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Portable Recorder/Reproducer

Model RSR 512



Features/Benefits

- 70 dB dynamic range
- DC to 80 kHz record/reproduce
- Digital I/0 module to 7.6 Mbits/sec
- Programmable data bandwidths
- 8, 16, 24, 32 and 64 channel configurations
- Bar graph data display
- AC/DC power supply
- Record times from 50 minutes to 426 hours
- 512:1 speed range ratio
- Simultaneous analog and digital outputs
- Uses ST-120 1/2-inch tape cassettes
- Integral time code
- Programmable analog input
- Programmable digital input for recording PCM streams up to 7.6 Mbits/sec
- Standard RS-232C/IEEE and TTL remote interfaces
- Helical scan recording technology
- Two-channel output monitor
- High Speed Digital Output
- Auto-range function

SYPRIS® DATA SYSTEMS

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Portable Recorder/Reproducer Model RSR 512

Overview

The Model RSR 512 Portable Recorder/Reproducer is a versatile multi-channel instrumentation recorder. The Model RSR 512 combines the capabilities of FM recording with the accuracy of digital recording. It converts analog data to digital form for recording onto ST-120 cassettes. It provides both analog and digital outputs. The Model RSR 512 is a precision voltage recorder, with accuracies 10 to 30 times that of analog recorders.

With its menu-driven, operator interactive display, the Model RSR 512 is easy to set up and operate. The user simply selects the input voltage range and data bandwidth; the Model RSR 512 does the rest. An electroluminescent (EL) monitor screen displays bar graph monitors for each channel. Overrange warnings allow the operator to change input sensitivity during recording to eliminate the possibility of excluding valuable data. Overrange incidents are recorded with the data and are visible on reproduce.

Applications

- PCM telemetry recording
- Synthetic Aperture Radar (SAR) image recording
- Compressed digital video images
- Satellite ground station recording
- Ordinance and weapon system testing
- Preflight system testing
- Flight test data collection and reproduce
- Rocket and jet engine test data acquisition
- Launch vehicle assembly monitoring
- Guidance system testing
- Multi-variable system failure analysis

Precision Recording Voltmeter

The Model RSR 512 provides recoverable signal accuracies with at least 10 times the power and clarity of FM recorder systems. Using a 12-bit Analog to Digital converter, it offers a 70 dB dynamic range and is free of tape speed artifacts.

Speed Scaling

The Model RSR 512 has a 512:1 speed range in binary steps. By contrast, FM tape recorders are dependent upon longitudinal tape velocity to generate a recoverable signal in the reproduce mode, and tape speed dynamic range is usually limited, generally to 64:1 or 128:1.

Automated Tape Log

The Model RSR 512 records administrative information directly on the tape, eliminating the problems associated with lost, unreadable or unidentified tape logs. On reproduce, the Model RSR 512 uses information on the recorded tape to set itself up automatically.

Search

The Model RSR 512 searches by time code or block number. It may be programmed to find and reproduce data labeled with a record number or a test number.

Media and Capacity

The Model RSR 512 records data onto low cost, broadcast-quality, high-density Sypris ST-120 S-VHS cassettes. Sypris tape is constructed from the highest broadcast-quality material, and its data-packing capacity is enhanced by high-energy, ultra-fine particles and an anti-static back-coating. For further data protection, the tape is encased in a high-impact plastic cassette. Sypris tape cassettes undergo certification to ensure cleanliness and minimize data drop-outs.



Unlike low-energy, nine-track tapes, high-energy Sypris cassettes are immune to self-erasure and print-through. Low tape tension eliminates periodic repacking.

Sypris data recording cassettes are universally accepted and available worldwide. Similar in design to standard VCR cassettes, Sypris cassettes are easy to handle, identify, bar code, ship and store. They have an expected shelf life of 20 years when properly stored.

Sypris Technology

The data path electronics designed by Sypris are a technological spin-off from longitudinal recorder prod-

ucts, technology in which Sypris has been a leader for over 30 years. The Model RSR 512 uses modulation schemes, advanced equalization techniques and powerful Reed-Solomon error correction codes and interleaving techniques to guarantee virtually error-free performance.

