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DARTCOM 136-138 MHz SYNTHESIZED SATELLITE RECEIVER

This receiver is specifically designed to receive APT (Automatic Picture Transmission) signals from NOAA and other orbiting weather satellites transmitting in the 136 to 138 MHz band. It also functions as an IF (Intermediate Frequency) receiver, when used in conjunction with a down converter, for the reception of geostationary weather satellite transmission in the 1.69 GHz (SHF) band.

The receiver is a double superhet design with a 1st IF of 10.7MHz using four cascaded ceramic filters to provide an IF bandwidth of 50KHz, and a second IF of 455KHz. The RF amplifier and first mixer use low noise BF981 dual gate MOSFET's with an SL6601 second mixer, IF, and demodulator. This is followed by active high and low pass filters to provide an optimum AF bandwidth for reception of APT signals.

The synthesizer can provide 10KHz steps with specific individual channels stored in an EPROM. In addition, the receiver features an automatic frequency control function normally enabled on SHF.

A 1 watt AF output stage provides audio to drive an 8 ohm loudspeaker with an additional low level AF output for driving a cassette recorder. A further AF output is provided to drive the DARTCOM Acquisition Board.

An optional wideband I.F. demodulator is available for countries served by the GMS geostationary satellite.

FEATURES

1. 500 channel capability divided into 5 ranges, selectable using a front panel mounted switch, with 100 channels per range. When in channel scan mode, scanning halts when a signal is received above the selected squelch threshold. The channel is held for approximately 5 seconds after LOS (loss of signal) after which scanning continues at a rate of 2 seconds per channel.
2. Fully adjustable squelch.

3. Low level AF output (approximately 80mv RMS at 17KHz deviation), for driving a cassette recorder.
4. An output of 1v RMS is provided to drive the Acquisition Board, either squelched or unsquelched (link selectable).
5. Remote control of cassette recorder motor by a volts free c/o contact of a relay, which is in turn controlled by the receiver squelch.
6. Built in S-meter to indicate received signal strength.
7. Remote S-meter output. (10v FSD meter required).
8. DC feed to signal feeder cables to provide power for the mast head pre-amplifier or down converter.
9. Unit supplied fully programmed for all known satellite APT and Beacon channels.
10. Up/down scan switch to provide quick selection of a wanted channel.
11. Scan halt and channel override facilities.
12. Direct frequency readout using LCD display module.
13. Separate N-type sockets for SHF/ VHF.
14. SHF channel selection for Meteosat.
15. Automatic selection of correct I.F. frequency when selecting SHF.

INSTALLATION

The receiver is supplied complete with a mains lead and a DIN terminated lead for all outputs.

Connect a suitable mains plug onto the lead supplied.

OBSERVE THE COLOUR CODE PRINTED ON THE LABEL ATTACHED TO THE CABLE :-

BROWN= LIVE
BLUE= NEUTRAL
GREEN/YELLOW= EARTH

ENSURE THAT THE FUSE FITTED TO THE PLUG IS RATED AT 3 AMPS.

IF YOU HAVE ANY DOUBTS REGARDING CONNECTION OF THIS PLUG CONSULT
A QUALIFIED ELECTRICIAN.

Select a suitable location for the receiver. Normally this will be near to, but not directly on top of the computer. Connect the coaxial cables from the VHF aerial and SHF down-converter to the appropriate N-type sockets on the back panel of the receiver. Plug the DIN connector on the interface cable supplied into the socket marked "FACILITIES" on the rear panel.

Connect the plug marked "MICRO" on this interface cable to the jack socket on the rear panel of the Acquisition Board which you have already installed in the computer.

The other two plugs on this lead are for use with a tape recorder, and connect to the remote control and microphone sockets as indicated. If you use this facility you will need to provide a lead for playback to connect the output of the tape recorder to the input jack socket on the acquisition board.

Finally plug the mains cable into the socket on the rear of the receiver and connect to the main supply.

