2, VCO3, VCO4).

The PCB CIM 3297 also is in charge to program the PLL division rate at the sub-module 4453. The rate number N vary from 0 up to 31. These numbers have digital format set by the streams DIV0 to DIV5, available at the pins #1 up to #7, at the connector CON-5.

For the first time, the channel programming is set from the factory (not accessed by the user) through the MCU, module 4459. Every time the equipment is turned on, the PCB CIM 3297 automatically select the correct VCO, and the PLL division rate number, on the sub-module 4453.

### 3.11.6. RF Power Control

The RF out put power adjust is made directly from the external LCD touch screen display located at the main control unit, MCU, module 4459. The chosen power level is digitally transmitted to the PCB CIM 3297 at the UHF exciter drawer via a RS485 communication link. From digital format the information is converted to continuous analogs level of voltage, present at the pins #4 and #5 at the connector CON-1 located at the PCB CIM 3297. This set level is routed to the pin #8 at the connector CON-7 located at the up-converter, sub-module 4453. This specific set level is termed "trellis voltage" and is displayed to the out side world at the main LCD screen as V.P. Adj.

The trellis voltage is directly proportional to the RF power level at the output of the transmitter. As higher the trellis level is, higher the power will be. At the nominal level, the ALC voltage will be read into the interval between +4V and +5V.

Some fault events will trigger the ALC down to 0V, and as consequence the RF output power will also drop to 0 watts, by shutting down the RF power at the exciter drawer. On other words, the trellis voltage equal 0v. The above mentioned fault events are listed on the table below:



Event	Location	Alarm set
• Drawer TEMPERATURE.	Module 4455	Above 149°F (+65°C)
• Phase Lock Loops.	Module 4453	Unlock
• 8VSB IF Signals (I/I') or (Q/Q').	Module 4454	Absence of any
• Master clock	Module 4454	Erratic
• Fan fuse	Transmitter rack	Open

The procedure described on this section is validated only if the transmitter operation mode is configured as AUTOMATIC MODE. (SetUp/Transmit/ReStart: AUTO).

At the time when the transmitter is powered ON, there is a 5s time lapse termed as RAMP TIME. During this period, the trellis voltage will raise from 0V up to the pre-set nominal level associated with the nominal transmitter output RF power.

### 3.11.6.1 Off-set Frequency Programming

The Linear ATSC/DTV UHF transmitter channel is factory set. On the top of the chosen frequency channel an off-set frequency can or not be added. If that is the case, the off-set frequency can be positive or negative on values between as low as 1Hz up to the maximum of 20 kHz.

The digital direct synthesizer circuit, DDS, sub-module 4466, generates the off-set frequency at steps of 1Hz. The chosen off-set value is however programmed at the PCB CIM 3297, which is than feed-backed to the DDS sub-module, throughout the pins #3, #4, #5 and #7 at the connector CON-4.

Every time when the transmitter is powered on, the PCB CIM 3297 at the exciter drawer automatically sets the programming for the up-converter sub-module 4466. The initial program set to the PCB CIM 3297 is made in the factory by means of the LCD touch screen display, but not accessible to the user during the transmitter field operation.

### 3.11.6.2 Re-powering the Power Supply

The SCU PCB located at the exciter drawer, CIM 3297, controls the exciter drawer power supply, sub-module 4456. The main commands are RE-POWERING, and SHUT DOWN, represented by +5V for able, or 0V for disable. These commands act as protection commands.

The RE-POWERING information (+5V), is available at the pin #5 at the connector CON-11. In case of the absence of this voltage, the sub-module 4456 interrupts the +32V ON/OFF power supply one, that feeds the 30W UHF ATSC driver power amplifier, sub-module 4455.

The SHUT DOWN information (+5V), is available at the pin #1 at the connector CON-3. In case of presence of this voltage, interrupts the power supplies drain with the voltages of +2.5V, +5V, +15V, -15V and +32V ON/OFF.

It is important to note that the +32V FIXED voltage (feeds the DC/DC converter, sub-module 4147, that is connected to the MCU), and the +15V DIRECT voltage (feeds the PCB CIM 3297 at the exciter drawer) are not affect by the SHUT DOWN command.

### 3.11.6.3 Serial RS485 Communication

The SCU (CIM 3297) is run by the MCU (Module 4459). The communication between these 2 command units is made via RS485 and on both units by the CON-12. For the SCU at the exciter drawer, the CON-12 is connected to the DB9 connector located at the drawer rear panel, labeled as RS485.

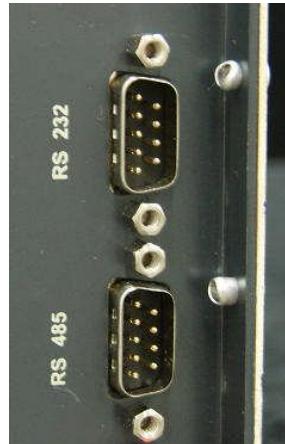


Fig.3.16: MCU-SCU communication access RS232 & RS485 connectors

### 3.11.6.4 Serial RS232 communication

It is possible to access the SCU's command at the exciter drawer locally. To perform this procedure, it is necessary to connect a PC that runs Windows Hype-Terminal at the DB9 connector located on the rear panel of the exciter drawer. This connector routes the external data stream to the internal connector CON-10 located at the SCU PCB CIM 3297 that is in fact the RS232's gate.

## 3.12. Module 4456 – sub-module 4470 – CIM3458 – Multiple Voltage Regulators

Some modules build-in to the exciter drawer module 4456, require specifics voltages values. These special voltages are provided by the voltage regulator PCB CIM3458, termed as sub-module 4470.

