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Electrical

| | |
|---------------------|--|
| Frequency Range: | 10MHz - 1000MHz continuous |
| Input Impedance: | 50 Ohm |
| Filter Bandwidth: | 4MHz at -3dB, constant with frequency. |
| Ultimate Rejection: | 60 dB |
| Gain : | +30 dB typ. |
| Ripple in Passband: | 0.7 dB max. |
| Coupling: | AC |
| Maximum Input : | 1.26V (+15 dBm, 32 mW) |

Power

| | |
|-------------------------|--|
| Power Consumption: | 2 watts |
| Input Voltage: | 16 VDC |
| Battery: | Nine ¹⁰ 2/3 AA cells in series. 12V 250mA/Hr total capacity. |
| Battery Discharge Time: | 1.5 Hours typ. |
| AC Adaptor: | Model AC104, 12-16VDC .5 Amps (Nominal Specification) |
| Connector: | 2.1mm coax power plug with center conductor positive. |

Physical

| | |
|-----------------|----------------------------------|
| Size: | 7" high x 3.9" wide x 1.4" thick |
| Weight: | 12 oz |
| Connector Type: | Female BNC |

Frequency Counter Compatibility

The APS104 will work with any frequency counter with a 10-1000 MHz frequency range. The input sensitivity of the counter will greatly effect the distance at which the transmitted signal can be counted. The Optoelectronics 2600H and 3000 Handi-Counters are ideally suited for use with the APS104. The signal strength bargraph feature is very useful when detecting signals. The BLB30 Backlight Beeper option is useful because it frees the operator from continuously monitoring the counter's display when waiting to detect a signal. The 2600HA and 2810 models do not have the signal strength bargraph and can not be fitted with the beeper option so they are somewhat less than ideal for use with the APS104. The model 2210A can be used but its sensitivity is not as good and its measurement time is not as fast.

Antenna Selection

If only a single type of antenna is available, it should be of the telescoping whip UHF/VHF type. For maximum pick up distances, the antenna used should be tuned for the frequency band of interest. For example, with cellular frequencies, a cellular type of antenna with male BNC connector is essential for best results. The model RD800 rubber duck or model GP800 ground plane antenna will give good results. The GP800 is more expensive but will give the maximum possible performance (pick up distance).

Attaching the APS104 to the Counter

The APS104 is designed to mount directly to the back of the 2600H style Handi-Counter. Velcro fasteners are provided for this purpose. Portable operation is then possible with the counter and APS104 connected in this fashion. A 6" long Male BNC to Male BNC cable is provided for connecting the output of the APS104 to the input of the counter.

Power

The APS104 can operate from the internal 12V NiCad battery pack. A 12-16VDC plug transformer is provided for 110VAC operation. (Note: this is a nominal specification for the plug transformer. The actual unit supplied will exactly match the characteristics of the APS104.) 13.8 VDC automotive power (nominal 12V) can be used but the NiCad batteries may not fully charge. To counter the short cycle memory effect that is characteristic of NiCad batteries, occasional deep cycling is recommended. Deep cycling is accomplished by discharging the batteries completely and fully recharging.

Operation of the APS104

Handi-Counters are unique in their ability to find RF transmission frequencies. Immediate response to frequencies that are 10 to 15 dB greater than the background RF level is possible. This is simply done by moving they Handi-Counter into the near field of the radio transmitter. The near field is the area close to the antenna where the field strength is high but falling off rapidly as distance increases. This is compared to the far field where the field strength is low but remains fairly constant over great distances. Handi-Counters work well at relatively close distances and can measure a transmission frequency rapidly without having to tune through the RF spectrum.

While this discussion applies to all RF frequencies, only Handi-Counters are equipped with the maximum possible broad band amplification in order to pick up an RF signal at the maximum possible distance. Additional broad band amplification can not be added because it will actually reduce sensitivity because it will drive the counter further into self oscillation. Traditional RF frequency counters that have 10 - 15 milli volt sensitivity must use a broadband amplifier between the APS104 output and the counter's input. This amplifier should have 20 dB gain. The model AP8015B is ideal for this purpose.

Handi-Counters and other counters with additional broadband amplification will self oscillate even when no signal is present. There is no real ^{Signal Capture} meaning to the constantly changing display. When a real signal is being counted then the display will stabilize and there will be a strong signal indication on the signal strength bargraph. It takes some time to develop a feel for using a counter to detect signals.

The table below gives actual test data showing the distances that various transmitters can be picked up with and without using the APS104.

