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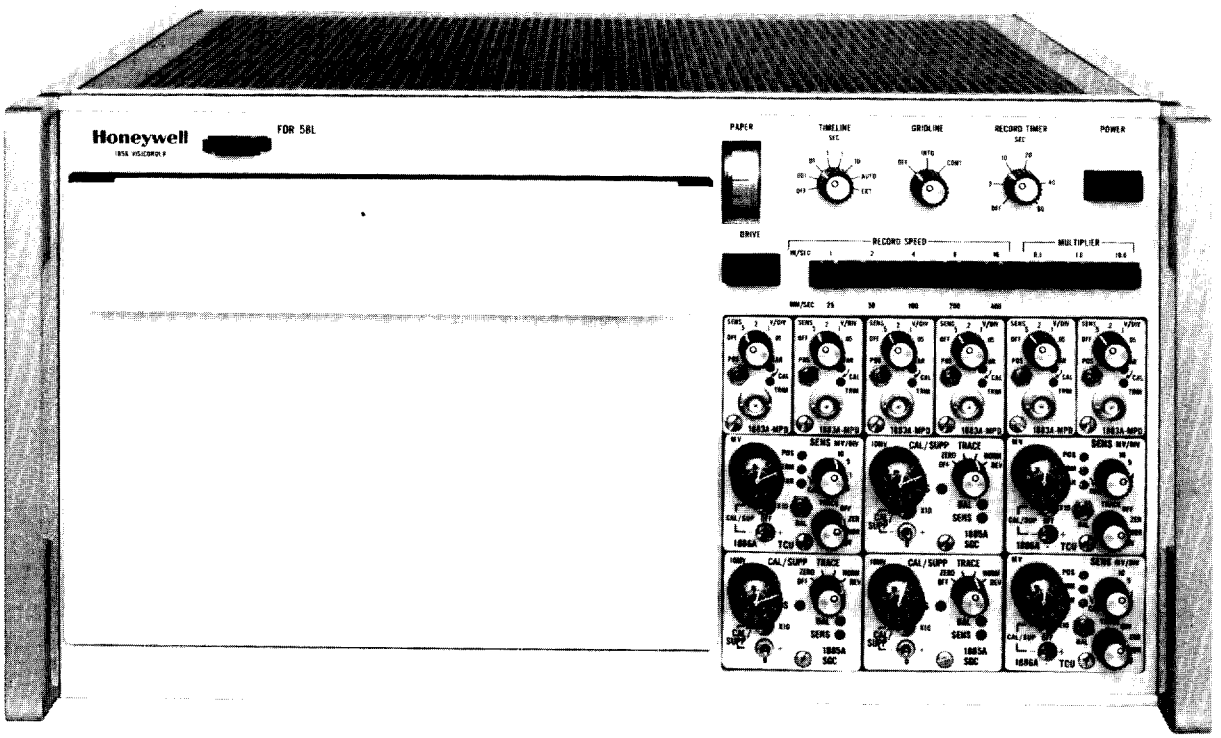
Honeywell

Oscillographic Recorders

VISICORDER MODEL 1858

PRODUCT INFORMATION

Fiber-optic CRT recorder complete with self-contained signal conditioning...a compact 18 channel Graphic Data Acquisition System. Expandable to 32 channels.