The regulator devices provide the following voltages according with the table below:

Module 4470 – Voltage Regulators – CIM3458 / CIP8369		
V in	REGULADOR ID	V out
+2,5V (CON-4)	CI-2	+1,2V (CON-9)
+5V (CON-3)	CI-1	3,3V (CON-8)
+15V (CON-2)	CI-3	+8V (CON-7)
+15V (CON-6)	CI-4	+12V (CON-6)



### **3.13. GV4452 – Schematic Diagram: SEE ANNEX A**

- 3.11.2.** Module 4454 - 8VSB Modulator and MASTER Clock Generator
- 3.11.3.** Module 4453 - IF/UHF Up-Converter
- 3.11.4.** Module 4466 – DDS
- 3.11.5.** Module 4464 - 20W UHF / ATSC
- 3.11.6.** Module 4456 - Power Supply
- 3.11.7.** PCB CIM3297 - Subordinate Control Unit (SCU)
- 3.11.8.** PCB CIM3458 – Multiple voltage regulator

## Section 4 – Intermediate Directional Coupler

### Module 4488

#### 4. General Description

The readings for direct and reverse RF power transmission on the exciter drawer on the ADVANCED TV line of transmitters are display on the frontal panel of the main control unit, module 4459.

The shown values for direct and reverse power levels are RMS values, referred to the 8VSB modulated carrier. The directional couplers are continuously delivering a DC voltage proportional to the each kind of power level.



Fig.4.1: Module 4488 - Intermediate Directional Coupler

The directional coupler is based on a  $50\Omega$  coaxial transmission line. By coupling, two other lines collect samples of the RF signal to be detected, DC converted, amplified and delivered to the MCU that read, interpret, process and display the results.

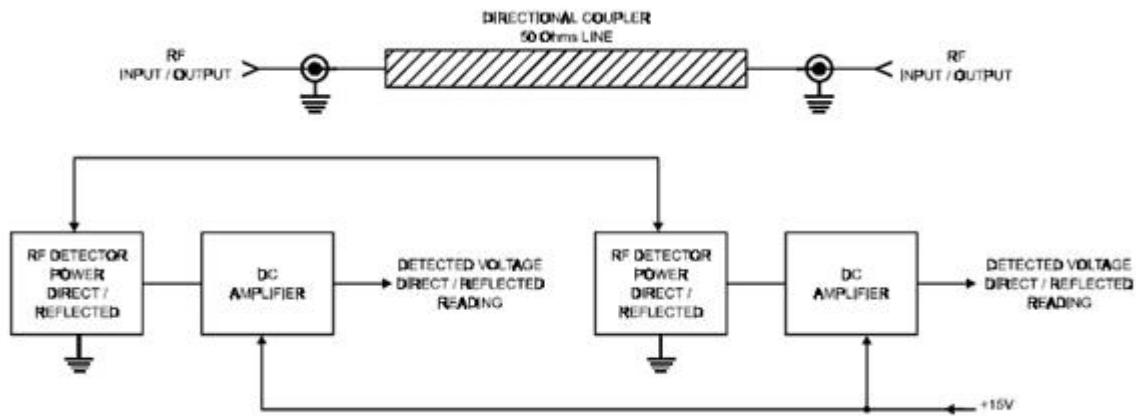


Fig.4.2: Module 4488 block diagram

#### 4.1. Module 4166 - Directional coupler cells

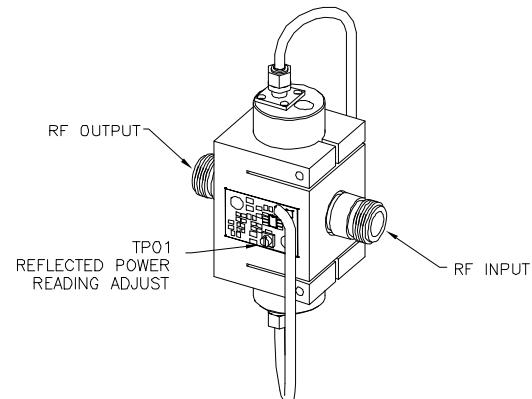
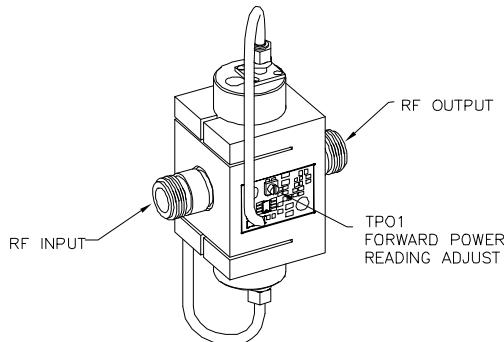


Fig. 4.2: Intermediate coupler cells – Module 4166 - spatial view, DP and RP sensors



The adjustments at the module 4166 are very simple; however they are very important for the correct performance of the entire equipment. The module come already adjusted from the factory according with ATSC procedures as stated on the recommendation A53/E.

If complementary adjustments become necessary, please contact the factory for a complete set of instructions and guidelines. Coupling wattmeter should NOT be used to measure ATSC power levels; instead LINEAR recommends absorption type wattmeter.

