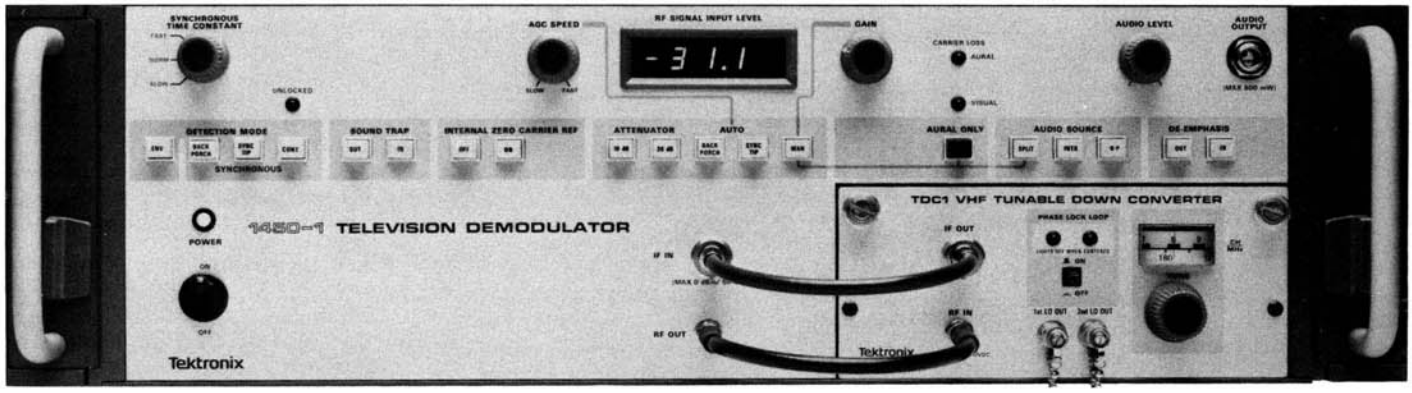


The 1450-1 is compatible with System M Television Transmission, the 1450-2 is compatible with System B/G, and the 1450-3 is compatible with System I.

1450-1/1450-2/1450-3

Series Television Demodulators

Measurement-Quality Performance for Negligible Distortion

Synchronous Detection Eliminates Quadrature Distortion

Envelope Detection for Accurately Determined Differential Phase

Surface Acoustic Wave Filter Provides Precise Nyquist Slope; Excellent Long and Short-Term Stability

Digital Readout of Input Power Level for Easy, Accurate Field Strength Readings

Constant-Bandpass Characteristics Over Wide Dynamic Range

Any Single VHF or UHF Channel Operation

UHF and VHF Tunable Down Converters

Conforms to EIA Standard RS-462 (System M Only)

Wideband Audio Output for BTSC Multichannel Sound Applications (System M Only)

Wideband Audio Output Compatible with Japanese Stereo Sound with FAX Channel (System M Only)

The 1450-1 (System M), 1450-2 (System B/G) and 1450-3 (System I) demodulator mainframes are combined with a Tektronix Television Down Converter (TDC) to provide an accurate link between your transmitter's RF signals and video baseband measuring equipment. Unique components work together to identify and eliminate any possible demodulation distortion in reproduced signal characteristics. You see a transparent picture of your transmitter's performance and signal output.

Tunable or Fixed-Channel Down Converters

For demodulating an RF signal at a TV channel frequency, the 1450 Series demodulator mainframes must be used with a Tektronix TDC. Three compatible TDCs are available for each system and provide a selection between tunable and fixed-channel performance. The TDC Fixed-Channel Down Converter supports your specified system channel number. Tunable Down Converters available for VHF and UHF channels are the TDC1 and TDC2, respectively.

Demodulation of the transmitter IF signal may be accomplished by using only the mainframe.

Synchronous and Envelope Detection

The 1450 Series demodulators allow you to select either synchronous or envelope detection. Each method has advantages, yet both are required for full measurement capability. For instance, synchronous detection is necessary for measurements that can be seriously affected by quadrature distortion.

The 1450 Series demodulators have two synchronous video detectors operating in phase quadrature. One detects the in-phase signal; the other detects the quadrature component of the video signal. (The quadrature component is a measure of change in visual carrier phase resulting from a change of video level.)