DESCRIPTION OF CONTROL FUNCTIONS

POWER

The ON-OFF mains switch is incorporated in the power socket on the rear of the receiver. A front panel mounted green LED will illuminate when the receiver is energised.

VOLUME

Controls the level of audio from the loudspeaker, used to monitor transmissions in progress. The setting of this control does not affect the other output levels.

SQUELCH

Controls the signal level at which the receiver will activate and is normally adjusted until the noise under no-signal conditions just disappears from the loudspeaker. The relay to control the remote control facility found on most cassette recorders is controlled by the squelch, and is held energised for approximately 5 seconds after squelch closure. This remote control feature allows for unattended

recording of satellite passes and is particularly useful when the system is required to view transmissions such as the overnight passes of the orbiting series of Russian and American meteorological satellites.

TAPE LEVEL OUTPUT

Most cassette recorders have automatic level controls built into them (ALC). This is a form of audio compression which tends to provide a constant volume level. Since APT signals from weather satellites work on the basis that the 2400 Hz sub-carrier gets louder for a "whiter" picture, and quieter for a "blacker" picture, any form of compression will result in a poor contrast range of taped signals. The tape output level control enables the correct level to be supplied to your cassette recorder, and should be set to provide AF drive which is just below the recorder's compression threshold. This is a matter of trial and error.

SCAN UP/DOWN

With the push button switch OUT ("SCAN UP") the selected frequency increments during scan and override operations. With the switch IN ("SCAN DOWN") the selected frequency decrements.

SCAN-HALT

With the switch OUT ("SCAN"), the channel scan will continue until a signal is received which is greater than the squelch threshold set. Then the channel is held until the signal falls below the squelch threshold. The channel scan will continue after a pause of about 5 seconds to allow for short fades in satellite signals.

With the switch IN ("HALT"), the current displayed channel will be held irrespective of the condition of the receiver squelch.

OVERRIDE

When the override button is depressed, the receiver will advance channel irrespective of the setting of SCAN/HALT or the condition of the receiver squelch.

FREQUENCY RANGE

The unit is supplied preprogrammed as follows:-

APT	All known APT frequencies including US, USSR, and METEOSAT/GOES weather satellites (10 channels).
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BEACON	Geostationary and orbital beacon frequencies, which contain the phase modulated split phase data from the low bit rate instruments and space craft telemetry (5 channels).
DOWN LINKS	A selection of frequencies in the 136 to 138 MHz band known to be used or have been used by APT and non-APT satellites (58 channels).
136-137MHz	All 10 KHz steps between 136.000 and 136.990 MHz (100 channels).
137-138MHz	All 10 KHz steps between 137.000 and 137.990 MHz (100 channels).

The specific frequency selected is indicated by the Liquid Crystal Display on the front panel of the receiver.

SHF / VHF

This switch selects the required aerial/dish system. For orbiting satellites this will always be "VHF" and for Geostationary Satellites "SHF". When the SHF setting is selected the receiver will automatically tune to the correct frequency and power will be supplied to the down-converter, as indicated by the red LED.

PRE-AMP

When a mast head pre-amplifier is fitted, this switch must always be "ON", otherwise you will lose all VHF signals. When the pre-amplifier is energised, the red LED on the front panel will be illuminated.

If you do not have a pre-amplifier fitted, no damage will result to the receiver due to accidental operation of this switch **AS LONG AS YOU ARE USING THE VHF AERIAL SUPPLIED BY DARTCOM FOR USE WITH THIS SYSTEM.** Aerials of different design may use other methods of impedance matching which could effectively provide a DC short circuit to the receiver.

CHANNEL SELECT - SHF

Used to select either channel 1 or channel 2, when using Meteosat. All other geostationary satellites only use one frequency for APT dissemination and for these this switch should therefore be set to channel 1.

SIGNAL STRENGTH METER

Indicates the relative strength of the signal being received from the spacecraft.