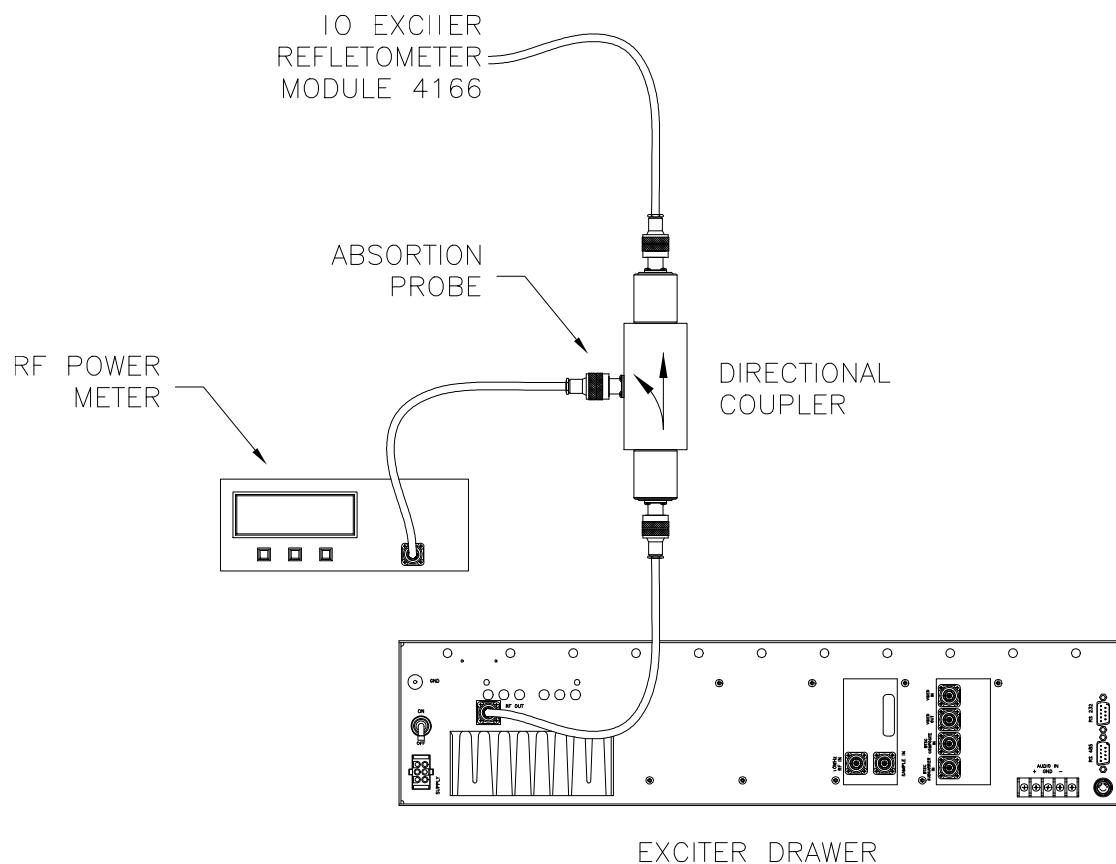


Fig. 4.3: Set up for adjustment on the power measurement directional coupler

## Section 5 – 220w UHF ATSC Power Amplifier

### Unit/Drawer GAV4445

#### 4. General Description

The unit GV5555 is a drawer that is powered by 208Vac voltage from the main breaker. The overall gain of this unit is in the range of 14dB up to 20dB depending of the assigned UHF channel. The amplification circuitry is factory tuned for one band among 4 UHF channels bands. It has stable input and output 50Ω impedance and it is ready to be combined with others same channel equal channels.



Fig.5.1: Top GAV4445 front view, bottom GAV4445 rear view.

The 220W UHF ATSC amplifier drawer is composed by the functional modules and sub-modules (see Fig.5.2) as follows:

- 75W UHF ATSC pallet amplifier, total of 4. MODULE 4451.
- Multiple voltage 60A switching power supply, MODULE 4275.
- Subordinate control unity, SCU- printed circuit board CIM2452.
- UHF Isolated [1:4] splitter, MODULE 4458.
- UHF Isolated [4:1] combiner, MODULE 4446.