Underwriters Laboratories Listed

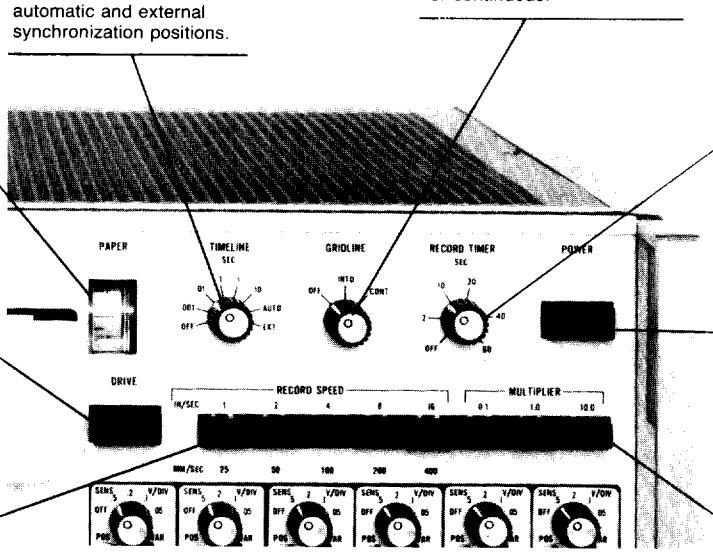
Outstanding Features

- 18 channel system in single 8¾ inch (22.3 cm) high package
- 32 channel system in a 14 inch (35.6 cm) high package
- Front panel plug-in signal conditioning modules
- Inertialess recording—no moving elements, no styli
- DC to greater than 5 kHz response at up to 7.2 inch (18.3 cm) trace amplitude
- 100 μV-300V input sensitivity, to 300V common mode
- No trace overshoot
- Sharp static traces without high frequency "wipe-out"
- Direct writing, 8 inch (20 cm) record width, 200 ft (61 m) record length
- 5-interval timing system with accentuated tenth line and 0.1% accuracy
- Time-interval marker
- Auto-linearized for increased data accuracy
- Numbered trace identification
- Wide-range, dc servo drive system
- 0.1 to 120 inch/sec (2.5 to 3000 mm/sec) record speeds
- 42 discrete record speeds via binary addition push buttons
- Remote drive and speed control
- Internal record takeup
- Automatic record-length control
- 120/240V, 50-400 Hz power, switch selectable
- Lightweight, low power consumption
- Rack or table mounting
- Wide selection of signal-conditioning modules available
- Easy to use as an oscilloscope—just add signal input connections

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Controls and Indicators



TIMELINE (optional)
Eight position rotary switch selects timeline intervals of 0.001, 0.01, .01, 1 and 10 sec, plus off, automatic and external synchronization positions.

GRIDLINE
Three position rotary switch allows selection of gridlines off, interrupted, or continuous.

PAPER
Indicator shows approximate amount of recording paper remaining.

RECORD TIMER
Rotary control selects manual or automatic record length (time); automatic is 1 to 60 sec.

DRIVE
Latching pushbutton switch energizes servo record drive system. Unblanks CRT for recording; glows green when on.

POWER
Pushbutton switch turns power on for standby; glows red when on.

RECORD SPEED
Five additive pushbutton switches select 1, 2, 4, 8 or 16 inch/sec (25, 50, 100, 200, 400 mm/sec) in steps of 1 inch (25 mm) per sec.

MULTIPLIER
Three pushbutton switches multiply the selected record speed by 0.1, 1.0 or 10.0 (120 inch/sec) (3000 mm/sec) max.

CONTROLS ON REAR PANEL

LINE VOLTAGE
Slide switch adapts system to 120 or 240V, 50-400 Hz power.

REMOTE DRIVE
Toggle switch selects local or remote record drive.

Specifications

General

Recording System . . . . . Single fiber-optic, cathode-ray tube in direct contact with direct-print photographic paper produces all data traces, timelines, gridlines and trace identification recordings. Single 8¾ inch (22.3 cm) high cabinet houses paper supply, paper takeup, drive system, fiber-optic cathode-ray tube, power supplies and all associated electronics, as well as openings for signal conditioning modules for up to 18 data channels.

Recording Medium . . . . . Direct print photographic oscillograph recording paper, spec 2 [spooled emulsion side out on 1⅛ inch (28.6 mm) ID core].

Record Width . . . . . 8 inch (200 mm)

Record Capacity . . . . . 3¼ inch (82.6 mm) max roll diameter; 100 ft (30 m) standard base, 200 ft (61 m) extra thin base.

Recording Channels . . . . . 18 max single-width modules, 9 max dual-width modules, or combinations.

Operating Specifications

(All specifications apply after 30 minute warmup.)

