User Manual

Tektronix

**SDA 601
Serial Digital Analyzer**

070-8913-03

For product related information, phone: 800-TEKWIDE (800-835-9433), extension TV.

For further information, contact: Tektronix, Inc., Corporate Offices, P.O. Box 1000, Wilsonville, OR 97070–1000, U.S.A. Phone: (503) 627–7111; TLX: 192825; TWX: (910) 467–8708; Cable: TEKWSGT.

Warranty

Tektronix warrants that the SDA 601 Serial Digital Analyzer will be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

This warranty is given by Tektronix with respect to this product in lieu of any other warranties, expressed or implied. Tektronix and its vendors disclaim any implied warranties of merchantability or fitness for a particular purpose. Tektronix' responsibility to repair or replace defective products is the sole and exclusive remedy provided to the customer for breach of this warranty. Tektronix and its vendors will not be liable for any indirect, special, incidental, or consequential damages irrespective of whether Tektronix or the vendor has advance notice of the possibility of such damages.

EC Declaration of Conformity

We

Tektronix Holland N.V.
Marktweg 73A
8444 AB Heerenveen
The Netherlands

declare under sole responsibility that the

SDA 601 Handheld Serial Digital Analyzer

meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 55011   Class A Radiated and Conducted Emissions

EN 50081-1 Emissions:

   EN 60555-2   AC Power Line Harmonic Emissions

EN 50082-1 Immunity:

   IEC 801-2   Electrostatic Discharge Immunity
   IEC 801-3   RF Electromagnetic Field Immunity
   IEC 801-4   Electrical Fast Transient/Burst Immunity

High-quality shielded cables must be used to ensure compliance to the above listed standards.

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injury

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

The common terminal is at ground potential. Do not connect the common terminal to elevated voltages.

Connect the ground lead of the probe to earth ground only.

Replace Batteries Properly. Replace batteries only with the proper type and rating specified.

Recharge Batteries Properly. Recharge batteries for the recommended charge cycle only.

Use Proper AC Adapter. Use only the AC adapter specified for this product.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in an Explosive Atmosphere.

Safety Terms and Symbols

Terms in This Manual. These terms may appear in this manual:

⚠ *WARNING. Warning statements identify conditions or practices that could result in injury or loss of life.*

⚠ *CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product. These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product. These symbols may appear on the product:

⚠
CAUTION
Refer to Manual

▣
Double
Insulated

Battery Recycling

This product contains a Nickel Cadmium (NiCd) battery, which must be recycled or disposed of properly. For the location of a local battery recycler in the U.S. or Canada, please contact:

RBRC	(800) BATTERY
Rechargeable Battery Recycling Corp.	(800) 227-7379
P.O. Box 141870	www.rbrc.com
Gainesville, Florida 32614	

Getting Started

Please read the following statements before using your new SDA 601 Serial Digital Analyzer. See the rest of this section for tips on supplying power, making preliminary settings, and connecting the instrument.

WARNING. Install or replace batteries only with the instrument switched OFF and the AC adapter disconnected. Electrical shock or equipment damage can result.

CAUTION. Do not attempt to operate the SDA 601 with an improper AC adapter. Damage to the instrument can result.

For best results, use the AC adapter supplied with the instrument. If the supplied adapter is incorrect for the local AC power supply, contact your nearest Tektronix representative.

The adapter voltage must be 9 to 15 VDC with an open-circuit voltage less than 18 VDC; the adapter connector must have the negative (–) polarity contact in the center.

NOTE. Internal batteries are recommended when using an external power adapter. A loose adapter connector can cause the loss of some user settings and unexpected results the next time the instrument is powered on.

The battery type, disposable or rechargeable, must be selected using through the Utility menu (see page 10). Failure to select the proper battery type can result in damage to the batteries and product.

Replace the batteries only with standard AA batteries (1.2–1.5 V, nominal), or the Tektronix rechargeable battery pack listed on page 45.

For more information, please contact your nearest Tektronix representative or field office. In the United States and Canada, you can also call the Tektronix information number, 1-800-TEK-WIDE (1-800-835-9433), between 8:00 am and 5:00 pm Pacific time.

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Supplying Power

The SDA 601 is DC powered. You may power it with the standard AC adapter, the optional 9.6 V NiCad battery pack, eight standard AA batteries, or a "BP" type battery pack with the correct voltage and polarity. The external DC power connector is on the left side of the instrument.
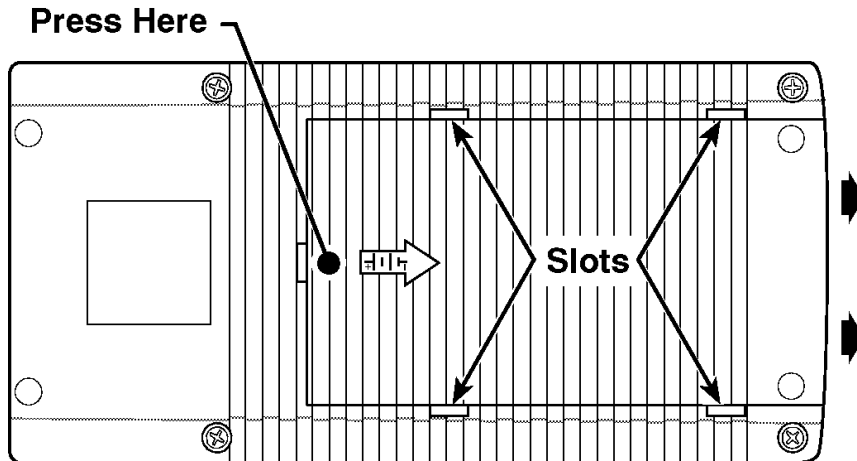

Figure 1: Opening the Battery Compartment

To install AA batteries or the battery pack, open the battery compartment of the SDA 601 by pressing down on the cover and sliding it in the direction of the inscribed arrow, as shown above. When the cover tabs line up with the slots in the case, lift the cover away from the instrument. Install batteries in alternating directions as indicated by the graphic molded into the "floor" of the battery compartment. If using the optional battery pack, take the time to identify both contacts and install the pack properly.

When selecting a power source for your SDA 601, please remember:

- Attempting to use an improper AC adapter can cause permanent damage to the instrument. USE AN APPROPRIATE DC POWER SOURCE ONLY: Voltage must be between 9 and 15 VDC; the center contact of the connector must be NEGATIVE polarity; and open-circuit voltage must not exceed 18 VDC. For best results, use the adapter supplied with the instrument.

- There is no need to remove the optional NiCad battery pack for recharging. The SDA 601 will "trickle charge" the battery pack whenever the standard AC adapter is attached *and the instrument*

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is switched off. It can take up to 16 hours to fully charge the battery pack. *Note that charging will occur only if the adapter supplies at least 12 V; make sure that the adapter you use is appropriate for the local AC supply.*

- AA batteries are not included with the instrument; buy them locally. Rechargeable AA batteries may be used, but they are NOT recharged automatically. To recharge AA batteries, remove them from the instrument and use an appropriate charger. For safety, read and follow the battery charger instructions. Do NOT attempt to recharge standard alkaline batteries.

- After three minutes with no key press, the LCD back light will be dimmed to save battery charge. (This may be disabled through the Utility/Diagnostics/Power Manage menu; see page 33.)

- To guard against battery discharge if you forget to turn the SDA 601 off, enable Auto Power Off through the Utility/Diagnostics/Power Manage menu (see page 10).

- The SDA 601 can sense low battery voltage. It will warn you when the charge is sufficient for approximately ten more minutes of operation. The instrument will shut itself down when the battery voltage becomes too low for reliable operation. See the Battery hints in Appendix C, beginning on page 47.

The **ON** key toggles instrument power On and Off.

NOTE. If the instrument is operating with low batteries, it may turn itself off and on. The batteries should be replaced or recharged depending on battery types.
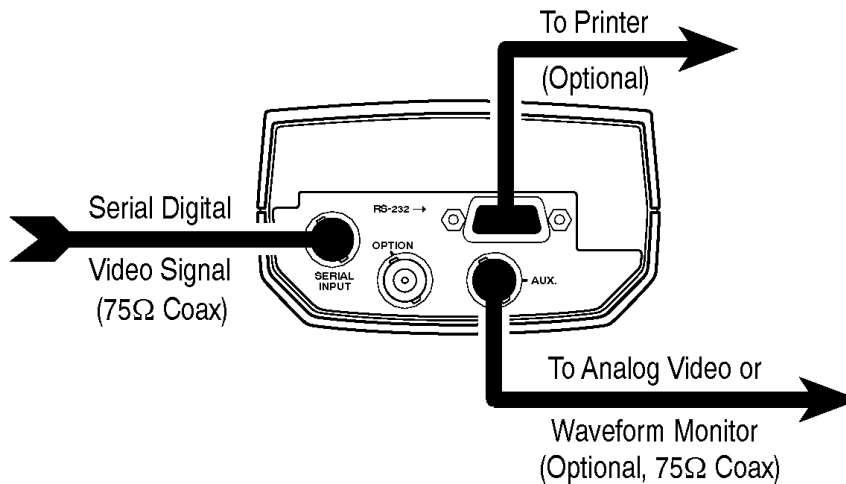

Connecting the SDA 601

Figure 2: Connecting the SDA 601

Connect the instrument as shown in Figure 2. The OPTION connector is reserved for later versions of the instrument. Note that the SDA 601 has many capabilities and features, and you may wish to gain familiarity with it by first connecting it directly to a serial digital, component video signal generator such as the Tektronix TSG 601, an analog video monitor, and—if convenient—a compact printer, such as the SeikoD-PU 411 printer (Tektronix part number 119-4594-00), available from Tektronix distributors and through TekDirect.

SERIAL INPUT

Connect the instrument to your system through the SERIAL INPUT with 75 Ω coaxial cable. Note that the SDA 601 has internal, *active* termination. The signal path that ends with the SDA will be properly terminated only when the instrument is switched on.

AUX Output

■ Lets you view the picture for convenient source identification.

■ Can contain the On-screen Display (OSD; see page 8), which shows the most recent Watch or Analyze results one page at a time—instead of one item at a time as on the SDA 601 display.

- With Pulse Cross enabled (see page 24), lets you "see" the contents of the vertical and horizontal interval portions of the serial video signal.

- Can include Cursor cross hairs for convenient positioning of the Cursors (see page 22).

- When Highlighting (see page 23) is turned on, can help you locate and identify errors in the picture, or the digital encoding of the signal.

The AUX output signal may be thought of as "pseudo video." It is derived from the serial input signal, converted to analog by an unfiltered 5-bit DAC. The signal can be the Y, R–Y, or B–Y component. Please see page 35 for more information about the AUX output.

RS-232 Interface

Connect an ASCII, serial printer to the RS-232 connector to create "hard copy" analysis reports, or to log errors detected during a Watch session. See page 35 for the connector pinouts, and other necessary communications settings. With a printer connected, you can choose—through the Alarm menu—to have the SDA 601 log every error as it occurs, or to print a Watch report every ten seconds. This will permit unattended monitoring of your system. See page 20 for more information.