However, if incidental phase modulation is present on the picture carrier, the amount of differential phase measured on a synchronously detected signal will be erroneous. Because of this, an envelope detector is necessary to determine the actual differential phase present. The envelope detector has linear transfer characteristics down to 3% carrier and so provides optimum modulation depth indication.

ICPM (Incidental Carrier Phase Modulation)

This distortion can be easily measured with a Tektronix demodulator using synchronous detection and the quadrature signal output. It cannot be measured with envelope detection, nor can it be measured using a demodulator that is not equipped with two quadrature-phased synchronous detectors and having a quadrature output.

Because of the higher subcarrier frequencies used in BTSC multichannel sound, accurate ICPM measurement is even more critical in these applications.

A special waveform monitor graticule and low pass filter are provided with each 1450-1 for the measurement of this distortion.

Quadrature Distortion

Quadrature distortion occurs when a single sideband signal is demodulated with an envelope detector.

Quadrature distortion most severely affects the chrominance signal, causing a loss of brightness in highly saturated colors, especially those at high luminance levels. Narrow white picture elements against the dark backgrounds are reproduced at reduced brightness.

Synchronous detection of the television RF signal eliminates quadrature distortion, allowing the true performance of the transmitter to be determined.

Tektronix-Developed Surface Acoustic Wave Filter

The 1450 Series demodulators feature a SAW (surface acoustic wave) filter developed by Tektronix. It provides more precise Nyquist slope characteristics without group delay distortion, improves long-term and short-term stability, and lowers maintenance costs compared to conventional filter network circuitry.

In conventional demodulators, the more precisely the bandpass characteristics approach an ideal Nyquist curve, the more complex the filter network required. In the 1450 Series demodulator mainframes however, the bandpass characteristics are determined by just a single component, the SAW filter. Precision is the result.

Conventional tuned IF circuitry must be meticulously adjusted and is subject to change with mechanical and thermal shock. But the SAW filter is in a sealed unit and accurately provides the critical selectivity characteristics of the demodulator — and requires no adjustments.

Constant-Bandpass Characteristics

The Tektronix 1450 Series demodulators offer constant-bandpass characteristics over the entire dynamic range of input signal level. Amplifiers in the mainframe operate at a constant gain, and pin-diode attenuators are used to adjust the overall gain of the demodulator. This more sophisticated approach to AGC (automatic gain control) is necessary to maintain constant-bandpass characteristics over the entire dynamic range of input power (−69 dBm to −3 dBm). Additional attenuation of 30 dB, available in 10 dB steps, can shift the range for higher input power levels. In addition to AGC, demodulator RF/IF gain control can be set for manual operation.

Digital Reading of Input Power

With the accurate (to 0.1 dB) digital readout you get measurements of input power you can depend on at transmitter sites, remote sites, or for calibrated field strength measurements.

Split and Intercarrier Sound

For making measurements or adjustments on aural transmitters, the 1450 Series demodulators feature both split and intercarrrier sound channels. The split carrier channel, which will operate without the presence of the visual carrier, may be used when making measurements on the aural transmitter only.

Four audio outputs give added measurement capability: a 600 Ω output, two low impedance outputs for driving a speaker or headphones, and a calibrated output for making deviation measurements with an ac voltmeter or an oscilloscope.

Multichannel Sound Compatible (System M Only)

The 1450-1 provides three aural detection modes — Intercarrier, Split and Quasi-Parallel. The split carrier mode will operate with or without the presence of the visual carrier. Quasi-Parallel detection substantially reduces the buzz that might otherwise be introduced on the detected signal due to the IF signal passing through the Nyquist filter of the demodulator when the intercarrier detection mode is used.

The 1450-1 has four audio outputs. The speaker and headphone outputs are 8 ohm impedance outputs and are filtered and deemphasized to provide only the monophonic main channel. A 15.734 kHz notch filter is provided to reduce the BTSC stereo pilot tone to an inaudible level.

