

PAN 1000

Mobile Monitoring and Control of
Unwanted Emissions



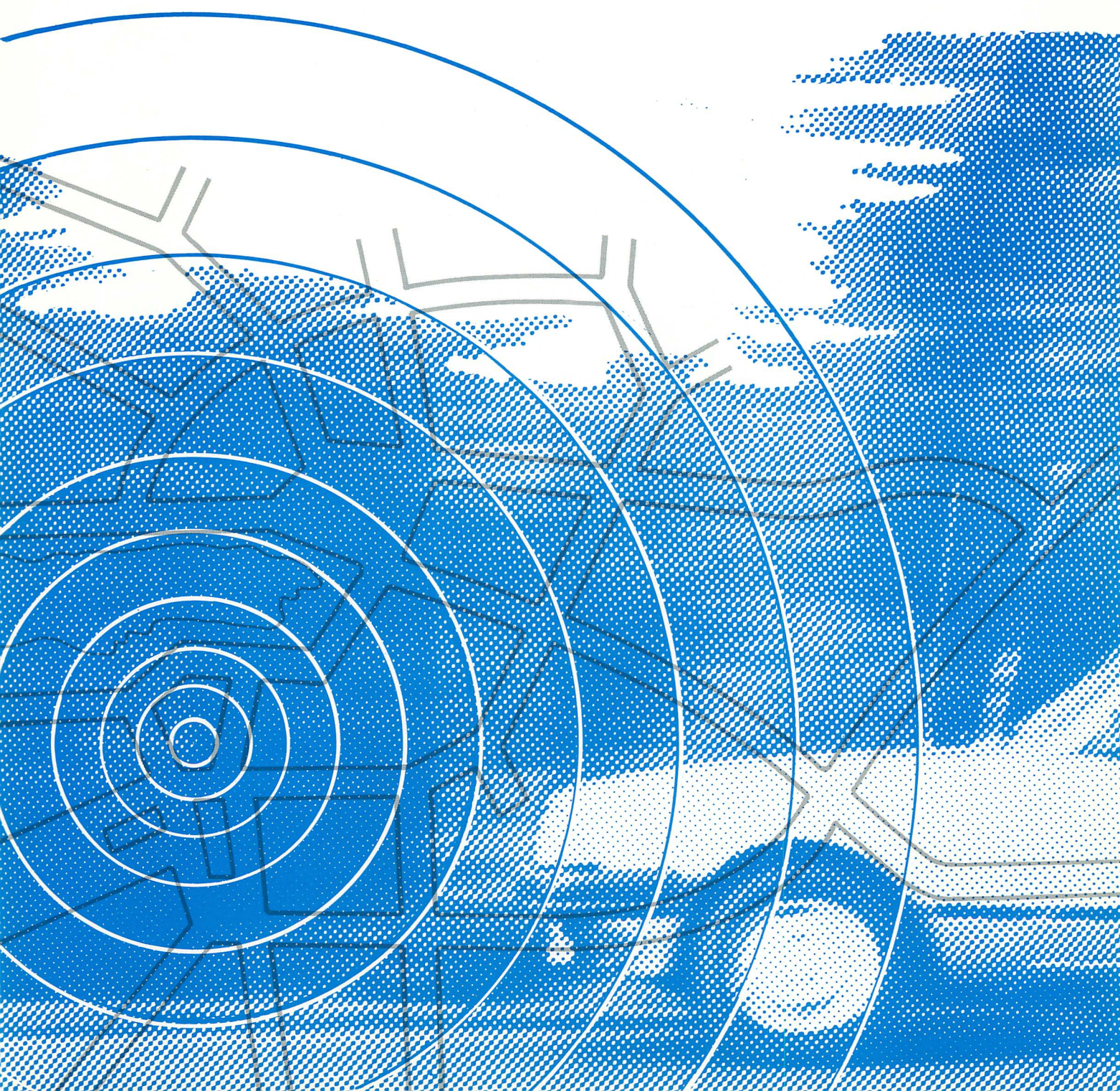
INTRODUCTION

Today's increase in the use of the radio frequency spectrum has necessitated the need to monitor and control unwanted emissions.

In 1981 the Dutch P.T.T. started an evaluation of all existing measuring systems such as panoramic receivers, monitoring receivers, scanning receivers and other measuring systems available at the time.