Power Required:

Voltage . . . . . 107/127V, 50-400 Hz or 214/254V, 50-400 Hz by rear switch selection. Transformer taps permit operation down to 100 or 200V, 50-400 Hz.

Wattage . . . . . 100-350, depending on options, paper speed and number of channels installed. See table on page 9 for typical values.

Frequency Response . . . . . DC-5 kHz sinewave. Will reproduce square waves that have a duration of >25 μsec except as otherwise limited by signal conditioning module selected.

Input Data Sampling Rate . . . . . Approximately 50 kHz (sweep time 15 μsec; flyback time 5 μsec).

Accuracy
Linearity
Sensitivity
Drift
Noise
Common Mode Voltage
Common Mode Rejection
Overload Recovery
Filtering
Crosstalk
. . . . . See signal-conditioning module specification sheets

Trace Dimensions . . . . . Max 0.015 inch (0.38 mm) dynamic, 0.020 inch (0.5 mm) static (plus applicable signal conditioning noise spec).

Trace Amplitude . . . . . Max 7.2 inch (18.3 cm) pk-pk or single deflection throughout dc-5 kHz frequency range.

Trace Positioning . . . . . Controls on signal conditioning modules permit electrical positioning of any channel at any point across the record.

Trace Off . . . . . Switch on signal conditioning modules permits any channel to be turned off the record. When turned on, trace restores to previously established base position.

Phosphor Burn Protection . . . . . Area of horizontal sweep is continuously moved up and down CRT face while both gridlines and data are continuously moved horizontally approximately 0.18 inch (4.5 mm) to maximize phosphor life. Vertical period is approximately 450 sec, horizontal period is approximately 2000 sec. Beam is blanked while drive switch is off. Operator does not have access to intensity or sweep rate controls.

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Tube Life (rated) . . . . . CRT gun, 5000 hr (power-on); phosphor, 2500 hr (drive switch on).

Recording Intensity Control . . . . . Internal control for initial setting and periodic maintenance. No change of intensity required over full writing or paper speed range. Automatic intensity reduction at paper speeds < 1 inch/sec (< 25 mm/sec).

Gridlines

Selection . . . . . Front panel control allows gridlines (amplitude reference) to be turned off, on intermittently or on continuously. Intermittent lines appear for approximately 1/16 inch (1.6 mm) adjacent and perpendicular to each timeline.

Spacing . . . . . Five patterns, controlled by switches located on the gridline printed circuit card assembly permit selection of one of the following:

0.2 inch (5 mm), each fifth line (25 mm) accentuated
0.1 inch (2.5 mm), each fifth line (12.5 mm) accentuated
0.1 inch (2.5 mm), each tenth line (25 mm) accentuated
2 mm (0.08 inch), each fifth line (0.4 inch) accentuated
Eight 20 mm (0.8 inch) zones separated by 4 mm (0.16 inch) spacing between zones.

Gridline spacing may vary slightly to compensate for nonlinearity of the CRT.

Accuracy . . . . . Within ±0.5% full scale relative to data. Gridlines vary in spacing to compensate for nonlinearity of CRT. Combined accuracy of gridlines and data traces, relative to each other, will be within the accuracy and linearity specifications of that listed for the signal conditioning module used.

Temperature Coefficient of Spacing . . . . . < ±0.075% /°C

Line Width . . . . . Minor lines 0.010 inch (0.25 mm) max; accentuated lines 0.020 inch (0.5 mm) max.

Record Drive System

Type . . . . . Wide range dc servo with 1200:1 speed range. No gears or clutches.

