

Measurement, analysis and monitoring of RF signals

19" rack mountable Spectrum Analyzer for remote controlled measurements and analysis of electrical signals ranging from 9 kHz up to 6 GHz.

▲ Application-oriented operating modes with resolution bandwidth (RBW) up to 32 MHz

- ▲ Spectrum Analysis mode with Wideband FFT and Channel Monitoring
- ▲ Multi-Channel Power mode for fast transponder evaluation (optional)
- ▲ Level Meter mode with True RMS and PEAK detection (optional)
- ▲ Scope with I/Q Data (optional)

▲ Easy integration and remote control of NRA into measurement environment via Ethernet

▲ Simple and convenient easily understood commands

▲ Outstanding remote documentation with examples and Demo Software

▲ High speed measurement

▲ Fan-less design for silent, continuous operation

▲ Compact size saving 1.75" (1RU) high



INTRODUCTION

The digital design of the NRA Analyzers is based on a smart combination of the super heterodyne principle with leading-edge FFT analysis and trigger functions. It captures pulsed and random signals and is ideal for short- and long-term observation of all types of RF signals. Evaluation functions and signal integration capabilities reduce the amount of raw data and increase measurement speed and performance.

THE NRA FAMILY

The NRA family is an application orientated product concept. Each NRA type is aimed at a specific RF signal measurement task. The compact size and wide range of remote operation facilities make integration with 3rd party software for monitoring & surveillance applications both fast and straightforward. The devices use ASCII based commands for all the measurement tasks needed for long-term monitoring, such as stability of carrier/band power. The measurement data are available in binary format to optimize the speed of communication.

To help you with programming, the NRA offers various demo software and web server applications. Wherever you are, you can obtain information from the NRA spectrum analyzer by accessing it from a PC using a standard web browser, as long as Ethernet connectivity is provided.



NRA – Front view

NRA-2500

- ▲ Signal Analysis from 5 MHz to 2.5 GHz
- ▲ Powerful L-Band (950 – 2150 MHz) analyzer for satellite pointing and tracking, antenna peaking, and carrier monitoring
- ▲ Optimized for use in D-SNG vehicles, at teleports and mission-critical V-SAT sites in offshore or other maritime applications

NRA-3000

- ▲ Signal Analysis from 9 kHz to 3 GHz
- ▲ Versatile analyzer for line-up, troubleshooting and wideband monitoring of TV / radio / telemetry carriers
- ▲ Optimized for use in operation & maintenance stations and at mission-critical tower sites

NRA-3000 with LNB Control

- ▲ Signal Analysis from 5 MHz to 3 GHz
- ▲ Optimized for use in satellite communication systems

NRA-6000

- ▲ Signal Analysis from 9 kHz to 6 GHz
- ▲ Ideal solution for managing wireless transmission systems, from radio to cellular (GSM / UMTS / LTE) and WiMAX



NRA – Rear view

NRA AND ITS APPLICATIONS

Satellite newsgathering

NRA is particularly suitable for use in satellite newsgathering trucks for SD or HDTV transmissions (D-SNG). Its compactness and wide variety of remote operation possibilities make for quick and straightforward integration.

When using NRA with 3rd party software for control & monitor (C&M) applications, ASCII based commands can be used to perform all the measurement tasks needed for antenna peaking and satellite tracking, as well as for transponder and carrier monitoring. However, semi-automated work procedures are quite common in smaller SNG vehicles. The new LNB Control variant of the NRA-3000 provides a space-saving solution for direct control of the satellite equipment. Functions and costs can be exactly tailored to specific needs with the aid of a broad range of options.

Recommended product:

NRA-2500, NRA-3000, NRA-3000 LNB Control or NRA-6000



Teleports

The NRA provides rapid measurement with reliable and accurate results required by specialists performing tests on SatCom network operation centers. As well as handling standard line up procedures, Multi Channel Power mode allows the spectrum analyzer to quickly determine trends, e.g. when weather conditions affect a whole band. Level Meter mode provides fast, real-time determination of true RMS power, as well as long-term level stability testing. NRA is also a valuable tool for checking guard times between TDMA signals, for example.

