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Willtek
4032

STABILOCK® TETRA Mobile Station Testing

Fast measurements:
All the relevant parameters shown on a single screen – almost twice a second!
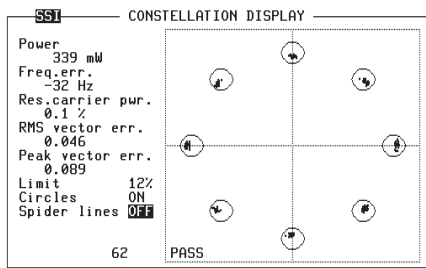
Easy fault finding:
Find problems and their sources quickly by looking at the graphical representation of measurements

Test analogue and new digital trunking using the same instrument:
Just load the test software option for MPT 1327 or LTR systems and check existing mobiles!

Upgrade path:
Existing STABILOCKs 4032 can be equipped with the new option.

```
┌SSI┬─────── CONSTELLATION DISPLAY ───────┐
│Power                                     │
│    339 mW                                │
│Freq.err.                                 │
│   -32 Hz                                 │
│Res.carrier pwr.                          │
│    0.1 %                                 │
│RMS vector err.                           │
│    0.046                                 │
│Peak vector err.                          │
│    0.089                                 │
│Limit      12%                            │
│Circles    ON                             │
│Spider lines OFF                          │
│                                          │
│         62   PASS                        │
└──────────────────────────────────────────┘
┌CONTIN┐┌DOTS┐┌LINES┐┌ACCUM┐┌    ┐┌RETURN┐
```

Testing TETRA equipment is the key to the success of the many groups involved with the new system – manufacturers, service shops, and user groups including emergency services whose safety relies on fully operational equipment.

Comprehensive validation of RF performance

The most important RF parameters and their variations over time can be viewed easily on the Min/Max mask. Intermittent spurious signals from the mobile transmitter can be identified. The constellation display shows how the transmitter of a TETRA terminal matches the specified symbol points. And on the burst display, the signal from the MS can be checked against the Power/Time Template. For receiver testing, the TETRA MS Test option of the STABILOCK 4032 provides a typical base station signal, allowing the mobile station to assess its receiver quality with variations of power level.
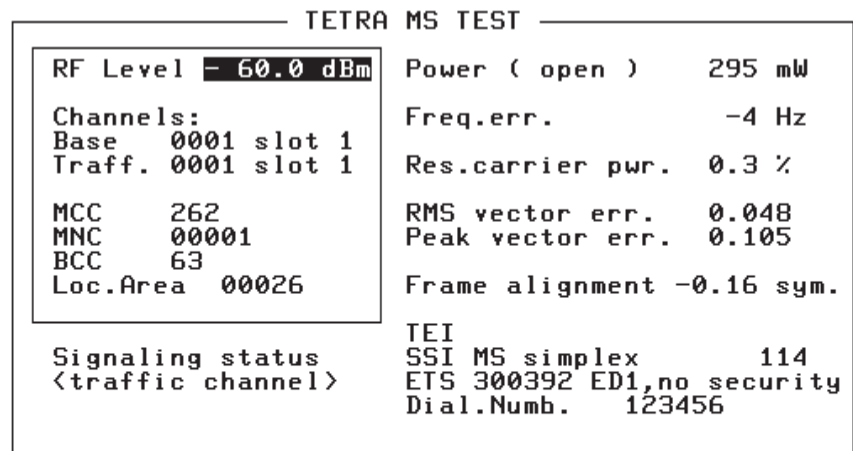
The mobile station's output power level and modulation characteristics can be tested at any frequency within the frequency range currently available in Europe for both emergency services and commercial systems.

First trace the fault, then diagnose it

For a fast Go/NoGo result, the TETRA MS Test option offers a test screen where all major quality parameters are combined. If this shows a failure, the STABILOCK 4032 moves on from its role as a Go/NoGo tester to a truly professional communication test set. So you benefit two ways: You can trace the fault and you can find the cause of the fault.