Speed Selection . . . . . Five front panel pushbutton speed selector switches of 1, 2, 4, 8, 16 inch/sec (25, 50, 100, 200, 400 mm/sec) plus three multiplier pushbutton switches of X0.1, X1, X10 give 42 discrete speed steps. Speeds of 1, 2, 4, 8 inch/sec (25, 50, 100, 200 mm/sec) may be engaged in combination, producing binary additive speeds of:

X0.1 range: 0.1-1.6 inch/sec in 0.1 inch/sec steps (2.5-40 mm/sec in 2.5 mm/sec steps)
X1 range: 1-16 inch/sec in 1 inch/sec steps (25-400 mm/sec in 25 mm/sec steps)
X10 range: 10-120 inch/sec in 10 inch/sec steps (250-3000 mm/sec in 250 mm/sec steps)

Remote Drive Control . . . . . Rear panel BNC connector and Local/Remote switch. Switch locks out actuation by other than selected mode. TTL compatible or actuation by single-pole, single-throw switch closure. Must sink 1.6 mA.

Remote Speed Control . . . . . By releasing front panel speed multipliers and providing an externally supplied voltage of +0.008 to +10.0V, speed may be varied from 0.1 through 120 inch/sec (2.5-3000 mm/sec). Input impedance is 2 kΩ ±1%. Polarity positive with respect to ground.

Acceleration Time . . . . . To 80 inch/sec (2000 mm/sec) < 250 msec; to 120 inch/sec (3000 mm/sec) < 500 msec.

Speed Markings . . . . . Front panel marked in inch/sec and mm/sec.

Recording Periods (continuous) . . . . . 200 ft (61 m) roll: 6.6 hr at 0.1 inch/sec (2.5 mm/sec), 20 sec at 120 inch/sec (3000 mm/sec). 100 ft (30 m) roll: 3.3 hr at 0.1 inch/sec (2.5 mm/sec); 10 sec at 120 inch/sec (3000 mm/sec).

Accuracy . . . . . ±5% with 1, 2, 4, 8 or 16 inch/sec (25, 50, 100, 200, 400 mm/sec) speed selector pushbuttons engaged; ±7% with additive speed selected, over full voltage and environmental range. Typically ±3% at nominal voltage and environment.

Auto Record Length Control . . . . . Front panel control selects from 1 to 60 sec drive time. Automatic control can be manually overridden by releasing drive switch. The cycle will be restarted when drive switch is reactuated.

Record Takeup (Option) . . . . . Internal. Will take up and spool full capacity of supply roll at all drive speeds, either on continuous or interrupted basis, over full environmental range. Records can be made with or without takeup as desired.

Timing System (option)

Timeline Intervals . . . . . Timelines recorded across min of 7.2 inch (18.3 cm) of record width each 0.001, 0.01, 0.1, 1 and 10 sec with each tenth line accentuated.

Selection . . . . . Front panel rotary switch permits manual or automatic selection, external synchronization and off.

Accuracy . . . . . Within ±0.1% ±10 μsec over full environmental range.

Timeline Width . . . . . Minor: 0.010 inch (0.25 mm) max; accentuated: 0.025 inch (0.6 mm) max.

Time Interval Marker . . . . . Coded marking perpendicular to each accentuated tenth timeline gives indication of timing interval selected, either manually or automatically. Disabled when timeline selector switch is in the "external" position.

Coding is:

no mark	= 0.001 sec
1 mark	= 0.01 sec
2 marks	= 0.1 sec
3 marks	= 1 sec
4 marks	= 10 sec

Automatic Time Interval . . . . . With the timeline interval switch in the automatic position, the timeline interval is automatically established with front panel record travel speed selection:

0.1-0.7 inch/sec (2.5-17.8 mm/sec)	= 1 sec timing
0.8-7 inch/sec (20.3-178 mm/sec)	= 0.1 sec timing
8-70 inch/sec (203-1780 mm/sec)	= 0.01 sec timing
80-120 inch/sec (2030-3048 mm/sec)	= 0.001 sec timing

External Timeline Synchronization:

Max Repetition Rate 1000/sec

Input Requirements . . . . . DTL/TTL/CTL/RTL compatible or contact closure through rear panel BNC connector. Source must be able to sink 3 mA. Timeline is triggered on negative-going transition from +2.4 to −0.4V. Signal must remain lower than +.04V for >100 nsec.

Max Safe Input Voltage . . . . . DC + ac peak ±60 V; 20V rms

Accuracy . . . . . Timeline will lag external signal by no more than 20 μsec.

