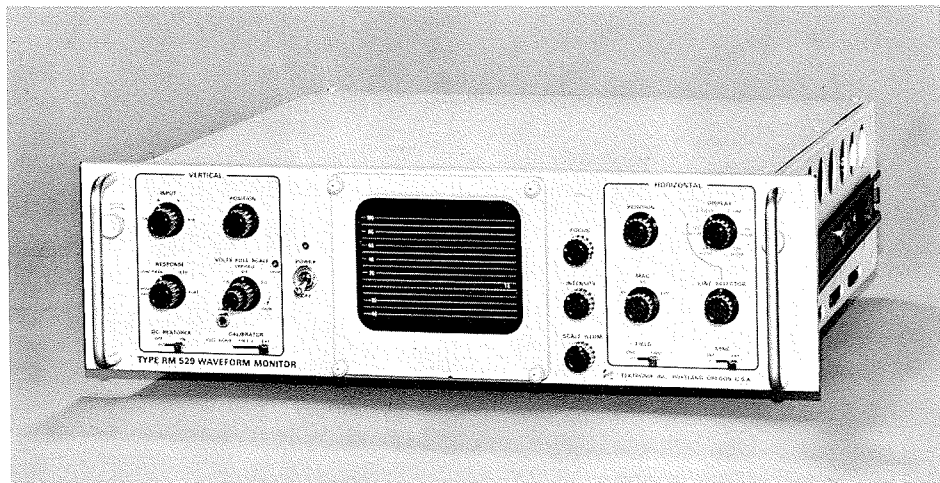


A NEW TELEVISION WAVEFORM MONITOR THE TEKTRONIX TYPE RM529

The Tektronix Type RM529 is a new television waveform monitor with capabilities for precise measurement of Vertical Interval Test Signals (VIT).

VIT signals have been in use in Europe and Canada for the past ten years. Their use on the North American continent was pioneered by the Canadian Broadcasting Corporation. The United States government authorized the use of VIT signals in that country as far back as 1956. They have, however, only recently come into common use there.

The Type RM529 is designed for use with the 525/50 line scanning rate used in the United States and here in Canada. This instrument can be obtained (on special order) with minor modifications to the sweep and vertical amplifiers that adapt it to other systems currently in use, including 405/50, 819/50 or high-resolution closed circuit systems. Tektronix, Inc. also produces a television waveform monitor, the Type RM529 MOD 158E, that is designed specifically for the CCIR system. This instrument is of interest, primarily to tele-



vision authorities, engineers and technicians in areas other than the North American continent.

The wide bandwidth of the Type RM529—flat to 8 MHz—assures excellent waveform fidelity and makes the instrument ideally suited for sine-squared testing.

A new highly efficient 12.7 cm aluminized mono-accelerator crt operating at an increased accelerating potential, assures brighter waveform displays in line-selector operation. Viewing area is 7 x 10 cm.

The electrical design of the instruments incorporates the best of both solid state and vacuum tube circuitry, thus assuring extra high reliability and longer component life. Except for the two power transistors all 45 transistors are socket mounted to enhance serviceability. The two power transistors are bolted to the heat sink on the rear panel of the instrument. Vacuum tubes (there are only seven in the instrument) have been used in but a few circuits, and then, only when they offered superior performance or

better reliability over presently available semiconductor devices. Total power consumption is only 80 watts and this low power consumption precludes the need for a fan. The result is cleaner operation and complete freedom from mechanical noise.

The design of the Type RM529 is compact. The instrument fits in a standard 19" rack and requires only 5 1/4" of vertical rack space. It is designed for mounting with the Conrac picture monitor, or other commercial picture monitors in a standard console or relay rack installation.

A positive field selector is incorporated in the Type RM529 and is ideal for monitoring VIT signals.

A video signal is composed of frames (complete pictures) occurring at a 30 Hz rate. Each frame is divided into two fields—Field One and Field Two. Each field contains 262 1/2 lines, making up a complete frame of 525 horizontal lines. The two fields interlace; that is, Field One lines occur between those of Field Two. Close inspection shows that a full line of video precedes Field One; while only one-half line of video precedes Field Two. These two identifying features occur *immediately* before the vertical blanking pulse which precedes the field in question. (See Figure 1,

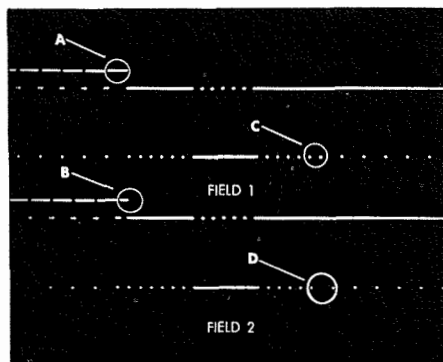


Figure 1. shows the differences between Field One and Field Two. (Double exposure photograph)

point a and b.) Careful inspection of the vertical-blanking pulse reveals another difference between Field One and Field Two—a difference in the time relationship between the last equalizing pulse and the first horizontal-sync pulse. (See Figure 1, points c and d.) This difference enables electronic circuits to identify individual fields.

