The VRX100 Video Recorder

Specification

Overview

The VRX100 recorder is a multipoint video recorder that does more than just process data recording. It offers display versatility, flexible data storage, dual loop control and advanced math functions. This integration of several functions within the same instrument eliminates the need for multiple devices and reduces installation costs.

The VRX100 offers significant improvements over traditional paper recorders. Its inexpensive storage medium and full color LCD display reduce the cost of maintenance and eliminate consumables. Reliability is increased with the elimination of vulnerable print mechanisms and other mechanical parts. Multiple data replay options provide quick information access. The VRX100 recorder is part of a family of products which share a common look, common functions, common software, common data structure, and a common language. This provides distinct advantages in superior data management, industrial ergonomics, and low life cycle cost. The family used in combination reduces spare parts, operating instructions, training requirements, maintenance variations, and other functional procedures.

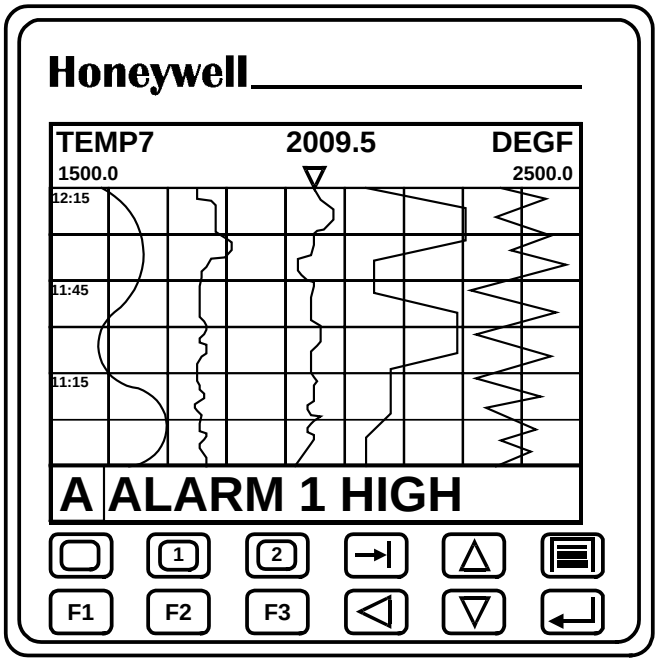

Figure 1 VRX100 Video Recorder

Features

- 140 mm (5.5") Diagonal full color LCD display
- 3.5" 1.44 MB or 120 MB Floppy disk drive
- Up to 12 analog inputs
- Up to 4 optional PID loop controllers
- Fuzzy logic setpoint overshoot suppression capability to enhance loop performance
- Optional set point programming capability
- PID, cascade, split output, DIAT and ON/OFF control strategies
- 18 primary & 13 support displays
- 16 alarm limits
- Up to 4 analog outputs
- Up to 32 calculations
- Optional 24 V instrument power
- Optional discrete I/O configurations
- RS485 Communications (binary or MODBUS™ RTU)
- Retain data during power loss without batteries
- CE compliant
- Assignable pen colors
- Large display trend buffer for extended data storage

Highlights

Simple to Use
Dedicated display keys and full screen menus allow the operator to easily set up the recorder and to quickly access and interpret data.

Improved Decision Making
On-line data analysis allows fast operator response during process upsets.

Meet Documentation Requirements
Permanent archived record of process and configuration data can be stored to disk and easily replayed on any VRX100 recorder or personal computer using SDA software.

Lower Cost of Ownership
Reduce maintenance costs, eliminate consumables such as chart paper and pens, while increasing reliability since no vulnerable print mechanism is present.

User Interface

The full color LCD display expands the window into your process. The 140 mm (5.5") diagonal display supports high resolution and 16 simultaneous colors. Trend and bargraph displays use color to assist point identification. Numerical values can be displayed in decimal notation (e.g. 0.00001) or scientific notation (e.g. 1E-5). To maximize display life, a screen saver is available.

Operator displays are selected during configuration from a list of 18 formats. Dedicated display keys allow operators to quickly reach needed information. On-line menus are full screen and easy to understand.

Buttons

Menu - Provides access to and from all setup and configuration menus.

Increment/Previous - Moves cursor up menus; increases value of selected numbers or parameters.

Decrement/Next - Moves cursor down menus; decreases value of selected numbers or parameters.

Left - Moves cursor to the left in entry fields for letters and numbers.

Enter - Executes menu and display selections (does not apply to setpoint or output entries on control loops).

Display - Successive presses access up to 9 preselected primary displays.

Display 1 - Accesses preselected primary display #1.

Display 2 - Accesses preselected primary display #2.

Auto/Manual - This button replaces the Display 2 button on instruments with the control option. It toggles Control Loop between Auto and Manual modes. Manual mode allows operator to manually set Control Loop output.

Tab/Utility - Accesses specialized functions and menus related to the current display format.

F1, F2, F3 **Function keys -** Act as momentary discrete inputs. Programmable by the user.

Display Formats

Operator responses are enhanced with improved presentation of data. More information is conveyed using a versatile library of 18 different primary display formats. (See Figure 2.) These include time-based trends, bargraphs, unit data, panel faceplates, totalizer, alarm summary, data storage, setpoint programmer, and control displays. Select any 10 during off-line configuration as primary operating displays. Dedicated display keys allow the operator to access and scroll through the displays in the order assigned. The VRX100 allows the selection of a black or white background on all trend, bar graphs, panel and loop screens. Using an IBM® compatible QWERTY keyboard with DIN-size connector, or a barcode reader, a 16 character descriptor and 7 character tag can be assigned to each point for easy identification during on-line operation. For status indication of alarms, diagnostics, and data storage, every on-line display uses icons and text in a dedicated area at the bottom of the screen. If two or more of these indicators occur at once, they will overlay in a cascade arrangement, with data storage on top, then diagnostics, and alarms underneath.