From analog to digital

If you previously purchased a STABILOCK 4032 for tests on equipment conforming to MPT 1327, your decision to buy the STABILOCK still proves right: You can upgrade your test set to TETRA without losing the analog test capabilities. Switching between the two systems is possible within seconds by just loading the appropriate system software that comes on a memory card.

```
┌──────────────── TETRA MS TEST ────────────────┐
│                                                 │
│ RF Level │-60.0 dBm│  Power ( open )   295 mW  │
│                                                 │
│ Channels:             Freq.err.         -4 Hz  │
│ Base   0001 slot 1                              │
│ Traff. 0001 slot 1    Res.carrier pwr.  0.3 %  │
│                                                 │
│ MCC    262            RMS vector err.   0.048  │
│ MNC    00001          Peak vector err.  0.105  │
│ BCC    63                                       │
│ Loc.Area  00026       Frame alignment -0.16 sym.│
│                                                 │
│                       TEI                       │
│ Signaling status      SSI MS simplex      114  │
│ <traffic channel>     ETS 300392 ED1,no security│
│                       Dial.Numb.   123456      │
└─────────────────────────────────────────────────┘
┌etc.┐ ┌MIN-MAX┐ ┌BURST┐ ┌MOD-SPEC┐ ┌CONST.┐ ┌RELEASE┐
```

Repairing defective mobiles

Even TETRA terminals that do not register with a network because of a defect, or those that can only be operated in test mode, cannot escape the fault diagnostics. Initially, an analysis is made of the CUB (control uplink burst), used by a terminal to initiate call setup or registration with the network immediately after powering up. This asynchronous burst can still be analyzed even if a terminal transmits with a frequency error of 1 kHz.

For tests on RF boards – whether in service or in production – even a continuous signal can be analyzed.

To test or not to test

Of course, you can test your terminal by switching it on and trying to establish a call. However, measuring equipment tells you how your terminal performs at various parameter settings. Take, for example, a receiver with a defective AGC. You may well be able to set up a call at one particular power level but fail at any other. If that one power level happens to be the one that you perform your "online test" with, the level of confidence of that test may not be sufficient. The 4032-TETRA, in contrast, can perform measurements at various power levels.

Audio testing

The built-in audio sine wave generator and voltmeter are accessible while on a TETRA traffic channel, avoiding the need for additional equipment.

Standards supported

TETRA is another standard defined by ETSI (European Telecommunications Institute). The acronym TETRA stands for TErrestrial Trunked RAdio.

The TETRA MS Test option of the 4032 is capable of testing V+D terminals that comply with ETSI standards ETS 300 392-2 ("TETRA V+D – Air Interface") and ETS 300 394-1 ("TETRA Conformance test-ing specification – Radio"), with voice transmission. Signaling and traffic chan-nels are available for simplex and duplex operation.
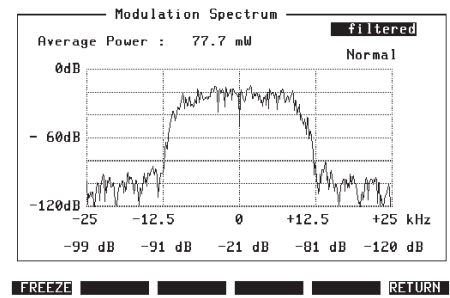
Base station TX tests

Apart from measurements from TETRA terminals on a traffic channel, the STABILOCK with the TETRA MS Test option also allows transmitter measurements from TETRA Base Station signals. RF power, frequency error, residual carrier power, vector error measurements, and the graphical displays are available not only for discontinuous but also for contin-uous signals. The Burst display might be helpful to identify power spikes e.g. between timeslots, and the Modulation Spectrum display may be used for I/Q adjustments.

