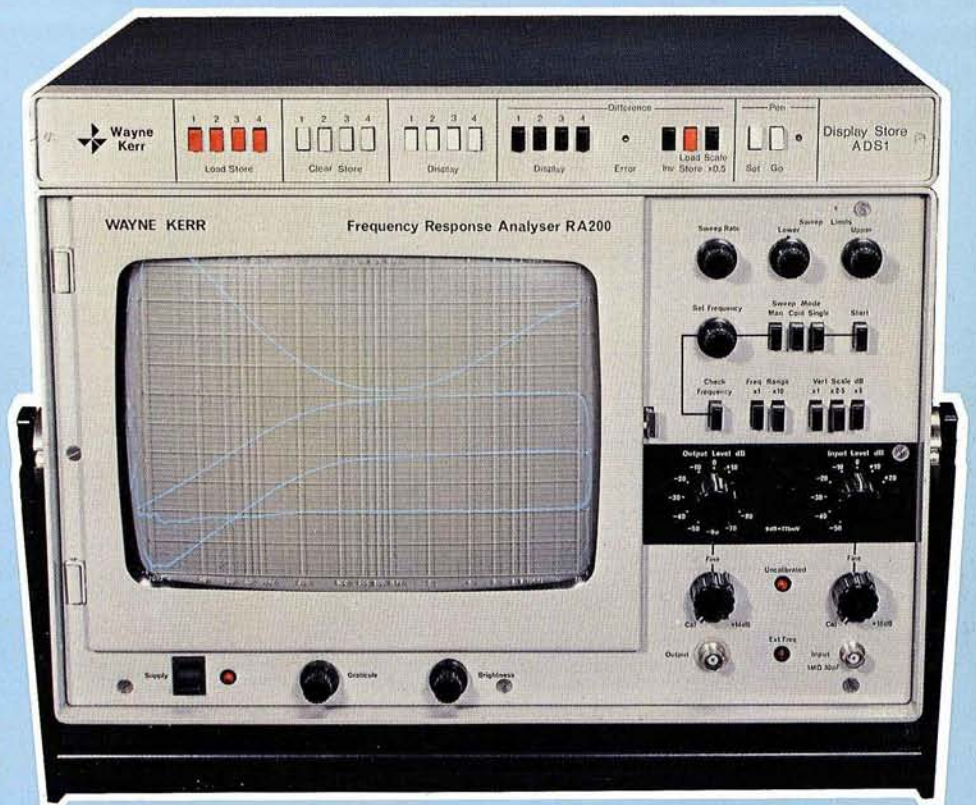




Wayne Kerr

Frequency Response Analyser & Display Store RA200 & ADS1



introducing a new range of a.f equipment for
automatic curve plotting, storage & analysis

A new, fast simplicity in AF response curve measurements

Wayne Kerr RA200/ADS1 is unique. It gives you – quickly and accurately – calibrated frequency response curves of audio-frequency equipments or networks. More: it will make a high-speed comparison of two curves, display their difference, amplify this, and provide push-button storage of up to four complete curves. All without need of any sync. or trigger signals.



Flexibility

The sheer ease of using this functional instrument brings immediate advantages to aspects of equipment testing where amplitude/frequency characteristics have to be checked, including amplifiers, equalisers, filters, mixers, transducers, tape recorders, transmission lines, telephone networks, reverberation units and ultrasonic flaw detectors. The list is endless and RA200/ADS1:

speeds design & development in electronics laboratories

ensures a consistent standard of production-line testing

provides immediate checking facilities to broadcasting & recording engineers.

The equipment is uncomplicated – there are no zeroing or calibration procedures – and it has found rapid acceptance in such diverse fields as medical research, seismology, marine echo-sounding and acoustics.