Recommended product:

NRA-2500, NRA-3000, NRA-3000 LNB Control or NRA-6000



Broadcast

The Ethernet access on the NRA makes it ideal for web remote monitoring of broadcasting facilities such as TV stations. In next to no time it is possible to remotely determine whether the spectrum is clear or if impairments are present. Even when there is a problem, it is not necessary to go to the site of the facility immediately, as the signals can be analyzed using helpful functions such as Scope and I/Q. This keeps traveling times down to a minimum and reduces costs.

Recommended product:

NRA-2500, NRA-3000 or NRA-6000



OPERATION AND MONITORING SYSTEMS

The compactness and wide range of remote operation functions of the NRA allows quick and straightforward integration with operational support software (OSS) or comparable control & monitor (C&M) systems. Measurement tasks can be carried out with the analyzer using the simple ASCII-based command set in conjunction with 3rd party software. The broad range of options means that the cost of the analyzer can be exactly tailored to specific needs and / or the available budget.

NRA provides straightforward remote performance and condition analysis for different signals. The analyzer can also give a rapid overview of occupancy and signals in neighboring channels, which can help to resolve potential interference issues before they start to affect service quality

Radio monitoring / spectrum management

The NRA provides the high accuracy, stability and dynamic range required by specialists performing tests on network operation centers. As well as handling standard line up procedures, Multi Channel Power mode allows the spectrum analyzer to quickly determine trends, e.g. when weather conditions affect a whole band. Level Meter mode provides fast, real-time determination of true RMS power (no sweep). NRA is also a valuable tool for checking digitally modulated signals, for example.

Recommended Product:

NRA-3000 or NRA-6000

Monitoring on-site

The NRA is especially useful for testing on-site at mobile phone towers. With the aid of the wide range of test modes, you can either get a quick overview of entire bands or analyze individual channels in depth (GSM).

- Spectrum analysis including level integration
- Detailed channel table showing individual power levels
- Level meter mode for true RMS measurements

Additionally, the NRA provides a wide choice of result types, such as ACT (current or instantaneous level), MAX, MIN, AVG, average MAX and average MIN.

Recommended Product:

NRA-3000 or NRA-6000

Driver software for SatCom C&M solutions

The following companies offer integration into their C&M products:

- **SAT Corporation** for Monics[®]
- **CRYSTAL** for Sentry[™]
- Others are in preparation

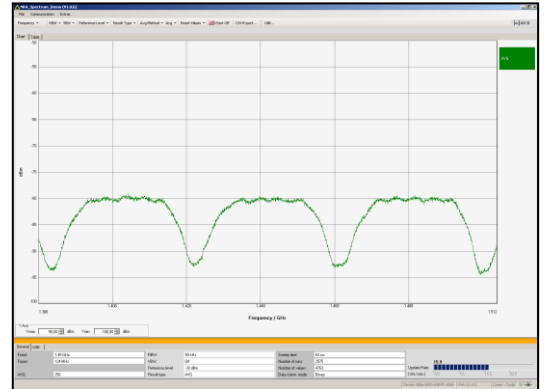


OPERATING MODES

The NRA is designed for flexible multi-purpose use, and is equipped with general and special measurement modes for spectrum, power level, and oscilloscopic observation of RF signals. Highly specialized setups can be programmed and stored in all measurement modes.

SPECTRUM ANALYSIS

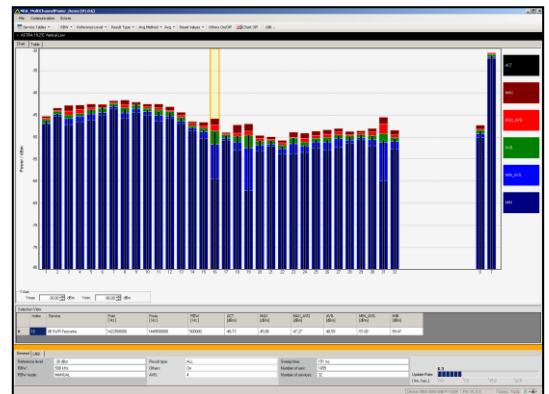
Spectrum Analysis mode operates over a wide frequency range depending on version from 9 kHz to 6 GHz with extremely broad resolution bandwidths (up to 20 MHz), allowing you to overview the entire RF spectrum or to analyze individual spectrum components.