None proved suitable for mobile use.

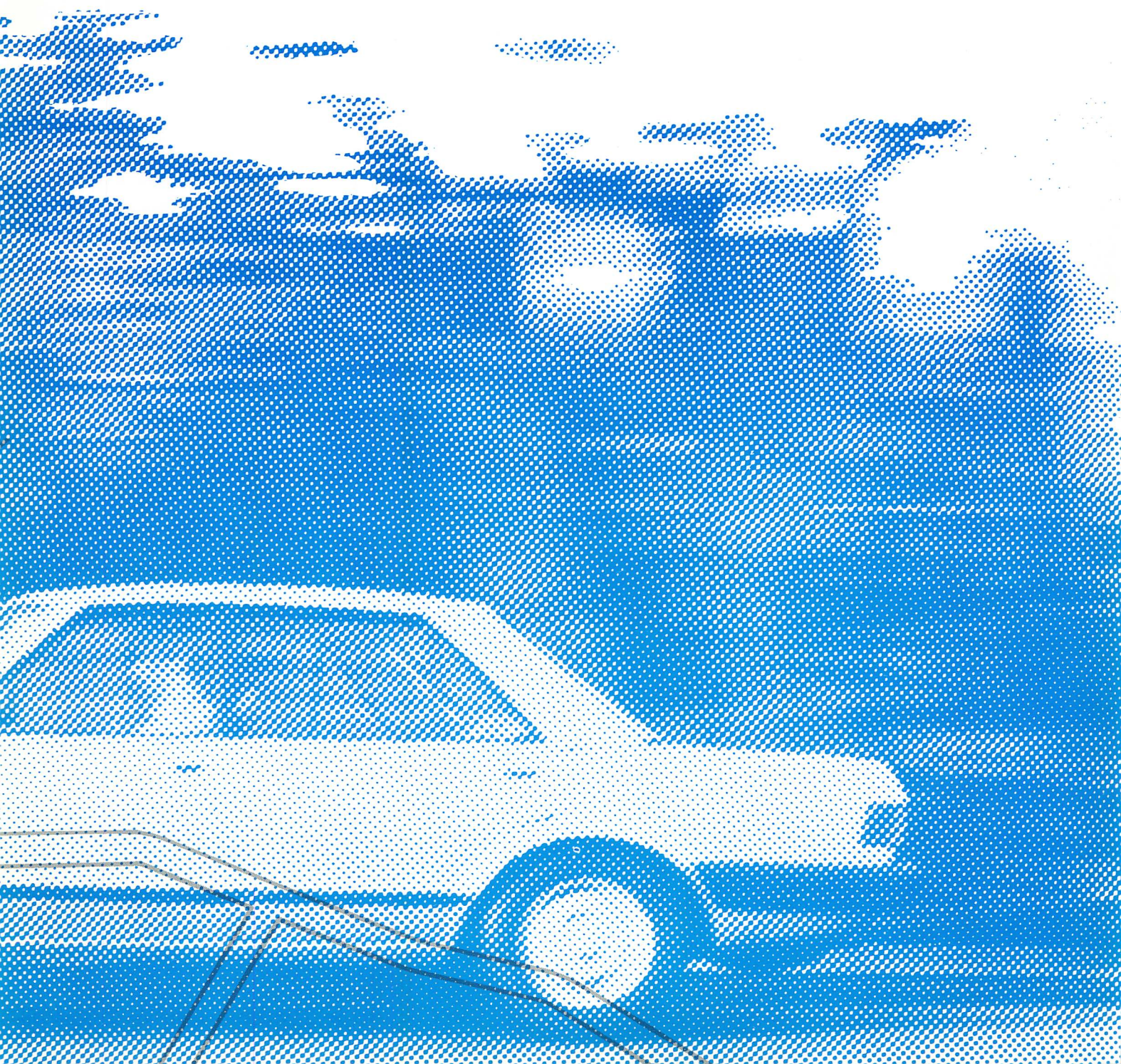
MONITORING AND CONTROL



The intention was to produce a wide band receiver which could be accommodated in a medium size family car under the control of the driver without any external antennas being visible, therefore reducing the possibility of the vehicle being detected.