Recording Trend Displays

Two live trends are available, each with up to 6 analog and discrete traces. Each is supported by a RAM-resident buffer which operates even if none of the files are stored to disk. Vertical or horizontal trends are available, both with pointers and alarm limit indication. Each trend trace may be displayed alongside a dedicated digital read-out or bar graph of the trend's real-time value. Trended data points may also be configured to appear in a rotating scoreboard above the trend traces. Information about each point is shown sequentially at a user-selected rate of between 1 and 60 seconds, with the color of the information matching the color of the corresponding trend trace. Trend displays have uniform time bases so the operator is presented with consistent information. Traces are updated once per second. Trace colors are selectable by the user. Trend displays can be scaled logarithmically.

Trend Display Tools

To monitor process activity, the following on-line analysis tools are available:

POINT HOLD - On trend screens featuring the rotating scoreboard, this tool temporarily halts or stops scoreboard rotation to focus on a critical point.

TIME BASE CHANGE - This tool toggles between two pre-programmed time bases to increase viewing resolution on any trend.

SCROLL (PAN) - This tool scrolls the most recent trend history without going off-line. User can move a cursor backward and forward through past trend data. An "end of data" message is shown when the oldest trend data has been reached.

ZOOM - Enhances resolution with scale change to 2x, 4x, or full span of all the points displayed. Full span shows the configured limits of the selected point.

DETAIL - Gives exact reading of any trend point, eliminating tedious and difficult manual analysis. The cursor moves in single pixel increments to select any spot along the trend trace, to view the value and time at that point.

FIND - Search for data based on a particular time and date.

Bar Graph Displays

Vertical bar graphs are available for 3 or 6 live point values. Vertical bar graphs are also available for showing 2 control loops or a single setpoint profiler parameters.

Panel Meter and Unit Data Displays

These displays can be configured to show up to 12 points in any combination of analog or discrete data in tabular or list form.

Panel Display

This display shows live values in a character size large enough to read from approximately 5 meters (17 feet) away. It rotates through all points in list (up to 12) at a user selected rate (1-60 seconds) or it can be stopped on a single point.

Data Storage Status Display

To help operators prepare for disk change, this display gives information on the current state of the storage media. Storage information includes

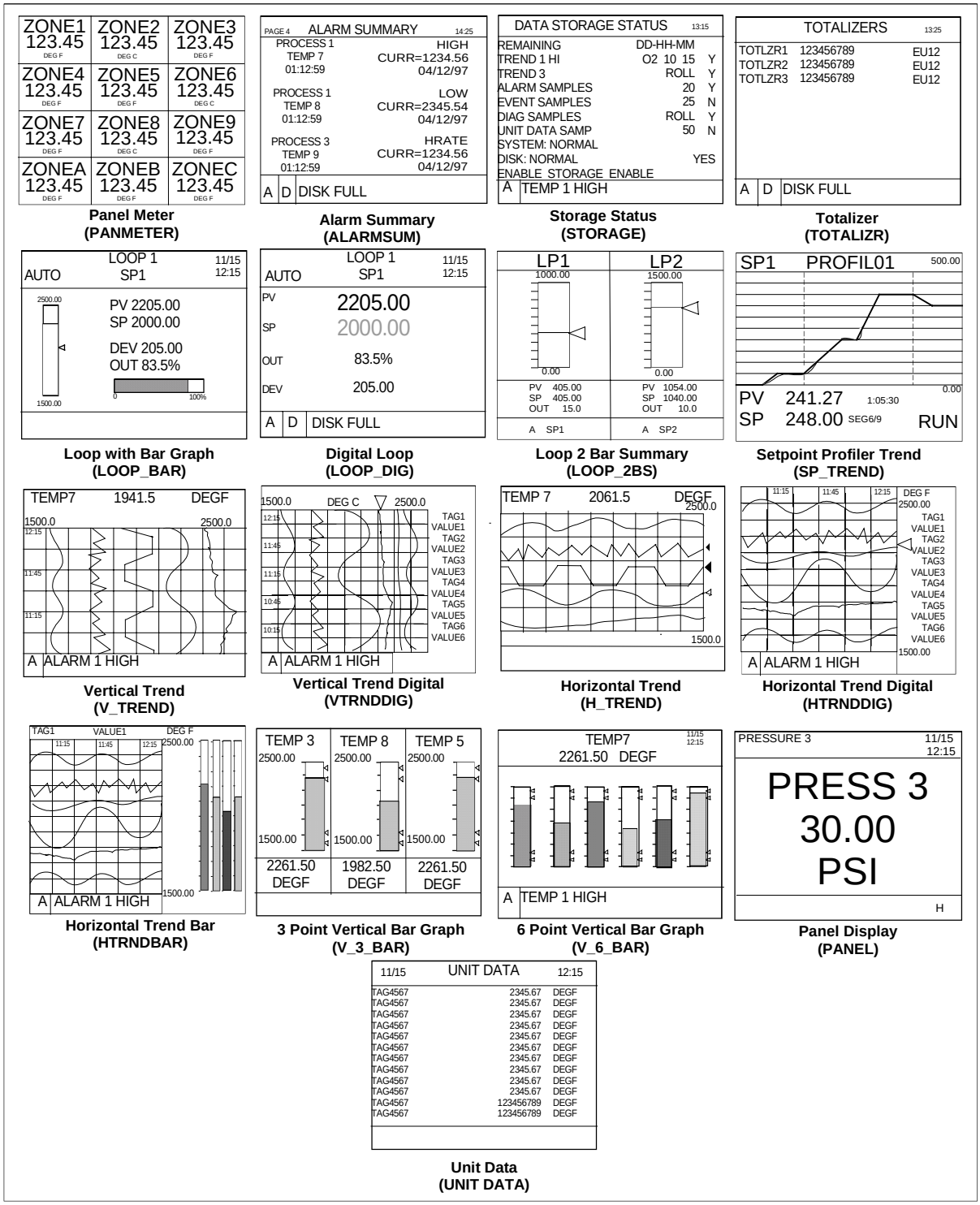

Figure 2 Primary Display Formats

time remaining, samples remaining, and status of individual stored files. Disk messages and warnings also appear in the message window of every operating display.