The Model RSR 512 has a helical scan recording mechanism that uses solid ferrite recording heads to ensure stable and long-lasting performance. All tape movement and scanner/head positioning are controlled by a servo system. The transport mechanism and housing are ruggedly constructed and suitable for use in mobile and field applications.

Unlike conventional longitudinal tape recorders, the Model RSR 512 records data on a path (or swipe) oriented at a six degree angle across the half-inch tape. This shallow angle creates a four-inch long track on which the digitized data is recorded. Mixing signals on adjacent tracks is prevented by the azimuth angles of the two heads. Two of these swipes comprise a fixed recording block. Each block of data is assigned its own number used for locating data during search and replay.

Interfaces/Remote Control

RS-232C, IEEE-488 (GP-IB) and TTL interfaces are included on the Model RSR 512 as standard features. These may be operated via an optional hand-held remote control.

Other Features

Interval recording The recorder can be programmed to "power up" at specified intervals, record for a specified time period, then "power down" until the next record interval.

Record and test identification The operator can name tests and assign numbers to each individual recording within a test name.

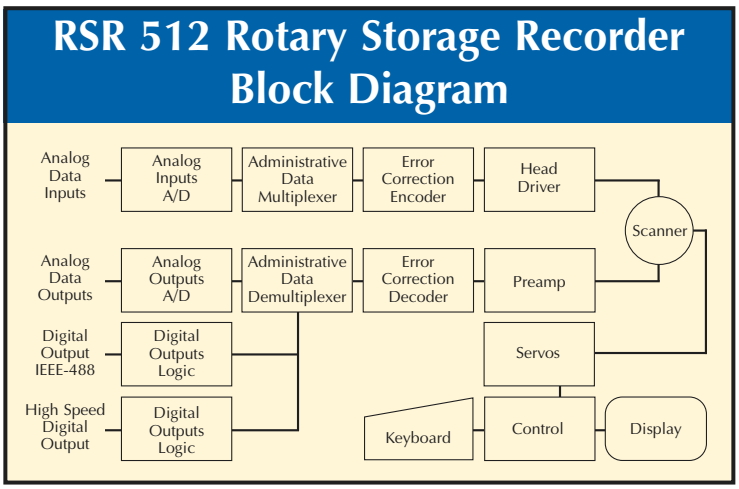
Channel annotation Each channel can be described with a 24-character input notation. During reproduce, the cards installed in the mainframe descriptions can be displayed on the electroluminescent (EL) screen or output to any attached data processing device or printer.

Event counter The Model RSR 512 event counter can be incremented automatically, manually or remotely. Event numbers are recorded with the data and can be used as a shuttle reference.

Overrange warning If data input exceeds the selected full-scale range, the operator is advised of the event and can decrease that channel's sensitivity. During record, the overrange event is tagged and is visible on the EL display during reproduce.

Setup replication The Model RSR 512 can be set up using the front panel or remotely by computer. Once a configuration has been defined and stored, the set-up can be replicated. Up to 7 configurations plus "power down" configuration can be stored in the internal memory and recalled at any time. An unlimited number of setups can be externally stored either on a cassette or a host computer, enabling replication of past test configurations for future repetitive tests.

Configurations



The Model RSR 512 can be configured easily to meet individual data recording requirements. A standard two-channel output monitor allows any two channels to be monitored without full reproduce electronics. Record and reproduce channels contain eight channels per circuit card, with a maximum of four circuit cards installed in the mainframe chassis. Eight, 16, 32 and 64 record/reproduce channel configurations are offered. Additional channels can be added by using optional auxiliary housing.

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Accessories

Vibration Isolator An optional Vibration Isolator is available for operation in a high vibration environment. The Model RSR 512 is clamped to the isolator using the four feet on the bottom of the recorder. The unit is easily removed or attached using the quick release clamps on the isolator platform.