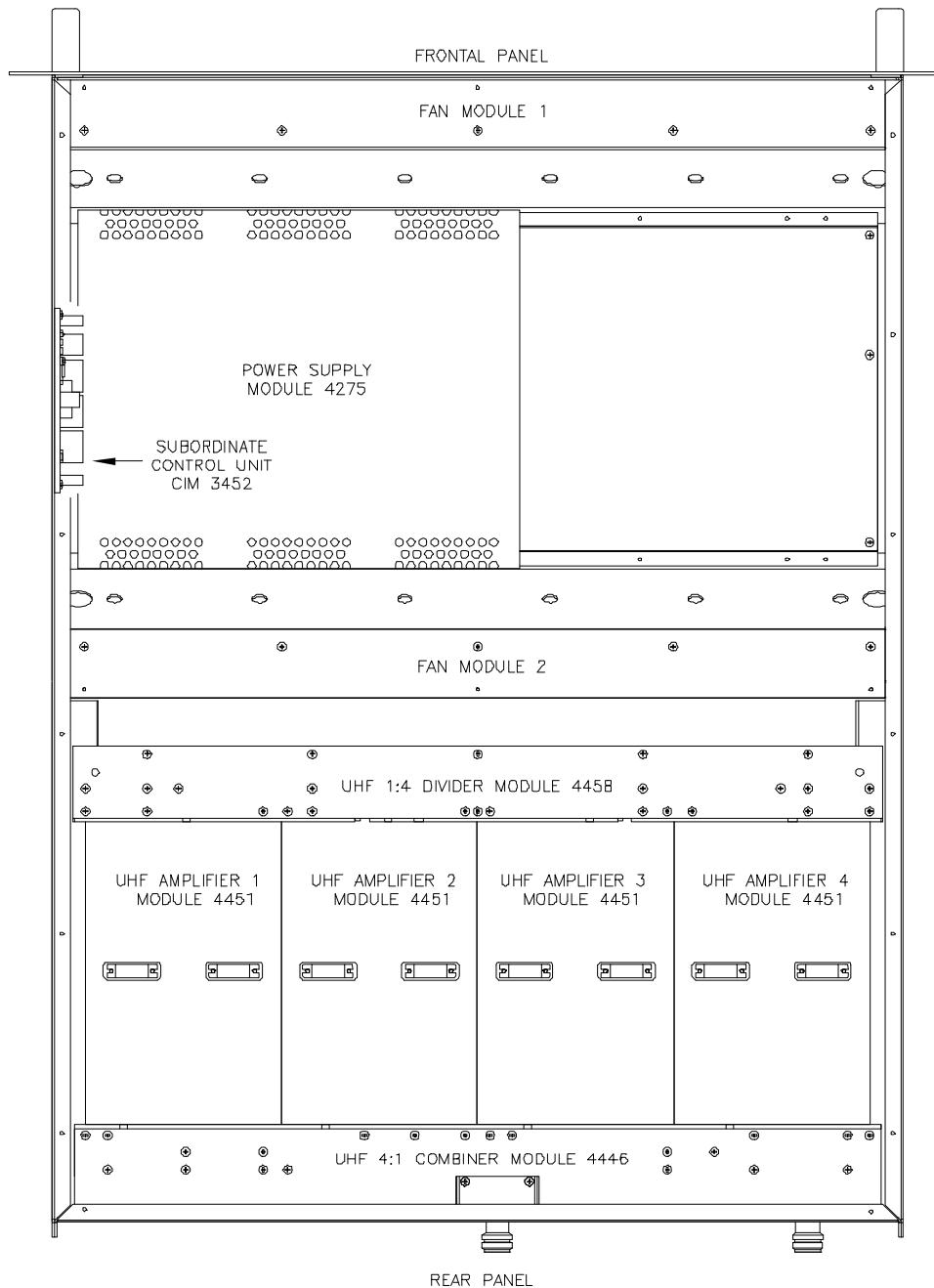
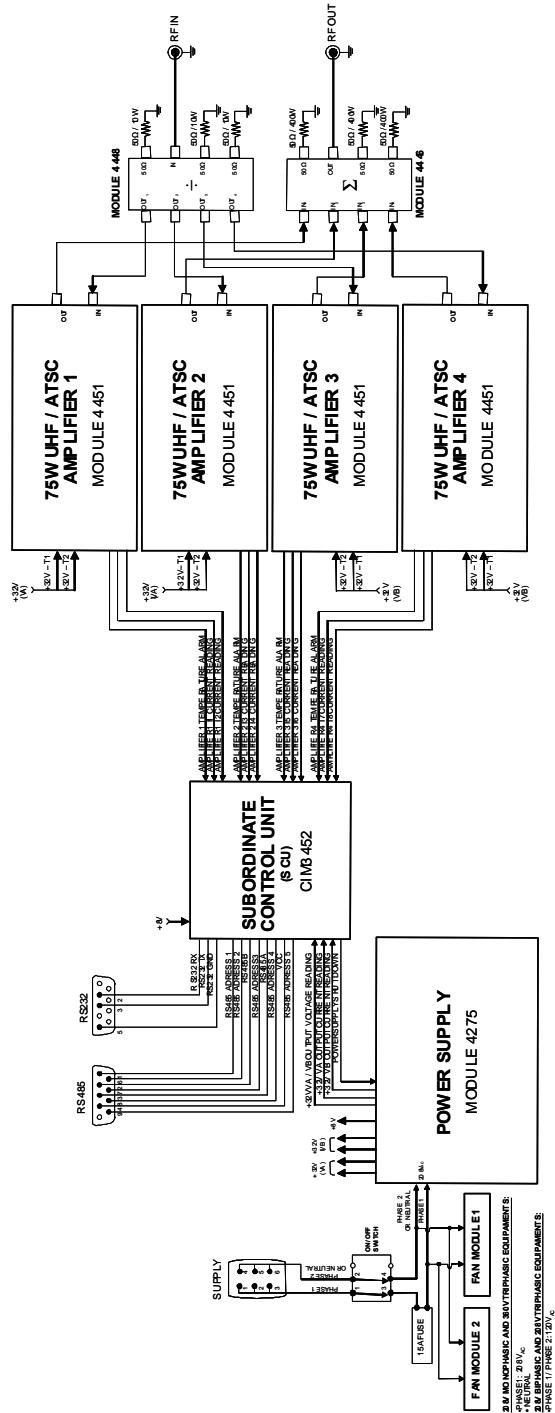


Fig.5.2: GAV4445 modules displacement



## 5. GAV4445 – 220w UHF ATSC Power Amplifier - Interconnection Diagram



## 6. GAV4445 - Module 4451 – 75W UHF ATSC Pallet Amplifier

### 6.1. General Functional Description

The 75W UHF/ATSC, sub-module 4451 is present on all the RF power amplifier drawers on the ADVANCED TV line of transmitter UHF models. On the module 4445, 250W ATSC UHF RF Power amplifier drawer, there are 4 sub-modules 4451 that combined are able to delivery 300W/UHF/ATSC.

