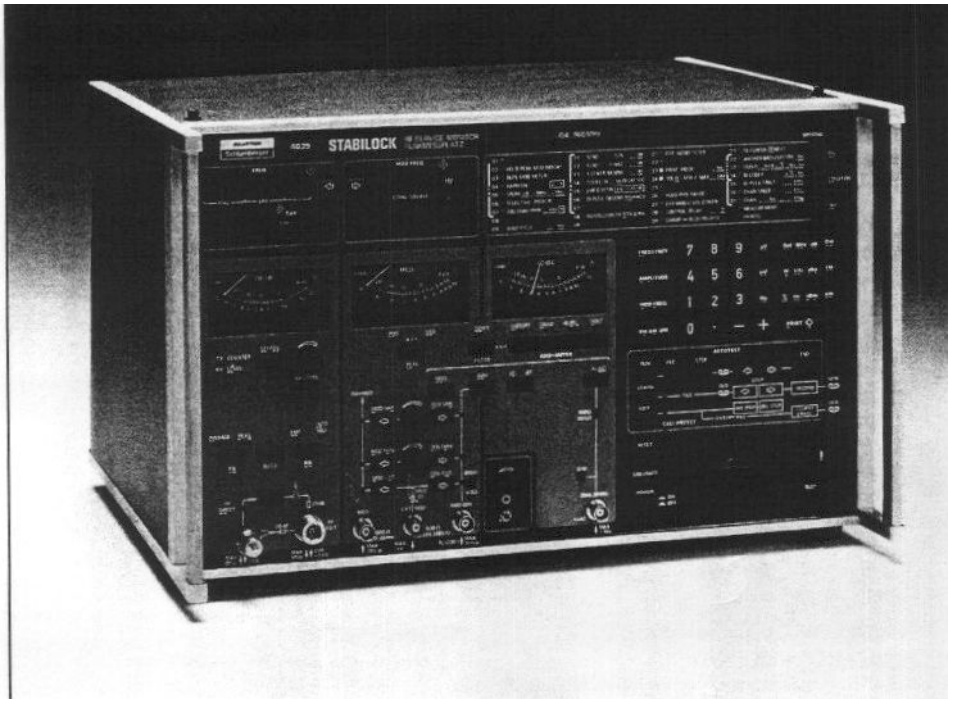
STABILOCK TEST SET 4040



The STABILOCK 4040 is the flagship of the Stabilock Series, which has gained world-wide recognition. It is a complete test system for radio communication. Both modular and compact it offers outstanding flexibility so that it can be adapted to the specific needs of any user.

With its high precision and reliability the STABILOCK 4040 is a reference instrument for all kinds of radio communications measurement. These include research, development, production, quality assurance and, last but not least, repair and service.

OPERATING FEATURES

The main operating features of STABILOCK 4040 are easy handling of complex test routines, high measurement speed, partial or fully automated programming (without the need of an external computer), and standard IEEE 488 interface with simple mnemonics high-lighted on the front panel.

All input parameters and special procedures are clearly presented on the front panel so that reference to the operating manual is minimised.

Fine tuning of important parameters may be carried out by individually designated tuning knobs. Big and bright LED displays and indicators ensure optimum readability under all light conditions and viewing angles. Analog meters, in addition to the digital displays, make the Stabilock particularly suitable for tuning and adjustment of transcievers.

Built in firmware routines, covering all important measurement procedures, simplify front panel operation and ensure repeatability of test set ups.

SIMPLE AUTOMATIC OPERATION

The learn facility of the STABILOCK 4040 provides semi- or fully-automated measurement routines by automatically repeating any manual front panel settings. Remote operation of the unit under test can be done by a control module with up to 32 relays.

Measured parameters can be sent to any IEEE488 printer with indication of tolerance and comments on results which are out of specification.

Up to 900 complex test steps can be stored on a single mini cassette.

REMOTE CONTROL VIA IEEE BUS

All bus commands are high-lighted and the programming sequence is the same as the manual control of the STABILOCK 4040.