Sweep Rate



Sweep Limits

Lower



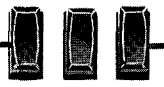
Upper



Set Frequency



Sweep Mode
Man Cont Single



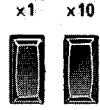
Start



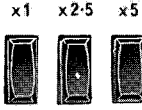
Check Frequency



Freq Range

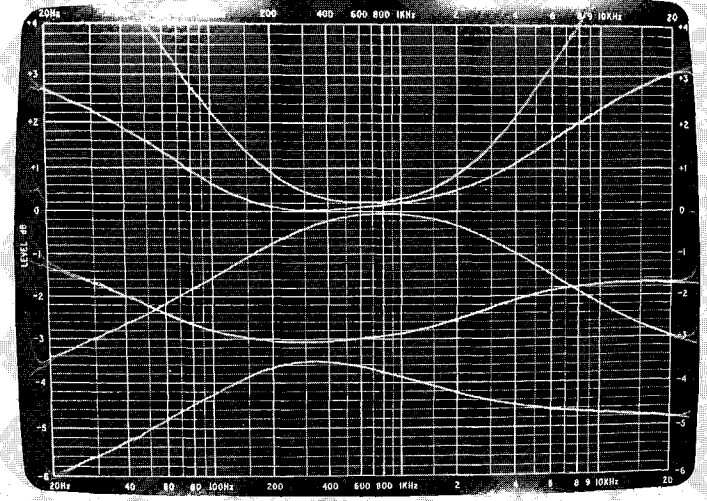


Vert Scale dB



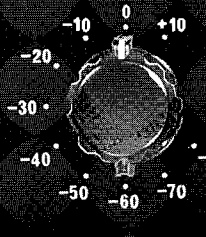
Direct Display

With RA200/ADS1 you have a continuous curve, continuously up-dated. No chance of missing a sharp spike at some point; no internal filters or integrators to distort the response pattern. Whether the signal source is the built-in sweep oscillator, or a gliding-tone test tape or disc, you simply read off dBs from the vertical scale and frequency from the logarithmic horizontal scale.

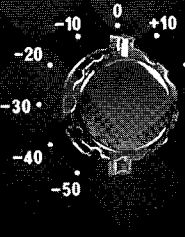


Unretouched photograph

Output Level dB



Input Level dB



0dB=775mV

Fine



Cal +14dB

Uncalibrated



Fine



Cal +10dB

Output



Ext Freq



Input

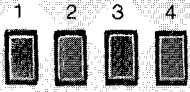


1MΩ 30pF

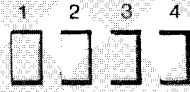
Curve Storage

The ADS1 section of the equipment is a solid-state digital store. It will record up to four complete curves and retain the information - with the RA200 switched off - while you take two weeks' holiday. The plot continues...

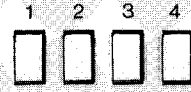
Anything that can be displayed can be stored - at the touch of a button. The contents of any store can be updated at any time, wholly or only in selected parts of the spectrum, without interrupting the display. Also, because readout from the stores is very much faster than the scan speed needed to establish some low-frequency response curves, you obtain a continuous overall picture of such curves.