Auxiliary Housing Each Auxiliary Housing can accommodate four 8-channel analog input or analog output circuit cards, or four, four-channel Digital I/O circuit cards. This allows expansion of the basic Model RSR 512 mainframe to a maximum of 64 analog inputs and 64 analog outputs using a maximum of three auxiliary housings with the basic unit, or to 32 digital inputs and digital outputs using one auxiliary housing.

Remote Control The hand held Remote Control unit controls the basic transport functions of Stop, Record, Fast Forward, Rewind, and EVENT. Individual LEDs indicate the status of each function as well as "Remote Active."

Voice Kit The Voice Kit is used to record and play back voice annotation on any data channel. The kit consists of a headset, microphone, interface control and required cables.

Heavy Duty Transit Case This reusable polyethylene case is designed to protect the Model RSR 512 during shipment and storage. Internal cavities are provided for tape cassettes, manuals and voice kit.

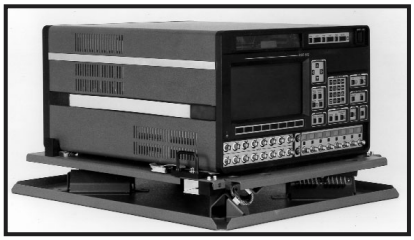
Rack Mount Kit The Rack Mount Kit contains all hardware required to mount the Model RSR 512 into a standard 19-inch EIA rack. The Model RSR 512 is clamped to the slide out shelf using the four feet on the bottom of the recorder. The unit is secured in the rack with two shelf latches and two bezel latches.

High-Speed Digital Output (HSDO) The High Speed Digital Output provides for the output Rack Mount Kit of 12 bit parallel PCM data at the maximum rate of 1.28 Mword/sec. The HSDO is either one channel or any number of channels via a 37 pin subminiature "D" style connector at the rear of the Model RSR 512.

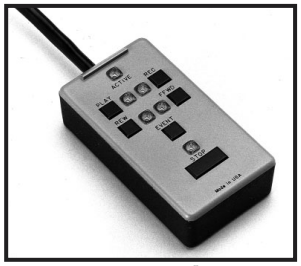
RC-5 Cassette Loader Provides unattended operation and sequential loading of up to five ST-120 cassettes for a total capacity of 26 GBytes.

Network Cable The network cable is used to connect two or more Model RSR 512s together to provide for Sequential Mode or Parallel Mode recording.

Copy Cable The copy cable is used with the network cable to facilitate cassette copy (tape duplicate) or edit copy (selected records) to another Model RSR 512.



Vibration Isolator



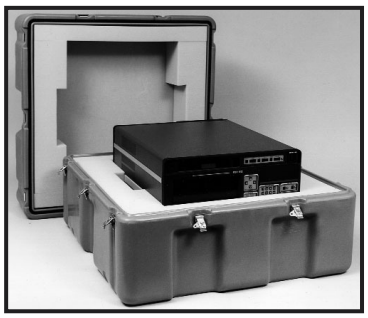
Remote Control



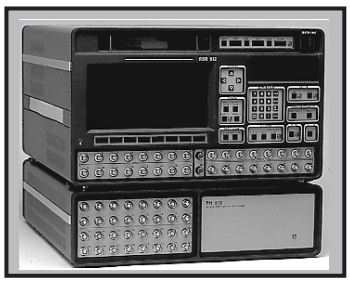
Voice Kit



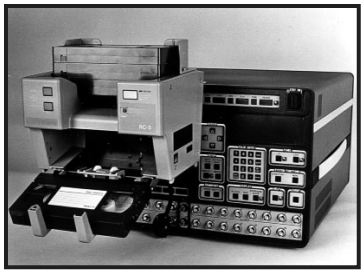
Rack Mount Kit



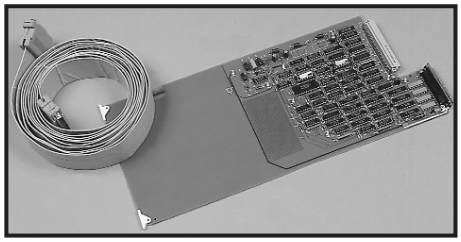
Heavy Duty Transit Case



Auxiliary Housing



RC-5 Cassette Loader



High-Speed Digital Output

Specifications

GENERAL

The Model RSR 512 has combined the characteristics of FM recording with the accuracy of digital recording. It accepts data in analog and digital form, converts to digital for recording on ST-120 tape cassettes and provides analog and digital outputs.