BASIC EQUIPMENT

The basic STABILOCK 4040 allows measurement and test of the important transceiver specifications:

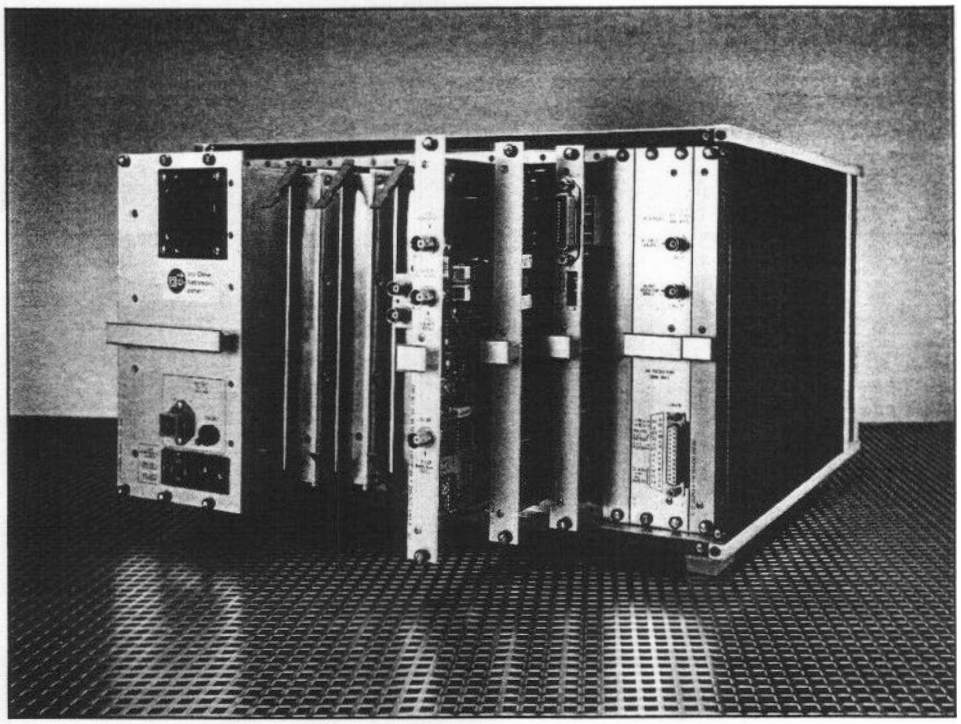
- A very accurate oven-stabilised crystal oscillator controls the precision synthesizer (frequency range 0.4 to 960MHz). The excellent spectral purity qualifies it for all multi-signal measurements on receivers; fast switching and settling guarantee trouble-free measurements even on very fast cellular systems.
- Wide output range up to 2 volts with continuous variation of 26dB.
- Power meter up to 50W with built-in attenuation routine for measurement of power up to 2.5kW.
- Frequency counter either for direct frequency measurements or channel related frequency deviations.
- Amplitude, frequency and phase modulators.
- AM, FM and ϕM demodulators with peak or trough indication and hold peak modulation facility.
- Two synthesized modulation generators with wide range of output level plus output coupling by transformer (either low impedance or 600Ω). Both can be added to external AF signal; 8 fixed frequencies selectable.
- AF (true rms) voltmeter for balanced or unbalanced input with 0dB key for relative measurements (e.g. frequency response).
- SINAD meter.
- CCITT P53A filter.
- 1kHz distortion meter.
- DC voltage and current meter. Five additional inputs for dc voltage measurements.
- AF frequency counter.
- AF power meter.
- Programmable selective call tone generator and analyser covering: ZVEI 1, ZVEI 2, VDEW, CCIR, EUROSIGNAL and NATEL and user system. Answer back made possible by short Rx/Tx switching time of <10ms.
- Firmware routines for:
  Tx: modulation sensitivity
  Rx: sensitivity (S/N and SINAD)
  IF filter bandwidth and centre frequency deviation
  Squelch on/off levels
  Duplex desensitisation
- Built in memory for 50 complete front panel settings or 50 program steps.
- Programming of channel space and duplex space with automatic upper/lower band switching.
- Switched mode power supply for ac and dc (11 to 33Vdc) operation.
- IEEE 488 interface.
- Self check routines.

OPTIONS

The STABILOCK 4040 modular concept enables the customer to optimise the test set to his applications. A row of slots in the mainframe is available for options. These are retrofitable (except the 1.85GHz module).