L-Band satellite signal
(Screen NRA Demo Software)

MULTI CHANNEL POWER (Option)

In this operating mode, the NRA can be configured to integrate total RF power of individual, user-definable frequency bands. Multi Channel Power mode provides an immediate overview of the contributions of individual frequency bands or channels to the overall RF power level in a given frequency band. The total power including or excluding the gaps between selected channels, where applicable, can be displayed.

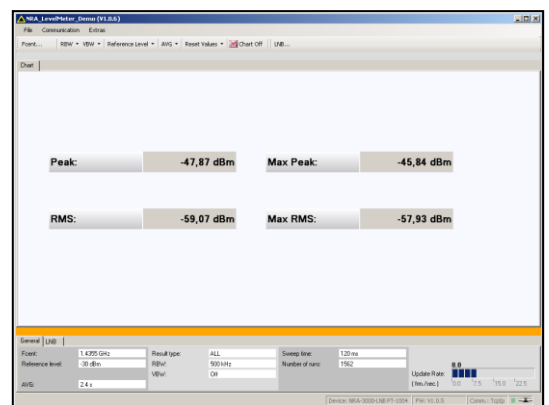


Multi-channel view (Bar graph or Table)
(Screen NRA Demo Software)

LEVEL METER (Option)

Level Meter mode allows measurement of RF power level at a pre-settable frequency. The measurement results are continuously processed in real time. The instantaneous (ACT) or maximum (MAX) value can be displayed numerically using the PEAK detector. The average of measurement values over a variable averaging time can additionally be displayed by selecting the RMS detector.

The NRA uses special steep cutoff channel filters in this mode to selectively monitor a specific frequency or frequency band over a period of time to exclude practically all the effects of adjacent signals.

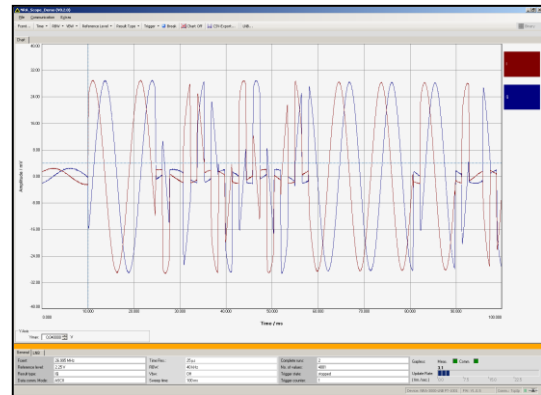


True RMS analysis by selecting Fcset and RBW
(Screen NRA Demo Software)

SCOPE and IQ DATA (Option)

Scope mode (zero span) provides an oscilloscopic time domain analysis. Almost all signal details can be made visible in this mode to allow rapid classification. The minimum resolution time of 32 ns even allows analysis of high-speed data transmissions or pulsed signals such as radar. A top sweep time of 24 hours allows full-day power monitoring of a single carrier. Extensive trigger functions allow for triggering and subsequent monitoring of burst signals including a pre-trigger view.

RF signals can be completely described by I/Q data. The I/Q demodulated data of the NRA allows the user to restore the signal for post-processing or deep analysis.



**Scope view for detailed analysis versus time
(Screen NRA Demo Software)**

DEFINITIONS AND CONDITIONS

Conditions

Unless otherwise noted, specifications apply after 30 minutes warm-up time within the specified environmental conditions. The product is within the recommended calibration cycle.

Specifications with limits

These describe product performance for the given parameter covered by warranty. Specifications with limits (marked as <, ≤, >, ≥, ±, max., min.) apply under the given conditions for the product and are tested during production taking measurement uncertainty into account.

Specifications without limits

These describe product performance for the given parameter covered by warranty. Specifications without limits represent values with negligible deviations which are ensured by design (e.g. dimensions or resolution of a setting parameter).

Typical values (typ.)

These characterize product performance for the given parameter that is not covered by warranty. When stated as a range or as a limit (marked as <, ≤, >, ≥, ±, max., min.), they represent the performance met by approximately 80 % of the instruments. Otherwise, they represent the mean value. The measurement uncertainty is not taken into account.

Nominal values (nom.)

These characterize expected product performance for the given parameter that is not covered by warranty. Nominal values are verified during product development but are not tested during production.