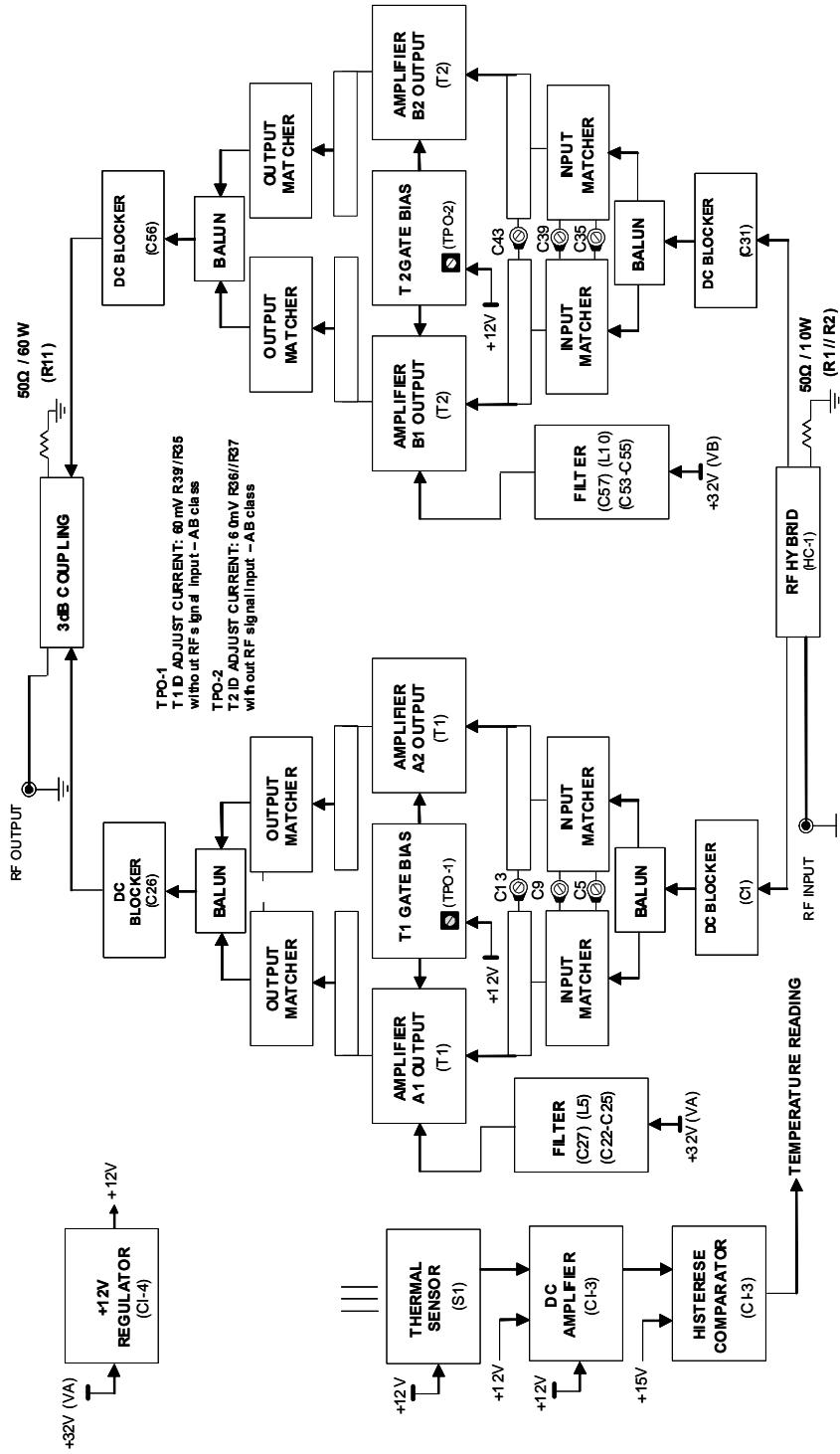


Fig.5.3: Module 4451 - 75W UHF ATSC pallet amplifier

The module 4451 is highly linear on all UHF frequency band. Despite that for performance optimization, the sub-module 4451 is built on the same PCB CIM 3440, and adjusted in one of the following bands:

- channels 14 to 25
- channels 26 to 38
- channels 39 to 53
- channels 54 to 69

## 6.2. Module 4451 – Block Diagram





The module 4451 is composed of 2 amplifier cells, polarized on class AB, on push-pull configuration, connected in parallel. Each cell carries 2 LDMOS transistors; assemble on the same die, delivering 37.5W each or 75W on total.

75W UHF / ATSC AMPLIFIER - 4451		
CIRCUIT	CIM	CIP
75W UHF / ATSC AMPLIFIER	3440	8352

### 6.3. Module 4451 –Technical Specifications

FEATURE	SPECIFICATION
INPUT	
FREQUENCY	470 - 862MHz
IMPEDANCE	50 Ohms
RETURN LOSS	<sup>3</sup> 22dB
OUTPUT	
GAIN	13 TO 16dB
RF POWER	UNTIL 75WRMS
HARMONICS	£ -60dB
SPURIOUS EMISSION	< -54dB
INTERMODULATION	< -46dB
IMPEDANCE	50 Ohms
GENERAL	
VOLTAGE SUPPLY	+32V
CONSUMPTION	12A (AB CLASS)

## 6.4. Module 4451 – Tuning and DC Setup Instructions

The module 4451 can either be adjusted connected to the equipment or out of it. On both cases, it is mandatory to keep the RF out put correctly loaded ( $50\Omega$ ). A  $+32V/2A$  power supply must be ready to be driving the drawer, during the proposed adjustments, done under reduced RF power conditions. While doing one pallet adjustment, disconnect the DC main power out from the other modules 4451.