The following options are available:

- Adjacent channel power meter for channel spaces 10, 12.5, 20 and 25kHz with high dynamic range. This option includes:
  Selective power measurement;
  Tx harmonics measurement;
  Spurious signals search.
- Duplex (FM) demodulator with programmable low noise synthesizer receiver for measurements on duplex systems and cellular radios.
- Cassette drive for storage of programs and/or front panel settings. Capacity per cassette 900 steps.
- Control interface with 5 or 32 programmable relays for control of units under test. Five relays are reserved for:
  Tx switch
  Squelch on/off
  Upper/lower band control
  Tx preset
  Call tone
  The 32 relay version provides channel control in BCD format.
- DC coupled FM modulator. Drift free modulator for NRZ data modulation in data radio systems with direct binary carrier frequency switching (eg POCSAG).
- Stabitexter. Alphanumeric keyboard for entering text or comments. The Stabitexter can be connected to the control interface.
- 1.85GHz frequency extension.
- Wideband FM demodulator for deviations up to 80kHz.



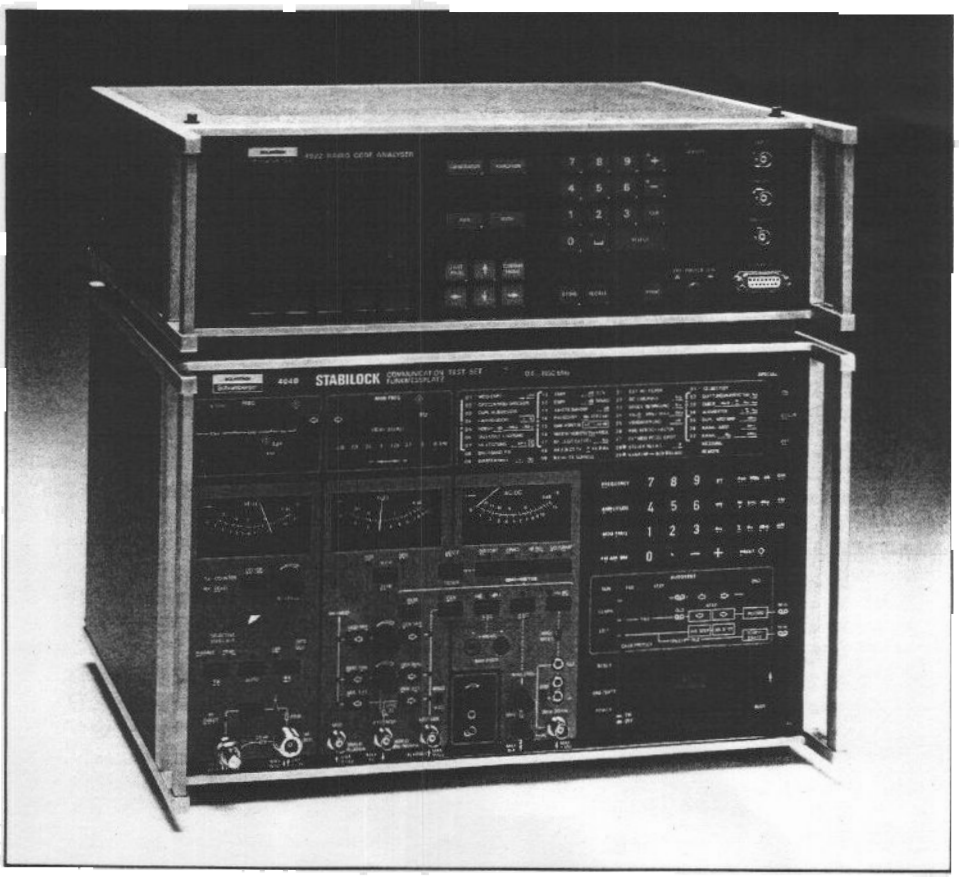
CELLULAR RADIO MEASUREMENT

By combining the STABILOCK 4040 with the Radiocode Analyzer 4922 the system becomes a precision simulator for cellular radio links. The basic equipment needs only the duplex FM option.

In NRZ coded systems the dc-coupled FM modulator option is important for correct data conversion (see Radiocode Analyzer 4922 page B10).

MAINTENANCE

An additional advantage of the modular design of the STABILOCK 4040 is that, in the unlikely event of a failure, most repairs can be carried out by easy replacement of the defective module, without sending the instrument to a service department. To this end the built in self check is a valuable tool for fault diagnosis, directly indicating the defective module.