The 600 ohm balanced output normally provides a full 150 kHz bandwidth output but can be restricted to 20 kHz by moving an internal jumper. The fourth output is a 75 ohm unbalanced output with a 150 kHz bandwidth and a calibrated level of 10 mV per kHz deviation of the aural carrier. This output can be used for accurate measurement and monitoring of the aural channel and can be used to drive a professional multichannel sound decoder, modulation monitor or spectrum analyzer.

CHARACTERISTICS

System RF Characteristics	Fixed Channel TDC	Tunable TDC1 or TDC2 (UHF)	System RF Characteristics	Tunable TDC1 (VHF) Fixed Channel TDC	Tunable TDC 1 or TDC2 (UHF)
RF Input Impedance	50 Ω (N)*	50 Ω (N)*	Image Rejection Ratio, Second IF Image:		≥60 dB
Return Loss with 0 dB Attenuation	≥20 dB	≥10 dB	IF Rejection Ratio:	≥60 dB	(TDC1 First IF) ≥50 dB
Return Loss with ≥20 dB Attenuation:	≥30 dB	≥30 dB			
Frequency:	Any System M, B, G, or I assigned carrier frequency ±20 kHz	(TDC1) All System M or B VHF assigned carrier frequencies, plus CATV Channels 14 through 36, ±27 kHz (TDC2) All System M, G or I UHF assigned carrier frequencies, ±27 kHz			(TDC2 First IF) ≥30 dB
			Adjacent Channel Cross Modulation:	≥60 dB	≥60 dB
			Alternate Channel Cross Modulation:	≥60 dB	≥60 dB
			Variation in System Frequency Response with AGC	(VHF) ≤0.1 dB (UHF) ≤0.15 dB	≤0.25 dB
Level Range*:					
0 dB Mainframe Attenuation	−69 to −3 dBm	−65 to +1 dBm	Variation in System Frequency Response, Channel to Channel:		≤0.3 dB across any 6 MHz channel bandpass
10 dB Mainframe Attenuation	−59 to +7 dBm	−55 to +11 dBm			
20 dB Mainframe Attenuation	−49 to +17 dBm	−45 to +21 dBm			
30 dB Mainframe Attenuation	−39 to +27 dBm	−35 to +31 dBm			
AGC Range:	66 dB	66 dB	Damage level at RF input	1 watt	1 watt
VHF Noise Figure:	≤10 dB	(TDC1) ≤19 dB	Readout Accuracy:	±2 dB	±2 dB
UHF Noise Figure:	≤11 dB	(TDC2) ≤19 dB	Readout Resolution:	±0.1 dB	±0.1 dB
Image Rejection Ratio, First IF Image:	≥60 dB	(TDC1) ≥50 dB (TDC2) ≥40 dB			

* In 50 Ω: +27 dBm = 5 V RMS +31 dBm = 8 V RMS
−3 dBm = 158 mV RMS +1 dBm = 251 mV RMS
−69 dBm = 80 μV RMS −65 dBm = 126 μV RMS

IF

Input Impedance (Z_{in}) — 50 Ω (BNC).

Return Loss — >18 dB.

IF Level Range — −20 dBm to −69 dBm. (Signal to noise ratio deteriorates below a signal level of −28 dBm.)

IF Frequency

1450-1: Visual is 37 MHz, 38.9 MHz, or 45.75 MHz ±127 kHz (as specified by the mainframe/TDC options). Aural is 4.5 MHz below visual.

1450-2: Visual is 38.9 MHz ±127 kHz. Aural is 5.5 MHz below visual.

1450-3: Visual is 38.9 MHz ±127 kHz. Aural is 6.0 MHz below visual.

VIDEO

Video Output — Z_0: 75 Ω (2 BNC). Return Loss: ≥34 dB. Level 1 V p-p sync tip to peak white.

Dc Level — Back Porch AGC: Blanking level at 0 V ±50 mV. Sync Tip AGC: Referenced to blanking level, sync tip is at −286 mV ±5.7 mV (1450-1), −300 mV ±6 mV (1450-2, 1450-3).

Line Time Distortion — ≤0.5%, wideband IF, synchronous detection. 1.0% in all other IF, detection mode combinations.

Field Time Distortion — ≤0.5%.

Line Time Nonlinearity — ≤1%.