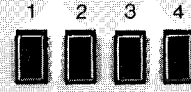
Load Store



Clear Store



Display



Display

Difference

Error



Load Scale
Inv. Store x0.5

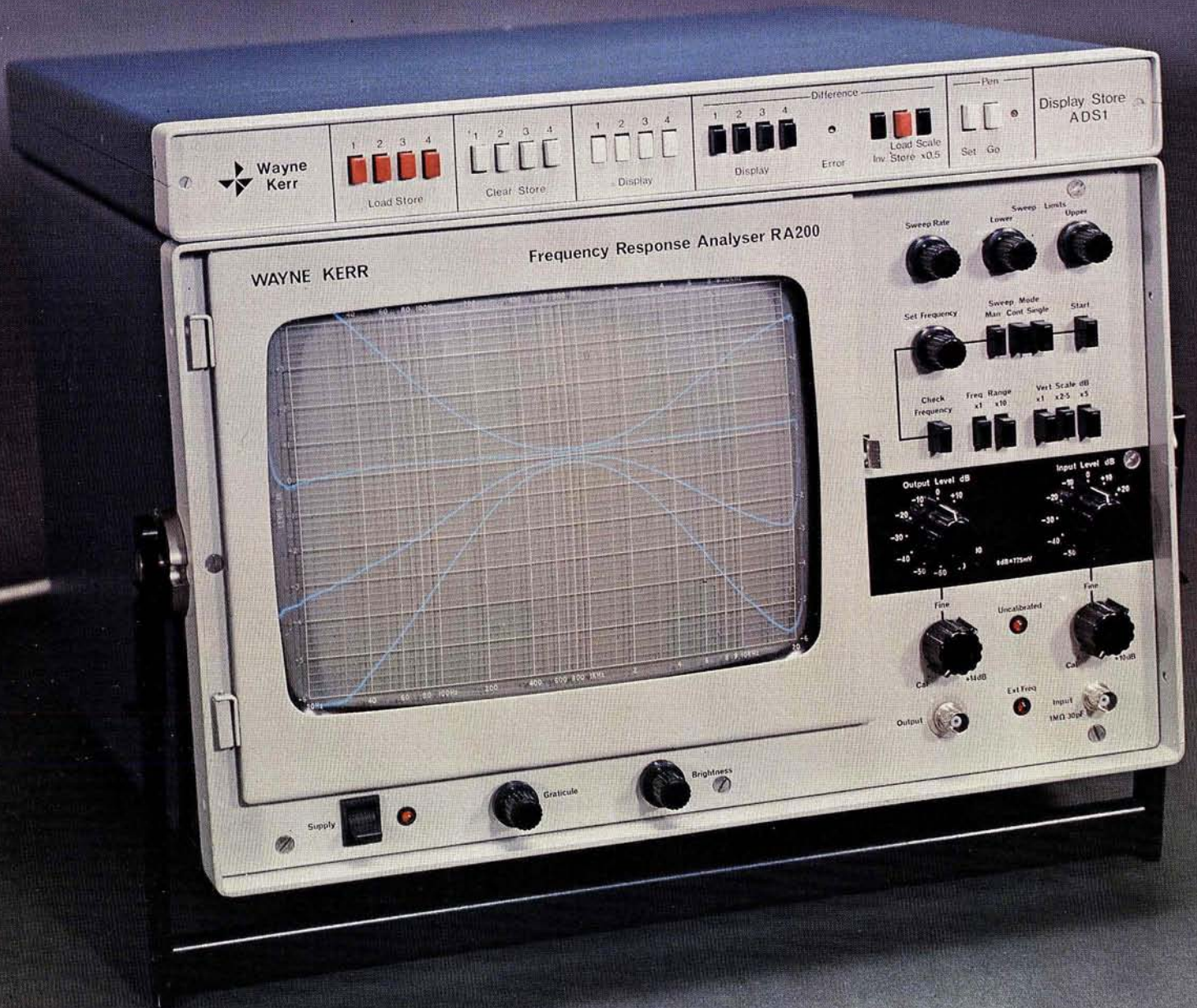
Pen



Set Go

Curve Comparisons

RA200/ADS1 will display any or all of the four curves stored. In addition, you can select any two stores and display their difference (with sign-reversal available). Using one store to provide a reference curve, and putting a particular test result into a second store, the display of their difference gives immediate and precise information on how they compare, shown as deviations from a straight line. If required, the difference plot can be amplified and stored - each at the touch of a button.



Wayne
Kerr

1 2 3 4
Load Store

1 2 3 4
Clear Store

1 2 3 4
Display

1 2 3 4
Display

Difference

Error

Load Scale
Inv Store x0.5

Pen

Set Go

Display Store
ADS1

WAYNE KERR

Frequency Response Analyser RA200

Sweep Rate

Lower

Upper

Set Frequency

Sweep Mode

Start

Check Frequency

Freq Range

Vet Scale dB

Output Level dB

Input Level dB

Fine

Uncalibrated

Fine

Output

Ext Freq

Input

Supply

Graticule

Brightness

The equipment in brief.....

