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PER.150

PR-150 HF band Pre-selector. User's Manual.

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The PR-150 preselector is an accessory that can enhance the performance of many HF band receivers. It is suitable for use with receivers that accept a co-axial aerial feed (nominally at 50 ohms) and are fed from external aerial systems.

As its name implies the preselector's job is to pass signals in the required frequency band and reduce the strength of signals outside this band. To do this the PR-150 uses a continuously tunable filter which is manually tuned to peak at or near to the receiver's tuned frequency.

The bandwidth of the preselector is much wider than that of the receiver, so it will not be able to remove interference from adjacent stations (although the PR-150 selectivity is sharp enough on medium and long wave frequencies to have some useful effect in this area.) What it can do, however, is to reduce the level of unwanted signals that are in different frequency bands to the one being received. This increases the readability of the wanted signal by removing spurious signals from harmonics and even-order intermodulation.

Because it only removes signals, the preselector does NOT increase signal strength. Indeed if you use a receiver with a signal strength meter fitted then expect to see a reduction of 1 to 2 S-points in signal strength when the preselector is switched in. If a signal is very weak the pre-amplifier in the PR-150 can be switched in - this will restore the original level or cause a slight increase depending on what frequency is tuned. Remember that it is the signal to noise ratio that decides how readable a signal is, not the signal strength alone.

Connections.

Power Supply.

The PR-150 operates from an external DC supply of between 11 and 15 volts and requires only 50mA of current. If it is used with a power supply unit then the unit should ideally be regulated - the LOWE PS12 is recommended.

In conjunction with the LOWE receivers, the receiver power supply unit can also power the preselector - the two power sockets on the PR-150 and the supplied power lead are for this purpose. Note that the two power sockets on the PR-150 are identical and it does not matter which connects to the PSU and which connects to the receiver.

Receiver.

The preselector should be connected to the receiver by a short length of co-axial cable. A lead with a PL-259 plug fitted is supplied for this connection - if this plug does not match the receiver antenna connection then a new plug should be fitted or an adaptor used. Ideally the connection should be made to a 50ohm, unbalanced input on the receiver. If this is not available then use connections marked "Lo-Z" or "Dipole" or experiment to see which connections work best.

Aerials.

The PR-150 can accept two aerial inputs and allow the user to select which is connected by a front-panel switch. Aerial input A is for low-impedance, co-axially fed aerial systems such as dipoles, verticals, active aerials and long-wire aerials with matching transformers. Aerial input B is for high impedance systems such as dipoles with 300ohm feeders and directly connected long-wire aerials. It is converted to a 50ohm unbalanced signal by a low-capacitance matching transformer within the PR-150.

Aerial Input A can be connected through the SO-239 co-axial socket on the left hand side of the preselector (when viewed from the rear) or through the red and black push terminals on the left hand side of the terminal block.

Aerial Input B is connected through the red and black push terminals on the right hand side of the terminal block. Balanced aerials should simply be connected to the two terminals - polarity is unimportant. The end of a long-wire aerial should be connected to the RED terminal and the BLACK terminal connected to ground.

The ground connection can be made to the receiver's ground by linking the two BLACK terminals with a short piece of wire, alternatively the right hand BLACK terminal can be connected to an RF earth, for example a metal water pipe or a buried metal plate. Using a separate RF earth can provide useful rejection of mains-borne interference, and the matching transformer in the PR-150 helps by isolating the receiver's earth from the aerial earth.

Operating the Preselector

Most of the controls on the PR-150 are self evident, but for those who don't like to plunge straight in here is a quick guided tour. The major functions are controlled by five latching push-buttons (ie push-on, push-off) in addition to the band select buttons (up and down) and the tuning knob.

Power Switch. The preselector must be switched on (one of the band indication LED's will light) for any signal to pass through it.

Pre-Amplifier. When the PRE-AMP switch is *in* the pre-amplifier increases signal strength by about 10dB (2 S-points).

Attenuator. When the ATTEN switch is *in* the signal strength is reduced by about 16 dB (3 S-points).

Aerial Select. When the AERIAL switch is *out* Aerial A is selected, when it is *in* Aerial B is selected.