To test your printer connection and settings, perform a signal analysis by pressing **Analyze**. Then, press **Shift-Analyze**. The printer should respond by printing an analysis report that resembles the one shown in Figure 3.

```
Page     1


Analyze at 08-Jul-94 13:25:40

270 Mb Component
625 lines
Video Present
8 Bit Video
EDH Found
Audio:   ----------------
Stuck Bits:   --------LL

No Errors Found
NO Illegal Value
Video In Range
Line/Fld Len OK
TRS OK
ANC Format OK
NO Zero Len ANC
NO AP CRC Change
FF CRC Changes
NO AP EDH Errors
NO FF EDH Errors
AP CRC is 0
EDH Flag NOT Set
```

Figure 3: A Printed Analysis Report

The RS-232 interface is also designed to support in-field upgrade of the operating software. Information regarding any such upgrades will be available from your Tektronix representative or field office.

Keypad and Display Conventions

Please see the Instruction card (p/n 070-8912-00) supplied with your SDA 601 for a "tour" of the keypad and an explanation of the display symbols. For your convenience, the following panels are taken from the card.


Display Symbols

S = Shift (Press **Shift** again to Shift Lock)

S L = Shift Lock (Press **Shift** again to unlock)

[lock] = Lockout enabled (press **Lock Out** to unlock)

/ = Auto power down enabled (symbol "rotates")
Disable through the Utility/Diagnostics/Power Management submenu; hold **Lock Out** down while pressing **ON** to enter the Utility menu

A = Alarm enabled (press **Alarm On/Off** to toggle)

W = Indicates that instrument is in Watch mode

E = An error condition (selected for monitoring through the Watch menu) has been detected

+ = Arrow keys control Cursors (see below)

Shift/Shift Lock

(Shift)   Only the next key press is shifted

Shift Lock
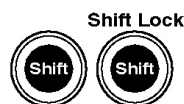
(Shift) (Shift)   All following keys are shifted, or *Cursor* movement is accelerated (Until **Shift** is pressed again)

Cursor Movement

Cursor

(= B)   Toggles arrow key function between (Analyze and Watch) list scrolling and cursor control

---

Keypad Lock Out

(Lock Out)   Toggles keypad Lock/Unlock

The On-screen Display (OSD)

The OSD is a 12 line, 24 column display containing results from an SDA 601 Analyze or Watch session. It can be superimposed on the AUX output and viewed on an attached video monitor. Toggle the OSD On/Off with the **Insert On/Off** key. The default OSD will resemble Figure 4 when the instrument is in Watch mode. You can control several OSD characteristics (size, color, screen position) through the Utility/OSD Setups submenu; see page 32.
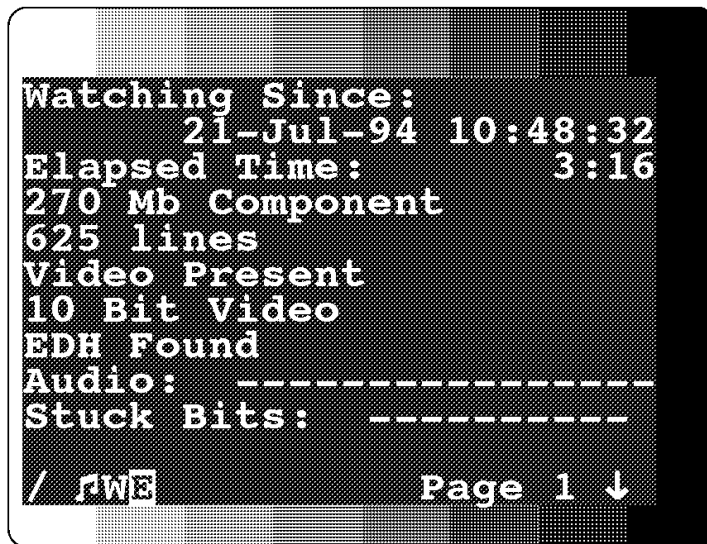
Figure 4: The Default Watching OSD

The symbols on the bottom line of the OSD have the following meanings:

■ The rotating line in the lower left indicates that Auto Power Off is enabled.

■ The musical note symbol indicates that Alarms are toggled On with the **Alarm** key or through the Alarm menu. This symbol can appear even when the beeper and print errors items in the Alarm menu are set to Off.

■ The "W" appears when the instrument is in Watch mode.

■ The reversed "E" means that an error is detected.

- Similar reversed "S" and "SL" icons (not shown) will appear when SDA 601 keypad is shifted and shift locked.

- The down arrow in the lower right indicates that the ▼ key may be used to reveal another page. An up arrow will appear if the ▲ key may be used.
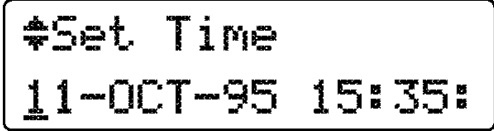
The Analyze OSD is similar; see Figure 6, on page 15.

Preliminary Settings

Once the SDA 601 is up and running, you should choose some settings depending on how you'll be using the instrument. These settings are made through the Utility menu. Invoke the Utility menu by holding **Lock Out** down while pressing the **ON** key (when the LCD says "Watching" or "Idle"). Then follow these directions to set the Battery Type and enable Auto Power Down (if desired).

Set the Date and Time

1. Once in the Utility menu, use the ▲ and ▼ keys to scroll to the Set Time item, and press **Enter**. The instrument display will change to resemble Figure 5.

```
⬍Set Time
11-OCT-95 15:35:
```

Figure 5: The Set Time display

2. The underline cursor indicates the active character position. Move the cursor with the ◄ and ► keys. Enter the appropriate character from the SDA 601 keypad. When the cursor is in positions that require numeric entry, the keys will be automatically shifted. When you enter an appropriate character for the field, the cursor will move one position to the right. The acceptable month abbreviations are the first three characters of the English name: JAN; FEB; MAR; APR; MAY; JUN; JUL; AUG; SEP; OCT; NOV; DEC.

Enter the time in 24 hour format; that is, if the present time is 4:15 pm, enter 16:15.

3. When the correct date and time is shown on the display, press **Enter**. If all values are valid, the instrument will respond with the message "Time Accepted." If you have made an error and entered an invalid date or time, the instrument will respond with an appropriate error message. If that happens, correct the error and press enter.

4. Press any rectangular key to exit the Utility menu, or proceed to other preliminary settings, as appropriate.

Set the Battery Type

1. After setting the clock, press the ▼ key once to scroll to the Diagnostics submenu item, and press **Enter**.

2. In the Diagnostics submenu, scroll down to the Power Manage item with the ▼ key. Again, press **Enter**.

3. The top item in the Power Manage submenu is Battery Type. Toggle to the selection that matches the type of battery you have installed in your SDA 601 by pressing either ◀ or ▶. The choices are "rechargeable" and "disposable." Select rechargeable when using NiCad AA cells or the optional battery pack; choose disposable when you are using common Alkaline AA batteries, which cannot be recharged. Press **Enter** to confirm the choice.

4. When the correct battery type is indicated by an asterisk (*) on the lower right of the LCD, continue to Auto Power Off, or press any rectangular key to exit the Utility/Diagnostics/Power Manage submenu and return to normal operation.

Enable (Disable) Auto Power Off

"Auto Power Off" will switch the instrument off when ten minutes have passed without a key press. Enable this feature when you are using battery power and operating in an environment in which unplanned shutdown of the SDA 601 is permissible.

1. While still in the Utility/Diagnostics/Power Manage submenu, press the ▼ key twice to scroll to the Auto Power Off item.

2. Disable/enable Auto Power Off by pressing either ◀ or ▶. Press **Enter** to confirm the choice. Enabled Auto Power Down is indicated by a "rotating line" symbol on the second line of the instrument display, and in the lower-left corner of the OSD.

3. Use the ▲ and ▼ keys to scroll to other "power manage" items, or press any rectangular key to exit the menu and resume normal operation.

Disable (Enable) Timed LCD Backlight Turn Off

Another power saving feature of the SDA 601 is timed turn-off of the LCD backlight. It is enabled by default in a new or reset instrument. If you will always operate with the AC adapter, you may wish to disable the feature. To toggle backlight turn-off:

1. In the Utility/Diagnostics/Power Manage submenu, use the ▲ and ▼ keys to scroll to the LCD Backlight item.

2. Choose between "Timed Turn Off" and "On all the time" with either ◀ or ▶, then press **Enter** to confirm the choice.

3. As before, use the ▲ and ▼ keys to scroll to other "power manage" items, or press any rectangular key to exit the menu and resume normal operation.

Performance Verification

A performance verification procedure, which some users may require for acceptance testing, is included in the optional SDA 601 service manual (Tek p/n 070-8914-0x). To order a service manual, please contact your nearest Tektronix representative or field office.

Operating Basics

NOTE. For more information on Serial Digital Video Systems request Tektronix publication 25W-7203-1 "A Guide to Digital Television System and Measurements" from your nearest Tektronix representativeor field office.

To begin using the instrument as quickly as possible, see "Using Your SDA 601," below. For additional information on selected topics, turn to the Reference section of this manual, beginning on page 27.
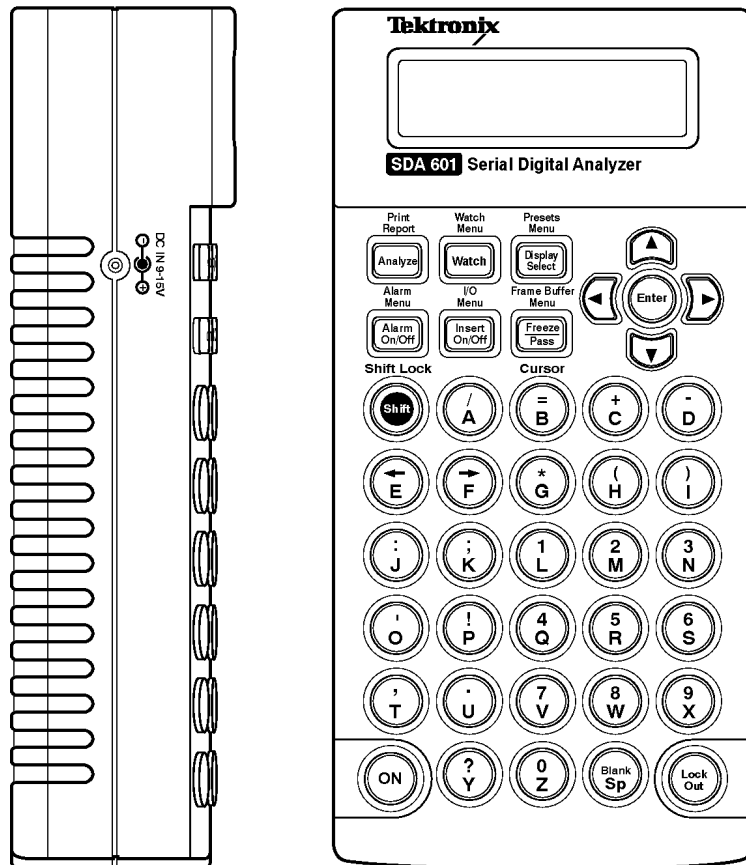
Using Your SDA 601

Here's what you can do with your SDA 601. Instructions for each function begin on the indicated page.