Support Displays

To review and modify process data, the following secondary level operating displays are accessed through the menu key.

- Diagnostic Summary
- Data Storage Setup
- Data Storage Status
- All Analog Points Summary
- All Discrete Points Summary
- Constant Values Summary
- Analog Input Value Adjustments
- DI/DO Status/Force
- Totalizer Reset
- Alarm Limits Adjustment
- Alarm Summary
- Analog Output Adjustment
- Tune Loops

Support displays can be security-protected to prevent unauthorized changes.

Data Storage/Archiving

Standard with the VRX100 is a 3.5 inch, 1.44 MB floppy disk drive for storage of configurations, calibrations, and programs, and data archiving and retrieval. An optional 120 MB super floppy disk drive is available for high capacity data storage requirements. The instrument can support both continuous and batch storage of trends, unit data, alarms, events and diagnostics. The trend data files are specified with a user-selected point list and storage rate. Available storage rates include 0.5 second, and 1 through 3600 seconds. On a 2 point instrument, a 0.25 second rate is also available. Two different storage rates may be programmed into the instrument, low and high. High speed storage can be triggered by an internal event (such as going into an alarm), or by an external event (such as a discrete input switching on). Three trend files may be stored. Each file may have up to 6 points, with a maximum of 12 points across all files.

The unit data file can have up to 12 points and is stored to disk at a user-selected time or event driven interval. As they occur, alarms, events and diagnostics are stored to a designated area of the disk.

Data storage may be started or stopped from:

- VRX100 Keypad
- External discrete triggers
- Internal discrete status triggers

Total disk capacity (in time) is calculated and displayed once all storage configuration is completed. This eliminates the need for manual calculations and gives the operator the exact duration of the disk. A disk full warning level may be entered to trigger a message whenever storage capacity is above this level.

Recorded trends and unit data may be replayed on the instrument display or on a personal computer using the Honeywell SDA data analysis software package. Data files may then be printed from the computer in whatever format is required. An export utility in SDA makes it possible to convert data files collected by the VRX100 into formats recognized by most commercially available spreadsheet programs (.DIF, .CSV).

Historic Trends

The layout of retrieved historic trends is identical to that of live trends. Upon playback, the operator is prompted to select a time base in which to review the data. Once brought to the screen, features for analysis are similar to those for live trends; that is, scroll (pan), zoom, compress, and detail. During this activity, the operator may choose to view an entire file, or only a portion based on a start and stop time and date. This saves time and allows the operator to focus on only the relevant information.

SDA software provides off-line data analysis for reviewing process data stored on the instrument's disk. The software runs on any personal computer operating in the Microsoft® Windows® environment. Using the floppy disk, there is no need for the expense of a computer dedicated to SDA operation; an existing machine may be used.

Control

The VRX100 supports the following control algorithms:

- Standard PID
- Advanced PID
- Cascade (Primary/Secondary)
- Split Output (Heat/Cool)
- ON/OFF
- Ratio
- DIAT

The following five Control Output types are available.

1. **Current Adjusting Type [CAT]** - Used for PID control or for retransmitting inputs or profiler setpoints.
2. **Voltage Adjusting Type [VAT]** - Used for PID control or retransmitting inputs or profiler setpoints.
3. **Duration Adjusting Type [DAT]** - Used for time proportioning control.
4. **Position Proportional Type [PP] -** Used for PID control, position proportional outputs establish slidewire feedback control signals for motor actuators.
5. **Duration Impulse Adjusting Type [DIAT] -** Used for PID control, DIAT outputs provide motor actuator positioning signals independent of slidewire feedback. This output type is comparable to the 3 position step output algorithm used in Honeywell's UDC controller product line.

For increased visibility of the control parameters, special displays are included:

- Process control faceplate - vertical bargraph with process variable and setpoint tick; PV, setpoint and output values are displayed digitally.
- Loop Bar Graph Summary - vertical bar graph display showing PV, setpoint, and output for up to 2 loops.
- Setpoint Programmer Trend and Summary screens for monitoring and controlling the process (Figure 2).

For tuning, a display (Figure 3) is provided to plot process variable over a user selected time base. This will assist the operator in locating optimum tuning parameters for the loop.

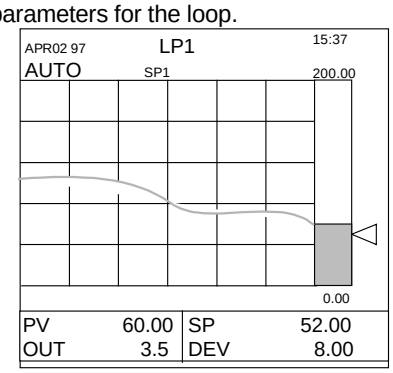

Figure 3 Loop Tuning Display

Control loop performance may be enhanced by engaging the VRX100's setpoint overshoot suppression feature. Developed using principles of fuzzy logic, the overshoot suppression algorithm reduces setpoint overshoot and works to complement controller behavior set forth by PID tuning constants. Improved responsiveness to load changes or process upsets and better loop efficiency are cost saving benefits that are realized when fuzzy overshoot suppression is used with loop operation.

Calculated Values

On-line data manipulation saves time and enhances analysis capabilities. Several built-in algorithms are available to customize specific applications. With full screen and easy to understand menus, configuration is simple. Up to 32 calculated variables can be configured. Calculations accept analog or discrete inputs from external sources or can be linked to internal values, constants, and status.

Totalizers

In addition to calculated values, up to 12 nine-digit totalizers are available. Both analog inputs and calculated variables may be used as the inputs to the totalizers. Reset can be done through the keypad, from an external discrete input, from an internal status, or locked for no reset.