Wideband. The WIDEBAND switch overrides the band selection buttons and when it is pressed *in* the filters in the preselector are bypassed, allowing all signals through. Note that the pre-amplifier and attenuator remain active if they are switched in. When the switch is *out* the band selection will revert to its former band and be controllable by the band up and down buttons. The wideband position can additionally be selected by these buttons.

Band Select. The two band select buttons form an up / down rocker to step through the frequency bands. The selected band is indicated by an LED indicator and selection will wrap-round from top to bottom and visa versa. The up / down buttons are inoperative when the WIDEBAND switch is *in*.

Tuning. Each band is tuned along its range by a single tuning control which rotates through a half turn. The suggested method of tuning is as follows : switch the preselector to wideband and tune the receiver to, or near to, a signal of interest. Then select the appropriate band on the preselector and rock its tuning control to give the strongest signal at the receiver. Avoid very slow tuning of the preselector - the receiver's AGC will make it difficult to find the peak signal point. If a signal frequency is near the transition between two bands, try both to see which gives best results. At low frequencies (ie below 1MHz) the preselector will need re-tuning as the receiver is tuned.

Technical Information.

Circuit Description.

The PR-150 preselector consists of seven dual-tank LC filter circuits, each of which can tune over a 2.5 : 1 frequency range. By selecting these filters in turn, continuous frequency coverage from 100kHz to 30MHz is attained, with about 5% band overlap between each filter. The filters are passive circuits giving excellent dynamic range and freedom from overload and harmonic generation - power is required to drive the diodes and relays used to select the appropriate filter.

Each filter consists of two LC tuned circuits which are tuned together by a dual-gang variable capacitor. They are coupled to the aerial and receiver inductively, and signal is transferred from one tuned circuit to the other by a capacitive network. The combination of inductive and capacitive coupling ensures good rejection of frequencies both above and below the tuned frequency. The coupling network ensures that the filter bandwidth remains essentially constant over its whole tuning range.

A user-switchable pre-amplifier is included in the PR-150 after the filter circuits. Using a UHF bipolar transistor with current and voltage feedback it gives low noise performance with high dynamic range.