Uncertainties

These characterize an interval for a given measurand estimated to have a level of confidence of approximately 95 percent. Uncertainty is stated as the standard uncertainty multiplied by the coverage factor k=2 based on the normal distribution. The evaluation has been carried out in accordance with the rules of the "Guide of the Expression of Uncertainty in Measurement" (GUM).

SPECIFICATIONS

Narda Rack Mount Analyzer		NRA-2500	NRA-3000	NRA-6000	
Frequency range		5 MHz to 2.5 GHz	9 kHz to 3 GHz 5 MHz to 3 GHz with LNB Control	9 kHz to 6 GHz	
Modes		Spectrum Analysis Multi Channel Power (option)		Level Meter (option) Scope and I/Q (option)	
RF features					
Frequency	Resolution bandwidth (RBW)	See specifications for each mode			
	Phase noise ^{a)} , (SSB)	10 kHz carrier spacing < -70 dBc / Hz 300 kHz carrier spacing < -100 dBc / Hz			
	Reference frequency	Initial deviation	< 1.0 ppm		
		Aging	< 1.0 ppm / year		
			< 5.0 ppm / 15 years		
		Thermal drift	< 1.5 ppm (within temperature range -10°C to 50°C)		
Amplitude	Reference level (RL) (in 1 dB steps)	-30 dBm to 0 dBm	-30 dBm to +20 dBm		
	Display Range	-110 dBm to +1 dBm (RBW = 1 kHz)	-150 dBm to + 21 dBm (RBW = 10 Hz)		
	RF attenuation (coupled with RL)	0 to 30 dB in steps of 1 dB	0 to 50 dB in steps of 1 dB		
	Maximum RF power level	+27 dBm (destruction limit)			
	Maximum DC voltage	50 V (Version with LNB Control up to 24 V)			
	Display Average Noise Level (DANL) for RL=-30 dBm (input attenuation = 0 dB)			f ≤ 30 MHz: < -160 dBm / Hz (noise figure < 14 dB)	
				f ≤ 2 GHz: < -156 dBm / Hz (noise figure < 18 dB)	
		< -140 dBm / Hz (noise figure < 34 dB)		f ≤ 3 GHz: < -155 dBm / Hz (noise figure < 19 dB)	f ≤ 4 GHz: < -155 dBm / Hz (noise figure < 19 dB)
				f ≤ 6 GHz: < -150 dBm / Hz (noise figure < 24 dB)	
	3rd order intermodulation products	< -60 dBc for two single tones with a level of 6 dB below RL, spaced by 1 MHz or more			
Extended level measurement uncertainty ^{b)}		< +/- 1.5 dB (15°C to 30°C)	< +/- 1.2 dB (within temperature range 15°C to 30°C)		
		< +/- 2.3 dB (-10°C to 50°C)	< +/- 2.0 dB (within temperature range -10°C to 50°C)		
Spurious responses (input related) ^{c), d)}	< -50 dBc or RL -50 dB	< -60 dBc or RL -60dB			
Spurious responses (residual) for RL=-30 dBm (input attenuation = 0 dB)	< -80 dBm	< -90 dBm except for the frequency range 294 MHz to 306 MHz and 4534 MHz to 4586 MHz, where the value is < -85 dBm			
Type	N-connector, 50 Ω				
RF input	Return loss (typ.)		> 12 dB		
	RL ≥ -28 dBm (input attenuation ≥ 2 dB)	> 10 dB	Version with LNB Control: > 10 dB for f ≤ 10 MHz	> 12 dB for f ≤ 4.5 GHz > 10 dB for f > 4.5 GHz	
LNB control (Hardware Version) ^{e)}	NA		LNB Current 350 mA max. LNB control voltage (typ.) : 13 V, 18 V, 22 kHz	NA	

Unless otherwise stated, the quoted specifications apply within the temperature range 20°C to 26°C and relative humidity between 25 % and 75 %. The device must be switched on for at least 30 minutes before the specifications can be checked. All specifications are valid only for remote control using the Ethernet (100 BaseTx) interface.

a) Verification at 57.5 MHz; 2140.5 MHz and 4500.5 MHz (NRA-6000)

b) 95 % confidence level, includes absolute uncertainty, frequency response in all RL (attenuator) settings and temperature response, valid for Spectrum and Multi Channel Power Mode

c) Frequency separation to carrier (df) > 1 MHz

d) Whichever is worse

e) Offers remote power supply and remote access, inbuilt in the NRA-3000-LNB basic unit