Size	10-1/2 H x 17-3/4 W x 22-1/2 D inches (267 H x 434 W x 572 D mm)
Weight	Average 16 x 16 channel record/reproduce channels approximately 70 lb (32 kg)
Power	AC/DC 90 to 254 V, 47 to 440 Hz,11 to 32 Vdc
Power Consumption	250 W typical

TAPE TRANSPORT

Record/Reproduce Method	PCM recording
Inputs	Analog and digital
Outputs	Analog and digital
Tape	EIAJ standard magnetic ST-120, 1/2-inch tape cassette, Sypris certified to ensure specifications and warranty
Record Format	Helical scan
Record/Reproduce Head	Quad-head, azimuth system
Erase Head	Full width
Tape Speed	512:1 (80.8 mmps to .16 mmps) Tape speed automatically selected for optimum recording time, or manually set by user, to extend time compression and expansion in the reproduce mode
Record Time	50 minutes to over 426 hours Record time based upon number of data channels, data bandwidth and sample density.
Start/Stop Time	Approximately 5 seconds from launch point
Fast Forward/Rewind Time	Approximately 170 seconds
Controls	F. FWD, REW, PLAY, STOP, REC, EJECT

SHUTTLE

Shuttle and Search	Shuttle and search from: Test name, Record number, Date, Time, Stopwatch time, Event number, or Block number

ANALOG DATA RECORD/REPRODUCE

NOTE: A combination of digital and analog channels may be used with any combination of clock rate/bandwidth settings within the total capacity limit for the tape speed in use.

Quantization	12 bit
Error Correction	Double encoded Reed-Solomon combined with data interleaving
Available Filters	80, 40, 20, 10, 5, 2.5, 1.25 kHz 625, 312, 156, 78, 39, 20 Hz (typically down 1.5 dB at 100 kHz). Selectable flat amplitude (4 pole Channels standard; 8 pole Chebyschev optional) or transient response (linear phase) characteristics. Filters are for input anti-aliasing and output smoothing. User programmable and selectable.
Sample Density	4, 6 or 8 samples per bandedge cycle, user programmable. The sum of bandwidth x sample density for an 8-channel system is <640 k and ≤1280 k for 16 or more channels.
Channels	8, 16, 24, 32 or 64 Channels are in modules of 8. The system accepts up to 4 modules. A 2-channel reproduce monitor is supplied as standard equipment.
Input/Output	Front BNC, rear multi-pin connector, mating connector DB-25P.

ANALOG INPUT

Input Voltage Ranges	7 ranges, user programmable. ±0.1 V, 0.2 V, 0.5 V, 1.0 V, 2.0 V, 5.0 V, 10.0 V peak.
Maximum Safe Input Voltage	±25 Vdc or peak ac
Gain Accuracy	±0.5% of full scale maximum
Over-Range	±102.4% of full scale input
Over-Range Warning	Warning at approximately ±94% of full scale
Input Impedance	1 Megohm shunted by <100 pF, Differential
Source Resistance	<1 kohm

ANALOG OUTPUT

Output Voltage Range	2 ranges, user programmable. ±1 V, or 2 V peak into 50 ohms
Output Current	50 mA maximum, short circuit protected
Output Impedance	<0.2 ohm, BNC
Signal rms to Noise rms Ratio	>70 dB
Linearity	±0.2%
Frequency Response	<1 dB, 0.3 dB typical
Total Harmonic Distortion	<0.3%

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Drift	±0.3% per 10ºC change after 15 minute warm-up
Phase Difference Between Channels (skew)	<1º typical using same bandwidth filters

NOTE: All specifications apply at 8 x sample rate, excluding ±0.1 V input range.