Differential Gain — Synchronous: ≤1%. Envelope: ≤4%.

Differential Phase — ≤1°.

Chrominance/Luminance Delay — ≤±20 ns.

Chrominance/Aural/Visual Carrier Intermod — ≥50 dB down.

Aural Signal Rejection — ≥46 dB.

Video Signal to Noise Ratio — Low Frequency (p-p video/p-p hum): ≥60 dB. Mid Frequency Coherent (p-p video/p-p noise): ≥50 dB. White Noise (p-p video/RMS noise): ≥60 dB.

Quadrature Output — Z_0: 75Ω (BNC). Return Loss: ≥34 dB.

Zero Carrier Reference Gate

1450-1: Width is 30 μs ±10%. Delay is 20 μs ±10% from leading edge of sync. Carrier Cutoff is ≥50 dB. Zero Carrier is ±0.5 IRE. Timing is factory set to line 20 of both fields, internally selectable from line 10 through line 25 of both fields. 1450-2, 1450-3: Width is 30 μs ±10%. Carrier Cutoff is ≥50 dB. Zero Carrier is ±3.5 mV. Timing is factory set to line 16/329 of both fields, internally selectable from line 10/323 through line 25/338 of both fields.

EXT Zero Carrier Reference Drive Input — Z_{in}: ≈ 5 kΩ (BNC). Level Required: ≈ ±1 V.

AUDIO

Frequency Response — 1450-1: Deviation Output and 600 Ω Output ±0.1 dB (30 Hz to 50 kHz) ±0.5 dB (30 Hz to 150 kHz). 600 Ω Output can be limited to 20 kHz by jumper. Speaker and headphone Output ±0.4 dB (30 Hz to 20 kHz, 15.734 kHz Notch Filter jumper selecatble). 1450-2, 1450-3: All Outputs ±0.4 dB (30 Hz to 20 kHz).

De-emphasis — 1450-1: Follows standard 75 μs de-emphasis curve ±0.4 dB. 1450-2, 1450-3: Both follow standard 50 μs de-emphasis curve ±0.5 dB.

Harmonic Distortion — 1450-1: 0.1% for 30 Hz to 15 kHz inputs measured with 50 kHz band limiting, 0.5% for 16.5 kHz to 50 kHz inputs measured with 120 kHz band limiting (with ±25 kHz deviation). 1450-2, 1450-3: 0.2% (30 Hz to 15 kHz, with ±50 kHz deviation).

Audio Signal to Noise Ratio — 1450-1 wide band mode: ≥50 dB in all detection modes measured at the 75 Ω output, band limited to 130 kHz and modulation of visual carrier.

≥60 dB in all detection modes measured at the 75 Ω output, band limited to 50 kHz and no modulation of the visual carrier.

1450-1 narrow band mode, 1450-2, 1450-3: Intercarrier Mode: ≥55 dB. Split Carrier Mode: 1450-1, 1450-2 is ≥75 dB. 1450-3 is ≥70 dB. External Aural Intercarrier In: ≥75 dB. Aural Only Mode: ≥75 dB. All at 1 kHz modulation and ±25 kHz (±50 kHz for 1450-2 and 1450-3) deviation and modulation of the visual carrier.

Deviation Output — 1450-1: 10 mV/kHz ±1% (75 Ω BNC). 1450-2, 1450-3: 50 mV/kHz ±1% (600 Ω BNC).

Aural Intercarier In — Z_{in}: 50 Ω (BNC). Return Loss: ≥20 dB. Level: −30 dBm ±5 dB.

Aural Intercarrier Output — Z_0: 50 Ω (BNC). Return Loss: ≥20 dB. Level Nominal: −6 dBm up to 0 dBm.

600 Ω Balanced Line Output — 1450-1 Wideband Mode: 50 mV/kHz ±3%; Narrowband Mode: 10 dBm at 25 kHz deviation. 1450-2: 10 dBm at 50 kHz deviation. 1450-3: 8 dBm at 50 kHz deviation. Connector XLR.

8 Ω Speaker Output — Level up to 5 W RMS, front panel adjustable. Connector Barrier block.

