

Over 20 years of research both at the National Institute of Standards and Technology (NIST) and in private industry have been dedicated to the research and development of Symmetricom's phase noise and Allan deviation (ADEV) test sets.

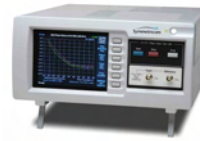
Our digital, state-of-the-art test sets bring a paradigm shift to the way that phase noise and ADEV measurements are made. What was once a complicated and costly procedure has now been made easier, more accurate, and more cost effective.

Typically used to characterize high precision oscillators and atomic clocks, Symmetricom's test sets are simple one-box solutions that characterize even the lowest noise references more accurately than ever before.

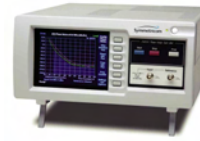


Your Network. Optimized.

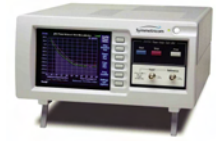
Test Set Product Matrix



5115A



5120A



5125A

	5115A	5120A	5125A
Input frequency range	1-30 MHz	1-30 MHz	1-400 MHz
Simultaneous real-time phase noise and Allan deviation measurements	●	●	●
Frequency counter	●	●	●
Allan Deviation noise floor (at 1 sec)	1E-14	3E-15	3E-15
Cross correlation		●	●
Phase noise floor 10 MHz input, 1 Hz offset	-133 dBc/Hz	-145 dBc/Hz	-145 dBc/Hz
Phase noise floor 10 MHz input, 10 kHz offset	-147 dBc/Hz	-175 dBc/Hz	-170 dBc/Hz
Phase noise floor 100 MHz input, 1 Hz offset	-	-	-130 dBc/Hz
Phase noise floor 100 MHz input, 10 kHz offset	-	-	-170 dBc/Hz
Factory upgrade options	to 5120A	internal reference osc.	-

5115A

High-Performance Phase Noise and Allan Deviation Test Set

KEY FEATURES/BENEFITS

- Simultaneous Phase Noise and Allan Deviation Measurements
- 1 - 30 MHz Frequency Range
- Measurement Results Displayed within Seconds: No External Data Processing Required
- Industry Leading Accuracy (± 1.0 dB)
- Supports Measurements with Input and Reference at Different Frequencies
- Cost Effective Solution
- Allan Deviation Measurements (to over 300 Days)
- Phase Noise Measurements as Close as 0.1 mHz from the Carrier
- No Measurement Calibration Required: Saves Time
- Real-time Noise Floor Displayed
- Intuitive Remote Network Management and Data Acquisition
- Easy to Use Graphical User Interface
- Phase Noise Measurements Down to -147 dBc/Hz

ACCURATE, COST EFFECTIVE MEASUREMENTS IN SECONDS

Making accurate phase noise and Allan deviation measurements has never been easier or more cost effective. The all-digital 5115A High-Performance Phase Noise and Allan Deviation (ADEV) Test Set transforms the way these measurements are made. Traditional analog measurement instruments require an external phase-lock loop, turning these types of measurements into a complicated and costly endeavor. Compare this to the innovative 5115A, which makes fast yet accurate single sideband (SSB) phase noise and ADEV measurements at the click of a button, all at a fraction of the cost of alternative solutions.

Symmetricon's 5115A is the easiest to use phase noise and ADEV test set in the world: simply connect the device under test (DUT) and a reference signal (which can be at a different frequency than the DUT) and press the 5115A's green **Start** button. Seconds later valid measurement data appears on the unit's high resolution display. With the all-digital 5115A, tedious multi-step configuration and calibration routines are no longer required.

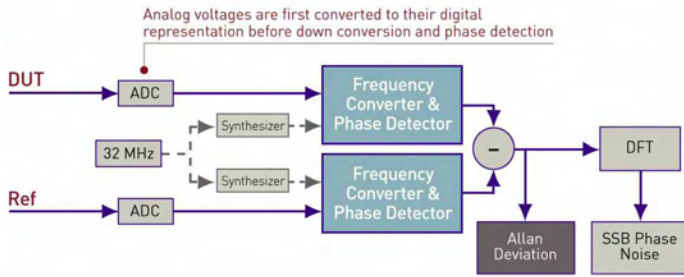
The 5115A leverages the extensive knowledge and experience obtained by Symmetricon during the development of the industry standard for ADEV measurements, the 5110A. In addition to ADEV measurement capability, the next generation 5115A provides phase noise measurement accuracy to previously impossible levels of ± 1.0 dB. This combined with the superb phase noise and ADEV measurement floor means that with the 5115A you can characterize references more accurately than ever before.