REAR PANEL CONNECTIONS

- a) Mains socket with integral switch and fuse.
- b) Remote S-meter 3.5mm jack socket.
- c) VHF aerial N-type socket.
- d) DOWN-CONVERTER N-type socket.
- e) 7 pin DIN socket with outputs for Acquisition board, Tape recorder audio, and Tape recorder remote control.

ADJUSTMENTS

COMPONENTS ON THE RECEIVER BOARD CARRY POTENTIALLY LETHAL MAINS VOLTAGES. NEVER OPEN THE RECEIVER CASE WITHOUT ENSURING THAT THE MAINS LEAD IS DISCONNECTED FROM THE SUPPLY.

The receiver has been fully aligned and tested for maximum performance and will not require any adjustments. DO NOT ATTEMPT TO MAKE ANY ADJUSTMENT OTHER THAN THOSE DETAILED BELOW UNLESS YOU HAVE ACCESS TO SUITABLE TEST EQUIPMENT AND A THOROUGH KNOWLEDGE OF RF TECHNIQUES. ANY SUCH ADJUSTMENTS WILL INVALIDATE THE GUARANTEE.

User preset links on the receiver main board can be adjusted as follows:-

- a) The AF output for the Acquisition Board has been set to 1-volt p-p for 10KHz deviation, but can be adjusted in level using the on board preset. The receiver is supplied with this output linked for squelched AF, and can be altered to unsquelched AF by means of the link located below the Acquisition Board AF output preset.
- b) The remote control relay contacts are set to MAKE on receipt of signal. This is normal for most types of tape recorder. However the contacts can be set to BREAK on signal by changing the link on the receiver board marked "RELAY LINK" to the position marked "O".

USING THE RECEIVER

Although this receiver is very versatile, operation is straightforward. For normal use the frequency range switch will be left in the "APT" position and the tape

recorder output level control, once set, will not need adjustment.

The volume control is set for personal preference and the squelch control is set as outlined in the section "SQUELCH". Again, once set this will not normally need adjustment.

The frequencies you will need to use for receiving pictures are all displayed on screen by the software, in the satellite descriptions within the prediction facilities.

There are 5 memory pages of frequencies to choose from and these have been included in the receiver design to allow for those interested in satellites other than the meteorological series. For most purposes you will only require the "APT" setting, which contains the frequencies for all current APT transmissions.

As there are only a small number of frequencies stored in this section, a quick way to set the one you require is to leave the SCAN-HALT button depressed and, irrespective of the setting of the UP-DOWN button, just depress the OVERRIDE button a number of times in succession until you see the frequency you need displayed.

The UP-DOWN control is usually only needed if you are using those ranges of the receiver's memory which hold a large number of channels.

SPECIFICATION

POWER REQUIREMENTS	Type A 220/240v AC Mains 50/60 Hz Type B 110v AC Mains 50/60Hz
SENSITIVITY	0.2uV PD for 12dB SINAD at 10KHz deviation. 0.3uV PD for 20dB quieting. S/N ratio at 1uV PD for 17 KHz deviation > 40dB S/N ratio at 5uV PD for 17 KHz deviation > 46dB
RF BANDWIDTH	3 MHz @ -3dB points.
IF BANDWIDTH	50 KHz
IF RESPONSE	100dB @ 400KHz from wanted signal. 70dB @ 175KHz from wanted signal.
IMAGE REJECTION	> 75 dB
AF FILTERS	High pass filter cut off frequency = 700 Hz Low pass filter cut off frequency = 4000 Hz AF bandwidth 400 Hz to 4000 Hz (-6dB points).
AF OUTPUTS	a) 1 watt RMS into 8 ohm load for less than 10% distortion 200mW RMS into 8 ohm load for less than 5% distortion. b) 80mV RMS into 50 Kohm load, 17KHz dev. @ less than 3% distortion. c) 1v RMS into 1Kohm load for less than 5% distortion.

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