SPECTRUM ANALYSIS		NRA-2500	NRA-3000	NRA-6000
Frequency span		10 kHz to 2.495 GHz	1 kHz to 2.999 GHz 1 kHz to 2.995 GHz with LNB Control	1 kHz to 5.999 GHz
Measurement principle		Spectrum analysis with up to 27000 samples (data points) per Result Type and Sweep		
Reference Level (RL)		Set individually from a list or use the "RL Search" function for determining the optimum Reference Level		
Resolution bandwidths (RBW) (-3 dB nominal) (list depends on selected sweep SPAN)		1 kHz to 1 MHz (in steps of 1, 2, 3, 5, 10, 20)	10 Hz to 20 MHz (in steps of 1, 2, 3, 5, 10, 20)	
Video bandwidth (VBW)		Off, 0.2 Hz to 2 MHz (in steps of 1, 2, 3, 5, 10, 20 depending on the selected RBW)		
Sweep time (typ., inclusive communication over Ethernet 100baseTx) ^{a)}	50 MHz Span	ASCII: < 21 ms (@ RBW = 0.5 MHz, 201 bins) BINARY: < 17 ms (@ RBW = 0.5 MHz, 201 bins)		
	1 GHz Span	ASCII: < 119 ms (@ RBW = 1 MHz, 2001 bins) BINARY: < 88 ms (@ RBW = 1 MHz, 2001 bins)		
	6 GHz Span	NA	NA	ASCII: < 875 ms BINARY: < 500 ms (@ RBW = 0.5 MHz, 24001 bins)
Filter	Type	Gaussian		
	Shape factor (-3 dB / 60 dB)	<3.8 (typ.)		
Result Type		ACT: Displays current (actual) spectrum MAX: Maximum hold function AVG: Average over a selectable number of spectra (4 to 256) or a selectable time period (1 to 30 minutes) Max AVG: Maximum hold function after averaging over a defined number of spectra Min Minimum hold function Min AVG: Minimum hold function after averaging over a defined number of spectra		
MULTI CHANNEL POWER (OPTION 3200/95.01)				
Measurement principle		Spectrum analysis, followed by Channel Power evaluation (Number of Channels 1 to 500)		
Resolution bandwidths RBW (-3 dB)		Auto: automatically set depending on the narrowest user-defined service bandwidth Manual: user-defined for all services, Individual: separately defined for each individual service		
Channel bandwidth (CBW), (-3 dB nominal)		Individually selectable for each channel, from 40 Hz to 6 GHz		
Roll-off factor		< 4 * RBW / CBW		
Applied Resolution bandwidths RBW (-3 dB)		Automatic: Frequency range of channel divided by 4 but not more than 20 MHz Manually: Can be set in the range of available RBWs of spectrum analysis, but not more than CBW of channel divided by 4 Individual: separately defined for each individual service		
Detection		Root mean square value (RMS), $RMS (integration\ time \approx \frac{1}{RBW})$		
Filter		See Spectrum Analysis mode		
Result Type and RBW		See Spectrum Analysis mode		
Others On / Off		Summarizes all measurement values for frequency gaps within the list of channels and shows the total value for all gaps. "Others" can be switched off if not required		

a) Values are valid for NRA firmware > V 1.0.5, > "Spectrum Demo 1.0.6", for one Result Type