Symmetricon's mastery of phase noise and ADEV measurement techniques as well as recent advances in high speed, low noise analog to digital converters, has allowed the combination of multiple measurement tools to be integrated into a single, one box solution. This enables the 5115A to make more accurate measurements while remaining cost effective.

The 5115A brings a paradigm shift to the way that phase noise and ADEV measurements are made. With the 5115A, measurements that used to be complicated and costly are now faster, easier, more accurate and more cost effective in both R&D and production environments.



5115A High-Performance Phase Noise and Allan Deviation Test Set



5115A Block Diagram

BENEFITS OF AN ALL-DIGITAL TEST SET

The 5115A combines sophisticated timing technologies into a single, advanced measurement instrument containing Symmetricom’s patented phase measurement algorithm. As is shown in the *5115A Block Diagram* above, upon entry to the 5115A the DUT and reference signals are immediately converted to their digital representations. This allows the 5115A to make accurate measurements without the need for an external phase-lock loop, enabling calibration-free measurements. Additionally, the all-digital 5115A does not require that the frequency of the reference be the same as the DUT.

FUTUREPROOFED TEST SET

If future measurement requirements change such that the 5115A’s phase noise and ADEV floor no longer meet your needs, the 5115A can be upgraded for even better performance. A quick factory upgrade converts the 5115A into a 5120A, improving the phase noise floor by up to 28 dB. For further information on the 5120A’s specifications please see this unit’s datasheet.

5115A SPECIFICATIONS

PERFORMANCE

- Input frequency range: 1-30 MHz (sinewave)
- Allan deviation: $1E-14$ at 1 sec (0.5 Hz bandwidth)

Phase Noise Specifications

- Measurement accuracy: ± 1.0 dB
- Offset frequency range: 0.1 mHz to 1 MHz
- System noise floor (for 10 MHz input):

Offset	L(f) Phase Noise
1 Hz	-133 dBc/Hz
10 Hz	-143 dBc/Hz
≥ 100 Hz	-147 dBc/Hz

ELECTRICAL SPECIFICATIONS

- Input signal level: 3-17 dBm
- Input impedance: 50 Ω
- Input connectors: TNC (supplied with two BNC adapters)

MECHANICAL & ENVIRONMENTAL SPECIFICATIONS

- Size: 34 cm x 17 cm x 44 cm (13" x 7" x 17")
- Power: 100-240 VAC, 50-60 Hz, 40W (max), IEC 320 connector, power switch.
- Operating temperature: 15°C to 40°C
- Storage temperature: -25°C to 55°C
- Unit weight alone: 9 kg (19 lbs)
- Shipping package weight: 12 kg (25 lbs)

OPTIONS

- Rack Mount Tray Kit (Option 001)

UPGRADES

- Factory Upgradeable to 5120A - For Improved Noise Floor

PRODUCT INCLUDES

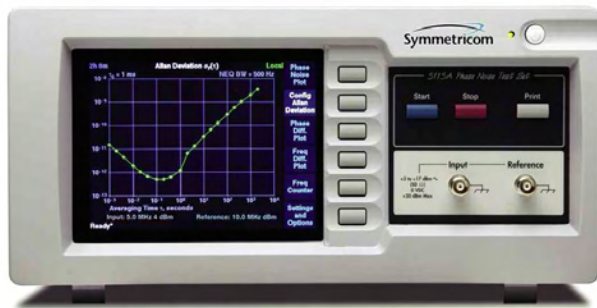
5115A Test Set, 2 TNC-BNC adapters, manual (on CD) and power cord. One-year warranty.