DIGITAL DATA RECORD/REPRODUCE

NOTE: A combination of digital and analog channels may be used with any combination of clock rate/bandwidth settings within the total capacity limit for the tape speed in use.

Channels	4, 8, 12, 16, 20, 24, 28 or 32 4 input and 4 output channels per module. Up to 4 modules per system. Additional channels available with auxiliary housing.
Modes	Asynchronous mode accepts any input clock rate within the defined range.

DATA RATE

Asynchronous Rate (bits/sec)		Maximum Number* of Channels at this Clock Rate
maximum	minimum	
7.6 M	1900	2
3.8 M	950	4
1.9 M	475	8
950 k	240	16
475 k	120	32
238 k	60	32
119 k	30	32
59.5 k	15	32
29.7 k	8	32
14.8 k	4	32

*Clock rate may be individually set for each channel in any combination permitted by total capacity.

DIGITAL INPUT

Front	6 pin connector per channel, data and clock, single ended, terminated with 75 ohms
Rear	50 pin Micro D connector, data and clock, differential, terminated with120 ohms, meets EIA Standard RS-485

DIGITAL OUTPUT

Front	6 pin connector per channel, data and clock, single ended, can drive impedances as low as 30 ohms
Rear	50 pin Micro D connector, data and clock, differential, terminated with 120 ohms
Data and Clock Levels	TTL
Data Code	NRZ-L

CLOCK

Phase (to data)	Trigger positive or negative edge, selectable
Waveform	Square wave
Duty Cycle	50% ±25%
Output Clock	Bit-level jitter: ±5 nsec, short-term frequency deviation: ±1 Hz maximum, absolute frequency accuracy: <1%, clock frequency dependent on record/ reproduce speed ratio within channel data rate range

DATA MANAGEMENT

Annotation	Cassette name, test name, channel information
Cassette Directory	Cassette name List of tests Name/version number Start date Start time Number of records in the test Start and stop blocks in the test Number of events
Test Directory	Test name/version number Number of records in the test List of records Start date Start time Start and stop block number Number of events
Memory	Up to 7 user-configurable program setups may be stored.

MONITORS

Bar Meter	16-channel bar graph display E to E (electronic to electronic) mode. Display of positive and negative peak values. Overranging indication, either plus or minus. Linear or log display. Preamble function. Autorange, continuous or brief. Display of digital clock and data.

CLOCK

Real Time	Record and reproduce year, month, day, hour, minute and second
Elapsed Time (from Record Start)	Record and reproduce hours, minutes and seconds

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Remaining Tape Timer	Hours, minutes and seconds displayed
Stopwatch Timer (time from first event)	Record and reproduce hours, minutes, seconds and tenths of seconds
External Time Code Generator	44 bit BCD time of year (milliseconds, seconds, minutes, hour, day and month) TTL-compatible. Input connector Amphenol 57-40500. Mating connector 3M 3564-1002, 16813740-404.

RECORD TIMES

System record time is based on the sum of the number of channels x the bandwidth x the sample rate.

Tape Speed Ratio	Total System Sample Rate	Recording Time	
	max limit	hours	minutes
1:1	1280 k		50
1:2	640 k	1	40
1:4	320 k	3	20
1:8	160 k	6	40
1:16	80 k	13	20
1:32	40 k	26	40
1:64	20 k	53	20
1:128	10 k	106	40
1:256	5.0 k	213	20
1:512	2.5 k	426	40

Example:
32 channels x 10 kHz x 4 samples per second = 1280 k samples per second. The total system sample rate cannot exceed 1280 k samples per second for 16 or more channels or 640 k samples per second for an 8-channel system.

DIGITAL OUTPUT

IEEE-488 PCM Data Output Standard High Speed Digital Output (HSDO) Digitized input data are directly available.