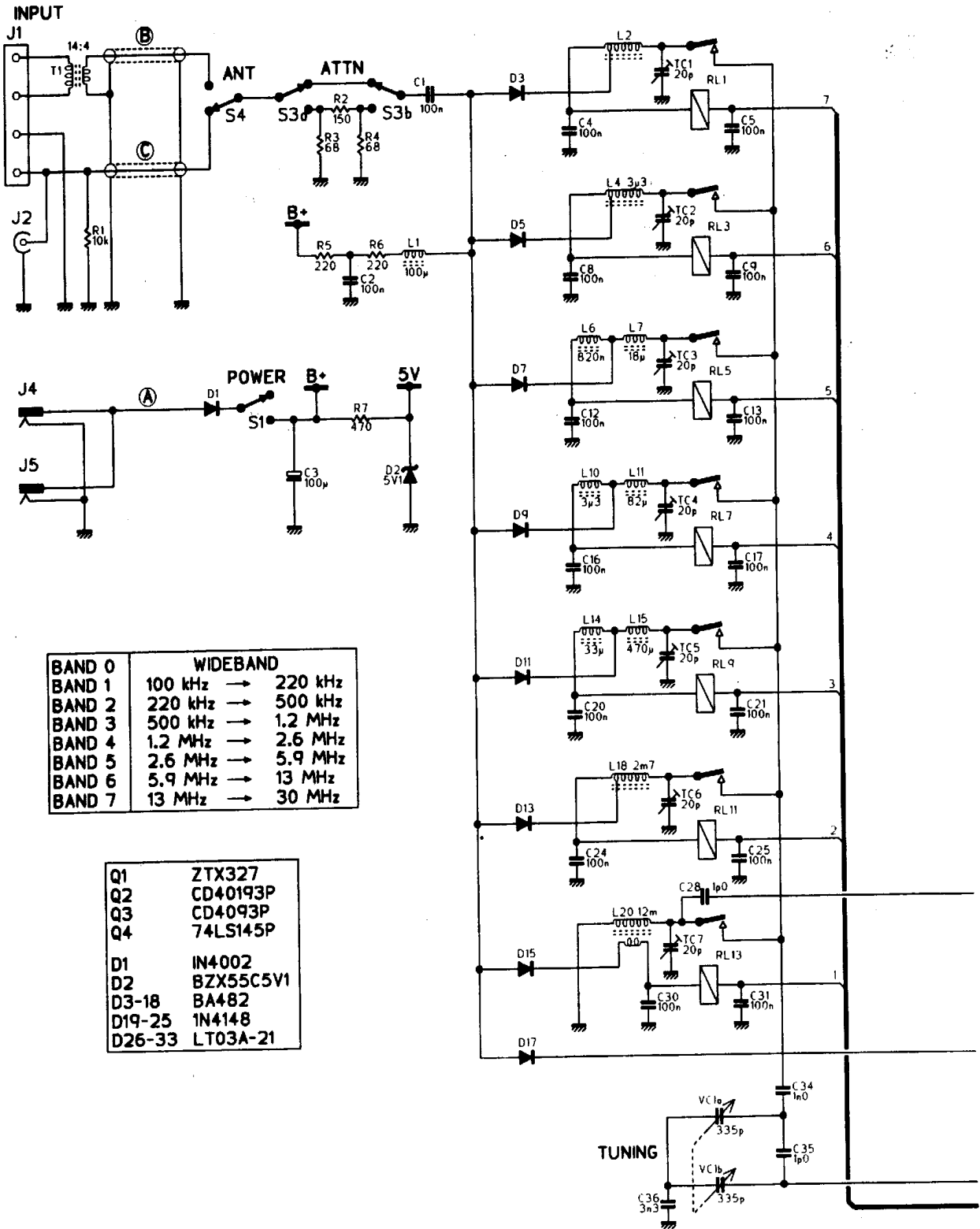
The control logic consists of an up/down counter driven from the band select buttons and a one-of-eight decoder to select either one of the filter circuits or the wideband "straight through" circuit. A large capacitor retains enough power to operate the CMOS circuit for several days when external power is removed, ensuring that the band selection is remembered.

Filter selection is by pin diode in the low impedance input and output circuits and by reed relay in the high impedance tank circuits. The use of four switches in each filter ensures that there is no signal leakage through deselected filters.

Schematic diagrams are shown on the following pages.