FRONT PANEL

- Display: Sharp, high-resolution 640x480 RGB LCD
- Buttons: 6 SoftKeys, Start, Stop, Print, Power
- TNC (2x): Input, Reference (3 - 17 dBm)
- LED: Power

REAR PANEL

- USB (2x): Supports mouse, keyboard and select PostScript-compatible printer connections
- Network: RJ-45 10/100BaseT Ethernet



5120A

High-Performance Phase Noise and Allan Deviation Test Set with Ultra Low Noise Floor

KEY FEATURES/BENEFITS

- Simultaneous Phase Noise and Allan Deviation Measurements
- 1 - 30 MHz Frequency Range
- Measurement Results Displayed within Seconds: No External Data Processing Required
- Industry Leading Accuracy (± 1.0 dB)
- Supports Measurements with Input and Reference at Different Frequencies
- Allan Deviation Measurements (to over 300 Days)
- Phase Noise Measurements as Close as 0.1 mHz from the Carrier
- No Measurement Calibration Required: Saves Time
- Real-time Noise Floor Displayed
- Optional Internal Reference Oscillator
- Best Price-Performance Solution
- Intuitive Remote Network Management and Data Acquisition
- Easy to Use Graphical User Interface
- Phase Noise Measurements Down to -175 dBc/Hz

ACCURATE, COST EFFECTIVE MEASUREMENTS IN SECONDS

Making accurate phase noise and Allan deviation measurements has never been easier or more cost effective. The all-digital 5120A High-Performance Phase Noise and Allan Deviation (ADEV) Test Set with Ultra Low Noise Floor transforms the way these measurements are made. Traditional measurement instruments require an external phase-lock loop, turning these types of measurements into a complicated and costly endeavor. Compare this with the 5120A, which makes fast yet accurate single sideband (SSB) phase noise and ADEV measurements at the click of a button, all at a fraction of the cost of alternative solutions.

Symmetricom's 5120A is the easiest to use phase noise and ADEV test set in the world: simply connect the device under test (DUT) and reference signal (which can be at a different frequency than the DUT) and press the 5120A's green **Start** button. Seconds later valid measurement data appears on the unit's high resolution display. With the all-digital 5120A, tedious multi-step configuration and calibration routines are no longer required.

The 5120A leverages the extensive knowledge and experience obtained by Symmetricom during the development of the industry standard for ADEV measurements, the 5110A. In addition to top of the line ADEV measurement capability, the next generation 5120A provides phase noise measurement accuracy to previously impossible levels of ± 1.0 dB. This combined with the best-in-industry phase noise and ADEV measurement floor means that with the 5120A you can characterize even your lowest noise references more accurately than ever before.

Symmetricom's mastery of phase noise and ADEV measurement techniques as well as recent advances in high speed, low noise analog to digital converters, has allowed the combination of multiple measurement tools to be integrated into a single, one box solution. This enables the 5120A to make more accurate measurements while remaining cost effective.

For further convenience, Symmetricom has added an internal reference oscillator option for the 5120A. This one box solution, known as the 5120A-01, saves you the time of procuring and calibrating an external reference. After making just one connection from the DUT to the 5120A-01, you can begin making accurate measurements.

The 5120A brings a paradigm shift to the way that phase noise and ADEV measurements are made. With the 5120A, measurements that used to be complicated and costly are now faster, easier, more accurate and more cost effective in both R&D and production environments.



5120A High-Performance Phase Noise and Allan Deviation Test Set with Ultra Low Noise Floor

5120A SPECIFICATIONS

PERFORMANCE

- Frequency range: 1-30 MHz (sinewave)
- Allan deviation: $3E-15$ at 1 sec (0.5 Hz bandwidth)

Phase Noise Specifications

- Measurement accuracy: ± 1.0 dB
- Offset frequency range: 0.1 mHz to 1 MHz
- System noise floor (for 10 MHz input):

Offset	$\mathcal{L}(f)$ Phase Noise
1 Hz	-145 dBc/Hz
10 Hz	-155 dBc/Hz
100 Hz	-165 dBc/Hz
≥ 10 kHz	-175 dBc/Hz

- System noise floor (for 10 MHz input) when using 5120A-01's internal reference:

Offset	$\mathcal{L}(f)$ Phase Noise
1 Hz	-120 dBc/Hz
≥ 10 kHz	-168 dBc/Hz

ELECTRICAL SPECIFICATIONS

- Input signal level: -3 to 17 dBm
- Input impedance: 50Ω
- Input connectors: TNC (supplied with two BNC adapters)

MECHANICAL & ENVIRONMENTAL SPECIFICATIONS

- Size: 34 cm x 17 cm x 44 cm (13" x 7" x 17")
- Power: 100-240 VAC, 47-63 Hz, 60W (max), IEC 320 connector, power switch.
- Operating temperature: 15°C to 40°C
- Storage temperature: -25°C to 55°C
- Unit weight alone: 9 kg (20 lbs)
- Shipping package weight: 12 kg (26 lbs)