Alarm Capabilities

Up to 16 alarms are available which can be assigned to any analog input or calculation. Each function may be configured as:

- High limit value exceeded
- Low limit value exceeded
- Increase rate of change limit exceeded
- Decrease rate of change limit exceeded
- Deviation value limit exceeded

Alarm functions may be configured to drive relay outputs directly, or they may be connected in an AND or an OR arrangement using internal logic. Alarms may also activate high speed storage, alternate time base on trend display, or storage of unit data. Present on every on-line display is a dedicated alarm status area which gives indication of active alarms. For increased visibility, the instrument offers an alarm summary display which gives more detailed information on all active alarms.

Analog Input/Output

Up to 6 universal analog inputs are available and capable of accepting thermocouple, RTD, millivoltage, voltage, milliamp (via 250 ohm shunt resistor), and Honeywell pyrometer signals. Up to 12 analog inputs are available and capable of accepting thermocouple, millivoltage, voltage, milliamp (via 250 ohm shunt resistor), and Honeywell pyrometer signals. Scan rates: 3 or less inputs run at 250 ms; 8 or less inputs run at 500 ms; 9 or more inputs run at 1 second. All alarms, events, calculations, and totalizers associated with instrument operation are monitored/executed at these same rates.

All analog inputs are provided with:

- Lag - dampens unstable measurements
- Hold - accepts a discrete input to freeze current value
- Failsafe Action - causes upscale or downscale action for open or breached input signal sources.

Up to 8 software analog outputs are available, with up to 4 analog outputs available for control or re-transmission. Four analog outputs can be 4-20 mA Current Adjusting Type (CAT) or 1-5 Vdc Voltage Adjusting Type (VAT). See Control on page 4 for other analog output types.

Discrete Input/Output

All discrete signals can be logically linked for use as interlocks and security checks. Discrete states can be identified from a library of labels for use in displays.

Discrete inputs can be used to trigger a number of actions associated with profiler and control loop execution, math calculations, or data storage.
Discrete outputs can be used to provide external indication of an internal event, status, calculation, or an alarm. The operator can force them into open or closed state. They are also used in Duration Adjusting Type (DAT) control outputs, or on/off control outputs.

Configuration

Complete instrument configuration can be achieved in three ways:

- Developed through the keypad using a series of menu selections as an easy guide. A copy may be saved on floppy disk using the instrument keypad.
- An IBM® QWERTY keyboard may be connected for easier text and label entry. Configuration is performed while the instrument is off-line, all operations are suspended, and all outputs are held constant. Changes may be password protected.
- Developed on a personal computer using Honeywell SCF Configuration Software. It can then be manually transferred by floppy or communications link to one or more instruments.

Non-Volatile Storage

To ensure operational integrity, the instrument's buffers will preserve key RAM-resident data for a maximum of 1.5 hours after power loss. Preserved data includes trends, alarms, events, diagnostics, storage, and function block values. No batteries are needed. If power is off for a longer period of time, worst case loss of data storage information will only be one minute, the archiving disk update time. Configuration and calibration data is supported with permanent non-volatile storage.

Communication Ports

The instrument accommodates RS485 serial communication over two shielded twisted pair conductors. This feature supports access to all on-line, setup, and configuration parameters in the instrument. All these functions may be performed from a PC using the appropriate software packages. The VRX100 supports both binary and MODBUS™ RTU communications protocols.

Software

The software packages SDA, SCF, and Plantscape™ Vista are offered for use with the VRX100 and are designed to operate under Microsoft® Windows® in any IBM® compatible personal computer.

Honeywell SDA (Data Analysis) - Allows off-line analysis of historical data from floppy disk. This includes horizontal and vertical trend displays, X-Y plots, simultaneous display of multiple trend files, split screens to compare two trend displays, panning (scrolling), value and box zooming, compression. Data can be converted to DIF or CSV for use in commercial spread sheet and word processing packages.

Honeywell SCF (Configuration) - Allows complete off-line instrument configuration using fill-in-the-blank templates. This information can then be transferred to one or more instruments over a communication link. It can also be transferred onto a floppy disk. The disk can then be loaded into one or more instruments.

Plantscape™ Vista - The Honeywell Plantscape Vista System can be used for real-time data acquisition from any device connected on a communication link using the Honeywell RS485 Binary Protocol.
Honeywell SDI is used on the PC for initialization of new LS120 floppy disk to save the time of initializing the disk on the recorder.

SpecView – Third party software sold by Honeywell for supervisory and real time data acquisition. Provides instrument views for quick startup.

Security

A 3 digit code may be assigned to operating menus to protect against unauthorized changes. Access to all set-up, maintenance and configuration may be security code protected.

Bar Code Capability

The VRX100 lets you scan in equipment tags and descriptors by bar code, saving time over entering them manually through the instrument's keys. You can also scan bar codes to store the scanned information in an event file.