Maximum Data Transfer Rate	1.28 Mword per second
Resolution	12 bits
Modes of Operation	Direct Memory Access (DMA) or Streamer
Output Formats	Bipolar Offset Binary (BOB) Complementary Offset Binary (COB) Binary Two's Complement (BTC) Complementary Two's Complement (CTC)

REMOTE CONTROL

RS-232C/IEEE-488/GP-IB fully programmable TTL remote control of 5 transport functions, Mating connector Cannon DA-15S-Al97, 16825952-012

AUXILIARY HOUSING

Size	5 1/4 H x 17 3/4 W x 22 1/2 D inches (134 H x 434 W x 572 D mm)
Weight (with 32data channels)	Approximately 30 lb
Power	25 W typical

ENVIRONMENT

Temperature (Tape Limited)	
Operating	5 to 40º C
Storage	-40 to 70º C
Humidity (Tape Limited)	
Operating	5 to 80% RH, non-condensing
Altitude	
Operating	to 15,000 ft (4500 m)
Storage	to 50,000 ft (15,000 m)

REGULATORY

The Model RSR 512 is designed to meet a variety of domestic and international safety standards.

Specifications subject to change without notice.

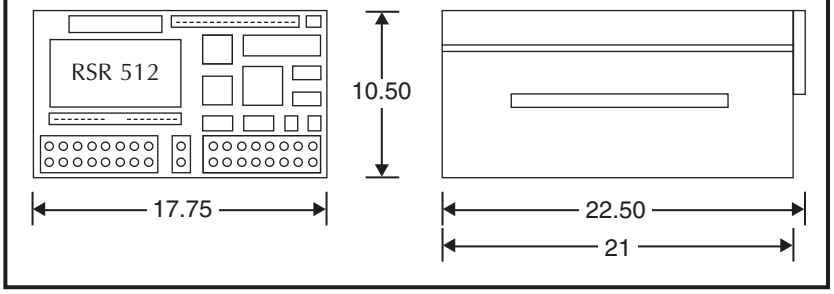
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ORDERING INFORMATION

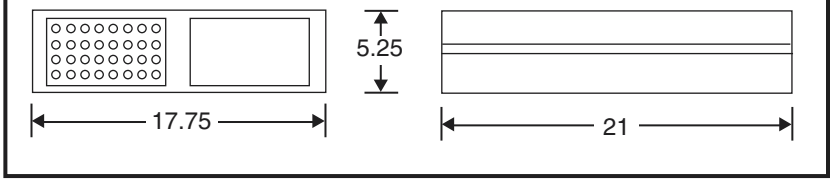
The Sypris Portable Model RSR 512 Recorder/Reproducer is available with a full range of configurations of data electronics and accessories. Contact your nearest Sypris sales engineer to assist you in selecting the configuration that best serves your particular requirements.

Dimensions

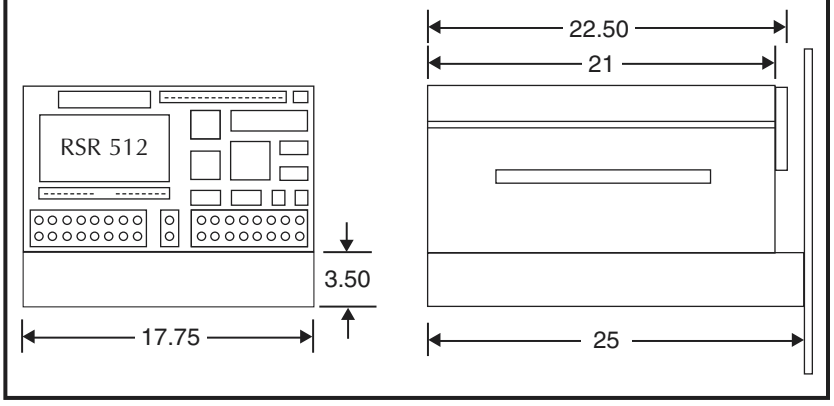
RSR 512 FRONT | **RSR 512 SIDE**



AUXILIARY HOUSING FRONT | **AUXILIARY HOUSING SIDE**



RSR 512 RACK MOUNT FRONT | **RSR 512 RACK MOUNT SIDE**



Measurements in inches.

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