OPTIONS

- Internal Reference Oscillator Option (5120A-01) – Factory Upgrade
- Rack Mount Tray Kit (Option 001)

PRODUCT INCLUDES

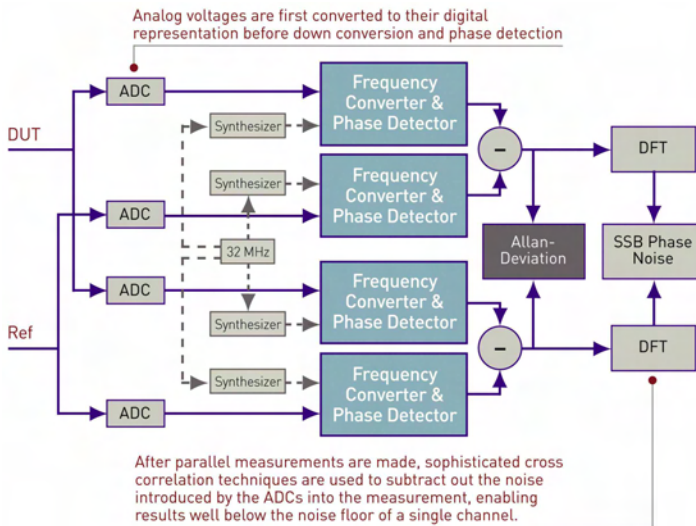
5120A Test Set, 2 TNC-BNC adapters, manual (on CD) and power cord. One-year warranty.

FRONT PANEL

- Display: Sharp, high-resolution 640x480 RGB LCD
- Buttons: 6 SoftKeys, Start, Stop, Print, Power
- TNC (2x): Input, Reference (3-17 dBm)
- LED: Power

REAR PANEL

- USB (2x): Supports mouse, keyboard and select PostScript-compatible printer connections
- Network: RJ-45 10/100BaseT Ethernet



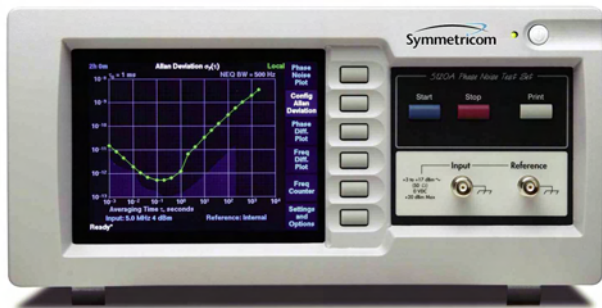
5120A Block Diagram

BENEFITS OF AN ALL-DIGITAL TEST SET

The 5120A combines sophisticated timing technologies into a single, advanced measurement instrument containing Symmetricom's patented phase measurement algorithm. As is shown in the 5120A Block Diagram above, upon entry to the 5120A the DUT and reference signals are immediately converted to their digital representations. This allows the 5120A to make accurate measurements without the need for an external phase-lock loop, enabling calibration-free measurements. Additionally, the all-digital 5120A does not require that the frequency of the reference be the same as the DUT.

BENEFITS OF CROSS-CORRELATION

The parallel upper and lower channels in the 5120A Block Diagram, illustrate the unit's innovative cross correlation technique. After making simultaneous measurements in parallel, the 5120A cross correlates the discrete Fourier transform from the two channels to estimate the noise of the input devices while rejecting the independent noises of the two measurement sub-systems. This enables the end result to be well below the noise floor of a single channel instrument.





5125A

High-Performance, Extended-Range Phase Noise and Allan Deviation Test Set

KEY FEATURES/BENEFITS

- Simultaneous Phase-Noise and Allan-Deviation Measurements
- 1 - 400 MHz Input Frequency Range
- Measurement Results Displayed within Seconds
- No External Data Processing Required
- Industry Leading Accuracy
- Makes Measurements with Input and Reference at Different Frequencies
- Allan-Deviation Measurements to over 300 Days
- Phase-Noise Measurements as Close as 0.1 mHz from the Carrier
- No Measurement Calibration Required: saves time
- Displays Internal Noise Estimate
- Easy to Use Graphical User Interface
- Excellent Phase-Noise Measurements Down to -170 dBc/Hz (typical) 10 kHz from the carrier (10 MHz input)

QUICK, ACCURATE, COST EFFECTIVE MEASUREMENTS NOW POSSIBLE OVER 400 MHz INPUT FREQUENCY RANGE

Symmetrcom's new 5125A makes accurate phase-noise measurements on signals from 1 MHz to 400 MHz, covering the full range of the most commonly used frequency references. The 5125A, which requires absolutely no configuration, displays measurement results seconds after the **Start** button is pressed.