Table 1 VRX100 Video Recorder Specifications

Physical	
Enclosure	Drawn aluminum case with high impact resistant polycarbonate plastic bezel and abrasion/scratch resistant lens. With the proper panel mounting with required gasketing and with the front bezel firmly closed, the VRX100 meets the criteria for NEMA Type 3 Enclosure for protection from rain & sleet as described in NEMA Standard 250-1991 Sec. 6.4.2.2.
Mounting (Panel)	1.52 mm to 12.7 mm (0.06" to 0.50") thickness
Dimensions	*Bezel:* 144 mm (H) x 144 mm (W) x 43 mm (D) 5.67" (H) x 5.67" (W) x 1.69" (D) *Case:* 137 mm (H) x 137 (W) x 295 mm (D) 5.39" (H) x 5.39" (W) x 11.61" (D)
Weight	3.6 kg (8 lbs).
I/O Ports Standard	QWERTY Keyboard Connector (5 pin DIN type) – on front panel behind bezel. May be used to connect to QWERTY keyboard or to ASCII Barcode Reader.
Environmental	
Temperature	*Operating:* 0 to 50°C (32 to122°F). 5 to 40°C (41 to 104°F) for 120MB floppy option. *Storage*: -20 to 70°C (-4 to 158°F). *Relative Humidity*: 10 to 90%, non-condensing at 40°C.
Altitude	< 2000 meters
Installation Category	II
Pollution Degree	2
Power	Universal supply, 85 to 265 VAC, 50/60 Hz, 45 VA, optional 24 VDC power ± 15%
Fuse Rating	2.0 amp/250VAC slow blow type. Not replaceable by operator
Attributes	
Display	*Type*: Color LCD active matrix. *Screen Size*: 5.5" diagonal. *Resolution*: 320 x 240 pixels. *Update Rate*: 1 second. *Trend Timebase*: 5 min. to 31 days/screen; 2 cm/hr to 72 cm/hr vertical, 3 cm/hr to 114 cm/hr horizontal.
Keys	12 membrane keys.
Data Storage:	*Media*: 3.5" 1.44 MB floppy disk (standard). 120MB super floppy disk (optional). *Data Types*: Analog points, calculations, discrete status, alarms, diagnostics. *Trends*: 3 max (12 points max), 24 MB max for each trend group *Unit Data:* 1 (up to 12 point, 10,000 records). *Alarm History:* Up to 500 records

Table 1 VRX100 Video Recorder Specifications (continued)

<table>
<tr><th colspan="8">Attributes (continued)</th></tr>
<tr><td>Data Storage (continued)</td><td colspan="7">
Event History: Up to 500 records
Diagnostic History: Up to 500 records
Setpoint Programs: 224 maximum on 3.5” floppy disk. Programs must be stored on a separate disk from Data Trend Storage information.
Storage Rate Range: 0.25 to 3600 sec.
Capacity: Automatically calculates storage time based on storage rate. See examples in the following chart. Examples assume 1) an equal number of points are in each trend, 2) only trends are being stored (no storage of alarms, events, diagnostics, etc.), 3) batch storage (not continuous).
<table>
<tr><td>Number of trends</td><td>Total number of trend points</td><td colspan="5">Estimated Disk Capacity</td></tr>
<tr><td rowspan="3">1</td><td>2</td><td>19.6 hrs.</td><td>4 days</td><td>8 days</td><td>24.5 days</td><td>1.5 months</td></tr>
<tr><td>4</td><td>11.7 hrs.</td><td>2 days</td><td>4.9 days</td><td>14.7 days</td><td>29 days</td></tr>
<tr><td>6</td><td>8.6 hrs.</td><td>1.8 days</td><td>3.6 days</td><td>10.8 days</td><td>21 days</td></tr>
<tr><td rowspan="3">2</td><td>2</td><td>14 hrs.</td><td>2.9 days</td><td>5.8 days</td><td>17.6 days</td><td>1 month</td></tr>
<tr><td>6</td><td>7 hrs.</td><td>1.5 days</td><td>3 days</td><td>9 days</td><td>18 days</td></tr>
<tr><td>10</td><td>5 hrs.</td><td>1 day</td><td>2 days</td><td>6.3 days</td><td>12 days</td></tr>
<tr><td rowspan="3">3</td><td>6</td><td>6.5 hrs.</td><td>1.3 days</td><td>2.7 days</td><td>8 days</td><td>16 days</td></tr>
<tr><td>9</td><td>4.9 hrs.</td><td>1 day</td><td>2 days</td><td>6 days</td><td>12 days</td></tr>
<tr><td>12</td><td>3.9 hrs.</td><td>19.6 hrs.</td><td>1.6 days</td><td>4.9 days</td><td>9 days</td></tr>
<tr><td colspan="2">Data Storage every n seconds where n is:</td><td>1</td><td>5</td><td>10</td><td>30</td><td>60</td></tr>
</table>
<table>
<tr><td rowspan="8">Capacities are for each trend file</td><td>Total number of trend points</td><td colspan="5">Estimated Disk Capacity (120 Megabyte disk)</td></tr>
<tr><td>2</td><td>13.5 days</td><td>2.2 mos.</td><td>4.5 mos.</td><td>1.1 yrs.</td><td>2.2 yrs.</td></tr>
<tr><td>4</td><td>8.1 days</td><td>1.3 mos.</td><td>2.7 mos.</td><td>8.1 mos.</td><td>1.3 yrs.</td></tr>
<tr><td>6</td><td>5.9 days</td><td>29.8 days</td><td>1.9 mos.</td><td>5.9 mos.</td><td>11.9 mos.</td></tr>
<tr><td>8</td><td>4.8 days</td><td>24.4 days</td><td>1.6 mos.</td><td>4.8 mos.</td><td>9.7 mos.</td></tr>
<tr><td>10</td><td>3.7 days</td><td>18.9 days</td><td>1.2 mos.</td><td>3.7 mos.</td><td>7.5 mos.</td></tr>
<tr><td>12</td><td>3.2 days</td><td>16.2 days</td><td>1.0 month</td><td>3.2 mos.</td><td>6.5 mos.</td></tr>
<tr><td colspan="2">Data Storage every n seconds where n is:</td><td>1</td><td>5</td><td>10</td><td>30</td><td>60</td></tr>
</table>
</td></tr>
<tr><td>Control Loops</td><td colspan="7">Number: Up to 4
Type: PID, On/Off, Cascade, Split Output, Ratio, DIAT</td></tr>
<tr><td>Auto Tune</td><td colspan="7">• Each loop can be pre-tuned automatically to establish acceptable tuning parameters.
• On-line fuzzy overshoot suppression</td></tr>
<tr><th colspan="8">Setpoint Program Capability</th></tr>
<tr><td>Number</td><td colspan="7">Up to 4 programmers capable of up to 63 segments per profile</td></tr>
<tr><td>Ramping Capability</td><td colspan="7">Ramp X – Ramp rate is set by specifying x degrees per second, per minute, or per hour.</td></tr>
<tr><td></td><td colspan="7">Ramp T – Ramp rate is set by selecting the time to go from previous setpoint to next setpoint in t time.</td></tr>
<tr><td></td><td colspan="7">Ramp E – Ramp rate is set to increment by ΔSP for every pulse of a digital input.</td></tr>
<tr><td></td><td colspan="7">Value Duration Ramp – Ramp rate is based on the start value of the ramp and the time specified to reach the next soak start value.</td></tr>
<tr><td>Ramp Time Range</td><td colspan="7">0-9,999,999 hours, minutes, or seconds.</td></tr>
<tr><td>Soak</td><td colspan="7">Guaranteed or non-guaranteed. Can be applied to ramp or soak segment or across entire profile/program.</td></tr>
<tr><td>Soak time range</td><td colspan="7">0-9,999,999 hours, minutes, or seconds.</td></tr>
<tr><td>Program Cycling</td><td colspan="7">Entire programs or portions of a program can be cycled up to 99 times. Loops can be nested at least 4 deep.</td></tr>
<tr><td>Startup/Shutdown Segments</td><td colspan="7">Can be set up to use a predefined startup profile separate from the normal processing programs. Shutdown profile can be attached to the end of a profile and can be jumped to for emergency shutdown.</td></tr>
</table>

