

- 140-ps TDR SYSTEM RISETIME
- 90-ps SAMPLING RISETIME
- RHO AND VOLTAGE CALIBRATION
- TWO INTERNAL PULSE SOURCES

The Type 1S2 Sampling Plug-In converts any Tektronix 530, 540, or 550-Series Oscilloscope to a time-domain reflectometry measurement system. As a TDR, the Type 1S2 has a system risetime of 140 ps and is calibrated in rho (ρ) from 0.005 ρ /div to 0.5 ρ /div. The horizontal is calibrated from 1 cm/div to 100 ns/div for dielectrics of air, TFE and polyethylene. Two pulse outputs provide either 50 ps t_r , 250 mV into 50 Ω , or 1 ns, 1 V into 50 Ω .

The 90-ps risetime, 5-mV/div deflection factor, 100-ps/div speed and built-in triggering capability make the Type 1S2 useful for many other sampling measurements. A pretrigger is required.

SYSTEM PERFORMANCE AS REFLECTOMETER VERTICAL

SYSTEM RISETIME

Less than or equal to 140 ps, for the displayed reflection from a short-circuited 20-cm air line.

VERTICAL SCALE

Calibrated in ρ (rho) and volts: 0.005 ρ /div to 0.5 ρ /div or 5 mV/div to 500 mV/div in 7 calibrated steps (1-2-5 sequence), accurate within 3%. Continuous variation between steps, uncalibrated.

RESOLUTION

Reflection coefficients as small as 0.001 can be observed.

INPUT CHARACTERISTICS

Nominal 50- Ω feed-through signal channel, (termination supplied), GR874 connectors.

DC OFFSET RANGE

-1 ρ to -2 ρ (or +2 V to -2 V). Allows open-circuit reflections to be displayed at full sensitivity. Actual DC offset may be monitored at 1 ρ /V through 10 k Ω .

VERTICAL OUTPUT

1 V for each division of displayed signal through 10 k Ω .

HORIZONTAL

HORIZONTAL SCALE

Calibrated in distance and time: full-scale, 10-div display (without magnification) of 10 m, 100 m, or 1 km; 100 ns, 1 μ s, or 10 μ s. Accuracy is $\pm 3\%$ with or without magnification.

MAGNIFIER

From X100 in 7 calibrated steps (1-2-5 sequence). Continuously variable between steps. Allows display to be magnified from a fixed on-screen reference point, 1 major division from the left edge of the graticule.

UNITS/DIV READOUT

Horizontal scale factor (combination of horizontal range and magnification settings) readout, directly at front panel, indicates either distance or time/div.



DISTANCE OR TIME POSITION

Ten-turn dial directly reads one-way distance or round-trip time to test-line discontinuity. Round-trip time readings are accurate to within $\pm 1\%$. Range of 10-turn dial is the same as the full-scale, 10-div display without magnification.

JITTER

Less than or equal to 20 ps with internal pulse sources.

DIELECTRIC

Calibrated for air, tfe and polyethylene lines. Preset mode adjustable for lines with velocity of propagation from 0.6 to 1.0X velocity of light.

DISPLAY MODES

Repetitive or single sweep, manual or external scan.

HORIZONTAL OUTPUT

1 V for each division of displayed signal through 10 k Ω .

PULSE SOURCES

FAST-RISE OUTPUT

Approximately 50-ps risetime, 250 mV, 50- Ω source (reverse terminated).

LARGE-AMPLITUDE OUTPUT

Approximately 1-ns risetime, 1 V, 50- Ω source (reverse terminated).

PERFORMANCE AS SAMPLER

RISETIME

Less than or equal to 90 ps.

BANDWIDTH

Equivalent to DC-to-3.9 GHz at 3-dB down.

Reflectometer & Sampling Unit

182

DEFLECTION FACTOR

Scale is 500 mV/div in 7 calibrated steps, 1-2-5 sequence, accurate within 3%. Continuous variation between steps, zero centered.

RANDOM NOISE

Equivalent to an input signal of 2 mV or less (tangentially measured).

SIGNAL RANGE

Signals between +2V and -2V limits may be displayed at any deflection-factor setting. Safe overload is $\pm 3V$ if signal channel is coupled directly into EXT TRIG INPUT, $\pm 5V$ if not.