Frequency Response Analyser Display Store ADS1

This unit has two electrically separate sections: an audio-frequency sweep oscillator, and a detector system with frequency-measuring circuits and a calibrated display.

The oscillator provides a low-distortion sinusoidal output, adjustable from 80 microvolts to 12 volts, which can be swept through any desired band of frequencies between 20Hz and 30kHz or between 200Hz and 200kHz. The sweep is exponential, at a rate which can be varied continuously over a wide range, and can be initiated by push-button or remotely.

The detector has a maximum sensitivity of -80dB (relative to 775mV) and a calibrated input attenuator. It measures the audio signal from the item under test and produces a direct-reading plot of amplitude against frequency. No sync signals are needed because the horizontal position of the spot, *at all times*, is determined only by the frequency of the incoming signal.

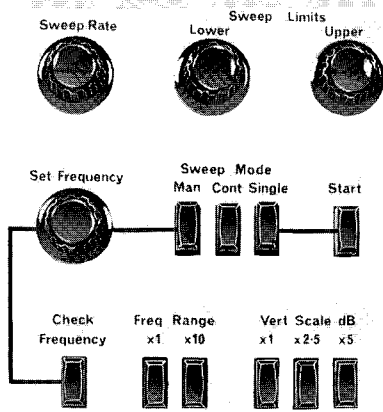
This unit is powered by the RA200 and incorporates rechargeable batteries which automatically maintain supplies to the four stores, giving hold-up of data even when the RA200 is unused for several days. The ADS1 records and reproduces complete traces by storing corresponding X and Y values for all parts of the display. These figures are monitored every 40 microseconds, giving a continuous curve including all fine detail. Readout from the stores is at 100 scans per second, with the original absolute values of level and frequency fully preserved.

The RA200 and ADS1, first in a new family of high-speed audio test instruments, combine Wayne Kerr's established skills in the science of measurement with the latest circuit technology. The result is dependable equipment which is at once accurate and easy to use.

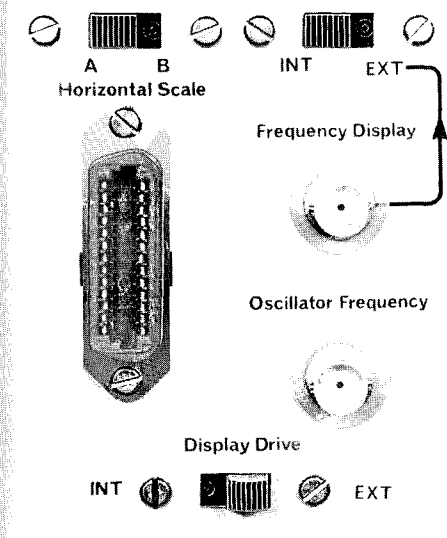
Versatility of the RA200

Frequency control options

The sweep oscillator of the RA200 can be set for either single shot operation or a continuously-repeated sweep. Upper and lower frequency limits can be set independently, and the sweep rate adjusted between 0.1 and 1 decade/second. These facilities allow particular sections of a response curve to be selected for an expanded display. Alternatively, manual tuning can be adopted for detailed examination of steep-slope response curves, with fine tuning provided by a multi-turn control.



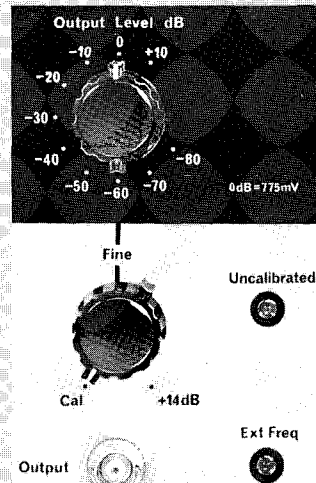
Further flexibility is provided by dual-purpose connections at the rear of the Analyser. Not only can the sweep be initiated by closure of external contacts, but the RA200 oscillator can be placed under external voltage control of spot frequency, sweep limits and sweep rate.