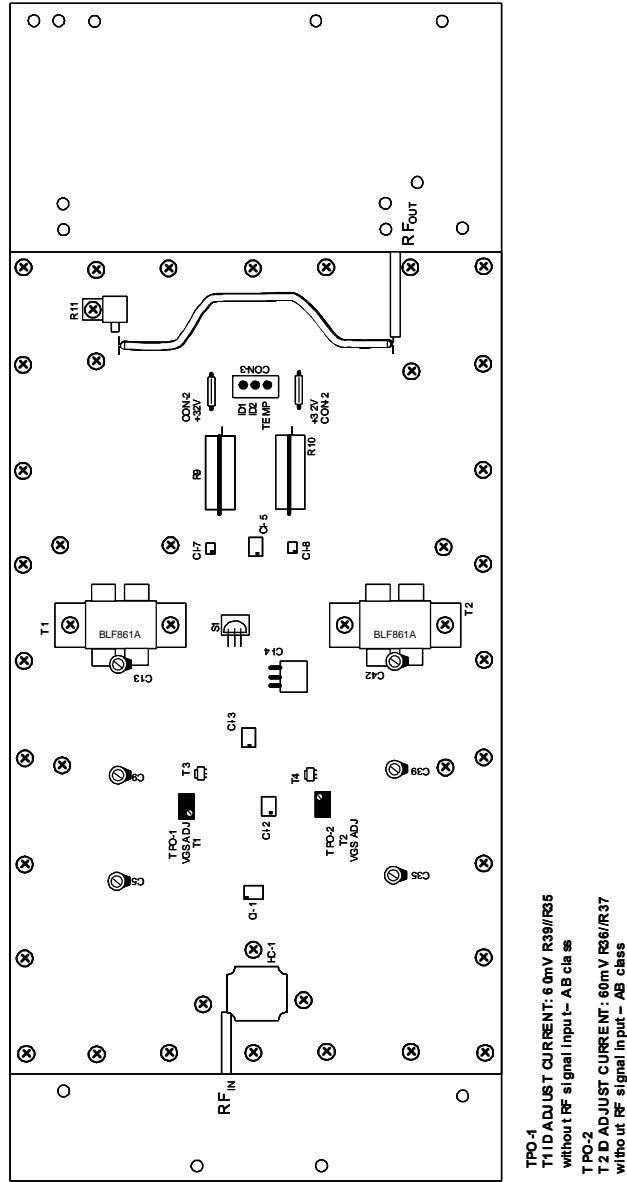


Fig.5.5: Module 4451 - Tests point and connections illustration

The adjustment procedures are maid one-by-one, an individual adjustment of each sub-module 4451. At the time that one sub-module is being adjusted, the others 3 should have disconnected its respective DC power supply.



#### 6.4.5. Module 4451 – Drain Current Adjustment

No RF signal should be present at the input of the sub-module 4451 during the ID adjustment procedures. Power the sub-module on, and wait 3 minutes for thermal stability. Take a multi-meter, and set for mVdc scale, avoid using the auto-range scale.

- Transistor T1:

- 1) Turn the trim pot TPO-1 all course anti-clockwise, as result the ID at T1 will be set 0.
- 2) Set the multi-meter scale for 100mV, and measure the voltage drop over R9.
- 3) Slowly turn the TPO-1 clockwise up to the point where a 60mVdc is shown at the multi-meter screen.

- Transistor T2:

Same as T1, but consider R10 instead R9.

#### 6.4.6. Module 4451 – Frequency Response

The module 4451, (PCB CIM 3440) is a broad-band UHF DTV amplifier for the band it was designed and adjusted for;

- Band 1: channel 14 up to 25.
- Band 2: channel 26 up to 38.
- Band 3: channel 39 up to 53.
- Band 4: channel 54 up to 69.

On the top of the band characteristics, there are also factories tuning optimization by channel. Even in the event of transistor exchange, there is no need to re-tuning the PCB/Circuit. The trimmer are all for frequency response adjustments. A flat response at higher gain is the target for this tuning procedure. See the hardware set up to perform this procedure.