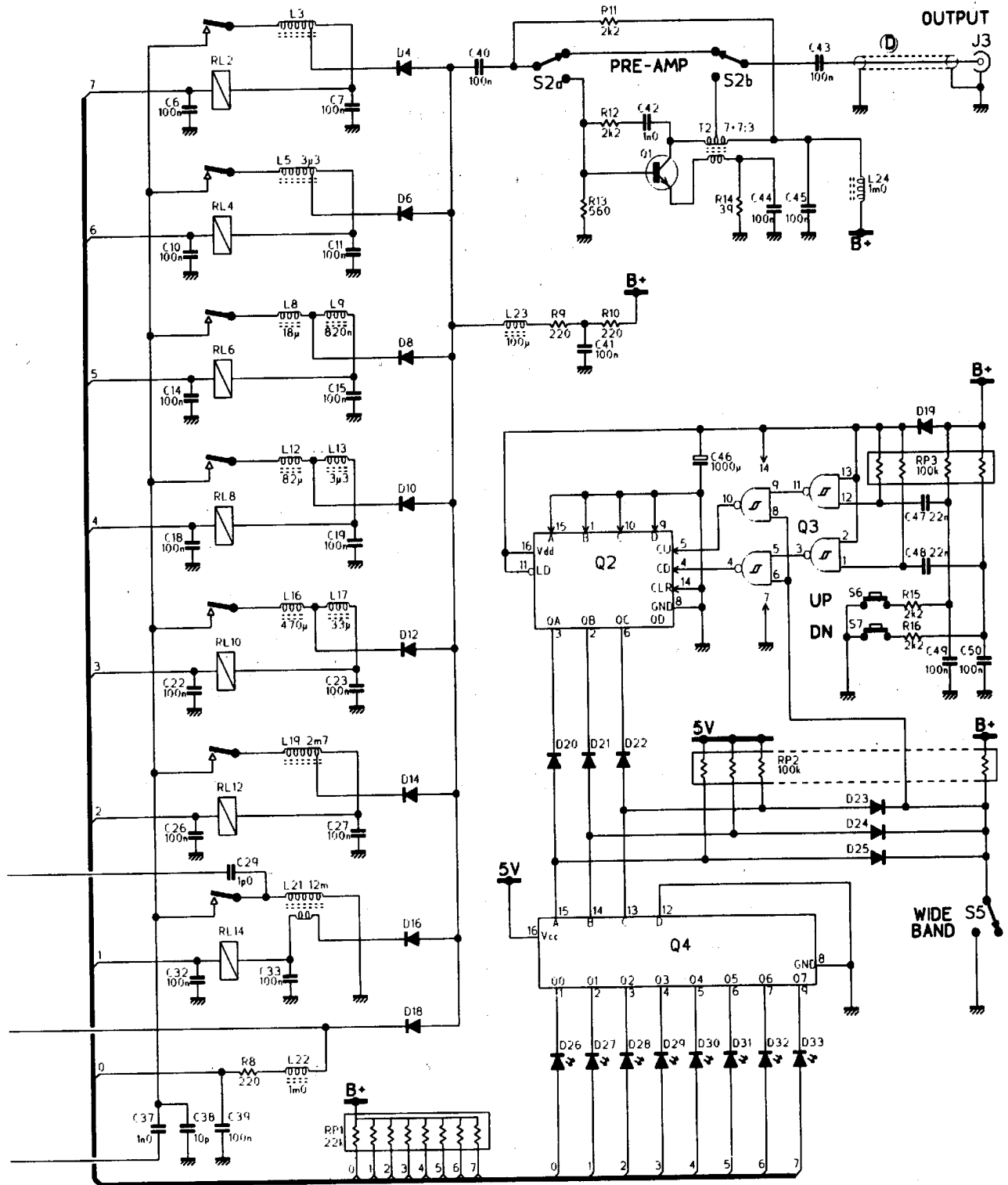
Specification.

Controls	Power on/off	Pre-amplifier on/off
	Attenuator on/off	Aerial (50ohm/600ohm)
	Wideband on/off	Band select (up/down)
	Tuning	



BAND	WIDE BAND
BAND 0	
BAND 1	100 kHz → 220 kHz
BAND 2	220 kHz → 500 kHz
BAND 3	500 kHz → 1.2 MHz
BAND 4	1.2 MHz → 2.6 MHz
BAND 5	2.6 MHz → 5.9 MHz
BAND 6	5.9 MHz → 13 MHz
BAND 7	13 MHz → 30 MHz

Q1	ZTX327
Q2	CD40193P
Q3	CD4093P
Q4	74LS145P
D1	IN4002
D2	BZX55C5V1
D3-18	BA482
D19-25	1N4148
D26-33	LT03A-21



PR-150 MAIN UNIT & CONTROL UNIT

Specification. (contd.)

Frequency coverage	100kHz to 30MHz in seven bands :- 100kHz to 220kHz 220kHz to 500kHz 500kHz to 1.2MHz 1.2MHz to 2.6MHz 2.6MHz to 5.9MHz 5.9MHz to 13MHz 13MHz to 30MHz Band selected by up/down buttons
Connections	Aerial input A 50ohm unbalanced SO239 socket or wire terminal Aerial input B 600ohm balanced or unbalanced Wire terminals with optional link to ground Output to Receiver 50ohm nominal via SO239 socket DC Power input 12V via 2.1mm power jack Duplicate socket for power loop-through
Characteristics	The values given here are typical - there will be some variation with the band selected, the position of the tuning control and the receiver and aerial impedances. -6 dB bandwidth +/- 5% of tuned frequency -30 dB bandwidth +/- 25% of tuned frequency Insertion loss 5 to 10dB Attenuator -16dB Pre-amplifier +10dB
Power supply	12V DC supply @ 50mA (11V to 15V acceptable)
Dimensions	Size 185 x 80 x 175 mm (WxHxD, overall) Weight approx 1.1 kg

Specification subject to change without notice.