Table 1 VRX100 Video Recorder Specifications (continued)

Setpoint Program Capability (continued)	
PV Hot Start	Can start the profile at the point where the present PV value first intersects the profile.
Batch Programming	1 to 255 Batch numbers. Batch number is assigned by the programmer and is incremented automatically when batch is started. Using a keyboard or bar code reader and the front keyboard connector, a batch can be labeled with a name of up to 8 characters.
Profile Events	Up to 16 events can be defined in each segment of a profile. Each event's state is activated at the beginning of the segment and is held throughout the segment.
Analog Inputs	
Number	Up to 6 universal, up to 12 TC/EMF and Pyrometer only.
Input Types	EMF (mV, V, mA via shunt), Thermocouple, RTD and Pyrometer.
All Types	*Resolution:* 15 bits (14 bits plus sign). *Scan Rate:* 250 msec for 2 inputs, and 2 control loops and 1 Profiler and 8 Calc. Values 500 msec for 8 inputs and 2 control loops and 1 Profilers and 32 Calc. Values 1 sec for 12 inputs and 2 control loops and 1 Profiler and 32 Calc. Values *Isolation:* Fully isolated, 400 VDC peak. *Normal Mode Rejection:* 60 dB (1,000:1). *Common Mode Rejection:* 120 dB (1,000,000:1) (@ 100 ohm source). *Normal Mode Voltage Limit:* RMS equal to high span limit (@ mains/line frequency). *Common Mode Voltage Limit:* 400 VDC peak. *Input Impedance:* >20 megohms. *Accuracy*: See Tables 2 and 3. *Temperature Effects:* See Table 3. *Ranges*: Assigned per point based on range table. See Tables 2 and 3.
TC/EMF	*Source Resistance Error:* 0.3 microvolts per 100 ohms. *Reference Junction Error (TC only):* 0.3°C (0.5°F). *Open Input Check:* Bleeder type (upscale, downscale, off).
RTD	*Excitation Current:* 0.15 mA. *Switching*: Common "B" lead. *Maximum Lead Resistance:* 5 ohms.
Analog Outputs	
Number	Up to 3 current outputs. Five additional time prop. outputs (DAT) available. Maximum 8 analog outputs.
Type	Current output (CAT), Voltage output (VAT) (customer selectable with internal switch), Time Proportion output (DAT).
CAT (Current Adjusting Type)	*Current:* Selectable from 0 to 20 mA. *Maximum Load:* 800 ohms maximum per CAT output. *Isolation:* 400 VDC peak (input/output) 30 VDC peak. (input to ground) *Resolution:* 12 bits, 0.025%.
VAT (Voltage Adjusting Type)	*Voltage*: Selectable between 0 and 5 Volts. *Minimum Load:* 1000 ohms. *Isolation*: 400 VDC peak (input/output) 30 VDC peak. (input to ground) *Resolution*: 12 bits, 0.025%.
DAT (Duration Adjusting Type)	Uses any discrete output relay or open collector output. *Impulse Time:* ≥ 1 *Resolution:* 4.0 msec. *Minimum Off Time:* Off, ≥ 0 *Minimum On Time:* Off, ≥ 0
Pos Prop (Position Proportional)	Up to 2 available. Slidewire resistance: 100 to 1000 ohms Drive unit speeds: 10 to 220 seconds.
DIAT (Duration Impulse Adjusting Type)	Up to 2 available. Drive unit speeds: 10 to 220 seconds.

Table 1 VRX100 Video Recorder Specifications (continued)