- **Analyze** one second of the incoming signal and read the results on the instrument display or an attached video monitor (page 14). You may also print the results on an attached ASCII, serial printer (page 15).

- **Watch** the input signal, paying attention to selected signal characteristics, or groups of characteristics (page 16). Errors are reported to the instrument display panel and an attached video monitor. You may also log errors to an attached printer (page 20).

- Set audible alarms to warn you of any errors encountered while the instrument is "watching" the input signal (page 19).

- View decoded video on an attached monitor (attached to the AUX output, see page 4)

- Highlighting (page 23)

- Signal Level Meter (page 21)

- Cursors (page 22)

- Pulse Cross (page 24)

Analyzing a Signal

Analyze Mode may be selected with the Analyze key at any time. In this mode, the instrument attempts to lock onto the digital video signal and, if successful, analyzes the status of the various signal characteristics at one instant in time and reports the status to the Review List. The Review List may be viewed on the OSD (on an attached video monitor) as well as on the SDA 601 LCD when no menu is active. The up and down arrow keys scroll through the list of detected "conditions."

The conditions detected and reported in an SDA 601 analysis are:

Video format	TRS (OK/incorrect)
Line standard (625 or 525)	ANC Format (OK/incorrect)
Video present or missing	Zero length ANC (yes/no)
Video resolution (8 or 10 bits)	APCRC changes (yes/no)
EDH packet found/missing	FFCRC changes (yes/no)
Audio status (16 channels)	APCRC errors (yes/no)
Stuck bits (if any)	FFCRC errors (yes/no)
Illegal (digital word) values	ØAPCRC (yes/no)

Video In/Out of range   EDH flag set/not set
Line/field length (OK/incorrect)

Performing an Analysis — To analyze a signal, simply press **Analyze**. The SDA 601 will observe the incoming signal for one second, analyze the data, and write the results to a "condition review list" and the OSD.

Reviewing the results on the OSD — There are three pages of results; use the ▼ and ▲ keys, as indicated by the arrow icons on the lower right of the OSD, to see all three pages.
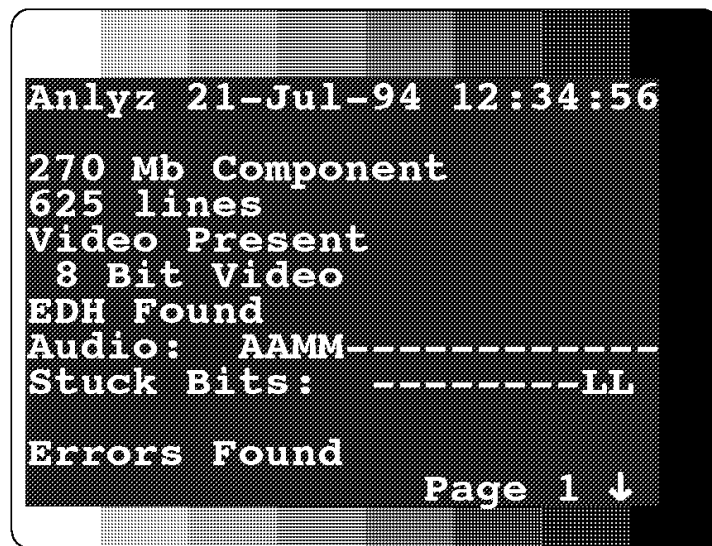
```
Anlyz 21-Jul-94 12:34:56

270 Mb Component
625 lines
Video Present
 8 Bit Video
EDH Found
Audio:   AAMM------------
Stuck Bits:   --------LL

Errors Found
                  Page 1 ↓
```

Figure 6: The Analyze OSD

Reviewing the results on the LCD — Use the ▼ and ▲ keys to scroll through the condition list on the instrument LCD. The display will "time out" after three seconds of no key press and return to its pre-analysis state—Idle, or the data enabled through the Display Select menu. Press **Enter** to return to the last condition; press ▼ or ▲ to scroll down or up the list.

Printing an Analysis report — With a printer connected to the RS-232 port and properly configured (see pages 35 and 36), press **Shift**, then **Analyze**. A report, resembling the printout shown in Figure 3 (page 6), will be printed.

Audio and Stuck Bits explained — Audio content and stuck bits are reported on the LCD and Printer output in the same format as in the OSD, shown in Figure 6:

The "Audio:" result line has room to display the status of all 16 audio channels that can be embedded in digital video. The status of channels (#1 through #16, from left to right) are reported as "–" for no audio detected, "A" for active audio, and "M" for mute (present, but silent).

The "Stuck Bits:" line shows the status of the 10 possible video word bits, MSB to LSB left to right. If the signal contains any stuck bits, they are indicated by an H (stuck high) or L (stuck low) in the appropriate position. The two LSBs will be reported as L when an 8-bit video signal is received. Other stuck bits suggest either an incorrect signal or faulty equipment.

Zero-length ANC — is reported by the SDA 601 when an ancillary data "Data Count word" with value Ø is detected. Analyze mode detects the presence of zero-length ANC because it can be inserted in the serial digital video data stream by some equipment, yet it can cause difficulty in many systems.

Watching a Signal

While Analyze takes a one-second "snapshot" of the input signal and reports the status of a predefined list of characteristics, Watch mode permits continuous observation of the characteristics—or "conditions"—of your choice. Besides reporting errors to the instrument display and the OSD, Watch mode can also sound an audible ("beep" or "tick") alarm to alert you of any error, and log errors to a printer for later review.

The steps to monitoring a signal with the SDA 601 are:

1. Select the conditions to be watched. This is done through the Watch menu, which can be set for "Group" or "Item" selection of conditions. Group selection may be more convenient, but not as flexible as Item selection.

   In all, there are 20 Watch conditions. Eight conditions are always watched and reported when "Watch Menu Type" is set—through the Utility menu—to "Groups":

Video format	EDH packet found/missing
Line standard (625 or 525)	Audio present/missing
Video present or missing	Stuck bits (if any)
Bits in active picture (8 or 10)	Other ANC (if any)

The twelve remaining conditions are organized into the four Watch groups:

Data Value Group:
Illegal (word) values
Video In/Out of range
Format Group:
Line/field length (OK/incorrect)
ANC Format (OK/incorrect)
TRS (OK/incorrect)
Zero length ANC (yes/no)

CRC Change Group:
APCRC changes (yes/no)
FFCRC changes (yes/no)
APCRC is/not Ø
EDH Group:
AP EDH errors (yes/no)
FF EDH errors (yes/no)
EDH flag set/not set

When only the Data Value group is set to "Watch," the SDA 601 will actually observe the status of ten conditions—the eight default conditions plus Illegal Values and Video In/Out of Range. If all four groups are selected, all 20 conditions are monitored.

Group selection can be inconvenient, however, when you are only interested in one condition in the group. An example might be when observing a changing test signal that is being generated with ØAPCRC. In this case, FFCRC changes are not an error, but non-zero APCRC is, and Watching the CRC Change Group can result in inappropriate alarms.

The remedy, then, is to use the Utility menu and set Watch Menu Type to Item Select. When this is done, the only always-watched condition is Video Format (270 Mb Component, for example). All other items are selected individually. See the Watch menu listings on pages 29 through 30.

2. Set the appropriate alarms; see page 19.

3. Once all conditions have been selected and alarms configured, begin the Watch session by pressing **Watch**. If none of the display options (Signal Level, Cursor Data, or Current Time) have been turned on through the Display Select menu, the display will resemble Figure 7. The "W" icon will appear whenever the instrument is in Watch mode; the "A" icon will be displayed when alarms have been toggled On with the **Alarm On/Off** key (whether

or not alarms are enabled through the Alarm menu); and the "E" icon will appear when an error is detected.

```
╭─────────────────────────────────╮
│  Watching                       │
│                                 │
│                    ╱  ▣▣▣        │
╰─────────────────────────────────╯
```

Figure 7: The SDA 601 "Watching" Display

4. Review the condition list on the SDA 601 LCD by pressing the ▼ key until you reach the END OF LIST message. Use ▲ to scroll back up the list as desired. The Watch review list will "time out" if more than 3.5 seconds pass without a key press. Press **Enter** to return to the last-displayed item; press ▲ to move up the list and display the previous item; press ▼ to display the next item "down" the list.

5. If you have a video monitor connected to the AUX output, you may review the condition list on the OSD. Toggle the OSD On with the **Insert On/Off** key, then page the OSD up and down with the ▲ / ▼ keys.

Restarting a Watch session — Pressing **Watch** during a Watch session will restart the Watch mode, resetting the elapsed time counter and the printer page count to zero.

Stopping a Watch session — The current Watch session will end when you press **Analyze** or enter the Watch menu. After the analysis, or on leaving the Watch menu, you may begin a new Watch session by pressing **Watch**.

Pausing a Watch session — A Watch session is temporarily suspended when you invoke any other SDA 601 menu (besides the Watch menu). Data collection continues, but OSD and printer updates are suspended. When you exit the menu by pressing a rectangular key, the OSD will update to include all events during the time spent in the menu.

```
Watching Since:
        21-Jul-94 12:34:56
Elapsed Time:         7:12

AP CRC Changes      1 SEC
        LAST AT 12:35:21
FF CRC Changes      1 SEC
        LAST AT 12:35:21
AP CRC NOT 0    >254 SEC
        LAST AT 12:42:08

   ♪WE           Page 4 ↑
```

Figure 8: Watch Errors Reported on the OSD

Interpreting error reports — The SDA 601 reports errors in many Watch conditions to the review list on an "error second" basis, as shown in Figure 8. In this illustration, the FFCRC and the APCRC changed at least once, giving one error second approximately 25 seconds after the Watch session began. In addition, APCRC was NOT zero at least once in over 254 seconds (254 is the highest count possible), and the last error was detected in the last reported second, 7:12 into the Watch session.

A similar format is used on the SDA 601 liquid crystal display.

Alarms

Alarms are enabled through the Alarm menu. When enabled, an alarm is generated when one or more signal conditions or errors are detected by the SDA 601 in Watch mode. The SDA 601 has two alarm modes.

■ A "beeper" (audible) alarm that may be configured in one of three ways:

  □ Long Beep — Several seconds long, produced each time an alarm condition is detected. In the case of frequently-recurring errors, the beep will repeat continuously, if necessary;

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however, there may be fewer than one alarm per error condition.

- ☐ Short Beep — One second duration; otherwise similar to the Long Beep.

- ☐ Beep "Tick" — A very short beep, almost a tick; useful when there are many alarm conditions, when they occur in "bursts," or for audible feedback when performing equipment adjustments for proper operation.

- ■ A Printer Port alarm, output on the RS-232 port. There are two ways to use the printer during watch sessions:

  - ☐ Log each error — or as many as the printer buffer allows. Intended for extended monitoring of the signal when few, if any errors are expected. You can leave the SDA 601 (powered by the AC adapter) and a printer unattended to log and help diagnose intermittent problems. This is the same as the audible alarm in that, once configured, it can be controlled with the **Alarm On/Off** key.