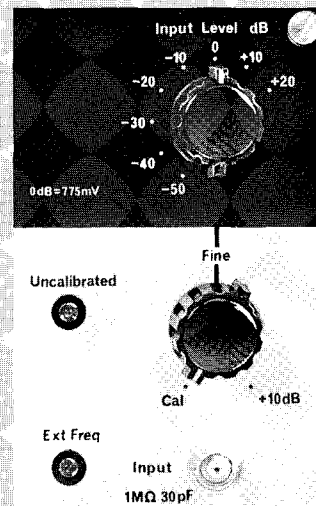
The second function of the rear connections is to provide for external monitoring of the RA200 oscillator control voltages. It is important to realise that these connections constitute an analog interface for controlling ancillary equipments, such as printers and waveform analysers.

Finally, a separate square-wave output is available for frequency monitoring. Isolation is provided by an optical coupling system, making the output suitable for direct connection to any type of counter.

Precise level control



Source impedance of the oscillator is 50 ohms and the level can be set accurately between -80dB and $+24\text{dB}$ relative to 775mV (ie approx. $80\mu\text{V}$ to 12V rms). The output is floating, obviating any earth loop problems.



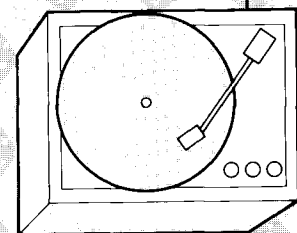
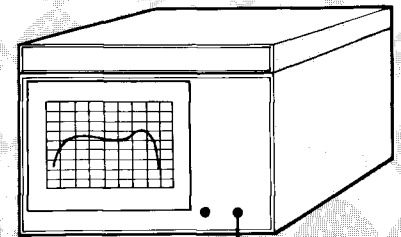
Wide-range input facilities

The detector input impedance is 1 megohm $+30\text{pF}$, which permits the use of standard $\times 10$ oscilloscope probes. An input attenuator, with switched and continuously-variable controls, covers the range -50 to $+38\text{dB}$ (ref. 775mV). To this can be added the range of the display which can be switched to provide a coverage of 10, 25 or 50dB. On the 10dB display scale, resolution is better than 0.1dB . Overall input level range is from -80dB to $+48\text{dB}$.

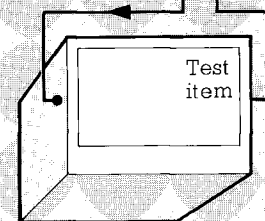
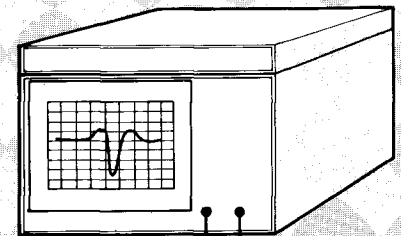
Large, clear display

Response curves are presented on a long-persistence cathode-ray tube of 27 cm diameter. Interchangeable graticules are supplied for 3 or 1 decades: the equipment has switch-selection of horizontal and vertical sensitivities to suit these and full provision for covering non-standard frequency sweeps and alternative level ranges. The edge lighting is adjustable and a hinged door means graticule change-over takes only a few seconds.

Automatic control of spot brightness ensures that trace clarity is maintained at times of high writing speeds: it also gives total protection against possibility of damage to the phosphor when the spot is stationary.



