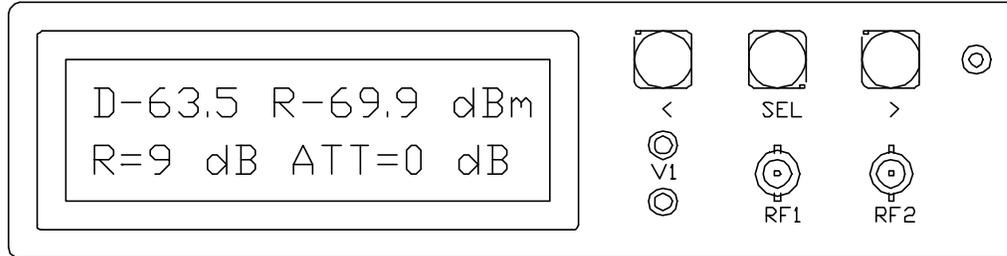


Power and field meter with PIC16F876 (ed 2)

Generality



A main board with PIC16F876 or PIC18F252 is equipped in the meter.
(See the attached schematic)

On the main board are equipped connectors for Lcd 16 x2 or 20 x2 characters (optional) and for the two logarithmic detector described in the following.

The meter uses Analog Devices AD8307 log. Detector.

The output of log amplifiers are connected to the 10 bit A/D converter available in the PIC micro controller.

Are equipped two detectors so Return loss measurement are also available (an external Directional coupler must be used) Since the detector have an high dynamic range (about 90 dB), the meter is also used as wide band Field meter. (up 500 MHz)

The meter can be programmed with a calibration procedure that store data into a EEPROM memory; so corrections with potentiometer it isn't necessary.
With a RS232 connection at 9600 baud the meter send measured data to an external equipment (i.e. a PC) to be displayed or stored.

In the following, a possible front panel is showed.

Main meter characteristics:

1. Frequency band : 1MHz - 500 MHz
2. linearity : +/- 1dB
3. Dynamic range: -70 to +15 dBm
4. Display Resolution : 0.1 dB
5. Input impedance: 50 OHM
6. N of log. amplifier: two
7. Simultaneous measurements Log. Det. N 1, N2 , Return Loss +IV LCD Field (see below)
8. Measurements log.: onto RS232 9600 baud serial connection
9. Samples /Sec.: about 10
10. Software calibration n1: 10 to 50 mV/dB (analogic calibration isn't necessary)
11. Software calibration n2: 0 dBm point
12. Software calibration stored on no volatile memory (EEPROM)

13. An input attenuator can be scaled to the measurement (up to 40 dB)
14. Return Loss measurement (with external directional coupler)
15. Two Dc level in the 0-25 Volt s can be measured also
16. Up and down limits on voltage and Return Loss can be programmed
17. If a limit is overcome an alarm is given on open collector output (also available on two led display)

Measures that can be performed.

High power measurement

Two solutions are possible to do high power measurement:

- To put an attenuator to the detector input so the measure range is shifted to $-30 +55$ dBm from $-70 +15$ dBm; the attenuator can be software scaled, so a real power is displayed on the LCD.
- To put a crossing connection with 0 dB loss in the antenna direction and 40 db attenuation in the detector direction.; this can be performed with a 5Kohm resistor (in the detector dection) attached to a 50 oHm line

Return Loss measurement

A directional coupler is necessary; the direct and forwarded power must be connected to the detector input and then scaled to have the real power measurement on the LCD.

(see ATT= xx dB command) (see also block diagram)

The return loss measurement is performed “real time” so it is possible also when the power is changing very quickly (i.e an SSB modulation).

Field measurement:

In the 1-500 Mhz band is possible to measure the Field of one or two antenna connected to the detectors input.

The instrument perform measurement of any antenna and the field difference from the two antenna also. (Measure range: $+15 - -75$ dBm @ 50 oHm)

The instrument power request is very low so it is possible to add a battery. So the instrument become portable and it is possible to measure a near field of any antenna.

Log function

An RS232 at 9600 Baud perform log of field data on a PC.

Data can be sended to PC automatically (up 10 / sec) or one by one manually to perform a Graphic .