If the modulation spectrum does not suf-fice then there is more help available from the normal built-in spectrum analyzer outside the TETRA software, with various spans. The STABILOCK 4032 can also be fitted with the high-speed spectrum ana-lyzer hardware option which allows spurious signal tests, occupied bandwidth measurements, and the alignment of I/Q modulators.
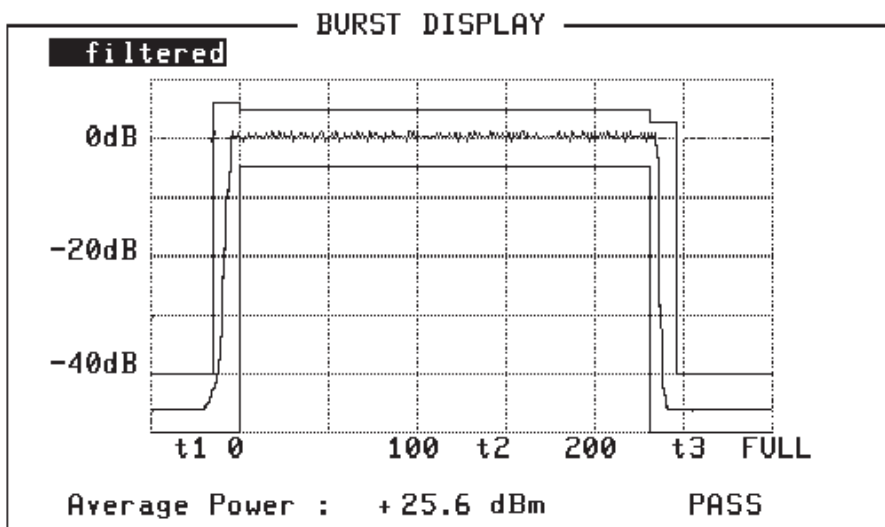
Specifications

Temperature range   +10 °C to +45 °C

TETRA Signal Generator:

Frequency range

with TETRA/FEX   100 to 1000 MHz

Channel

Channel spacing	25 kHz
Channel numbering	0 to 9999
Duplex spacing	10 MHz
(TX selectable for upper/lower band)	

Output power

RF socket (N-type)	−130 to −20 dBm
RF DIRECT socket (TNC)	−95 to 0 dBm
Resolution	0.1 dB
Accuracy	1.5 dB
(N-type socket, P > −115 dBm)	

Modulation[2]

π/4 differential quadrature phase shift keying
(DQPSK)

Roll-off factor a	0.35
Symbol rate	18 k symbols/s
Residual carrier power	< 3 %

TETRA Analyzer[1] :

Frequency range

Frequency range   100 to 1000 MHz

Power measurement

(N-type connector only)

Range	+15 to +45 dBm
Resolution	0.1 dB
Accuracy (P > 20 dBm)	1.0 dB
Indications	current, min., max., average

Frequency error measurement

Resolution	1 Hz
Accuracy	
(P > 15 dBm)	5 Hz + ref. osc. accuracy
Indications	current, min., max., average

Vector error measurement [2]

Resolution	0.001
Accuracy (rms meas.)	0.03
Indications	current, min., max., average

Residual carrier measurement [2]

Resolution	0.1 %
Accuracy	0.3 %
Indications	current, min., max., average

Timing measurement

Resolution   0.01 symbol period

Constellation display

Display modes:

dots, lines, statistics
continuous, freeze

Additional measurements

power
RMS vector error
residual carrier power
frequency error

Burst power display

Reference   average power over burst

Template

user-definable
with pass/fail indication

Horizontal range

normal bursts	350 symbols
control uplink bursts	175 symbols
Display modes:	

continuous, freeze
TETRA-filtered, unfiltered

Additional measurements

power

Modulation spectrum display

Reference	average power over burst
Horizontal range	±25 kHz
Vertical range	120 dB

Display modes

TETRA-filtered, unfiltered

Additional measurements

absolute power over burst
relative power at 0, ±12.5, ±25 kHz

Ordering details:

STABILOCK 4032	M 108 802
TETRA/FEX MS Test	M 248 308

[1] Analyzer specifications only valid for test
signals on N-type socket with:

– Frequency error	< 1.0 kHz
– RF power	0 to 45 dBm
– RMS vector error	< 0.10
– Residual carrier power	< 10 %
– At least 20 symbol changes available	

[2] Accuracy specified for average of
10 measurements

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4032/DS331/0904/EN