RECEIVER MEASUREMENT

Carrier Frequency

Frequency range	0.4 to 960 MHz
Resolution	10 Hz
Accuracy	as Ref. Oscillator

Reference Oscillator

Frequency error	$<1\times10^{-7}$ after 15 min, at 20°C
Temperature drift	$<5\times10^{-9}$/°C
Ageing	$<1\times10^{-6}$/year
Output	10 MHz, appr. + 5 dBm

Output Level

EMF	with FM and ϕM	with AM
at RF socket	0.1μV–0.2V	up to 0.1V
at RF DIRECT	1μV–2V	up to 1V
Level resolution	0.1 dB	
EMF error at socket RF		
20–500 MHz	<1.3 dB ± 1 digit	
0.4–960 MHz	<1.8 dB ± 1 digit	
at RF DIRECT	<0.7 dB additionally	
Impedance	50Ω	
VSWR	<1.1 at socket RF	
at RF DIRECT	<1.5/<−5 dBm	
Interruption free setting range	26 dB	
Error	<0.1 dB/dB additionally	

Spectral Purity

(Interruption free EMF at 0 dB)

Phase noise 25kHz from carrier,	
f<500 MHz	<−132 dBc/Hz
f>500 MHz	<−126 dBc/Hz
Residual FM in a 30 Hz to 3 kHz bandwidth,	
f<500 MHz	<2 Hz rms
f>500 MHz	<3 Hz rms
Spurious signals 0.01 to 30 MHz from carrier,	
<500 MHz	<−80 dBc
>500 MHz	<−75 dBc
Harmonics	<−25 dBc
Residual AM	<−70 dB relative to 30% AM, CCITT-P53 weighted

FM

Range	0 to 20 kHz
Resolution	10 Hz/Δf<4 kHz
	100 Hz/Δf>4 kHz
Modulation frequency	
internal	30 Hz to 30 kHz
external	2 Hz to 140 kHz (−3 dB)
Setting accuracy with Δf <10 kHz and	
fmod 0.3–3 kHz	<4% ± 2 digit
fmod 0.03–30 kHz	<8% ± 2 digit
Distortion	<2% at Δf <10 kHz and fmod 0.3 to 3 kHz

DC-coupled FM (Option)

Range	0 to 5 kHz
Resolution	10 Hz/Δf <4 kHz
	100 Hz/Δf >4 kHz
Mod frequency	0 to 30 kHz
Setting error	<4% ± 2 digit
Distortion	<2%/fmod 0.3 to 3 kHz
Frequency offset	<150 Hz

Wide Band FM

Maximum frequency deviation,	
0.4 to 60 MHz	80 kHz
60 to 120 MHz	20 kHz
120 to 250 MHz	40 kHz
250 to 960 MHz	80 kHz

Phase Modulation

Range	0 to 6 rad
Resolution	0.01 rad
Modulation frequency internal and external	100 Hz to 16 kHz (fmod × rad <20 kHz)
Accuracy	<4%±2 digit, 0.3 to 3 kHz
Freq. response	<−3 dB/100 Hz to 16 kHz
Distortion	<1%/0.3 to 3 kHz

AM

(Interruption free EMF at 0 dB)	
Range	0 to 90%
Resolution	0.1%
Modulation frequency	
internal	30 Hz to 20 kHz
external	2 Hz to 20 kHz
Setting accuracy at m<70% and fmod	
0.3 to 3 kHz	<4% ± 2 digit
0.03 to 10 kHz	<8% ± 2 digit
Distortion	<2% up to 50% AM and fmod 0.3 to 3 kHz

TRANSMITTER MEASUREMENT

Frequency

Frequency range	30 kHz to 960 MHz
Resolution	10 Hz
Input level range	
at RF socket	0.3 mW to 50 W
at RF DIRECT	3 to 100 mV
Accuracy	as Ref. Oscillator±10 Hz

Frequency Offset

Frequency range	2 to 960 MHz
Measuring range	0 to ±10/±100 kHz
Resolution	1 Hz/10 Hz
Input level range with <10 kHz offset	
at socket RF	10 μW to 50 W
at RF DIRECT	0.5 to 200 mV

Power

Frequency range	2 to 960 MHz
Measuring range	20 mW to 50 W
Resolution,	
at <10W:	10mW
at >10W:	0.1W
Accuracy with average indication,	
15 to 500 MHz	<8% ± 1 digit
5 to 960 MHz	<12% ± 1 digit

FM

Frequency range	2 to 960 MHz
Measuring range	0 to 50 kHz
Resolution	10 Hz <9 kHz, 100 Hz ≥ 9 kHz
Accuracy at FM <10 kHz and	
fmod 0.3 to 3 kHz	<4% ± 2 digit
fmod 0.06 to 10 kHz	<8% ± 2 digit
Input level range	
at RF socket	0.8 mW to 50 W
at RF DIRECT	5 to 200 mV
Demod output	DC to 20 kHz (−3 dB)