The data are ASCII and can be observed and stored with any Terminal emulator as “ Windows Hyperterminal” .

The stored data can be displayed on graphic form with “EXCEL”. The data are, indeed, Excel compatible.

User manual

Four simultaneous measures are available:

- First field: dBm value of first log detector (CH A)
- Second field: dBm value of second log detector (CH B)
- Third field: dB value of detector ratio (CH A- B)
- Fourth field: can be selected many parameter to be displayed (voltage, measure limit and so on)

The operation is performed with only four key as described in the following :

Central position KEY

This key select the following measures or parameter:

1. First DC voltmeter 0-25 V on the fourth LCD field (V1 on LCD)
2. Second DC voltmeter 0-25 V on the fourth LCD field (V2 on LCD);
3. Attenuator value at the log. Ampli. N 1(ATT1 dBxx on LCD)
4. Attenuator value at the log. Ampli. N 2(ATT2 dBxx on LCD)

Side position Key (< >)

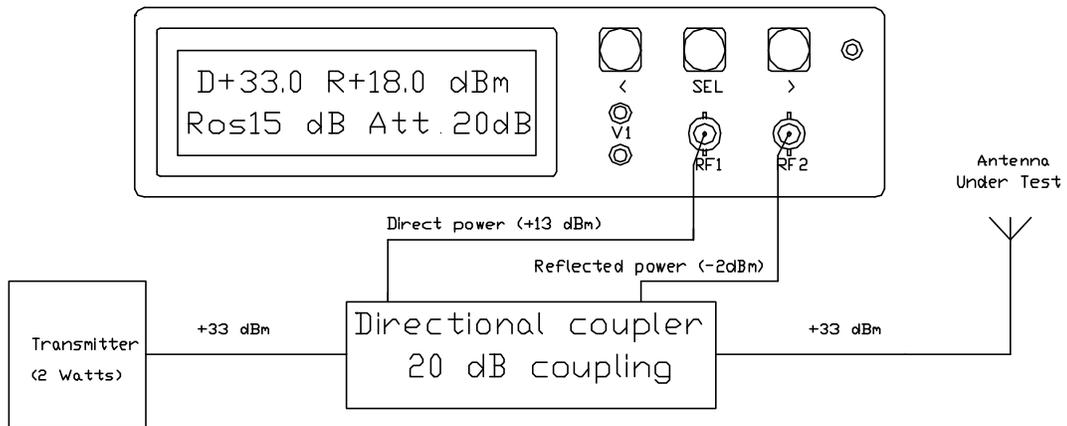
The Right and left position Key are used to increase or to decrease the IV field parameters (I.e. the attenuators value, the calibration value, ore the up and low limit alarm)

Fourt Key

The fourth key is used only for calibaration or for the alarm limits set-up.

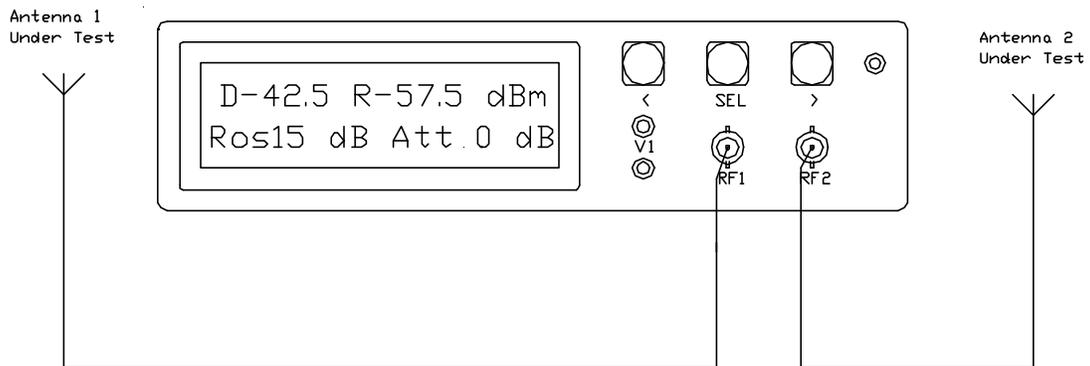
Is usefull that this key isn't easy available because this change the calibration set-up.