A prime feature of the Type RM529 is the ability to distinguish between Field One and Field Two. Through the use of appropriate delay circuitry to interrogate the vertical blanking interval, the Type RM529 can generate a trigger which *positively* locks the Field Trigger Generator to Field One or to Field Two. Hence, triggers initiating a sweep at the start of either Field One or Field Two can be selected with a front-panel switch. After a noise transient

or temporary loss of video, this circuit will always return to the proper field.

By introducing a delay between these triggers and the start of the sawtooth, any line of the TV raster can be inspected individually. Horizontal magnification allows more detailed inspection of the signal on the line selected.

Bright waveform displays are another important feature of the Type RM529. A single line displayed at a frame rate is inherently dim. The Line Selector circuitry in the Type RM529 furnishes a brightening pulse to the crt grid (ac-coupled). This feature makes it unnecessary for the operator to re-adjust the intensity control in line-selector operation. It also limits the normal intensity range, thus preventing accidental burning of the crt phosphor; particularly in the event of sweep circuit failure. The net result is waveforms—exceptionally bright and sharp—that are clearly viewed or photographed.

The Type RM529 has four vertical-amplifier-response positions: high pass, low pass, IEEE and flat.

The high-pass or chroma position is often used to remove low-frequency components from the staircase. With these removed, amplitude of the 3.58 MHz modulation is more easily measured and differential gain determined. Adequate reserve gain exists to expand the subcarrier signal for accurate measurements.

The low-pass position is used to attenuate the high-frequency bursts on the multiburst signal when making axis-shift measurements. It will limit the 0.5 MHz-modulation to approximately 20% of the original amplitude. Modulation is scarcely detectable on the 2-MHz portion of the burst and negligible at the higher frequencies. (This response position is also useful when it is necessary to observe a waveform in the presence of extreme amounts of white noise.)

The IEEE position is the standard response designated by the broadcast industry in Canada and the U.S.A. for making amplitude measurements. It removes the chrominance signal from video containing color in-

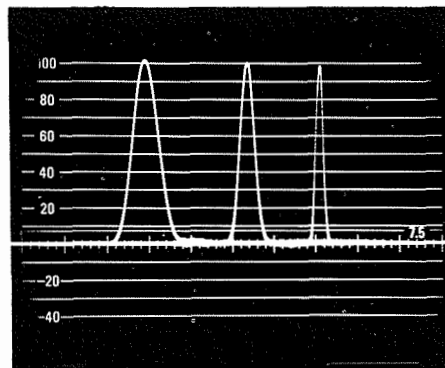


Figure 2. 2T Signal. Multiple exposure. Left: 2T. Center: T. Right: 1/2 T Sine².

formation, and eliminates high frequency noise which is often present.

The flat response position is usually used when making measurements with multiburst and sine² pulses. It will not significantly attenuate a T pulse and it provides good reproduction of the 50 nsec 1/2 T pulse, see Figure 2. This position is also useful for making signal-to-noise-ratio measurements because it readily passes all white noise present in the system. A calibrated 14db increase in sensitivity over the 1.0 v full-scale calibrated sensitivity is provided for such purposes.

DC RESTORATION

A dc restorer on-off switch is incorporated in the Type RM529 to facilitate its use as a modulation monitor. In normal use, the dc restorer serves the function of clamping the video signal to a reference level so that it will not change position with varying average voltage level (brightness). The dc restorer normally clamps to the back porch of the video signal. Black level is usually set to 7.5 IEEE units above the back porch, and the white level to 100 units. The bottom of the sync tip is normally set to -40 IEEE units. Studio signals are usually measured at the 1 v level and 1 v equals 140 IEEE units in normal signal.

When the dc restorer is turned off, the input capacitor of the Type RM529 may be shorted out. All following stages are decoupled, making it possible to use the Type RM529 in conjunction with a diode detector for % of modulation measurements. Signals which are not video, such as found in tape recorders, may also be measured. DC coupling is also useful for measuring hum and bounce in the video system. With the dc restorer disabled, and the input of the Type RM529 ac-coupled (normal), the low frequency 3-db down point is approximately 0.32 Hz.

Both the back porch (blanking level) and the sync tip represents stable reference levels in the video signal. Back-porch clamping has in the past been objectionable because it interfered with color burst. Design considerations in the Type RM529 make this objection invalid. Back-porch clamping has the advantage that there is a more direct relationship between the blanking level (back porch) and picture black level than there is to the sync tip level. (A simple modification of the Type RM529 circuitry will adapt the instrument for sync-tip clamping. This modification is described in the Type RM529 Instruction Manual.)

Change in blanking level due to the presence of color burst is well under 1%. No aberrations to the color burst are caused by the clamping circuit.