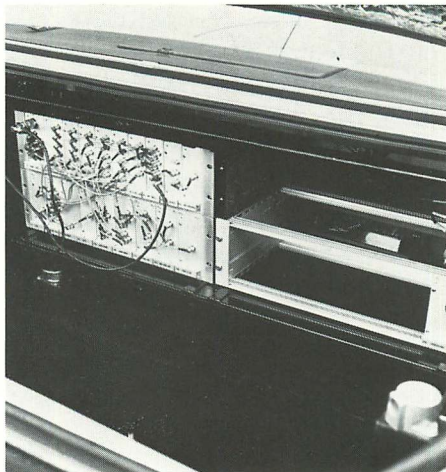
Working in close co-operation with the Dutch electronics industry, the N.R.P. (Nederlands Radar Proefstation) developed a system which encompassed all the technical requirements as well as addressing the tactical issue of the car-receiver-technician combination.

OF UNWANTED EMISSIONS



System Description

The search-receiver described here, was developed to allow indication and identification of signals in the RF spectrum between 100 KHz en 1000 MHz. The signal to which the receiver is tuned, can be monitored aurally and is also presented on an electro luminescent display, together with its adjacent signals. The frequency range is covered with continuous tuning and with all relevant demodulation modes available (Wide Band FM, Narrow Band FM, AM, USB and LSB).



As the equipment had to be used in a single-manned car, special attention was paid to the driver's comfort. This resulted in a receiver of which the major part is mounted in the trunk.

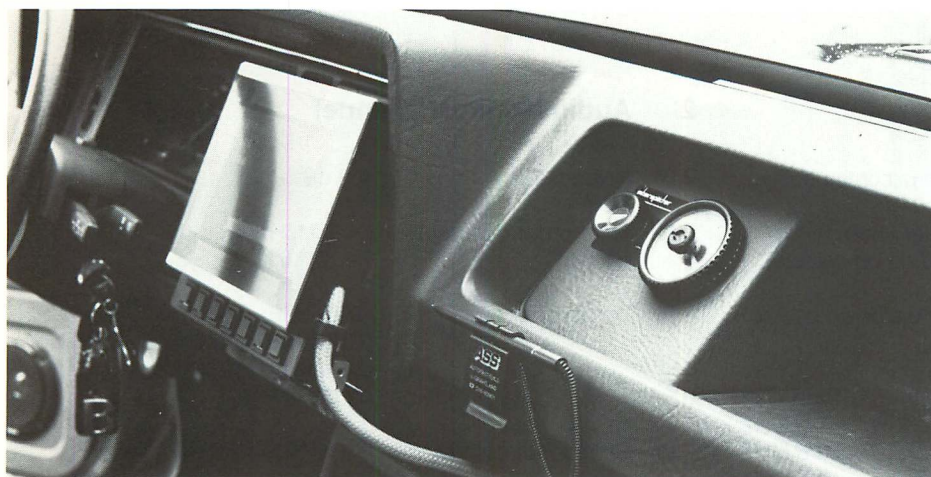
Only a control unit and the display panel are located close to the driver's seat.



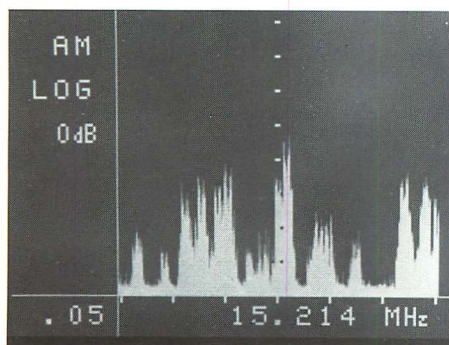
The specially shaped control unit is mounted between the front seats, enabling easy access to all controls.



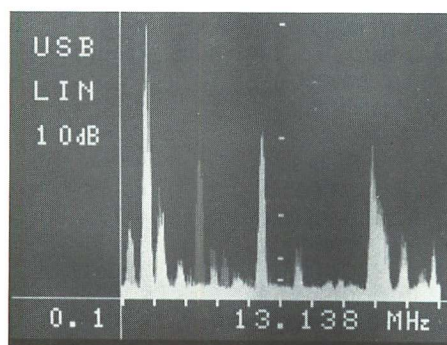
The controls have been laid out such, that the driver-operator can identify and locate them by touch, rather than visually guiding his fingers.