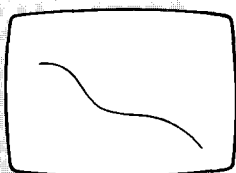
Immediate, calibrated response curve from test record or tape



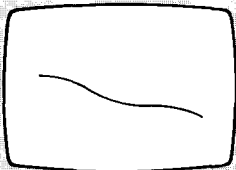
RA200 measures & analyses:

- Active or passive networks
- Attenuators or amplifiers
- Wide-band or tuned devices
- Transducers or lines

Response required
can be stored
as a reference



Test response
examined



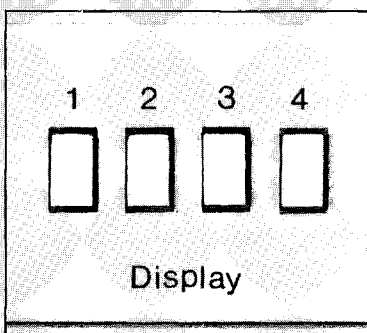
Their difference
computed,
displayed
& stored



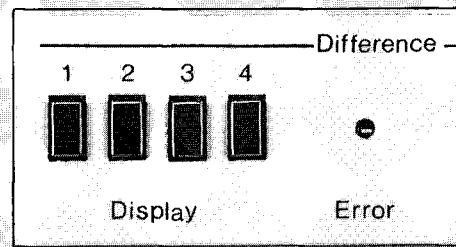
The difference
amplified,
displayed
& stored



Features of the ADS1

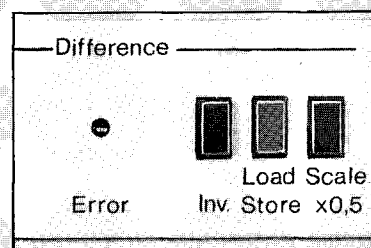
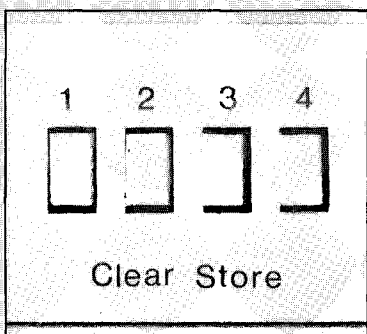


the application of max./min. limits and it makes available, in the most useful form, information on the variations of performance from unit to unit.



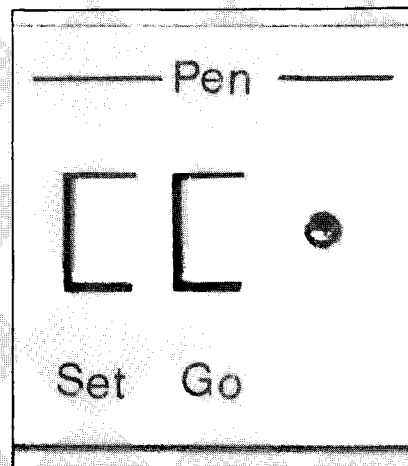
Data protection

To minimise the possibility of accidental or unauthorised cancellation of stored information, the designers have arranged that a store is cleared -

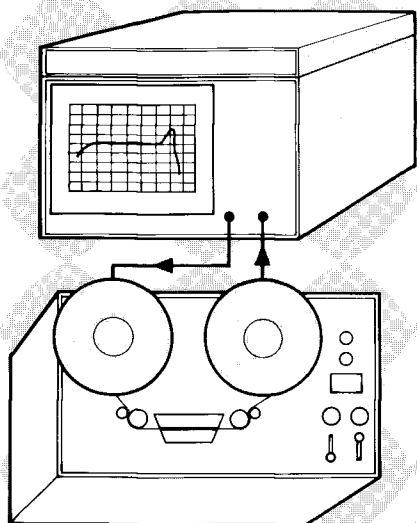


The RA200/ADS1 is of outstanding value in setting up *multi-track tape recorders*. Not only does it speed the adjustments to interdependent circuits (eg bias and equalisation) but, using the storage facilities, it gives an accurate means for quickly establishing equality of gain and frequency response on *all* channels.