Wide Band FM Demodulator (Option)

Frequency range	2 to 960 MHz
Measuring range	0 to 50 kHz
Input level range	
at socket RF	10 mW to 50 W
Measuring error with	
fmod 0.3 to 50 kHz	<5% + Residual FM
fmod 50 to 100 kHz	<9% + Residual FM
Residual FM	<350 Hz peak/<500 MHz
	<500 Hz peak/>500 MHz
Demod output,	
dc to 140 kHz:	−3dB

Phase Modulation

Frequency range	2 to 960 MHz
Measuring range	0 to 6 rad (FM dev. <50 kHz)
Resolution	0.01 rad
Accuracy at	
0.3 to 3 kHz	<4% ± 2 digit
0.2 to 10 kHz	<8% ± 2 digit
Demod output	150 Hz to 16 kHz (−3 dB)

AM

Frequency range	2 to 960 MHz
Measuring range	0 to 99%
Resolution	0.1%
Accuracy at	
fmod 0.3 to 3 kHz	<4% ± 2 digit
fmod 0.06 to 10 kHz	<8% ± 2 digit
Input level range	
at RF socket	0.1 mV to 50 W peak
at RF DIRECT	7 mV to 1 V peak
Demod output	DC–20 kHz (−3 dB)

Spurious Modulation

Weighting	True rms
Measuring ranges for Measuring error <1 dB, relative to 3 kHz FM, 3 rad ϕM or 30% AM,	
f<500 MHz	0 to 60 dB, CCITT-weighted
f>500 MHz	0 to 56 dB, CCITT-weighted
f<500 MHz	0 to 48 dB, 0.03 to 30 kHz
f>500 MHz	0 to 44 dB, 0.03 to 30 kHz
Input level	at RF socket >10 mW
	at RF DIRECT >20 mV

Adjacent Channel Power Meter (Option)

Frequency range	10.5 to 960 MHz
Input level range	
at RF socket	1 mW to 50 W
at RF DIRECT	20 to 200 mV
Adjacent channel power measuring range	
at f<499 MHz	−18 to −80 dBc
f≥499 MHz	−18 to −76 dBc
	usable from −15 dBc
Channel spacings	10/12.5/20/25 kHz
Measuring error	<3 dB
Measuring of harmonics: 0 to −70 dBc	
Measuring error	<3 dB to −60 dBc
Measurement of spurious signals:	0 to −80 dBc
Measuring error	<2 dB at −35 to −75 dBc and carrier offset 0.05 to 20 MHz
Selective level measuring range	
at RF socket	−70 to +47 dBm
at RF DIRECT	−105 to +0 dBm
Measuring error	<4 dB/<600 MHz
Measuring bandwidth appr. 3 kHz	

Duplex FM Demodulator (Option)

Frequency range	27 to 960 MHz
FM range	0 to 20 kHz
Resolution	10/100 Hz
ϕM range	0 to 6 rad (fmod × rad ≤20 kHz)
Resolution	0.01 rad
Mod frequency	0.2 to 20 kHz
Measuring error (fmod 0.3 to 3 kHz, Pin 0.5 to 50 W):	
FM	<5% + res. noise ±2 digit
ϕM	<6% + res. noise ±2 digit
Residual noise (CCITT, RMS):	
FM	<10 Hz /f≤500 MHz <2 Hz/100 MHz /f≥500 MHz
ϕM	<0.02 rad /f≤500 MHz <0.01 rad/100 MHz /f≥500 MHz
Squelch-threshold	>10 mW /f≥200 MHz

Variable Modulation Generator

Synthesizer	
Frequency range	30 Hz to 30 kHz
Resolution	0.1 Hz<300 Hz, 1 Hz < 3 kHz, 10 Hz ≥ 3 kHz
Fixed frequencies	0.15/0.3/0.4/1/1.25/ 2.7/3/6 kHz
Frequency error	<0.01%
EMF range	0.1 mV to 5 V
Load resistance	>200Ω
Level resolution	0.1 mV<0.1 V, 1mV < 1 V, 10 mV ≥ 1V
EMF error	<4%±1 digit/0.3 to 3 kHz
Distortion	<1% at >50 Hz
Source resistance	<5Ω/0.3 to 3 kHz floating or 600Ω ± 5%