  - ☐ Print an error report every ten seconds — Strictly speaking, this option is not an alarm because when it is selected, the instrument will print a report every ten seconds of the Watch session *whether an error has been detected or not, and regardless of the Alarm On/Off state* (set with the key or through the menu). The print line will contain at least the time and video format; only errors that occurred in the preceding ten-second interval will be printed.

Select alarm conditions or errors through the Watch menu (see "Watch Mode," above). Conditions that will always trigger an alarm if detected by the SDA 601 in Watch mode are:

> No PLL Lock
> Video Missing
> "Other" ANC Data
> Illegal Value
> Video Ovr Range
> Line/Field Len
> EAV/SAV/TRS Error
> ANC Format Error
> Zero Length ANC
> AP CRC change

FF CRC change
AP EDH error
FF EDH error
Flag Set

Conditions that will trigger an alarm only if they are configured to do so through the Item Watch menu are:

Line Std Detect (if "Alarm if 525" or "Alarm if 625" is selected)
AP Bits (8/10) (if "Alrm if 8 bits" or "Alrm if 10 bits" is selected)
EDH packet miss (if "Alarm if Miss" is selected)
AP CRC Not Ø (if "Alarm Not Ø" is selected)

Configure the beeper and printer alarms through the Alarm Menu (see page 30). As you might expect:

1. Enter the Alarm menu (press **Shift**, then **Alarm On/Off**).

2. Scroll to the desired menu item with the ▼ / ▲ keys.

3. Select the option with the ◄ / ► keys.

4. Confirm the option choice by pressing **Enter**.

5. Exit the Alarm menu by pressing any rectangular key.

Toggle the alarms On/Off with the **Alarm On/Off** key.

Displaying the Signal Level

The relative level of the serial digital input signal is displayed by default on every new (or reset) SDA 601. This display can be helpful in identifying points in your system where the signal may be marginal because of long cable runs or faulty equipment.
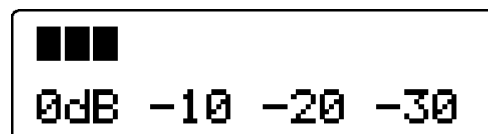
Figure 9: The SDA 601 Signal Level Display

The signal level display may be toggled On/Off through the **Display Select** key/menu (see page 31).

Cursor

The SDA 601 "cursor" may be used to pinpoint a single word in the digital video frame and discover the actual value of the selected word and the three that follow. The location of the cursor may also be shown with "cross hairs" on a video monitor connected to the AUX output.

The cursor is positioned (and a word is selected) with the arrow keys.
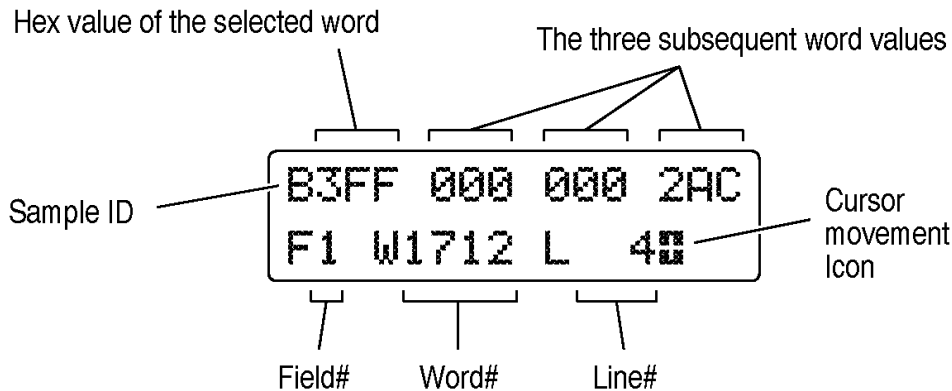
Figure 10: The Cursor Data Display

The address/coordinates of the word, and its actual hexadecimal value, may be viewed on the SDA 601 display, as shown in Figure 10. Toggle display of the Cursor Data on the instrument LCD through the **Display Select** key and menu (see page 31).

The first line of the cursor data display contains the hexadecimal values of the selected word and the three that follow it. Values typical for the SAV timing and reference signal are shown in Figure 10. The video "type" of the selected word is indicated by the sample ID:

B = C_B color difference
Y = Cosited luminance
R = C_R color difference
y (lowercase) = Isolated luminance

The second line contains the address or coordinates of the selected word. In the example, the selected word is number 1712 of line 4 in field 1.

The cursor movement icon is present on the second line when you can use the arrow keys to position the cursor. Use the **B** (Cursor) key to toggle the arrow keys between cursor movement and their alternate display scrolling function. Normal cursor movement is one line for each press of the ▲ or ▼ key, and one word per press of the ◄ or ► key. Pressing **Shift** twice (to invoke shift lock) will increase horizontal movement to 20 words per key press, and vertical movement to 10 lines per key press. Press Shift again to return to "fine" cursor control.

Toggle display of the Cursor cross hairs in the AUX output through the I/O menu (see page 31).

Highlighting

Highlighting is a feature of the AUX video output in which the SDA 601 "flashes" pixels that correspond to certain Watch conditions. With highlighting, you can visually monitor the occurrence, placement, and prevalence of these signal conditions in the context of the video signal.

The following Watch conditions or errors can be highlighted on an attached video monitor:

- □ ANC packet format error (e.g., checksum or parity errors)
- □ Zero-length ANC packets
- □ Other ANC data (data that is neither audio nor EDH format)
- □ Incorrect Line/field length
- □ Incorrect TRS/EAV/SAV format
- □ Illegal data values
- □ Out of range video levels

To use Highlighting:

1. Configure the SDA 601 to monitor one or more of the above items; see "Watching a Signal" beginning on page 16.

2. Enter the I/O menu (press **Shift**, then **Insert On/Off**).

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3. The first I/O menu item is Highlighting. Use the ◀ or ▶ key to select "Display," then press **Enter** to confirm the choice.

4. While still in the I/O menu, press the ▼ key once to scroll down to the "Dim Video" item.

5. Toggle Dim Video to On with a horizontal arrow key, then press **Enter** to confirm the choice. Dim Video reduces the video signal by 50%, ensuring good contrast between the video signal and highlighted pixels.

6. Exit the I/O menu by pressing any rectangular key.

7. If necessary, start or restart the Watch session by pressing **Watch**.

8. The default OSD will obscure any highlighting in the portion of the picture that it occupies. Therefore, if the OSD is on, toggle it off with the **Insert On/Off** key.

A convenient way to see the effects of Highlighting is to set either the Data Value Group or the Video Over Range item to Watch, then input a Pluge signal. The "sub-black" portion of active video will be highlighted.

Note that the ANC highlight conditions occur in the horizontal or vertical interval. Use Pulse Cross to "see" those conditions.

Pulse Cross

Pulse Cross is an SDA 601 AUX output mode that allows the user to "see" the horizontal and/or vertical intervals, which are normally blanked in serial video monitors. The original four-word timing reference signals (TRS, which contain EAV and SAV) are replaced with legal video samples, and analog H and V sync information is inserted in the original active picture region. To invoke pulse cross:

1. Enter the I/O menu (press **Shift**, then **Insert On/Off**).

2. Press the ▼ key repeatedly to scroll down to the Pulse Cross menu item.

3. With the ◀ / ▶ keys, scroll to the desired pulse cross option. The options are:
   Normal — the default
   HCross — reveals the "horizontal interval" region of the signal
   VCross — reveals the "vertical interval" region of the signal
   Both — combines HCross and VCross

4. Press **Enter** to select the new option.

5. Press any rectangular key to exit the I/O menu.

Presets

The configuration of the SDA 601 at any given time may be saved as a Preset for later recall. Three different configurations can be saved. Using presets, you can easily change between completely different combinations of (for instance) Watch conditions, alarm settings, LCD display options, and AUX output options. To save a Preset:

1. Enter the Presets menu (press **Shift**, then **Display Select**).

2. Press ▼ once to reach the Save Preset item.

3. Choose a preset storage location (1, 2, or 3) with the ◄ / ► keys. Remember that previous contents of the storage location will be overwritten in the next step.

4. Press **Enter** to save the current settings in the indicated location. "Working... Done" will appear on the LCD during the save process.

5. Press any rectangular key to exit the Presets menu.

To recall a previously saved Preset:

1. Enter the Presets menu.

2. Choose the Preset (1, 2, or 3) with the ◄ / ► keys.

3. Press **Enter** to recall the saved configuration. "Working... Done" will appear on the LCD. Some settings (I/O and Display settings, for example) will change instantly; Watch and Alarm settings will be restored in the next Watch session.

4. Press any rectangular key to exit the Presets menu.

NOTE. *Recalling a preset will turn Watch mode off.*

Software Reset

To reset the instrument NVRAM and restore the SDA 601 to "factory" default settings, select the Factory Reset item in the Utility/Diagnostics/NVRAM/TIC Dgs submenu. See page 34.

NOTE. *All user settings and presets will be lost.*

Reference

SDA 601 Menus

The instrument menus are explained here, and listed on the following pages.

Menu Conventions

Once you have entered a menu, use the arrow keys and **Enter**, as shown Figure 11, to scroll the menu and select and confirm choices.
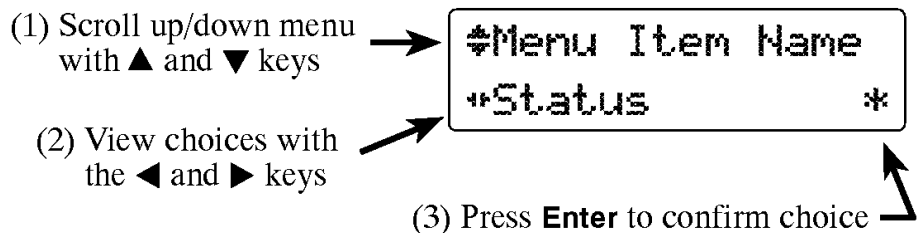
Figure 11: SDA 601 Menu Conventions

The current status is indicated by the asterisk at the end of the second line. In the display illustrated in Figure 12, for example, the asterisk tells you that 15 is the current horizontal position of the OSD (this item is in the Utility/OSD Setups submenu; see page 32). The asterisk will disappear if you press the ▶ key once to change the value to 16. It will reappear if you then press **Enter** to confirm 16 as the new position.