LEVEL METER (OPTION 3200/95.02)	
Measurement principle	Selective level measurement at a fixed frequency setting.
Detection	Peak
	Root mean square value (RMS), RMS (integration time = 480 ms)
Filter	Type
	Roll-off factor
Resolution bandwidth RBW (-6 dB nominal)	Steep cut-off channel filter (app. raised cosine) 0.16
Resolution bandwidth RBW (-6 dB nominal)	100 Hz to 32 MHz (in steps of 100, 125, 160, 200, 250, 320, 400, 500, 640, 800, 1000,..., 10 MHz, 13.333 MHz, 16 MHz, 20 MHz, 26.666 MHz, 32 MHz)
Video bandwidth (VBW)	Off, 0.01 Hz to 32 MHz (depending on the selected RBW)
Result Type	Peak ACT: Displays the actual peak value Peak MAX: Max hold function for peak values RMS ACT: Averaging over a defined time period (0.48 seconds to 30 min) RMS MAX: Max hold function for RMS values
SCOPE AND I/Q DATA (Option 3200/95.03) – not NRA-2500	
Measurement principle	Selective level measurement at a selectable frequency in the complete frequency span up to 16000 samples (data points) in ACT, up to 4000 samples (data points) with condensed mode (MIN, AVG, MAX), up to 250000 samples (data points) in IQ Mode Trace Data
Resolution bandwidth RBW, (-6 dB nominal)	100 Hz to 32 MHz (in steps of 100, 125, 160, 200, 250, 320, 400, 500, 640, 800, 1000,..., 10 MHz, 13.333 MHz, 16 MHz, 20 MHz, 26.666 MHz, 32 MHz)
Filter	Type
	Roll-off factor
Video bandwidth (VBW)	Steep cut-off channel filter (app. raised cosine) 0.16
Sweep Time	Off, 0.01 Hz to 32 MHz (depending on the selected RBW)
Sweep Time	500 ns to 24 h
Time Resolution	Selectable from 31.25 ns up to 90 min
Result type	Time resolution = 1/RBW
	Time resolution > 1/RBW
Evaluation functions	Act: Instantaneous magnitude value I, Q or I & Q In-phase demodulated signal, Quadrature demodulated signal or both MAX: Maximum value within the time resolution interval (corresponds to peak detector). AVG: Average value within the time resolution interval (corresponds to RMS detector). MIN: Minimum value within the time resolution interval.
Triggering	Duty cycle (ratio of average power to maximum power)
Triggering	Free run, single, multiple, manual start, time controlled Programmable trigger level, trigger slope and trigger delay

GENERAL SPECIFICATIONS		
Remote access	ASCII based command sets, response in ASCII or fast Binary Mode (selectable)	
Web server	Web applications "NRA Web Terminal" and "NRA Live Display Viewer" based on Java Applets and HTML	
Compliance	Climatic	
	Storage	1K3 (IEC 60721-3) extended to -10 °C to +50 °C
	Transport	2K4 (IEC 60721-3)
	Operating	7K2 (IEC 60721-3) extended to -10 °C to +50 °C
	Mechanical	
	Storage	1M3 (IEC 60721-3)
	Transport	2M3 (IEC 60721-3)
	Operating	7M3 (IEC 60721-3)
	Ingress protection	IP 50
	EMC	
European Union	Complies with EMC Directive 2004/108/EC and IEC/EN 61326 -1: 2006	
Immunity	IEC/EN: 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, 61000-4-6, 61000-4-11	
Emissions	IEC/EN: 61000-3-2, 61000-3-3, IEC/EN 55011 (CISPR 11) Class B	
Safety	Complies with European Low Voltage Directive 2006/95/EC and IEC/EN 61010-1: 2004	
Environmental		
Operating temperature	-10 °C to +50 °C	
Humidity	< 29 g/m ³ (< 93 % RH at +30 °C), non-condensing	
Dimensions	Standard EIA Rack Unit (1RU): 482 mm (19" w) x 45 mm (1.75" h) x 362 mm (14.3" d)	
Weight	< 5 kg (11lbs)	
Interface		
USB mini B (USB 2.0)	on the front panel - for programming/debugging and updates	
Ethernet (100BaseT)	on the back side - for measurement control	
Status information	System - LED (bicolored) and LAN (single-colored)	
Power supply	100 to 240 V (AC), 50/60Hz	
Power consumption	< 20 W, <25W for LNB Control	
Country of origin	Germany	
Recommended calibration interval	24 months	
Intended use	Indoor	

ORDERING INFORMATION

NRA	Part number
NRA-2500 Remote Analyzer, 5 MHz – 2.5 GHz	3201/101
NRA-3000 Remote Analyzer, 9 kHz – 3 GHz	3202/101
NRA-3000-LNB Remote Analyzer, LNB Control, 5 MHz – 3 GHz	3202/102
NRA-6000 Remote Analyzer, 9 kHz – 6 GHz	3203/101
OPTIONS	
Option, Multi Channel Power	3200/95.01
Option, Level Meter	3200/95.02
Option, Scope and I/Q Data not for NRA-2500	3200/95.03
Option, Calibration Report	CAL3201/01 for NRA-2500 CAL3202/01 for NRA-3000 CAL3203/01 for NRA-6000

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