1 kHz Modulation Generator

Frequency error	<0:1 Hz
Distortion	<0.2%

AF Superposition

Variable Modulation Generator + 1 kHz Modulation Generator + external modulation signal

Sum voltage	15 V p-p max

AF Voltmeter

Frequency range	30 Hz to 30 kHz or CCITT-P53 weighted
Measuring range	0.2 mV to 30 V unbalanced 10 V maximum balanced
Resolution	0.1 mV<0.1 V, 1 mV<1 V 10 mV<10 V, 100 mV≥10 V
Measuring error	<5% ± 1 digit/ 0.3 to 3 kHz <8% ± 1 digit/ 50 Hz to 20 kHz
Input resistance	100 kΩ ± 10% or 600Ω ± 4% floating or grounded

Distortion Meter

Measuring frequency	1 kHz ± 5 Hz
Measuring range	0 to 99%
Resolution	0.1%
Measuring error	<5% ± 3 digit/1 to 90%
Input level	0.1 to 30 V

SINAD Meter

Measuring range	1 to 46 dB
Resolution	0.1 dB<30 dB, 0.5 dB≥30 dB
Measuring error	<0.8 dB ± 1 digit
Input level	0.1 to 30 V

AF Counter

Frequency range	30 Hz to 30 kHz
Resolution	0.1 Hz<300 Hz, 1 Hz<9700 (9999) Hz 10 Hz≥9700 (10 000) Hz
Measuring error	<0.01% ± 1 digit
Input level	5 mV to 30 V

DC Voltmeter

Measuring range	0 to ± 50 V
Resolution	10 mV<10 V, 100 mV≥10 V
Measuring error	<5% ± 1 digit
Input resistance	>100 kΩ

DC Ammeter

Measuring range	0 to ± 15 A
Resolution	1 mA<2 A, 10 mA≥2 A
Measuring error	<4% ± 5 mA
Shunt resistance	10 mΩ

Selective Call Testing

Encoder, decoder and receipt call testing with tone sequences of up to 8 tones

Call systems	ZVEI1, ZVEI2, CCIR, VDEW, EURO, NATEL and a user programmable sequence
Frequency error	<0.01%
Distortion	<1%
Frequency offset	0 to ± 9.9%
Tone duration	20 to 999 ms
Pause duration	0 to 99 ms
Decoder bandwidth	±0.1 to ±9.9%

Control Interface 236 042 (Option)

With 5 switchover relays one each for Transmitter On, Squelch On, UB/LB

Switchover Contact load	<100 V/0.5 A

Control Interface 236 041 (Option)

16 on-off relays and 16 Change-over relays

IEEE Bus Interface

Standards	IEEE 488
Connector	24 pole
Functions	AH1, SH1, L2, T1, SR1, RL1, DC1

GENERAL DATA

Power Supply, Dimensions, Weight

AC Mains	97 to 140 V or 180 to 260 V 47 to 450 Hz, appr. 120 VA
DC Supply	11 to 32 V, approx 85 W
Operating temperature	+5 to +45°C
Storage temperature	−25 to +70°C
Width	443 mm (17.5 in)
Depth	374 mm (14.75 in)
Height	264 mm (10.4 in)
Weight	21 kg (46 lb) approx

ORDERING INFORMATION

STABILOCK 4040

incl. IEEE Bus Interface	102501

Optional units and accessories

Cassette Recorder	235040
Mini Cassette	879021
Control interface 5 Relays	236042
Control interface 32 Relays	236041
Frequency-Range Extension 1.85 GHz	222040
Duplex FM Demodulator	229051
DC FM Modulator	217040
Adjacent Channel Power Meter	229042
Ink Jet Printer	896091
Stabitexter**	248081
RF Probe	860108
Wide Band FM Demodulator*	229039
300 Hz Low Pass Filter	248074
500 Hz High Pass Filter	248087
4 kHz Band Pass Filter (NMT)	248075
200 to 600 Hz Notch Filter	248079
Front Panel Cover	860034
Soft Carrying Case	860001
Transport Case	300644
Military Case	860060
19" rack ears	478353
RF cable N-N, 1m	380384
RF cable N-N, 2m	380386
RF cable BNC-banana	380385
25 pole "D" type connector	300641
3 pole AF connector	886101
TNC/BNC-Adapter	886255
AF-Service Adapter	248071
RF-Service Adapter	248073
Service Manual	291125

*Can not be used simultaneously with 229051

**A Control Interface 236 041 or 236 042 is required for connecting the Stabitexter.