Figure 12: The OSD Setups/Horizontal Position Item

Number Entry: In many cases, numbers may be entered directly from the keypad. In the "Horiz Position" item, for example, you can enter the desired location with the number keys 0 through 9—see the following illustration—without first pressing **Shift**.
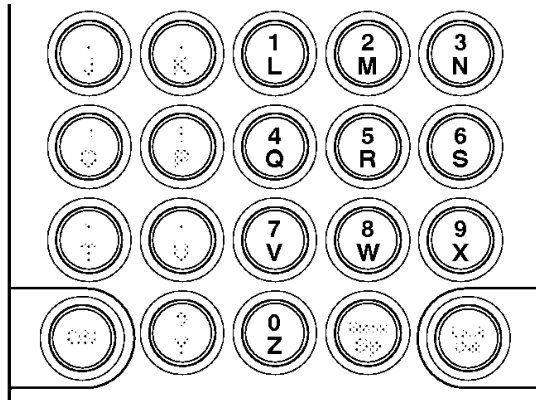
Figure 13: The SDA Number Keys

Note that once the new horizontal coordinate has been entered through the keypad and is visible on the LCD, you must press **Enter** *twice* to confirm the change. The first press completes the numeric entry; the second makes the entry permanent. If you leave the menu or submenu without confirming the entry with a second press of the Enter key, the setting will revert to its previous value. Just remember to press **Enter** repeatedly until the asterisk appears.

NOTE. In the menu listings that follow, the factory default for each item is the first listed option. Defaults for items that can be set within a range of numeric values are given within square brackets [for example] on the option line.

Watch Menu (groups enabled)

Enter the Watch menu by pressing **Shift**, then **Watch**. Configure the menu for Group or Item selection through the Utility menu; see page 33. See page 17 for a list of the items in each group.

(1) ✤ Data Value Grp
    Off <> Watch

(2) ✤ Format Group
    Off <> Watch

(3) ✤ CRC Chnge Group
    Off <> Watch

(4) ✤ EDH Group
    Off <> Watch

Watch Menu (items enabled)

(1) ✤ Line Std Detect
    Off <> Watch[1] <> Alarm if 625 <> Alarm if 525

(2) ✤ Video Missing
    Off <> Watch

(3) ✤ AP Bits (8/10)
    Off <> Watch[2] <> Alrm if 8 bits <> Alrm if 10 bits

(4) ✤ EDH packet miss[3]
    Off <> Watch

(5) ✤ Embedded Audio
    Off <> Watch

(6) ✤ Stuck Bit Detec
    Off <> Watch

(7) ✤ Other ANC Data[4]
    Off <> Watch

(8) ✤ Illegal Value
    Off <> Watch

(9) ✤ Video Ovr Range
    Off <> Watch

(10) ✤ Line/Field Len
    Off <> Watch

[1] Status is reported but not treated as an error.

[2] Word length is reported.

[3] Missing

[4] Ancillary data packet, which is neither Audio nor EDH, is detected.

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(11) ♣ EAV/SAV/TRS err
Off <> Watch

(12) ♣ ANC Format Erro
Off <> Watch

(13) ♣ Zero Length ANC
Off <> Watch

(14) ♣ AP CRC change
Off <> Watch

(15) ♣ FF CRC change
Off <> Watch

(16) ♣ AP CRC Not ∅
Off <> Watch <> Alarm Not ∅[5]

(17) ♣ AP EDH error
Off <> Watch

(18) ♣ FF EDH error
Off <> Watch

(19) ♣ Flag Set
Off <> Watch

(20) ♣ Clear All Items[6]
Press Enter

Alarm Menu

Enter the Alarm menu by pressing **Shift**, then **Alarm On/Off**.

(1) ♣ Beeper
Beep: Off <> Long <> Short <> Tick

(2) ♣ Print Errors
Off <> Log each Error[7] <> Log every 10s[8]

(3) ♣ Alarm On/Off[9]
Off <> On

---

[5] Non–zero APCRC is reported as an error and will trigger an alarm, if set.

[6] Sets all items to Off.

[7] Only when alarms are toggled On.

[8] Independent of alarm settings.

[9] Duplicates the action of the **Alarm On/Off** key.

I/O Menu

Enter the I/O menu by pressing **Shift**, then **Insert On/Off**.

(1) ⬍ Highlighting
No Display < > Display

(2) ⬍ Dim Video
Off < > On

(3) ⬍ Video Cursor
No Display < > Display

(4) ⬍ Pulse Cross
Normal < > HCross < > VCross < > Both

(5) ⬍ AUX
Pixmon Y < > Pixmon R–Y < > Pixmon B–Y

Display Select Menu

Enter the Display Select menu by pressing **Display Select**.

(1) ⬍ Disp Sig Level
On < > Off

(2) ⬍ Disp Cursr Data
Off < > On

(3) ⬍ Disp Cur Time[10]
Off < > On

Presets Menu

Enter the Presets menu by pressing **Shift**, then **Display Select**.

(1) ⬍ Recall Preset
Preset 1 < > Preset 2 < > Preset 3

(2) ⬍ Save Preset
Preset 1 < > Preset 2 < > Preset 3

Utility Menu

Enter the Utility menu when the instrument is Watching or Idle (as indicated on the LCD) by holding **Lock Out** down while pressing **ON**.

Note that some items in the Diagnostics submenu—are for use by qualified service personnel only (these items are marked with a ✝)

---

[10] Current time and date, set through the Utility menu.

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symbol); see the SDA 601 Service manual (Tektronix p/n 070-8914-0x) for instructions on their use.

(1) ♣ OSD Setups...
Press Enter

    (a) ♣ OSD On/Off[11]
        On <> Off

    (b) ♣ Horiz Position
        0 <> MAX=31 [default = 5]

    (c) ♣ Vert Position
        MIN = 0 <> MAX = 31 [default = 11]

    (d) ♣ Set char Size
        Medium <> Big <> Small

    (e) ♣ Previous Menu
        Press Enter

    (f) ♣ Set char colors
        White on Black <> Black on White <> White w/outline
        <> Black w/outline

(2) ♣ Printer Setup..
Press Enter

    (a) ♣ Page Limit[12]
        Min = 0 <> Max = 250 [default = 10]

    (b) ♣ Top of Form
        Form Feed <> End of Lines[13] <> 3 End of Lines[14]

    (c) ♣ Line per Page
        Min = 0 <> Max = 250 [default = 60]

    (d) ♣ End of Line
        Line Feed (LF) <> CarriageRet(CR) <> CR and LF

    (e) ♣ Previous Menu
        Press Enter

(3) ♣ RS232 Setup...
Press Enter

    (a) ♣ Set Baud Rate
        9600 <> 4800 <> 2400 <> 1200 <> 300

    (b) ♣ Set Parity
        None <> Odd <> Even <> Mark <> Space

---

[11] Supersedes **Insert On/Off** key.

[12] Pages containing the number of lines set in (c). Min/0 setting is equivalent to "no limit." The page count is reset when Watch is started or restarted.

[13] As selected in item (d).

[14] Three end of lines as selected in item (d), may be used as an alternative to Form Feed in order to save paper.

         (c) ✦ Previous Menu
             Press Enter

(4) ✦ Watch Menu Type
     Group Select **< >** Item Select

(5) ✦ LCD Contrst Adj
     MIN = 020 **< >** MAX = 80 [default = 80]

(6) ✦ Set Time
     Press Enter

(7) ✦ Diagnostics...
     Press Enter

         (a) ✦ Show SW/FW Vers
             Press Enter

         (b) ✦ Power Manage ..
             Press Enter

             1) ✦ Battery Type
                 Rechargeable **< >** Alkaline

             2) ✦ LCD Backlight
                 Timed Turn Off **< >** On all the time

             3) ✦ Auto Power Off
                 Disabled **< >** Enabled

             4) ✦ Previous Menu
                 Press Enter

         (c) ✦ Device Tests..
             Press Enter

             1) ✦ Test Beeper
                 Press Enter

             2) ✦ LCD Pattern
                 Press Enter

             3) ✦ Clear OSD
                 Press Enter

             4) ✦ Fill OSD Screen
                 Press Enter

             5) ✦ Keypad Test
                 Press Enter

             6) ✦ RS232 loop thru
                 Press Enter

             7) ✦ Previous Menu
                 Press Enter

         (d) ✦ NVRAM/TIC Dgs..
             Press Enter

             1) ✦ Get TIC Serial
                 Press Enter

             2) ✦ Get TIC Time
                 Press Enter

3) ♣ Read TIC Memory
      <> 0 *

4) ♣ Factory Reset[15]
    Press Enter

5) ♣ Previous Menu
    Press Enter

(e) ♣ Flash Diags.. †
    Press Enter

1) ♣ Checksum Memory
    Press Enter

2) ♣ Read Byte 10000
    Press Enter

3) ♣ Writ Byte 10000
    MIN = 0 <> MAX = 255

4) ♣ Erase Sec 10000
    Press Enter

5) ♣ Read SLM Cals
    Press Enter

6) ♣ Write Byte Loop
    MIN = 0 <> MAX = 255

7) ♣ Previous Menu
    Press Enter

(f) ♣ Calibration.. †
    Press Enter

1) ♣ Calibrate SLM
    Press Enter

2) ♣ Adj Serial Pot
    MIN = 0 <> MAX = 511[16]

3) ♣ Previous Menu
    Press Enter

(g) ♣ FW Upgrade
    Press Enter

1) ♣ Show Cur Bank
    Press Enter

2) ♣ Download
    Press Enter

3) ♣ Copy B1 to B∅
    Press Enter

4) ♣ Previous Menu
    Press Enter

(h) ♣ Write Test Reg †
    tr: 0 <> 255

---

[15] Will reset the instrument to factory defaults.

[16] Value is adjusted during manufacture. To be changed only by qualified service personnel; see the Service manual, Tektronix p/n 070-8914-0x.

(i)   ✚ Previous Menu
       Press Enter

The AUX Output

The analog signal present at the SDA 601 AUX output is derived from the Serial Video input. It is a single channel, 5-bit decoded and unfiltered, suitable for identifying the input and displaying the cursor cross hairs, Highlighting, and OSD.

The AUX choices in the I/O menu are: Pixmon Y; Pixmon R–Y; and Pixmon B–Y. As you might guess, this determines which of the three video components is shown on the video monitor. The behavior and appearance of the cross hairs, Highlighting, and OSD are not affected by this choice.

RS-232 Connector

The RS-232 connector is 9-pin subminiature D-type connector that provides a serial interface for printer output and eventual in-field software upgrades. It has a driver built in for RS-232 serial binary data interchange. The operational mode is full duplex; data type is asynchronous. Baud rate and parity are selected throuth the Utility/RS232 Setup submenu; see page 32. The pin assignments are listed in Table 1.

Table 1: RS-232 Connector Pin Assignments
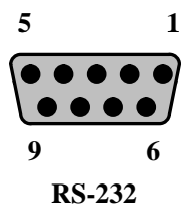
Pin	Data Connection
1	Not connected
2	RXD (Received Data) from SDA 601
3	TXD (Transmitted Data) to SDA 601
4	Not connected
5	Signal Ground
6	Not connected
7	RTS (Request to Send) to SDA 601
8	CTS (Clear to Send) from SDA 601
9	Not connected

5   1

9   6

RS-232

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The connector pinout has been chosen to interface directly with an IBM PC/AT 9-pin serial port using a straight-through cable. A simple ribbon cable may be adequate.

For logging errors and printing reports, a "null-modem" cable may be required, depending on the pinout of the printer connector. Consult your printer manual to determine compatibility.