Transmitter Power Supply (Standard Output)	
	24 VDC, 90 mA max.
Optional Discrete Inputs/Outputs	
Combinations available	3 DIs/4 DOs (Relay Outputs) (Not available with 8 and 12 Analog Input options) 6 DOs (Relay Outputs) (Not available with 8 and 12 Analog Input options) 16 DIs/16 DOs (open collector Outputs), 8 DI/24 DOs (open collector outputs)
Inputs	*Type*: Dry contact actuation. *Input Level:* 24 VDC, 15 mA (internally supplied). *Isolation:* 30 volts point-to-ground.
Relay Outputs	*Type*: Form C. *Max Switch Current:* 14/5 (NO/NC) Amps, 120 VAC resistive *Max Switch Voltage*: 265 VAC *Max Switch Power:* 200W, DC; 2000 VA, AC *Max Carrying Current:* 2 Amps @ 250 VAC; 5 Amps @ 120 VAC, 2 Amps @ 24 VDC.
Solid State AC Outputs	*Type:* Form A contacts. *Max Output Current:* 2 Amps. *Voltage Range:* 12-280 VAC. *Minimum Current:* 20 mA. *Switchbase:* Zero-crossing.
Solid State DC Outputs	*Type:* Form A contacts. *Max Output Current:* 2 Amps. *Voltage Range:* 5-60 VDC. *Minimum Current:* 20 mA.
Open Collector Outputs	Open transistor collector output rated at 30VDC max, 100mA max. User must provide a relay for each output along with external 24VDC power supply for the relays.
Digital Input Capability	3, 8, or 16 Digital Inputs
	Digital Inputs can be used to trigger instrument functions based on status of external switches.
Digital Output Capability	4 or 6 Relay Outputs; 8, 16, or 24 Open Collector Outputs.
	Digital Outputs can be triggered by Alarms, Program Status, Diagnostics, Math Result, Logic Result, or DAT Control Outputs.
Performance/Capacities	
Math Calculations	**Standard Math includes:** 8 Calculated Values along with the following Math functions: Free Form Math, Math Operators (+, -, x, ÷, Absolute Value, Square Root, Std. Deviation), Free Form Logic, Logic Operators (AND, OR, XOR, Inverter, Flip Flop, One-Shot), Periodic Timer. Logic gates can accept up to 8 inputs.
	Advanced Math includes: 32 Calculated Values with the functions from Standard Math along with the following types of pre-packaged algorithms: Signal Select, Compare, Signal Clamp, Interval Timer, Counter, Relative Humidity, Standard Splitter, Scaling, Peak Picking, Function Generator, Rolling Average, Carbon Potential, Mass Flow, F0 Calculation, Multiple Input Average, Single Point Average, Advanced Splitter, Continuous Emissions Block Average and Rolling Average.
Constants	Up to 16
Alarm Setpoints	Up to 16
Totalizers	Up to 12 (optional).
Control Loops	Up to 4 (PID, ON/OFF, Cascade, Split, Ratio, DIAT).
Primary Displays	Up to 10 displays may be assigned from the 18 formats shown in Figure 2 on page 3.
Support Displays	13 (menu access).
Communications (optional)	*Type:* RS-422/485, Honeywell Binary/MODBUS™ RTU protocols *Connection:* 2 twisted pair with shield. *Distance:* 600 meters, (2000 feet). *Number of links:* Up to 30 *Baud Rate:* 1200, 2400, 4800, 9600, 19.2K, 38.4K, 76.8K. *Parity*: Selectable; odd, even, none.

Analog Input Accuracy

Table 2 Analog Input Accuracy--Linear types

Input Range	Accuracy at Calibration Temperature		
	+/- Accuracy		+/- Temperature Effects
	% Range	mV	
-25 to 25 mV	0.02	0.01	0.003 mV per °C
-75 to 75 mV	0.02	0.03	0.009 mV per °C
-200 to 1000 mV	0.02	0.24	0.037 mV per °C
-200 to 5000 mV	0.02	1.04	0.150 mV per °C
0 to 10 VDC	0.3%	30 mV	1.86 mV per °C
-10 to 10 VDC	0.2%	40 mV	0.045 mV per °C
-20 to 20 VDC	0.5%	200 mV	0.255 mV per °C

See additional analog input specifications in Table 3 on next page.

Standards

This product is designed and manufactured to be in conformity with applicable U.S., Canadian, and International (IEC/CENELEC/CE) standards for intended instrument locations. The following Standards and Specifications are met or exceeded.

Case Protection	NEMA 3 on front of panel only, when instrument is panel mounted and front bezel is securely closed.
Rear of Panel	IEC 529, IP 20; EN 60529, IP 20
Flammability Rating	UL 94 - V2
Vibration Level	5 to 15 Hz, 1mm displacement; 15 to 150 Hz, 0.5g acceleration
Electromagnetic Compatibility	CE EMC Directive 89/336/EEC
Safety	CE Low Voltage Directive 73/23/EEC (EN 61010-1). For US, ANSI/ISA S82-1994. For Canada, CAN/CSA - C22.2 No. 1010.1-92
Intended Instrument Locations	• Rack or panel mounting in control room or industrial environments (operator accessibility front of panel only) • Installation Category II with grounded mains supply from isolation transformer or GFI (ground fault interrupter) • Pollution Degree 2 with rear of panel enclosed, in industrial environment