Headphone Output — Level up to 50 mW into 8 Ω headphone (stereo or mono style). Connector phone jack (monaural output only).

Remote Connector — Alarm output SPDT relay contact rated at 28 V, 3 A. External synchronous/envelope switch. Ground for envelope detection.

Damage Level at RF Input — 1 W maximum (any attenuator setting).

AC POWER

Line Voltage Ranges — 100 V ac ±10%. 120 V ac ±10%, 220 V ac ±10%. 216 V ac to 250 V ac.

Power Consumption — 100 W maximum.

Mains Frequency — 48 Hz to 62 Hz.

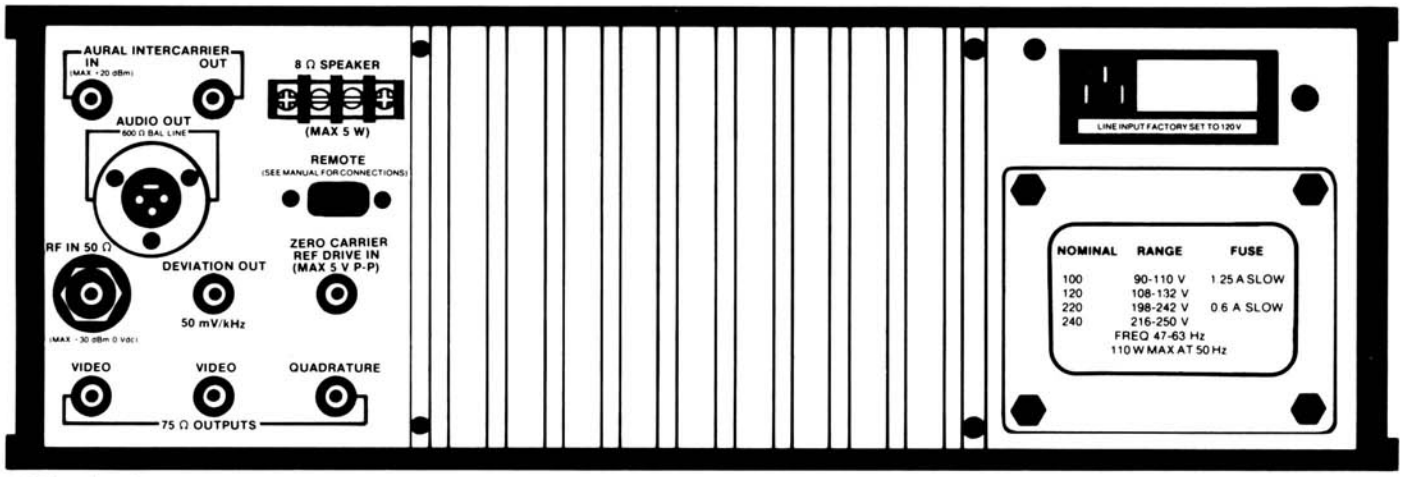
ENVIRONMENTAL

Temperature Range — Operating: 0°C to +50°C.

Altitude Range — Operating: Sea level to 4570 m (15,000 ft).

PHYSICAL CHARACTERISTICS

Dimensions	mm	in
Height	133	5.3
Width	483	19.0
Depth	486	19.1
Weight	**kg**	**lb**
Mainframe	16.3	36.0
Down Converter	2.3	5.0



1450 Rear Panel.

ORDERING INFORMATION SYSTEM M

1450-1 Television Demodulator
(Order one vision IF option)

Includes: Pair rackmount slide guide (351-0301-03); N to BNC coaxial adapter (103-0045-00); extender circuit board (670-5034-00); 50 Ω BNC coax cable (012-0715-00); 50 Ω SMA double shield coax cable (012-0752-00); two BNC to square-pin adapter cables (175-2140-00); BNC to Peltola adapter cable (067-0709-00); TORX screwdriver (003-0816-00); male connector (131-1007-00); hood (200-1170-00); two screws (213-0260-00); low pass filter (015-0352-00). For 1450-1: ICPM graticule (331-0393-12); 0.6 A slow blow fuse (159-0043-00).

OPTIONS

Option 01 — 37 MHz Vision IF.

Option 02 — 38.9 MHz Vision IF.