Because of space limitations on the connector end of the SDA 601, you may have to insert a 9-pin adapter between the cable and the connector. If the cable has a female end, use a male/male adapter such as ITT Cannon p/n 111805–1.

RS-232/Printer Setups

Set the printer to software flow control (XON/XOFF), if possible.

Specify 60 lines per page (in the Utility/Printer Setup submenu) for most printers using 8.5 x 11.0 inch paper.

Set the Baud rate and Parity—through the Utility/RS-232 Setup submenu—to match the printer. When in doubt, set Parity to None.

Using the Watch Mode

Here are some notes and hints regarding the use of the SDA 601 Watch mode to verify the integrity of Serial Digital Video signals.

Format Error Checking

Format error checking is normally useful for verifying that equipment has been designed to conform the various signal format and interface standards. Format errors should not be routinely present. If a signal is being altered by transmission errors, then there is a probability that resulting bit errors will cause some format errors which are detectable by the SDA 601.

The SDA 601 monitors some specific format error conditions, and if format errors occur in at least three video lines in a single field, this is evidence of signal transport errors.

The format errors that may be used to indicate the likelihood of transport errors are:

- **EAV/SAV mis-format** — derived by decoding the EAV/SAV protection bits for errors.

- **EAV/SAV incorrect placement** — which may be the result of a receiver momentarily losing clock sync to the received signal, and thereby adding or dropping a data bit. This may also result from a bit error altering an EAV or SAV so that its presence is unrecognizable.

- **Illegal data** — whereby the reserved values of 000-003 (00.0-00.3) or 3FC-3FF (FF.0-FF.3) are improperly present.

- **ANC format error** — derived from checking the checksum and parity information in ancillary data packets.

Practically speaking, a video signal that fails the last check is most certainly seriously impaired. This check is provided because it works with in-service equipment operating without the benefit of any source signal encoding whatsoever. In the absence of either fixed signal patterns or signal encoding, this is a criterion for judging transport layer signal corruption which can be automated and applied to video signals (and video content) which can be expected in common use.

Video Missing/Interrupted — If EAVs and SAVs are missing or corrupted beyond recognition, for a period of approximately seven video lines, the SDA 601 will assume that video is utterly corrupted or entirely missing. When this occurs, the instrument artificially maintains a horizontal and vertical reference which ignores the input signal. When this condition occurs, and all attempts to reestablish synchronization to the input signal fail, this failure is reported as "Video Missing."

In order to reestablish horizontal and vertical synchronization to the input signal, the SDA 601 must be able to recognize the presence of EAVs in the incoming signal for 64 consecutive video lines. When this is achieved, then horizontal synchronization is immediately reestablished. Vertical synchronization is achieved at the beginning of the next vertical interval.

If the synchronization is lost and restored, this condition is reported as "Video Interrupted."

Either of the "Video Missing" and "Video Interrupted" conditions indicate gross equipment or transmission failure, and should never occur in normally configured equipment.

Using the CRC Change Watch Group

The three items in the CRC change Watch group—ØAPCRC, FFCRC Changed, and APCRC Changed—are designed to facilitate the testing of equipment or signals that don't have EDH encoding.

ØAPCRC — If you are testing equipment that won't pass the vertical interval, but will pass the entire active picture area, then ØAPCRC is an excellent test method. Vision mixers (production switchers) and some VTRs or still stores are typical examples of equipment that can benefit from this test method.

ØAPCRC is an encoding process in which the last five video words in the last full line of active video are altered so that the CRC of the active picture words for the entire field will be exactly zero (Ø).

The SDA 601 calculates the same Active Picture CRC (APCRC) that is used for EDH error checking. The SDA 601 can recognize that this CRC is consistently Ø for each field, and will then assume that any occurrence of a non-zero CRC is the result of a signal propagation error. This check is as reliable as the APCRC check in the EDH checking method.

Because ØAPCRC encoding does modify the active video signal, the method may not be acceptable in all operational cases. As a practical consideration. however, the encoding results in a small bright spot in the very bottom right corner of the active picture, where it is not normally visible on overscanning monitors or receivers. Furthermore, the encoding is designed to not introduce any illegal data values that might provoke video signal processing errors in conventional operational video equipment.

Another advantage of this method is that it doesn't require a fixed test signal and may be applied to any legal digital component or composite format signal.

This method of signal checking will not work if the equipment being tested does not pass the entire active video line, or if a 10-bit signal encoded with ØAPCRC is passed through an 8-bit transmission link. Eight-bit signals which are encoded may be used to check either 8-bit equipment or the eight higher-order bits of 10-bit equipment, and 10-bit signals which are encoded may be used to check 10-bit equipment.

FFCRC Changed — Is an out-of-service check for either 8-bit or 10-bit equipment which will not pass EDH, or for which EDH en-

coded signals are not available. This check requires a fixed (un-changing) video signal.

The SDA 601 calculates the Full Field CRC (FFCRC) that is used for EDH error checking. Then, for this check, the SDA 601 compares the calculated CRC in each field to the CRC calculated for the same field in the previous frame. If the incoming video signal is fixed, then the calculated CRCs should be identical from frame to frame. If the CRCs are not identical, either the transmitted signal has been deliberately changed, or a transmission error has altered the signal.

This check has some limitations. As noted, the signal must be presumed to be fixed, and the equipment being checked must therefore be temporarily removed from service. Also, embedded audio ancillary data is by its nature changing from field to field; therefore, this check will be useless if audio is embedded in the signal. In the case of embedded audio, APCRC Changed is a more appropriate check method.

APCRC Changed — Is also an out-of-service check, very similar to the FFCRC Changed checking method, except the checking is limited to the active picture data only. This allows the check to be used with signals that have constantly changing ancillary data, as do signals that contain embedded audio.

With this checking method, data in the vertical and horizontal regions is completely unchecked.

Appendix A: Characteristics

The information in this section is included for the convenience of the SDA 601 operator. For a full list of instrument specifications, as well as performance verification and adjustment procedures, please see the SDA 601 Service Manual (Tektronix p/n 070-8914-XX).

NOTE. Shielded cables were used in the EMI certification of this instrument; therefore, it is recommended that shielded cables be used when operating. (EC 92)

Safety Standard Compliance

The following safety standards apply to the SDA 601:

- ANSI S82 — Safety Standard for Electrical and Electronic Test, Measuring, Controlling, and Related Equipment, 1988.

- CAN/CSA C22.2 No. 231 M89 — CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment.

- IEC1010-1 — Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use (1990).

- UL1244 — Standard for Electrical and Electronic Measuring and Testing Equipment, Second Edition (1980).

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Specification Tables

Table 2: Serial Digital Video Input

Characteristic	Performance Requirements	Supplemental Information
Format		CCIR 601 Component 525/625, 10 bits data, Scrambled NRZI; 270 Mb/s. Complies with SMPTE 259M and CCIR 656.
Input Impedance		75 Ω
Input Level		800 mV ± 80 mV (peak-to-peak) at signal source
Return Loss	≥ 15 dB	1 MHz to 270 MHz
Serial Receiver Equalization Range	Proper operation with up to 15 dB loss at 135 MHz using coaxial cable with $1/\sqrt{f}$ loss characteristics. 800 mV launch amplitude.	Nominally 150 m of Belden 8281 coaxial cable; typically up to 200 m.
Error detection protocols supported	EDH (RP-165), 0APCRC	

Table 3: AUX Output

Characteristic	Performance Requirements	Supplemental Information
Output		5-bit output; monochrome signal
White Amplitude	700 mV ± 25%	Terminated into 75 Ω
Sync Amplitude	300 mV ± 25%	Terminated into 75 Ω
DC Offset	≤ 500 mV	Terminated into 75 Ω
Quantization		22 mV
Impedance		75 Ω nominal
Return Loss		≥ 10 dB to 10 MHz

Table 4: Signal Level Meter

Characteristic	Information
Resolution	2 dB @ 135 MHz

Table 5: Physical Characteristics

Characteristic	Information
Height	5.6 cm (2.2 in)
Width	9.1 cm (3.6 in)
Depth	19.1 cm (7.5 in)

Net Weight
    SDA 601
    SDA with battery pack
	
	0.48 kg (1.06 lb)
	0.68 kg (1.5 lb)

Shipping Weight	1.50 kg (3.31 lb) with AC adapter

Table 6: Environmental Characteristics

Characteristic	Information

Temperature
    Operating
    Storage
	
	0° C to +35° C (32 to +95° F)
	−30° C to +65° C (−22 to +149° F)

Altitude
    Operating
    Storage
	
	to 15,000 feet (4572 m); IEC 1010-1 compliance to 2000 m
	to 50,000 feet (15420 m)

Equipment Type	Test
Equipment Class	Class III (as defined in IEC 1010-1, Annex H)
Installation Category	Category II (as definded in IEC 1010-1, Annex J) Note: Rated for indoor use only.
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1)
Transportation	Meets the requirements of NTSB Test Procedure 1A, category II (24 inch drop)

SDA 601 Serial Digital Analyzer User Manual

Appendix B: Replaceable Parts

The following replaceable parts for the SDA 601 are available through your local Tektronix, Inc. field office or representative.

It is important when ordering parts to include the following information in your order: Part number; instrument type and number; instrument serial number; and modification number, if applicable.

Description	Tektronix Part No.
Instructions (card)	070-8912-xx
Service Manual (Optional accessory)	070-8914-xx
Rechargeable Battery Pack (Optional accessory)	119-4488-00
Carrying Pouch	016-1229-00
AC Adapter	119-4538-00 [1]
Case Assembly, Top	614-0921-00
Case Assembly, Bottom	614-0913-00
Battery Door	200-4075-00
LCD Display	119-4506-00
Rear Panel Assembly	333-4146-01
Fuse, 2A	159-0378-00
Touch Memory/Timer Module	156-4357-00
Stand	386-6897-00

[1] The U.S. standard adapter. See your Tektronix representative for other adapters.

Appendix C: User Service

Battery Hints

For optimal battery life and capacity, use the rechargeable NiCad battery pack (Tektronix p/n 119-4488-00) in full charge/discharge cycles. In other words, fully discharge the battery pack before recharging, and then charge the battery pack until fully charged, approximately 16 hours. A new battery pack will take a few charge/discharge cycles to reach full capacity.

> ⚠ **WARNING.** *Install or replace batteries only with the instrument switched OFF and the AC adapter disconnected.*
>
> *Replace the batteries only with standard AA batteries (1.2–1.5 V, nominal), or with the optional rechargeable battery pack.*

Setting the Auto Power Off and Battery Type functions in the Utility/Diagnostic/Power Manage submenu (see pages 9 and 33) also has an impact on battery life. The battery types are Alkaline (disposable) or rechargeable (NiCad). Setting the battery type changes the voltage thresholds for both the BATTERY LOW display message and low-battery shut down.

The BATTERY LOW Message

The warning "BATTERY LOW" will appear on the second line of the SDA 601 display when the battery voltage drops below a predetermined level. The level depends on the Battery Type setting. The SDA will operate for approximately ten minutes after the message first appears. For best results, replace or recharge the batteries when you first see this warning.