Symmetrcom, the world's leading provider of high performance frequency standards, has designed the third generation, all-digital 5125A to meet the most demanding requirements. The 5125A's industry-leading close-in phase-noise performance, -140 dBc/Hz at a 1 Hz offset (10 MHz fundamental), makes it the perfect solution to characterize the lowest noise frequency references available, such as those used in RADAR and satellite communications.

The all-digital architecture employed in the 5125A uses advanced, high-speed, low-noise analog-to-digital converters in a patented architecture that does not require a phase-lock loop to make measurements. This provides multiple benefits for 5125A users. First, the input carrier signals can be characterized much more accurately than before, to within 0.1 mHz of the carrier. Second, the measurements can be used to simultaneously evaluate the short-term stability. Last but not least, the user does not need to calibrate each individual measurement setup.

In addition to phase-noise measurements, the 5125A simultaneously performs a variety of other measurements, which enables users to more fully characterize their Devices Under Test (DUT).

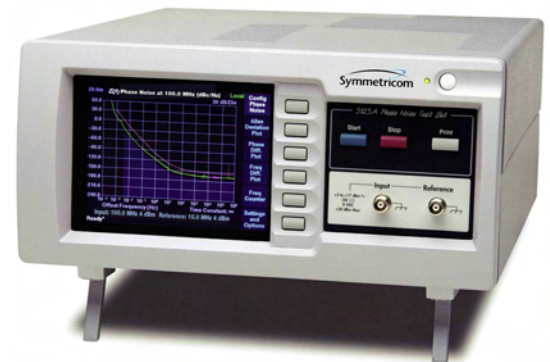
The industry-standard stability metric for short-term stability, the Allan deviation (ADEV), can be measured out to more than 300 days; the frequency and phase vs. time are plotted in real time; and the frequency counter displays 13 digits of precision in 1 second.

ESTABLISHED HERITAGE IN TIME AND FREQUENCY MEASUREMENTS

Over 25 years of research at the National Institute of Standards and Technology (NIST) and in private industry have come to fruition in Symmetrcom's phase noise test sets, which employ both direct sampling of the RF waveforms as well as cross correlation, making it possible to easily characterize the highest performance time and frequency references. The 5125A builds on the experience gained with the Symmetrcom's ground breaking 5120A by extending the direct sampling approach throughout the frequency range up to 400 MHz.

QUICKEST START-TO-FINISH MEASUREMENTS

Thanks to the 5125A's innovative internal architecture, it requires no user configuration or calibration and thus makes phase-noise measurements in a matter of seconds.