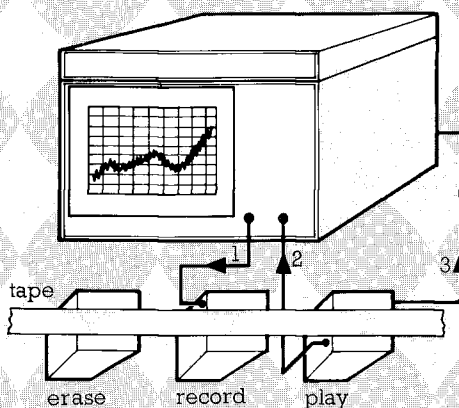
Permanent records



Where circumstances demand the availability of a hard copy, the RA200/ADS1 provides the ideal input to any type of X-Y plotter. Provision is made for direct plotting of any curves, whether in real time or from the stores. In the latter instance, the normal display rate of 100 scans/second is replaced by a readout at either 5 or 40 seconds per trace (to suit the pen recorder in use).



Record-play time lag no problem:
display locks to incoming frequency

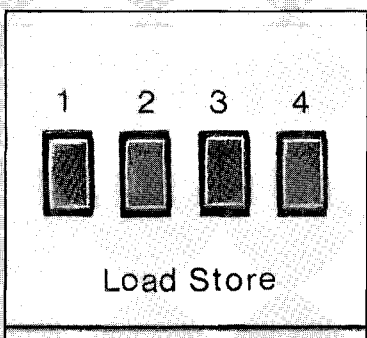


Measuring cross-talk

- 1 Record upper channel
- 2 Feed noisy signal from lower channel to vertical display
- 3 Clean signal gives stable horizontal scan

instantly - only when *two* specific buttons are pressed at one time. When the RA200 is switched off, stored information in the ADS1 is automatically held, using internal rechargeable batteries.

Faster curve-setting



Setting-up a particular response characteristic from the circuit under test is a very much quicker and easier task when the difference facilities of the stores are used. These enable you to adjust the circuit to match a reference curve simply by observing departures from a straight-line plot of their difference. Working to a linear result has two further advantages. It simplifies

Specifications

Frequency Response Analyser RA200

Oscillator

Maximum Frequency Range :
20Hz-30kHz and 200Hz-200kHz

Automatic Sweep Range :
Upper and lower limits independently
adjustable over full range

Continuous Sweep Mode :
Approximately exponential sweep, speed
adjustable from approximately 0.1 to 1
decade/sec. Remains constant when sweep
limits are altered

Single Sweep Mode :
Single upward or downward frequency
sweep between selected limits when START
button operated or external contacts closed

**Output Level
(open circuit, relative to 775mV) :**
Total range -80dB to +24dB (80 μ V to
12V rms)
Attenuator -80dB to +10dB in 10dB steps
Fine Level range: 0(CAL) to +14dB
continuously variable
Level Accuracy in CAL position: ± 0.2 dB
Attenuator accuracy (rel. to 0dB position):
 ± 0.2 dB

Output Impedance :
50 ohms $\pm 2\%$ in all positions

Distortion :
Total harmonic products
20Hz-20kHz < 0.25%
20kHz-100kHz < 1.0%
100kHz-200kHz < 2.0%

Monitor Output :
Square wave amplitude 1V p-p nominal,
source impedance < 1k Ω

Detector

Frequency Range :
 $\times 1$: 20Hz-30kHz total, 20kHz maximum with
standard graticule
 $\times 10$: 200Hz-200kHz

Frequency Accuracy :
With 3 decade graticule, steady frequency:
 $\pm 4\% \pm 1$ Hz
With 1 decade graticule, steady frequency:
 $\pm 2\% \pm 1$ Hz

Horizontal Response Speed :
With swept frequency, indication updates
every cycle of input signal on $\times 1$ range and
every 10 cycles on $\times 10$ range