Trace Identification (option)

Trace Marking . . . . . Each channel installed is identified in sequence by two dash lines placed adjacent to the trace, perpendicular to record travel. Total length of the two dashes with a space in the middle is approximately 0.25 inch (6.25 mm) and within 0.065 inch (1.6 mm) of the trace.

Trace Numbering . . . . . The channel number of each marked trace is placed on the righthand edge of the record in time registration with the trace marker. Characters are 7 bar system presentation having dimensions of approximately 0.125 inch (3.1 mm) high and 0.075 inch (2 mm) wide. Gridlines and timelines are inhibited within 0.065 inch (1.6 mm) of trace number.

Identifier Sequence Spacing . . . . . Each 0.5 ±0.1 inch (12.5 ±2.5 mm) for each succeeding trace. Vacant signal-conditioning channels are not identified. When double-width modules are installed, only the lower of the two channel numbers is identified.

Environmental

Temperature:

Operating . . . . . 0 to +50°C) (32 to 122°F)
Nonoperating . . . . . −55 to +60°C (−67 to 140° F)
Rate of Change . . . . . 10°C (18°F) per minute max.

Humidity:

Operating . . . . . 5-95% relative, noncondensing (except as otherwise stated in signal conditioning module specifications).
Nonoperating . . . . . 5-95% relative, noncondensing

Altitude:

Operating . . . . . to 10,000 ft (3048 m)
Nonoperating . . . . . to 50,000 ft (15,240 m)

Vibration:

Operating . . . . . Designed and tested to requirements of MIL-T-21200G, para. 3.2.19.4 (except 5-15 Hz, 0.06 inch (1.5 mm) pk-pk; 15-25 Hz, 0.04 inch (1 mm) pk-pk; 25-55 Hz, 0.0032 inch 0.08 mm) pk-pk.

Nonoperating . . . . . Designed and tested to meet requirements for transportation and packaged shipping.

Shock . . . . . Designed and tested to meet requirements for normal bench handling, transportation and packaged shipping.

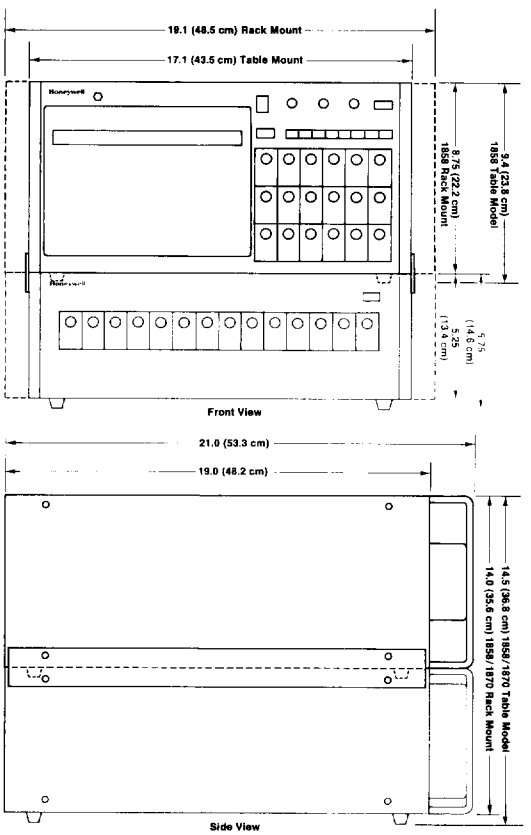
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Packaging

Size (Model 1858):

Table Model . . . . . 9.4 inch (23.8 cm) high x 17.1 inch (43.5 cm) wide x 21 inch (53.3 cm) deep.

Rack Mount . . . . . 8.75 inch (22.2 cm) high x 19.1 inch (48.5 cm) wide x 21 inch (53.3 cm) deep.



Size (Model 1858 with 1870 Housing):

Table Model . . . . . 14.5 inch (36.8 cm) high x 17.1 inch (43.5 cm) wide x 21 inch (53.3 cm) deep.