TRIGGERING

SOURCE: External only, AC coupled—may serve as termination for signal channel. **AMPLITUDE:** Sinewaves, 100 mV to 2V, peak-to-peak; Pulses, 50 mV to 1V either polarity. 3V max DC. **REPETITION RATE:** Sinewave triggering or synchronizing from 100 kHz through 5 GHz. Pulse triggering from 10 Hz through 5 GHz. **JITTER:** Depends on signal shape, repetition rate and amplitude; ≤ 30 ps under optimum conditions.

WEIGHTS

| | | |
|--------------------------|-----------------|-------------------|
| Net weight | 8 lb | 3.3 kg |
| Domestic shipping weight | ≈ 18 lb | ≈ 8.2 kg |
| Export-packed weight | ≈ 28 lb | ≈ 12.7 kg |

INCLUDED STANDARD ACCESSORIES

10-inch GR cable (017-0513-00); 5X attenuator (017-0079-00); 2X attenuator (017-0080-00); 50- Ω termination (017-0081-00); 20-cm air line (017-0084-00); 50- Ω termination, short circuit (017-0087-00); 5-ns, 50- Ω RG213 cable (017-0502-00); 18-inch patch cord (012-0039-00); 18-inch BNC-to-banana plug patch cord (012-0090-00); two instruction manuals (070-0889-00).

OPTIONAL ACCESSORIES

P6034 10X Probe Package, order 010-0110-00
 P6035 100X Probe Package, order 010-0111-00
 Power Divider, GR 874-TPD, order 017-0082-00
 Coupling Capacitor, GR 874-K, order 017-0028-00

This listing covers only a few of the more commonly useful items for sampling instruments. A more complete listing can be found in the accessory section of this catalog.

183

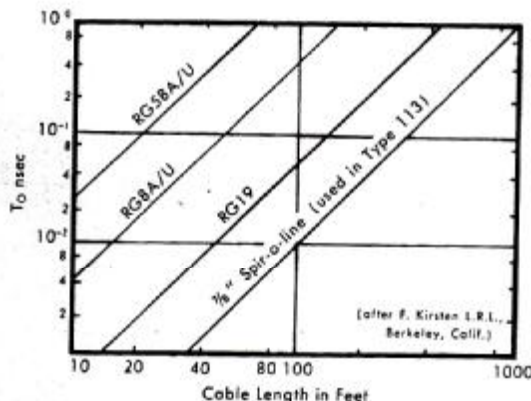
Delay Cable

113

Transmission Lines

Transmission line distortion of a step function shows up in a distinctive way. After a small transition period, the output rises fairly rapidly and then slows considerably, compared to an RC charge. An RC step requires 2.2 time constants to change from 10% to 90% of the input step. A transmission line requires 30 times the 0-to-50% risetime period to accomplish this (10% to 90%) transition.

The graph illustrates time of rise from 0-to-50% ($T_{0.5}$) of the input for various common coaxial cables. Note that the risetime deteriorates as the square of the length. Thus, it is very important to keep cable lengths (or delays) to a minimum. The Type 113 uses about 50 feet of $\frac{7}{8}$ -inch diameter cable, resulting in a 10% to 90% risetime of better than 0.1 nanosecond.



The Tektronix Type 113 Delay Cable has a delay of 60 ns and a characteristic impedance of 50 Ω . In general it is used in those sampling applications where the vertical amplifier does not contain internal delay lines and the triggering of the sweep is external and signal delay is required.

CHARACTERISTIC IMPEDANCE

50 $\Omega \pm 1\%$.

HIGH QUALITY CABLE

Approximately 1.5-dB loss per 100 feet at 1000 MHz. Risetime approximately 0.1 ns.

DIMENSIONS AND WEIGHTS

| | | |
|--------------------------|---------------------|-------------------|
| Height | 22 $\frac{7}{8}$ in | 57.1 cm |
| Width | 8 $\frac{5}{8}$ in | 21.9 cm |
| Depth | 21 $\frac{7}{8}$ in | 55.5 cm |
| Net weight | 44 $\frac{3}{4}$ lb | 20.3 kg |
| Domestic shipping weight | ≈ 60 lb | ≈ 27.3 kg |
| Export-packed weight | ≈ 75 lb | ≈ 34.1 kg |

Please refer to Terms and Shipment, General Information page.