Low-battery Shut Down

To prevent erratic operation at very low power levels, the SDA 601 will shut itself down if the battery voltage drops below a second, lower threshold that also depends on the Battery Type setting.

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Low-battery shut down can happen with little or no warning if, for instance, the instrument has been left on by mistake with Auto Power Down disabled. In such cases, the SDA 601 is likely to shut itself down almost immediately the next time you switch it on. If this happens:

☐ Install fresh batteries or operate the instrument with the AC adapter, and

☐ Confirm that the diagnostic menu Battery Type setting is appropriate.

The shut down threshold is higher for rechargeable batteries than for disposable. Therefore, you will receive a false BATTERY LOW message and may experience premature shut down if using Alkaline batteries when the Battery Type is set to "rechargeable." On the other hand, NiCad batteries may be damaged—they can lose their "rechargeability"—if they are discharged to the SDA 601 threshold for disposable batteries. Be sure to select the correct Battery Type.

Replacing the Batteries or Battery Pack
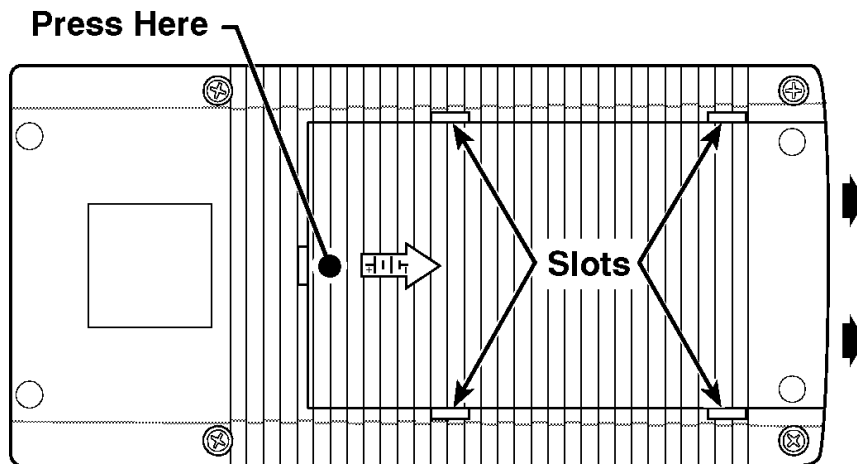
To install AA batteries or the battery pack, open the battery compartment of the SDA 601 by pressing down on the cover and sliding it in the direction of the inscribed arrow, as shown above. When the cover tabs line up with the slots in the case, lift the cover away from the instrument. Install batteries in alternating directions as indicated by the graphic molded into the "floor" of the battery compartment. If

using the optional battery pack, take the time to identify both contacts and install the pack properly.

Replacing the Touch Memory/Timer Module

The Touch Memory/Timer module has an internal Lithium battery. Eventually, this module will need replacement. Please refer this task to qualified service personnel. The original module has been secured to its holder with RTV sealant. Take the time to renew this sealant after a new module is installed.

The instrument Date/Time must be reset when a new Touch Memory is installed. See page 9.

Preventive Maintenance

Under average conditions, the SDA 601 should receive preventive maintenance every 2000 hours. This is approximately one year of operation. Preventive maintenance includes cleaning, visual inspection, a performance check and, if necessary, calibration. See the Service manual for performance verification and adjustment procedures.

⚠ *CAUTION. The SDA 601 case is made of molded plastic. Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with organic cleaning solvents—benzene, toluene, xylene, acetone, or similar compounds—because they may damage the plastic.*

Glossary

ØAPCRC (zero active picture CRC)

A CRC created by an encoding process in which the last five active video words in the last full line of active video are altered so that the active picture CRC is exactly zero.

4:2:2

A commonly used term for a component digital video format. The details of the format are specified in the CCIR-601 standard document. The numerals 4:2:2 denote the ratio of the sampling frequencies of the single luminance channel to the two color difference channels. For every four luminance samples, there are two samples of each color difference channel. See *CCIR-601*.

AES/EBU

Informal name for a digital audio standard established jointly by the Audio Engineering Society and European Broadcasting Union.

analyze

When **Analyze** is pressed the SDA 601 locks to the incoming signal (if possible) and monitors it for one second. The status of a predefined set of signal characteristics ("conditions") may then be read on the instrument LCD—and the OSD, when an external video monitor is used.

ancillary (ANC) data

Auxiliary, non-video data that is inserted into any portion of the data stream that is not occupied by timing reference signals or video data. Component digital signals may have ancillary data in both the vertical and horizontal interval portions of the signal; composite may have only it only in the horizontal. Described in SMPTE 125M.

Ancillary data may include up to 16 channels of digital audio as well as the calculated checkwords (CRCs) and error information flags (EDH flags) that are used in verifying the integrity of the digital signal and locating the source of any faults.

APCRC (active picture CRC)

A CRC derived from the samples in the active picture *only*. Described in SMPTE RP 165.

AUX

In the SDA 601, the auxiliary output. The AUX output can be configured as analog "pseudo-video" (unfiltered DAC output) or as the trigger pulse.

bit serial

Bit-wise transmission of digital video down a single conductor such as coaxial cable. May also be sent through fiber optics. This standard is covered under CCIR 656.

bit stream

A continuous series of bits transmitted on a line.

cable equalization

The process of altering the frequency response of a video amplifier to compensate for high frequency losses in coaxial cable.

CCIR

International Radio Consultative Committee, an international standards committee, now replaced by ITU-R.

CCIR 601

(See ITU-R BT.601.)

CCIR 656

The physical parallel and serial interconnect scheme for CCIR-601. CCIR-656 defines the parallel connector pinouts as well as the blanking, sync, and multiplexing schemes used in both parallel and serial interfaces. Reflects definitions in EBU Tech 3267 (for 625 line signals), SMPTE 125M (parallel 525), and SMPTE 259M (serial 525).

clock recovery

The reconstruction of timing information from digital data.

coding

Representing each level of a video signal as a number, usually in binary form.

component analog

The unencoded output of a camera, videotape recorder, etc., consisting of three primary color signals: red, green, and blue (RGB) that together convey all necessary picture information. In some component video formats, these three components have been translated into a luminance signal and two color difference signals, for example, Y, B–Y, R–Y.

component digital

A digital representation of a component analog signal set, most often Y, B–Y, R–Y. The encoding parameters are specified by CCIR 601. The parallel interface is specified by CCIR 656 and SMPTE 125M (1991).

CRC (Cyclic Redundancy Code)

A binary number that is computed from the digital samples in the serial digital video frame. CRCs serve a function similar to that of the Parity Bit in the RS-232 serial interface, and are used to verify the integrity of the digital video transmission. SMPTE RP 165 defines a full field CRC (FFCRC) and an active picture CRC (APCRC).

CRC change group

An SDA 601 Watch group that contains:

- APCRC changes
- FFCRC changes
- APCRC status (Ø or not Ø)

The CRCs are monitored; changed CRCs and non–Ø APCRCs are reported on an "error second" basis.

cursor

In the SDA 601, the "cursor" is used to pinpoint a single word in the digital video frame and discover the actual value of the selected word and the three that follow. The location of the cursor may also be shown with "cross hairs" on a video monitor connected to the AUX output.

data value group

An SDA 601 Watch group that contains:

- Illegal (data word) values

- Video samples in/out of range

The data word values are monitored; illegal values and out of range samples are reported on an "error second" basis.

D1

A component digital video recording format that uses data conforming to the CCIR-601 standard. Records on 19 mm magnetic tape. (Often used colloquially to indicate 4:2:2 component digital video.)

deserializer

A device that converts serial digital information to parallel.

digital word

The number of bits treated as a single entity by the system. Digital video words are 8 or 10 bits. In the active picture portion of digital video, each word represents a single luminance or color difference sample.

EAV

End of active video in component digital systems.

EBU

European Broadcasting Union. An organization of European broadcasters that, among other activities, produces technical statements and recommendations for the 625/50 line television system.

EBU TECH.3267-E

The EBU recommendation for the parallel interface of 625 line digital video signal. A revision of the earlier EBU Tech. 3 246-E, which in turn was derived from CCIR-601 and contributed to CCIR-656 standards.

EDH (error detection and handling)

Proposed SMPTE RP-165 for recognizing inaccuracies in the serial digital signal.

EDH flag

A digital "marker" inserted in the data stream to feed forward information regarding detected errors. EDH flags are set by many input/output devices to help identify faulty equipment in the signal path. The flags defined in RP-165 are: error detected here; error detected already; internal error detected here; internal error detected already; and unknown error status.

EDH Group

An SDA 601 Watch group that contains:

- APCRC EDH errors
- FFCRC EDH errors
- EDH flags (set/not set)

The CRCs and flags are monitored. Flag status is reported, but not considered an error condition; EDH errors are reported on an error second basis.

Equalization (EQ)

Process of altering the frequency response of a video amplifier to compensate for high-frequency losses in coaxial cable.

embedded audio

Digital audio is multiplexed onto a serial digital data stream.

error second

A second that contains at least one error. An error second can result from one isolated error, or a "burst" of many errors all in the period of one second.

FFCRC (full field CRC)

A CRC derived from the samples in a full field of digital video. Described in SMPTE RP-165.

format group

An SDA 601 Watch group that contains:

- Line/field length
- TRS (includes EAV and SAV)
- ANC format
- Zero-length ANC

The four characteristics are monitored. Errors in line/field length, TRS, or ANC format are reported on an error second basis; Zero-length ANC is considered an error, and error seconds are also reported.

group

See Watch Group.

highlighting

An SDA 601 operating mode in which pixels in the AUX output that correspond to selected error conditions "flash" when that error occurs. Permits visual monitoring of the frequency and placement of the errors in context of the video signal and picture.

horizontal interval (horizontal blanking interval)

The time period between lines of active video. In serial digital video, it is the time between EAV and SAV.

illegal value

Data levels 0 to 3 and 1020 ($3FC_h$) to 1023 ($3FF_h$) are reserved to indicate timing references. These values are considered illegal if they occur elsewhere.

in range (video)

All video words are within the permissible range of values; luminance between levels 64 and 940 (40_h and $3AC_h$), and color difference between levels 64 and 960 (40_h and $3C0_h$).

I/O menu

The SDA 601 I/O menu containing selections for configuring the AUX pseudo-video output.

ITU-R

The International Telecommunication Union, Radio Communication Sector (replaces the CCIR).

ITU-R BT.601

An international standard for component digital television from which was derived SMPTE 1 25M (was RP-l25) and EBU 3246E standards. CCIR defines the sampling systems, matrix

values, and filter characteristics for both Y, B–Y, R–Y and RGB component digital television.

LSB

Least significant bit.

MSB

Most significant bit.

multiplexer (mux)

Device for combining two or more electrical signals into a single, composite signal.

NRZ

Non return to zero. A coding scheme that is polarity sensitive. O = logic low, 1 = logic high.

NRZI

Non return to zero inverse. A video data scrambling scheme that is polarity insensitive. O = no change in logic; 1 = a transition from one logic level to the other.