Rack Mount . . . . . 14 inch (35.5 cm) high x 19.1 inch (48.5 cm) wide x 21 inch (53.3 cm) deep.

Weight:

Model 1858 . . . . . Less signal conditioning modules or accessories, 65 lb (29.5 kg).

Model 1858/1870 . . . . . Less signal conditioning modules or accessories, 95 lb (43 kg).

Signal Conditioning Modules:

Single Width . . . . . 5 oz. (141.7 gm) [1883A-MPD, 1884-IFM].

Dual Width . . . . . 10 oz. (283.5 gm) [1881-HGD, 1882-LGD, 1885A-SGC, 1886A-TCU, 1887B-TCD, 1889A/B-FVC, 1890-RLL].

Power Requirements

Table of Typical Power Requirements* (120V, 60 Hz Reference)

Paper Drive inch/sec	Spill-out Mode (rms watt, no signal conditioning modules installed)	Take-up Mode (rms watt, no signal conditioning modules installed)
Off	91	91
0.1	104	110
1	110	120
10	123	135
50	164	197
80	188	230
120	248	306

Signal Conditioning Modules*

Type	Watt (rms)	Type	Watt (rms)	Type	Watt (rms)
1881	2.8	1884	1.2	1887	2.8
1882	2.9	1885A	2.8	1889A/B	2.0
1883A	1.3	1886A	2.0	1890	3.2

*Notes:

1. Peak currents typically 2-3 times the rms value, due to peak rectifiers used in system.
2. Peak "power-on" surge current, first cycle, is approximately 14A; steady state reached in approximately 180 msec.
3. At line frequencies of 50 and 400 Hz, wattage approximately 5% greater than above figures.
4. 1890 power includes power necessary for CSA-4000 accessory.

Reliability

The Honeywell Model 1858 has been designed to provide the maximum in reliability and minimum maintenance. The design program included Quality Assurance design review and a mean-time between-failure (MTBF) prediction for the electrical and electronic components.

To aid the user in determining maintenance requirements, the estimated MTBF of any 1858 system configuration can be determined from the table below.

This prediction was performed using MIL-HDBK-217D failure rates (paragraph 7.0) and the K-Factors for GROUND environment. A detailed parts application review (a review to ensure that all parts are correctly applied and that parts are not overstressed by voltage, current, power or temperature) was performed.

Based on the fact that all the parts are correctly applied and are not overstressed, the prediciton was performed in accordance with MIL-HDBK-217D, para. 4.5, utilizing specific parts count on part types operating at an ambient temperature of 50°C. The stress ratios selected were those that are typical of Honeywell's derating practice.

The estimated mean time between failure assumes an exponential distribution. The failure rate allocations for the specific system elements are summarized in the table.

MTBF TABLE

Component	Number of Units (n)	Failures per 10^6 Hr (λ)	($n\lambda$)
Basic 1858 (less options & signal conditioning modules)	_____	67.20	_____
1870 Housing	_____	10.55	_____
Trace Identification Option	_____	7.69	_____
Timeline Option	_____	7.49	_____
1881-HGD Signal Conditioning Module	_____	8.54	_____
1882-LGD Signal Conditioning Module	_____	8.66	_____
1883A-MPD Signal Conditioning Module	_____	4.87	_____
1884-IFM Signal Conditioning Module	_____	2.15	_____
1885A-SGC Signal Conditioning Module	_____	6.88	_____
1886A-TCU Signal Conditioning Module	_____	7.98	_____
1887B-TCD Signal Conditioning Module	_____	8.37	_____
1889-FVC Signal Conditioning Module	_____	8.34	_____
1890-RLL Signal Conditioning Module	_____	8.71	_____

Example: Total = _____

1858 with timeline option and three 1884 modules:

MTBF (in hr) = $\frac{1}{\text{Total} \times 10^{-6}}$

1 x 67.20 = 67.20
1 x 7.49 = 7.49
3 x 2.15 = 6.45
Total = 81.14
MTBF = $1/81.14 \times 10^{-6}$
MTBF = 12,320 hr

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