Typical APS104 Performance

| Transmitter Type | Counter only | Counter/APS104 |
|-------------------|--------------|----------------|
| Cordless Phone | 1 foot | 120 feet |
| CB Radio | 25 feet | 500 feet |
| VHF two way radio | 80 feet | 1/4 mile |
| Cellular phone | 20 feet | 250 feet |

The APS104 was designed to increase pick up distances by blocking all but 4 MHz of RF spectrum. This also permits additional broad band gain to be added.

If two transmitters are operating at the same time within the pass band and they appear to have the same signal strength, then the bargraph will display a strong signal indication but the counter display will not stabilize. To compensate you must move physically closer to the transmitter of interest until the counter sees its signal as 10 to 15 dB greater in strength.

Multipath cancellation. The distance at which the signal can be detected may be much greater than the distance at which it can be counted. At 850 MHz the wave length is about 35 cm and multipath cancellations can repeat at very close intervals. As you decrease the distance then the problem goes away. If you are in a vehicle then best results can be obtained when you come to a complete stop and the transmitter also stops motion. Always operate the counter on the fastest measurement interval possible. Use the display hold switch as necessary. It is helpful to know the available frequencies in the area to assist in determining when you have an accurate reading.

MODEL APS104 ACTIVE PRESELECTOR

Bill Of Materials July 15, 1991 13:37:00

rev 4

Item Quantity Reference

Part

| Item | Quantity | Reference | Part |
|------|----------|---------------------------------|--|
| 1 | 1 | A1 | FILTER ASSEMBLY, 1300MHz |
| 2 | 1 | A2 | VCO, V600S002x |
| 3 | 1 | BT1 | BATTERY, 4 CELL 2/3AA NiCad |
| | 1 | BT2 | BATTERY, 5 CELL 2/3AA NiCad } |
| 4 | 4 | CR1,CR2,CR3,CR4 | 1N4148 Leadless |
| 5 | 1 | CR5 | 1N4752A Leadless |
| 6 | 1 | CR6 | 1N4004 Leadless |
| 7 | 1 | CR7 | T1 LED |
| 8 | 4 | C1,C3,C16,C20 | 3.3pF 0805 CHIP |
| 9 | 2 | C2,C18 | 6.8pF 0805 CHIP |
| 10 | 9 | C4,C5,C7,C8,C10,C11,C13,C14,C21 | 47pF 0805 CHIP |
| 11 | 1 | C31 | 4.7uF TANT. CHIP |
| 12 | 6 | C9,C23,C24,C25,C26,C27 | .1uF 1206 CHIP |
| 13 | 4 | C12,C21,C22,C32 | 33UF TANT. CHIP |
| 14 | 5 | C28,C29,C30,C31 | 1000 pF 0805 CHIP |
| | 1 | C6 | 1000 pF 1206 CHIP |
| 15 | 1 | C17 | 1.5 pF 0805 CHIP |
| 16 | 1 | C19 | 1 pF 0805 CHIP |
| 17 | 2 | J1,J2 | BNC, UG1094U |
| 18 | 1 | J3 | POWER JACK |
| 19 | 6 | L3,L4,L5,L6,L9,L10 | 100UH |
| 20 | 2 | M1,M2 | SRA3500 |
| 21 | 1 | Q1 | 2N2222, SOT |
| 22 | 4 | R1,R5,R6,R10 | 390 0805 CHIP |
| 23 | 2 | R2,R4 | 180 0805 CHIP |
| 24 | 1 | R3 | 30 0805 CHIP |
| 25 | 2 | R11,R14 | 100 0805 CHIP |
| 26 | 4 | R8,R9,R15,R22 | 100K 1206 CHIP |
| 27 | 2 | R16,R17 | 120K 0805 CHIP |
| 28 | 1 | R18 | 30K 0805 CHIP |
| 29 | 1 | R19 | 680K 750K 0805 CHIP |
| 30 | 2 | R7, R20 | 47 1206 CHIP |
| 31 | 2 | R21,R23 | 1.8K 1206 CHIP |
| 32 | 1 | SW1 | SPDT MINI TOGGLE |
| 33 | 4 | U1,U2,U3,U4 | MAR7 |
| 34 | 1 | U5 | LM7555 |
| 35 | 1 | U6 | LM10N |
| 36 | 1 | VR1 | 10K KNOBPOT (5K, 50K, 10K Any Rc supply) |
| 37 | 1 | | CABINET ASSEMBLY |
| 38 | 1 | | 12-16 VDC PLUG TRANSFORMER |
| 39 | 1 | | Wire harness with connector |
| 40 | 1 | | Socket Pins, .025" sq, strip of 5 |
| 41 | 1 | | Set of brass shields. |