# NETWORK ANALYZER

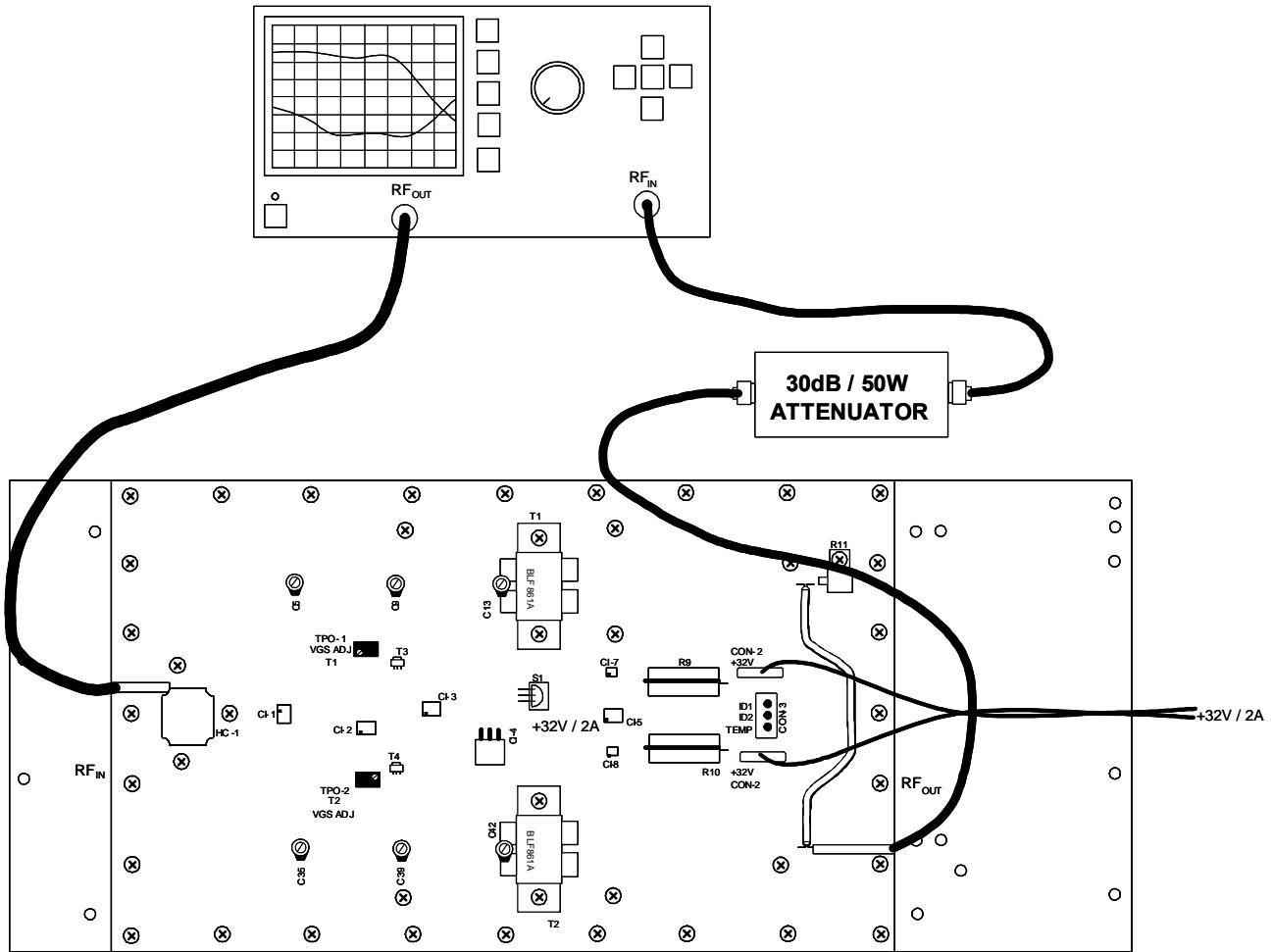


Fig. 5.6: Set up for tuning procedures – module 4451

Adjust the network analyzer for -20dBm RF output level. Connect the RF signal to the RF input of the sub-module. Adjust the trimmer to reach the following nominal gains under flat response conditions:

- Channels 14 to 25: .... 16dB
- Channels 26 to 38: .... 15dB
- Channels 39 to 53: .... 15dB
- Channels 54 to 69: .... 14dB

## 7. GAV4445 – Board CIM3452 – Subordinate Control Unit, SCU

### 7.1. CIM3452 General Functional Description

For each GAV4445 installed on the series ADVANCED TV transmitters, there is also a SCU associated with, termed CIM3452.



FIG. 5.7: Board CIM3452 installed on GAV4445 at bottom side, lateral right panel

The SCU installed on the RF power drawer, GAV4445, maintain a constant communication with the master control unit, MCU, module 4459. The SCU manage and monitor the drawer according with MCU commands.

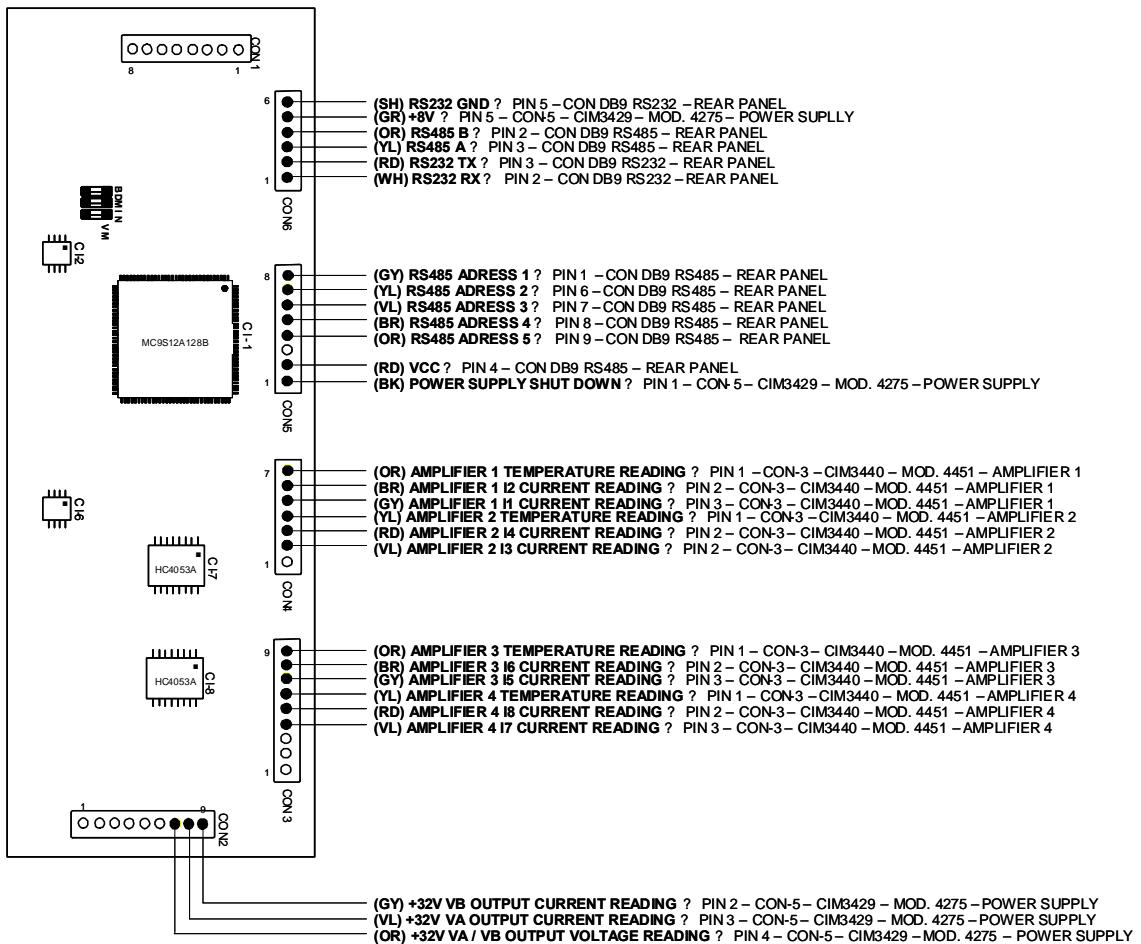


Fig.5.7: SCU – RF power drawer, PCB CIM 3452. Wiring and connection diagram

### 7.1.7. CIM3452 Controls

#### 7.1.7.1 Digital Controls

The integrated circuit CI-1 (MC9S12A128B) is responsible to oversee all the command functions concerning to the RF power drawer. This integrated circuit is programmable on the factory, according with the number and the software version. For the power drawer on the ADVANCED TV line the microcontroller assembled at the PCB 3452 was termed PR1003 version 1.0. Future upgrades when happen, will generate new versions.