Input Impedance :
1M Ω $\pm 2\%$ shunted by 30pF nominal

Input Level (ref. to 775mV) :
Total range: -80dB to +48dB
($\times 5$ position, minor division = 1dB)
-65dB to +40dB
($\times 2.5$ position, minor division = 0.5dB)
-56dB to +34dB
($\times 1$ position, minor division = 0.2dB)
Attenuator: -50dB to +20dB in 10dB steps
Fine Level range: 0(CAL) to +10dB,
continuously variable
Display range:
 $\times 1$ position -6dB to +4dB
 $\times 2.5$ position -15dB to +10dB
 $\times 5$ position -30dB to +20dB
Attenuator accuracy (rel. to 0dB position):
 ± 0.2 dB
Level accuracy in CAL position, 0dB on
screen: ± 1 minor division
Display accuracy (relative to 0dB line):
 ± 1 minor division

Maximum Input Level :
200V ac or dc all ranges

Rectifier Law :
Average reading rectifier calibrated in
terms of rms value of sinusoidal input

Frequency Response :
Rel to 600Hz: 20Hz-50kHz ± 1 minor division
Rel to 600Hz: 50kHz-200kHz ± 2 minor
divisions

Vertical Response Speed :
With steady change of level, using
appropriate vertical range, error does not
normally exceed 0.2dB at 20dB/sec or 1dB at
60dB/sec

External Frequency Input :
Minimum level 100mV
Input impedance 100k Ω nominal

External Control :
Rear connections to dual-purpose lines
allow external monitoring or control of both
sections: for the oscillator the functions are
spot frequency, sweep limits, sweep rate
and single-scan triggering. For the detector,
the functions are X deflection, Y deflection
and brightness modulation

Cathode-ray Tube
27cm (11 in) diameter
Long persistence phosphor

Operating Temperature :
5 $^{\circ}$ to 40 $^{\circ}$ C ambient

Power Supply :
115/230V $\pm 10\%$, 50/60Hz

Dimensions (overall) :
Width 466mm (18.4 in)
Height (flat) 275mm (10.8 in)
Height (tilted) 350mm (13 in)
Depth 395mm (15.6 in) (excluding handle)
Packaged Size: 560 \times 500 \times 460mm
(22 \times 19.7 \times 18 in)
Adaptor plates available for rack mounting

Weight :
16kg (35 lb)
Packaged Weight: 23kg (51 lb)

Display Store ADSI

Number of stores : four

Load Store facility :
Trace information can be loaded to any or
all of the 4 stores

Sampling Rate : 1m. sec*

Vertical Scale :
512 bits symmetrically arranged about
0dB on 3-decade graticule

Horizontal Scale :
256 bits symmetrically arranged about
600Hz on 3-decade graticule

Converter Accuracy : $\pm \frac{1}{2}$ LSB

Converter Linearity : $\pm \frac{1}{2}$ LSB

Analog Errors : $\pm 0.1\%$ of FSD

Display facility :
Contents of any or all of the 4 stores can be
selected for display

Readout Rate : 100 scans/sec

Converter Accuracy : $\pm \frac{1}{2}$ LSB

Converter Linearity : $\pm \frac{1}{2}$ LSB

Analog Errors : $\pm 0.1\%$ of FSD

Clear Store facility :
Operates on selected store only when
appropriate Clear and Display buttons are
both pressed, giving security of information

Difference facility :
Continuous computation of numerical
difference between selected stores;
 $\times 2$ amplification of difference;
Storage of difference;
Push-button inversion, ie from (A-B) to (B-A)

Pen output :
Nominal 1V/decade at low impedance
Stored information to recorder at 5* sec/
trace or 40* sec/trace

Store protection : see Clear Store facility

Power supplies :
Normally powered from RA200 with
automatic change-over to rechargeable
batteries when RA200 not in use. Each hour
of RA200 use gives 5* hours of battery
operation; fully charged batteries give
more than 16* days hold-up of stored data.

Dimensions (overall) :
Width 420mm (16.6 in)
Depth 395mm (15.6 in) as RA200
Height 45mm (1.8 in)
Adaptor plates available for rack mounting

Weight (inc batteries) : 3.5kg (7.7 lb)

*Typical figure

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