Measurement example

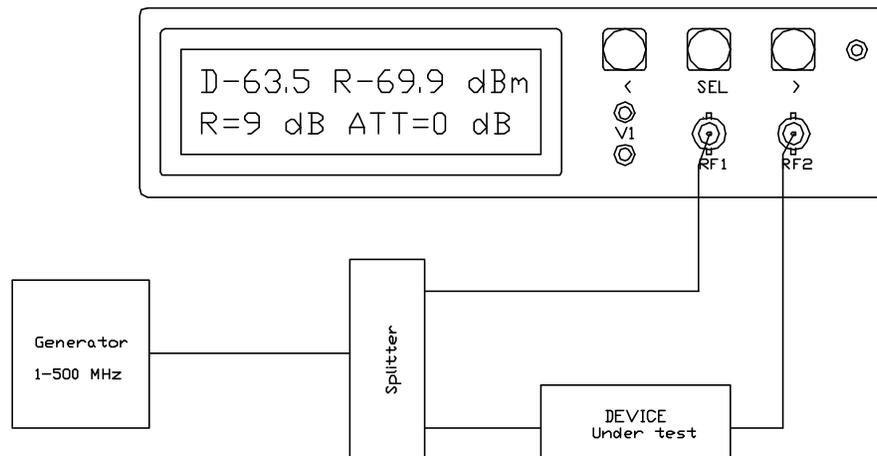


Return loss measurement.

The Direction coupler loss is equalized with the ATT set-up to 20 dB.



Field measurement with two antenna



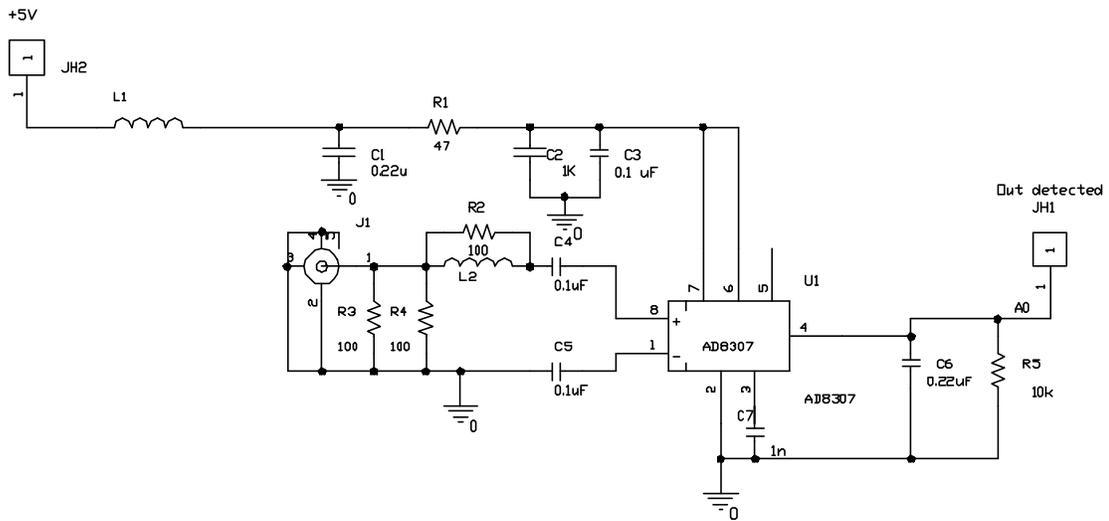
A Device under test (I.e. a filter or amplifier) is measured with a splitter.

Detector 1 display input level

Detector 2 display output level

In the third display field the absolute loss or gain is displayed. (RF1-RF2 channel)

Log detector with AD8307



The power meter use two log. Amplifier. They must be very well shielded to avoid coupling from them.

R2 with L2 perform frequency equalization. Can be possible increase or decrease R2 value to exatly equalize the dettector in the 0-500 MHz range.

The log amplifiers are implemented on SMD tecnology.

I/O schematic