The display panel measuring 20x17x3 cm³ is mounted on the dashboard. Its effective display area is 9x12,5 cm². Moreover the display unit contains 7 push-buttons, enabling the operator to store and recall up to 6 frequencies.



logarithmically

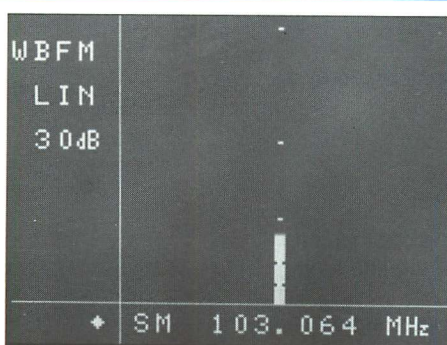
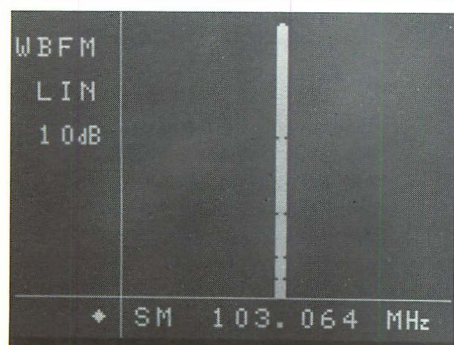


linearly

The spectrum display is specifically intended to show relative levels of desired and adjacent channels, it is not intended for signal analysis.

The amplitude of the signal can be represented in two ways:

In the first case a range of 70 dB can be displayed, in the second case a range of 20 dB. To adjust the amplitude of a signal on the screen in the latter case, a step-attenuator with 12 steps of 10 dB's each is available.



It is also possible to stop the sweep-oscillator in the centre of the display, showing the level of the signal at the tuning frequency as a vertical bar. This is also the signal, which is reproduced aurally.

The display shows:

96.808 MHz

numerically the tuning freq.

1

the sweep width per division

40dB

the attenuator setting

LIN

the representation lin or log

S

the reception of a pilot tone for stereo transmission

WBFM

the demodulation mode

In case a (doppler) direction finder is present, the display gives the opportunity to indicate up to 8 directions.

The receiver tuning, including the sweep-oscillator, is synthesised and all functions are controlled via a microprocessor. Significant characteristics of the receiver are summarized in the accompanying specifications.

Technical Specifications:

1. Tuning

1.01	Tuning range	100 kHz-1000 MHz continuously
1.02	Tuning	Continuous vernier knob, step-size depending on selected demodulator. Push-buttons for up/down coarse steps.
1.03	Coarse tuning	Tuning frequency Step-size 500-1000 MHz 1.6 MHz 125-500 MHz 0.8 MHz 31.25-125 MHz 0.4 MHz 0.1-31.25 MHz 0.1 MHz If after pushing the "up" button the "down" button is also activated or vice versa, the step-size is increased by a factor 8.
1.04	Fine tuning NBFM, AM, USB or LSB	Tuning frequency Step-size 500-1000 MHz 1600 Hz 125-500 MHz 800 Hz 31.25-125 MHz 400 Hz 0.1-31.25 MHz 100 Hz
	WBFM	Tuning frequency; Step-size 500-1000 MHz 16 kHz 125-500 MHz 8 kHz 31.25-125 MHz 4 kHz 0.1-31.25 MHz 1 kHz
1.05	Lock	The tuning can be disabled by a switch.
1.06	Number of steps of tuning knob	250/rev.
1.07	Tuning vernier for SSB and CW	Clarifier covering more than one frequency step of the fine tuning knob. This clarifier is always active.
1.08	Maximum tuning speed	Band Change/sec 500-1000 MHz 64 MHz/sec 125-500 MHz 32 MHz/sec 31.25-125 MHz 16 MHz/sec 0.1-31.25 MHz 4 MHz/sec
1.09	Frequency indication	Digital readout on display.
1.10	Resolution frequency indication	1 kHz (Frequency changes because of clarifier operations are not indicated).
1.11	Memory	6 push-buttons on the display provide the possibility to store and recall 6 tuning frequencies together with the selected scanwidth. If the memory is open to receive frequency-information, the character "M" is displayed.