OSD (on-screen display)

In the SDA 601, a 12 line, 24 column character display that may be superimposed on the AUX output and viewed on an attached video monitor. For convenient review of Analysis results and Watch status.

pixel

The smallest distinguishable and resolvable area in a video image. A single point on the screen. In digital video, a single sample of the picture. Derived from the words *picture element.*

preset, Presets Menu

In the SDA 601, the current instrument configuration may be saved as a preset for later recall. Presets are saved and recalled through the Presets Menu.

pulse cross

An SDA 601 AUX output mode that allows the user to "see" the horizontal and/or vertical intervals, which are normally blanked

in serial video monitors. The original four-word timing reference signals (TRS, which include EAV and SAV) are replaced with legal video samples, and analog H and V syncs inserted in the original active picture region.

Rec. 601

See CCIR-601.

reclocking

The process of clocking the data with a regenerated clock

resolution

The number of bits (four, eight, ten, etc.) determines the resolution of the digital signal.

4-bits = a resolution of 1 in 16

8-bits = a resolution of 1 in 256

10-bits = a resolution of 1 in 1024

Eight bits is the minimum acceptable for broadcast TV.

RP-125

See SMPTE 125M.

SAV

Start of active video in component digital systems.

scrambling

1. To transpose or invert digital data according to a prearranged scheme in order to break up the low frequency patterns associated with serial digital signals. 2. The digital signal is shuffled to produce a better spectral distribution.

serial digital

Digital information that is transmitted in serial form. Often used informally to refer to serial digital television signals.

SMPTE (Society of Motion Picture and Television Engineers)

A professional organization that recommends standards for the television and film industries.

SMPTE 125M

Recommended practice for bit parallel digital interface for component video signals. SMPTE 125M defines the parameters required to generate and distribute component video signals on a parallel interface.

SMPTE RP-165

Recommended practice for "Error detection checkwords and status flags for use in bit-serial digital interfaces for television." It defines the APCRC, FFCRC, and EDH flags as well as the ancillary data packets that contain them.

SMPTE 244M

The SMPTE recommended practice for bit parallel digital interface for composite video signals. SMPTE 244M defines the parameters required to generate and distribute composite video signals on a parallel interface.

SMPTE 259M

The SMPTE recommended practice for 525 line serial digital component and composite interfaces.

stuck bit

A bit in the video sample words that has the same value (0 or 1) for the entire active picture region of at least one complete field. A stuck bit may indicate a defective component in the digital video system "upstream" of the SDA 601.

synchronous

A transmission procedure by which the bit and character stream are slaved to accurately synchronized clocks, both at the receiving and sending end.

sync word

A synchronizing bit pattern, differentiated from the normal data bit patterns, used to identify reference points in the television signal; also to facilitate word framing in a serial receiver.

transport layer

Having to do with the transmission path from a digital video generator to the receiver. The FFCRC, APCRC, and EDH flags

are the primary means of monitoring the integrity of the transport layer.

TRS

Timing reference signals in digital video systems (four words long). Defined, for component systems, in SMPTE 125M.

truncation

Process by which digital signals are converted to lower resolution. The least significant bits (as many as necessary) in each sample are "stripped," or simply ignored. In digital video, 10-bit samples may be truncated for compatibility with 8-bit equipment.

Utility Menu

The "catch-all" menu of the SDA 601 in which seldom-used configuration and diagnostic utilities are found. Selected by holding **Lock Out** down while pressing **ON**.

video missing

Reported by the SDA 601 in both Analyze and Monitor modes when the EAV and SAV are absent from the digital signal.

Watch

The SDA 601 operating mode for monitoring selected characteristics of the input signal. User may set alarms to trigger on error conditions. Explained in detail beginning on page 16 of this manual.

Watch Group

In the SDA 601, a collection of related signal characteristics or "conditions" that, for convenience, may be selected for monitoring when the Watch menu is set to Group Select (through the Utility menu).

word

See digital word.

zero-length ANC

Reported by the SDA 601 when an ancillary data "Data Count word" with value Ø is detected.

Manual Change Information

At Tektronix, we continually strive to keep up with the latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on the following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

Product:	Manual P/N:	Effective S/N:
SDA 601 Users	070–8913–01	B020000

Text Changes

OPERATING BASICS
Displaying the Signal Level, *Page 20*
CHANGE the last sentence preceding the Cursor discussion **TO READ:**

> After selecting another operating mode, the Signal Level display
> may be reselected by pressing the front panel **SLM (A)** key, or may
> be toggled On/Off through the **Display Select** key/menu (see page 29).

Cursor, *Page 20*,
CHANGE the Cursor discussion **TO READ:**

Cursor

In Cursor mode, selected by pressing the **Cursor (B)** key, the SDA 601
is capable of locating a single word in the digital video frame and
displaying the actual value of the selected word and the three that
follow. The selected words location is pinpointed by "cross hair"
cursors on a video monitor connected to the AUX output. The word
is selected by positioning the cursor with the arrow keys. To com-
pletely exit this mode, press the **Review (G)** key.

The address/coordinates of the word, and its actual hexadecimal val-
ue, may be viewed on the SDA 601 display, as shown in Figure 14.

Hex value of the selected word

The three subsequent word values

B3FF 000 000 2AC
F1 W1712 L   4▪

Sample ID
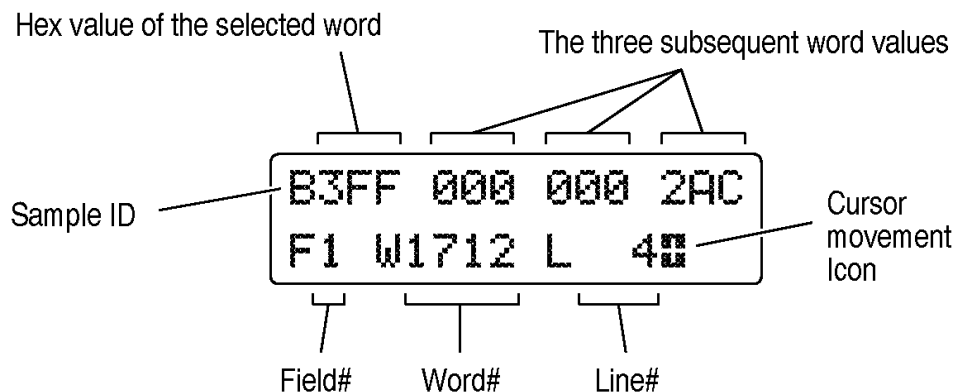
Cursor
movement
Icon

Field#   Word#   Line#

Figure 14: The Cursor Data Display

The first line of the cursor data display contains the hexadecimal values of the selected word and the three that follow it. Values typical for the SAV timing and reference signal are shown in Figure 10. The video "type" of the selected word is indicated by the sample ID:

$B = C_B$ color difference
Y = Cosited luminance
$R = C_R$ color difference
y (lowercase) = Isolated luminance

The second line contains the address or coordinates of the selected word. In the example, the selected word is number 1712 of line 4 in field 1.

The cursor movement icon is present on the second line when you can use the arrow keys to position the cursor. Normal cursor movement is one line for each press of the ▲ or ▼ key, and one word per press of the ◄ or ► key. Pressing **Shift** twice (to invoke shift lock) will increase horizontal movement to 20 words per key press, and vertical movement to 10 lines per key press. Press Shift again to return to "fine" cursor control. The Cursor cross hairs in the AUX output may be turned off through the **I/O** menu (see page 29).

The Cursor Data display may also be invoked through the **Display Select** menu, but Cursor cross hairs must be enabled separately, through the **I/O** menu (see page 29).

Highlighting, *Page 21*,
CHANGE the To use Highlighting example **TO READ:**

To use Highlighting:

1. Configure the SDA 601 to monitor one or more of the above items; see "Watching a Signal" beginning on page 14.

2. Enter the I/O menu (press **Shift**, then **Insert On/Off**).

3. The first I/O menu item is Highlighting. Use the ◄ or ► key to select "On, Dim Video" then press **Enter** to confirm the choice.

   Dim Video reduces the video signal by 50%, ensuring good contrast between the video signal and highlighted pixels.

4. Exit the I/O menu by pressing any rectangular key.

5. If necessary, start or restart the Watch session by pressing **Watch**.

6. The default OSD will obscure any highlighting in the portion of the picture that it occupies. Therefore, if the OSD is on, toggle it off with the **Insert On/Off** key.

Pulse Cross, *Page 22*,
CHANGE the Pulse Cross discussion **TO READ:**

Pulse Cross

Pulse Cross is an SDA 601 AUX output mode that allows the user to "see" the horizontal and/or vertical intervals, which are normally blanked in serial video monitors. The original four-word timing reference signals (TRS, which contain EAV and SAV) are replaced with legal video samples, and analog H and V sync information is inserted in the original active picture region. To invoke pulse cross, press the **Pulse Cross (E)** key, which will scroll through the pulse cross modes:

Normal — the default
HCross — reveals the "horizontal interval" region of the signal
VCross — reveals the "vertical interval" region of the signal
Both — combines HCross and VCross

To invoke pulse cross through the I/O menu:

1. Enter the I/O menu (press **Shift**, then **Insert On/Off**).

2. Press the ▼ key repeatedly to scroll down to the Pulse Cross menu item.

3. With the ◀ / ▶ keys, scroll to the desired pulse cross option. The options are:
   Normal — the default
   HCross — reveals the "horizontal interval" region of the signal
   VCross — reveals the "vertical interval" region of the signal
   Both — combines HCross and VCross

4. Press **Enter** to select the new option.

5. Press any rectangular key to exit the I/O menu.

REFERENCE
I/O Menu, *Page 29*,
CHANGE the I/O Menu **TO READ:**

I/O Menu

Enter the I/O menu by pressing **Shift**, then **Insert On/Off**.

(1) ♣ Highlighting
   Off <> On <> On, Dim Video
(2) ♣ Video Cursor
   No Display <> Display
(3) ♣ Pulse Cross
   Normal <> HCross <> VCross <> Both
(4) ♣ AUX
   Pixmon Y <> Pixmon R–Y <> Pixmon B–Y

Utility Menu, *Page 30*,
CHANGE the Printer Setup and RS232 Setup portions of the Utility Menu
TO READ:

(2) ♣ Printer Setup..
   Press Enter
   (a) ♣ Page Limit[12]
      Min = 0 <> Max = 250 [default = 10]
   (b) ♣ Top of Form
      Form Feed <> End of Lines[13] <> 3 End of Lines[14]
   (c) ♣ Line per Page
      Min = 0 <> Max = 250 [default = 60]
   (d) ♣ End of Line
      Line Feed (LF) <> CarriageRet(CR) <> CR and LF
   (e) ♣ Flow Control
      Software (XOFF) <> Hardware (DTR) <> None
   (f) ♣ Previous Menu
      Press Enter
(3) ♣ RS232 Setup...
   Press Enter
   (a) ♣ Set Baud Rate
      19200 <> 9600 <> 4800 <> 2400 <> 1200 <> 300
   (b) ♣ Set Parity
      None <> Odd <> Even <> Mark <> Space
   (c) ♣ Previous Menu
      Press Enter

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