- In the case of substitution of the microcontroller, on this PCB (CIM 3452) on the RF power drawer, it is mandatory to correctly inform to the factory the software number and its version. These numbers are printed on the case of the component.



### 7.1.7.2 Analog Readings

At the connectors CON-2, CON-3 and CON-4, on PCB CIM 3452, as part of the RF power amplifier drawer, analogs information is driven in regarding the following parameters generated out of the power supply, sub-module 4456. The CIM 3452 at the RF power amplifier drawer read the following analog parameters:

1. Voltage referring to +32V (VA/VB) out from the power supply, sub-module 4275.
2. Current out from VA power supply, sub-module 4275.
3. Current out from VB power supply, sub-module 4275.
4. Amplifier 1, temperature on sub-module 4451.
5. Amplifier 2, temperature on sub-module 4451.
6. Amplifier 3, temperature on sub-module 4451.
7. Amplifier 4, temperature on sub-module 4451.
8. Drain current on transistor T1 at amplifier 1 (I1).
9. Drain current on transistor T2 at amplifier 1 (I2).
10. Drain current on transistor T1 at amplifier 2 (I3).
11. Drain current on transistor T2 at amplifier 2 (I4).
12. Drain current on transistor T1 at amplifier 3 (I5).
13. Drain current on transistor T2 at amplifier 3 (I6).
14. Drain current on transistor T1 at amplifier 4 (I7).
15. Drain current on transistor T2 at amplifier 4 (I8).

All these analogs information get at the CON-2, CON-3 and CON-4 from where are routed to the microcontroller CI-1. Once there they are digitalized and processed. The resident software on this microcontroller states that the nominal value of all readings is 4V. On other words, at the connectors CON-2, CON-3 and CON-4 the available readings should be 4V for all nominal values displayed on the LCD display located on the front panel of the MCU. Test points are spread out through over the RF amplifier drawer. Each one of those has a trim pot associated with. These trim pots adjust the voltage associated to the parameter to be written by the PCB CIM 3452. These voltages are all set for 4V when the associated parameter is at its nominal value. For instance: regarding the +32V out of the sub-module 4275, the voltage read at the pin #4 at the connector CON-5, is set for 4V by the trim pot TPO-3. This same voltage also appears at the pin #7 at the connector CON-2, at the PCB CIM 3452.

### 7.1.7.3 Power Supply Shut Down Process

The PCB CIM 3452 sends to the power supply, sub-module 4375 the command-information SHUT DOWN, on the format of a +5V DC voltage. This voltage can be measured at the pin #1 at connector CON-5, and its presence disrupts the +32 supply, (VA and VB outputs). This routine will take place every time that a normal readings becomes an alarm. For instance: if the readings of temperature out of the RF pallet amplifier exceeds 65°C, an alarm status will be generated triggering the shut down command, and the subsequent +32V supply disruption.

#### 7.1.7.4 Serial RS485 Communication

The PCB CIM 3452 located at the RF amplifier drawer, is subordinated to the PCB CIM 3297, located at the MCU (Module 4459). The communication between these 2 command units is made via RS485 and pins # 3, 4 and 5 at the connector CON-5 on each one of the PCBs is the gate for IN and OUT of data streams. For the RF power amplifier drawer, the pins # 3, 4, and 5 at the connector CON-6, located on the PCB CIM 3452, is interconnected to the DB9 connector, and labeled as RS485 locates at the rear panel of the RF power amplifier drawer.

#### 7.1.7.5 Serial RS232 Communication

It is possible to access the CIM 3425 at the RF power amplifier drawer locally. To proceed the local access connect a PC that is able to run the Windows Hyper terminal at the connector DB9 labeled as RS232, located at the rear panel of the RF power amplifier drawer. This connector routes the external data stream to the internal pins #s 1, 2 and 6, at the connector CON-6 located at the PCB CIM 3452, built inside of the RF power amplifier drawer.

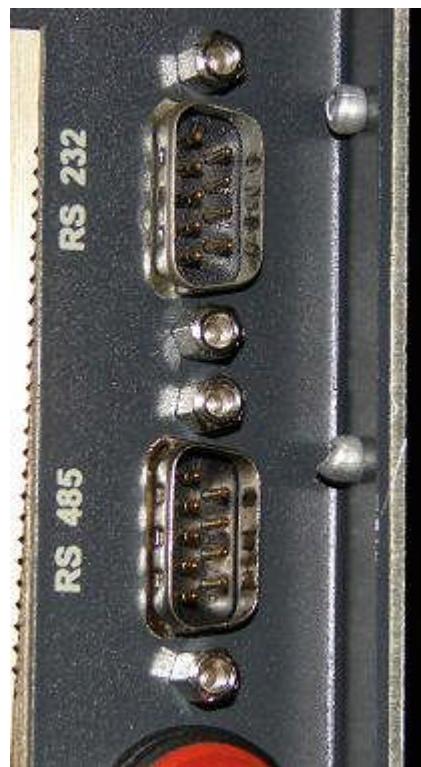


Fig.5.10: RS485 and RS 232 external connectors.