2. Audio Monitor/Channel

2.01	Noise figure	< 9 dB
2.02	Third order intercept point	f < 30 MHz > 5 dBm f > 30 MHz > 0 dBm
2.03	Demodulators	USB, LSB, AM, NBFM, WBFM (CW in position USB or LSB). Selected demodulator is indicated on display.
2.04	Stereo indicator	If a pilot-tone stereo signal is received, a character "S" will be displayed.
2.05	Bandwidth IF channel	USB 2.4 kHz LSB 2.4 kHz AM 5 kHz NBFM 12 kHz WBFM 100 kHz These selectivities are realised by X-tal filters.
2.06	Squelch	Active IF "Wide Band" or "Narrow Band" FM is selected. Squelch level is controllable.
2.07	AF Output	a: 2 Watts in a 4 Ohms speaker Level controllable. b: Recorder output: nominally 1mW, 600 Ohm, fixed level.

These values are measured with modulation levels of:
AM: 60% modulation
NBFM: 3 kHz peak deviation
WBFM: 60 kHz peak deviation

3. Spectrum Display

3.01 Display	Electro luminescent Display 90 x 120 mm, 240 x 320 picture elements. Colour: Orange-yellow (peak wavelength 585 nm) Brightness: 86 cd/m ² (normal value), adjustable with potentiometer on display unit.
3.02 Scanwidth spectrum display	500-1000 MHz 100, 30, 10, 3 or 1 MHz 62.5-500 MHz 30, 10, 3 or 1 MHz 31.25-62.5 MHz 10, 3 or 1 MHz 0.1-31.25 MHz 3, 1 or 0.3 MHz
3.03 Video bandwidth	Scan width 100 MHz 1 MHz 30 MHz 1 MHz 10 MHz 100 kHz 3 MHz 30 kHz 1 MHz 10 kHz 0.3 MHz 3 kHz
3.03 Scanwidth selection	Scanwidth is selected by two push-buttons: "up" and "down". Each push increases or decreases the scanwidth by one step until the limit range is reached. Maximum scanwidth is automatically corrected in case of tuning to lower frequencies.
3.05 Zero-scan	In order to display - as a vertical bar - the field strength of only the 'wanted' signal, the receiver is tuned at the center position and the sweep can be stopped. The video bandwidth depends on the selected demodulator: WBFM 30 kHz NBFM 10 kHz AM 3 kHz LSB 3 kHz USB 3 kHz
3.06 Minimum step-size sweep oscillator	As the sweep signal is generated by a synthesiser, there is a limit to the resolution. The minimum step-size is: Range 31.25-1000 MHz: 10 kHz Range 0.1-31.25 MHz: 2.5 kHz
3.07 Scan frequency	5 Hz
3.08 Vertical scale a. logarithmic representation b. linear representation	Linear dB scale. Range 70dB. Linear amplitude scale, displayed range 20 dB, selected from a total range of 13 0dB by a 13 step attenuator.

3.09 Screen presentation

Following items are displayed:

1. Tuning frequency (MHz)
2. Demodulator selected
(WBFM, NBFM, AM, USB, LSB)
3. Attenuation (0-120 dB)
4. Horizontal scale factor
(MHz/div.)
5. Logarithmic or linear
presentation (LOG-LIN)
6. Vertical scale factor
a. LOG 10 dB/div.
b. LIN 4 reference lines,
5 dB/div.
7. Memory open for frequency
storage: "M".
8. Stereo indication: "S"
9. Possibility to display
direction-finder information.
8 directions can be presented.

4. General

4.01 Antenna	50 Ohms. N-connector (female).
4.02 VSWR	< 2.5
4.03 50 MHz monitor output	Connector SMA female Impedance 50 Ohms Bandwidth (-3dB) ... 7 MHz AGC controlled
4.04 10.7 MHz monitor output	Level -20 dBm max. Connector SMA female Impedance 50 Ohms Bandwidth (-3 dB) .. 12 kHz AGC controlled
4.05 Local oscillators	All local oscillators (except 60.7 MHz and 10.7 MHz BFO) are synthesised.
Supply voltage	min. 10.6 V max. 15 V
Supply current	< 6 A

Each receiver consists of:

- 1 double card cage for extended
Eurocards 450x270x270 mm³
- 1 single card cage for extended
Eurocards 450x135x270 mm³
- 1 Interface box 265x240x55 mm³
- 1 Control box
- 1 Display unit 200x170x40 mm³
- 1 Set of cables.



Sales

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