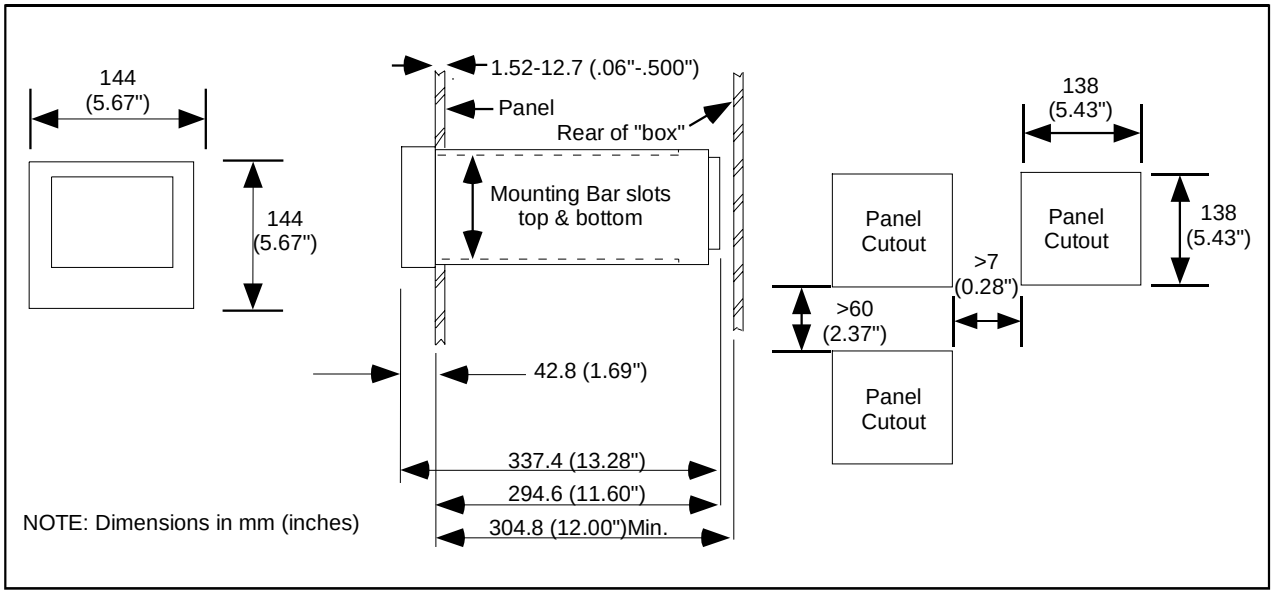

Figure 4 Dimensions and Mounting

Table 3 Analog Input Accuracy--Non-linear types

Type	Accuracy at Calibration Temperature						
	Operating Span [1]		+/- Accuracy			+/- Temperature Effects	
	°F	°C	% Range	°F	°C	mV per °F	mV per °C
Thermocouples - ITS-90 except where noted							
J	*0* to *2190*	*-18* to *1199*	0.1	2.2	1.2	0.005	0.009
K	*0* to *2500*	*-18* to *1371*	0.1	2.5	1.4	0.005	0.009
E	*-450* to -241 -240 to *1830*	*-268* to -152 -151 to *999*	0.6 0.1	13.7 2.3	7.6 1.3	0.005	0.009
T	*-300* to *700*	*-184* to *371*	0.1	1.0	0.6	0.002	0.003
N	*0* to *2372*	*-18* to *1300*	0.1	2.4	1.3	0.005	0.009
B	*110* to 949 950 to *3300*	*43* to 509 510 to *1816*	1.2 0.1	38.3 3.2	21.3 1.8	0.002	0.003
R	*0* to *3210*	*-18* to *1766*	0.1	3.2	1.8	0.002	0.003
S	*0* to *3210*	*-18* to *1766*	0.1	3.2	1.8	0.002	0.003
W5/W26 [2]	*0* to *4200*	*-18* to *2316*	0.1	4.2	2.3	0.005	0.009
PLAT II [2]	*-100* to *2500*	*-73* to *1371*	0.1	2.6	1.4	0.005	0.009
NI-NIMO	*32* to *2502*	*0* to *1372*	0.1	2.5	1.4	0.005	0.009
RTD							
CU10 [3]	*-100* to 155 156 to *310*	*-73* to 68 69 to *154*	0.1 0.2	0.4 0.8	0.2 0.4	0.005	0.009
PT100	*-300* to *1570*	*-184* to *854*	0.1	1.9	1.1	0.005	0.009
Pyrometry (Rayotube & Spectray) Types							
18890-3302	*750* to *1600*	*399* to *871*	0.1 typical	0.8	0.4	0.002	0.003
18890-0073	*800* to *1800*	*427* to *982*	0.1 typical	1.0	0.5	0.002	0.003
18890-0074	*1100* to *2300*	*594* to *1260*	0.1 typical	1.2	0.6	0.002	0.003
18890-0035	*1200* to *2600*	*649* to *1426*	0.1 typical	1.4	0.7	0.002	0.003
18890-0412	*1375* to *3000*	*747* to *1648*	0.1 typical	1.6	0.9	0.002	0.003
18890-0075	*1500* to *3300*	*816* to *1815*	0.1 typical	1.8	1.0	0.002	0.003
18890-1729	*1650* to *3600*	*899* to *1982*	0.1 typical	0.9	1.0	0.002	0.003
18890-00643	*1850* to *4000*	*1010* to *2204*	0.1 typical	2.2	1.2	0.002	0.003
18890-0216	*2110* to *4600*	*1155* to *2537*	0.1 typical	3.5	1.4	0.002	0.003
18890-5423	*2210* to *5000*	*1210* to *2760*	0.1 typical	3.8	1.5	0.002	0.003
18890-0163	*200* to *1000*	*94* to *537*	0.1 typical	0.8	.4	0.002	0.003
18899-8814	*340* to *1800*	*172* to *982*	0.1 typical	1.4	.81	0.002	0.003
18894-9014	*752* to *2552*	*400* to *1400*	0.1 typical	1.7	1.0	0.002	0.003
18894-0579	*752* to *2552*	*400* to *1400*	0.1 typical	1.7	1.0	0.002	0.003
Spectray 18885	*1832* to *3452*	*1000* to *1900*	0.1 typical	1.6	0.9	0.005	0.009
Spectray 18885-1	*1292 to 2912*	*700 to 1600*	0.1 typical	1.6	0.9	0.005	0.009
Spectray 18885-2	*806 to 1400*	*430 to 760*	0.1 typical	0.6	0.3	0.005	0.009
Spectray 18886	*1833* to *3452*	*1001* to *1900*	0.1 typical	1.6	0.9	0.005	0.009
Spectray 18886-1	*1292* to *2912*	*700* to *1600*	0.1 typical	1.6	0.9	0.021	0.037
18874-0578	*752* to *2552*	*400* to *1400*	0.1 typical	1.7	1.0	0.083	0.150
18875-0579	*752* to *2552*	*400* to *1400*	0.1 typical	1.7	1.0	0.083	0.150

1 Italicized values indicate overall input range.

2 IPTS-68

3 Accuracy for the calibrated channel. The factory calibrates channel #1. If calibrated on channel #1 channel #6 may be as much as 5.0 Degrees F higher. If using all 6 inputs for CU10 it is recommended to field calibrate on channel #3 or channel #4 to minimize the correction needed. Use Analog Input Value Adjust screen to compensate the other channels.

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