Option 03 — 45.75 MHz Vision IF.

For demodulation of RF signals, one of the following three down converters must be plugged into the 1450-1 mainframe.

Order one vision IF option and either Option 11 or Option 14.

TDC Fixed Channel Down Converter —
(Stipulate channel number when ordering.)

TDC-1 — Tunable Down Converter VHF Band.

TDC-2 — Tunable Down Conveter UHF Band.

Option 01 — 37 MHz Vision IF.

Option 02 — 38.9 MHz Vision IF.

Option 03 — 45.75 MHz Vision IF.

Option 11 — System M Countries. (See list.)

Option 14 — (See list.).

For upgrading 1450-1 and 1450 (S/N BO 19999 and below) to provide a wide band audio output suitable for use with BTSC System multichannel sound in North America install:

1450F20 Field Upgrade Kit.

ORDERING INFORMATION SYSTEM B/G

1450-2 Television Demodulator
(Order both Option 02 and Option 09)

Includes: In addition to 1450-1; a ICPM graticule (331-0393-15); 1.25 A slow blow fuse (159-0041-00); manual.

OPTIONS

Option 02 — 38.9 MHz Vision IF.

Option 09 — +90 ns/−170 ns Group Delay.

For demodulation of RF signals, one of the following three down converters must be plugged into the 1450-2 mainframe. Order both Option 02 and Option 12.

TDC Fixed Channel Down Converter —
(Stipulate channel number when ordering.)

TDC-1 — Tunable Down Converter VHF Band.

TDC-2 — Tunable Down Converter UHF Band.

Option 02 — 38.9 MHz Vision IF.

Option 12 — System B/G/I Countries. Required for 1450-2 and 1450-3.

ORDERING INFORMATION SYSTEM I

1450-3 Television Demodulator
(Order Option 02)

Includes: Same as for 1450-2.

OPTIONS

Option 02 — 38.9 MHz Vision IF.

For demodulation of RF signals, one of the following three down converters must be plugged into the 1450-3 mainframe. Order both Option 02 and Option 12.

TDC Fixed Channel Down Converter —
(Stipulate channel number when ordering.)

TDC-1 — Tunable Down Converter VHF Band.

TDC-2 — Tunable Down Converter UHF Band.

Option 02 — 38.9 MHz Vision IF.

Option 12 — System B/G/I Countries. Required for 1450-2 and 1450-3.

ORDERING INFORMATION SYSTEMS D and K

1450 Series Television Demodulators and Down Converters with modifications. Contact Tektronix to request quote.

OPTION 11 COUNTRIES: SYSTEM M

Antigua, Barbados, Bermuda, Brazil, Canada, Chile, Columbia, Costa Rica, Cuba, Curacao, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Johnston Islands, Korea, Mexico, Micronesia, Netherlands Antilles Nicaragua, Panama, Peru, Phillipines, Puerto Rico, Samoa, St. Kitts, Surinam, Taiwan, Trinidad/Tobago, Uruguay, U.S.A., Venezuela, Virgin Islands.

OPTION 12 COUNTRIES: SYSTEM B/G/I

Algeria, Austria. Bahrain, Bangladesh, Belgium*1, Brunei, Cyprus, Denmark, East Germany, Egypt, Equatorial Guinea, Ethopia, Finland, Ghana, Gibraltar, Greece, Hong Kong, Iceland, india, Indonesia, iran, Iraq, Israel, Ireland (UHF)*1, Italy (UHF), Jordan, Kenya, Kuwait, Lebanon, Liberia, Libya, Malta, Mauritus, Netherlands, Nigeria, Norway, Oman, Pakistan, Portugal, Qatar, Rhodesia, Saudi Arabia*2, Sierra Leone, Singapore, South Africa (UHF)*1, Spain, Sudan, Sweden, Switzerland, Syria, Tanzania, Thailand*2, Tunisia, Turkey, Uganda, United Arab Emirates, United Kingdom (UHF)*1, West Germany, Yemen Arab Republic, Republic of Yemen, Yugoslavia, Zambia.

**1 System I.*
**2 System B only.*

OPTION 14 COUNTRIES: SYSTEM M

Japan and Okinawa.