5125A High-Performance Extended-Range Phase Noise and Allan Deviation Test Set

BENEFITS OF AN ALL-DIGITAL TEST SET

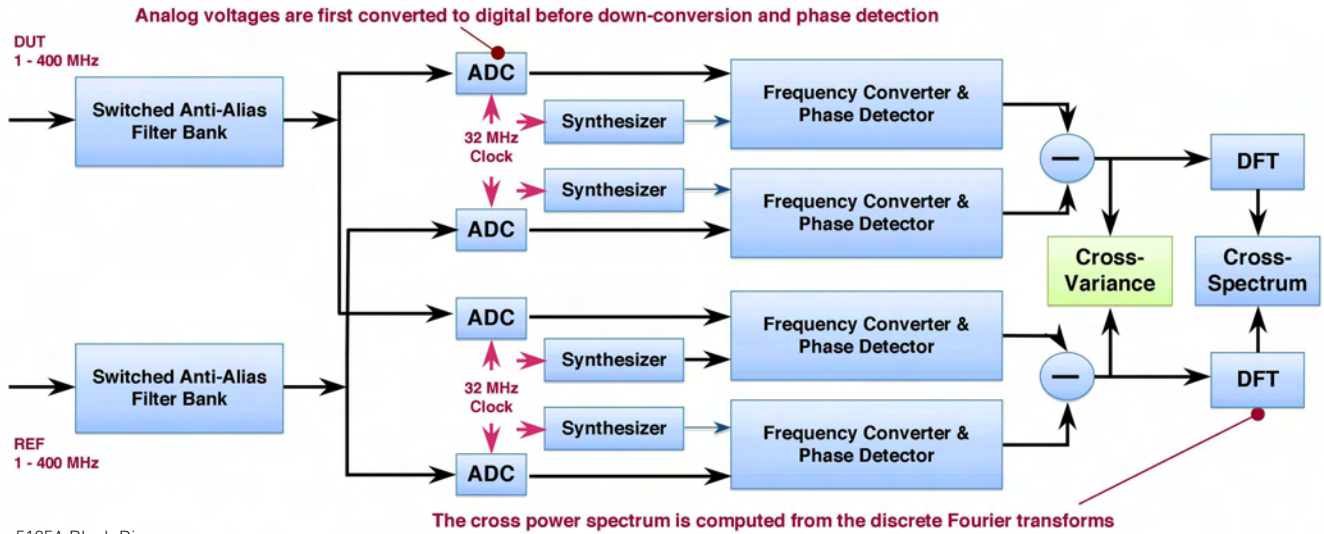
The 5125A combines sophisticated timing technologies into a single, advanced measurement instrument. As is shown in the *5125A Block Diagram* below, after bandpass filtering to prevent undesired aliasing, the DUT and reference signals are converted to digital. This allows the 5125A to make accurate measurements without the need for an external phase-lock loop and to measure both phase

noise and Allan Deviation simultaneously. The use of a ratiometric phase measurement that depends on a trigonometric phase detector eliminates the need for user calibration.

BENEFITS OF CROSS-CORRELATION

The parallel measurement channels in the 5125A Block Diagram, illustrate the unit's use of cross correlation. After making independent phase-difference

measurements, the 5125A computes the cross spectrum using the discrete Fourier transforms from the two channels to estimate the noise of the input devices while rejecting the noises of the measurement sub-systems. This enables the instrument noise to be well below the noise floor of a single channel.



5125A Block Diagram

5125A SPECIFICATIONS

PERFORMANCE

- Frequency range: 1-400 MHz (sinewave)
- Allan deviation: $3E-15$ at 1 sec (10-400 MHz, 0.5 Hz BW)

Phase Noise Specifications

- Measurement accuracy: ± 1.0 dB
- Offset frequency range: 0.1 mHz to 1 MHz
- System noise floor (specifications): $\mathcal{L}(f)$ dBc/Hz

Offset Frequency	10 MHz	100 MHz	400 MHz
1 Hz	-140	-120	-110
10 Hz	-150	-130	-120
100 Hz	-157	-140	-130
1 kHz	-162	-150	-140
10 kHz	-165	-160	-150
>100 kHz	-165	-165	-155

- System noise floor (typical): $\mathcal{L}(f)$ dBc/Hz

Offset Frequency	10 MHz	100 MHz	400 MHz
1 Hz	-145	-130	-116
10 Hz	-155	-140	-126
100 Hz	-160	-150	-136
1 kHz	-165	-160	-146
10 kHz	-170	-170	-156
>100 kHz	-170	-170	-162

ELECTRICAL SPECIFICATIONS

- Input signal level: 3-17 dBm
- Input impedance: 50 Ω
- Input connectors: TNC (supplied with two BNC adapters)

MECHANICAL & ENVIRONMENTAL SPECIFICATIONS

- Size: 34 cm x 17 cm x 44 cm (13" x 7" x 17")
- Power: 100-240 VAC, 47-63 Hz, IEC 320 connector, power switch.
- Operating temperature: 15°C to 45°C
- Storage temperature: -25°C to 55°C

OPTIONS

- Rack Mount Tray Kit (Option 001)
- Unlike the 5120A there is no internal reference option

PRODUCT INCLUDES

5125A Test Set, 2 TNC-BNC adapters, manual (on CD) and power cord. One-year warranty.

FRONT PANEL

- Display: High-resolution 640x480 RGB LCD
- Buttons: 6 SoftKeys, Start, Stop, Print, Power
- TNC (2x): Input, Reference (3-17 dBm)
- LED: Power

REAR PANEL

- USB: 2 each
- Network: RJ-45 10/100BaseT Ethernet
- Printers: Printers with internal PostScript interpreters only.