





## **Statement of Warranty**

The ISIS Group, Inc. warrants its products for a period of seven (7) years from the date of shipment to be free from defects in materials and workmanship and meets applicable published specifications. Equipment which has been operated within its ratings and has not been subjected to mechanical or other abuse or modification by the purchaser, its agents, and/or employees, will, at the option of The ISIS Group, be replaced or repaired if it is returned, freight prepaid, to ISIS. Equipment that fails under conditions other than described herein will be repaired at the price of components and labor in affect at the time of repair.

This warranty is in lieu of all other warranties, expressed or implied, with respect to the condition or performance of any ISIS Group product, its merchantability or fitness for a particular purpose. ISIS is not liable for any consequential damages.

## **FCC Compliance**

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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January 2006

Part Number 71-0016

## **ISIS ARTS-201/DRTS-201 Protection Switchers**

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### **EC declaration of conformity**

#### **Declaration**

We certify that the apparatus to which this declaration relates conforms to the requirements of the EMC and Low Voltage Directives.

#### **Covering the following:**

ARTS-201/DRTS-201 series of rack mounting frames and modules.

Above rack mounting frames containing any mix of ARTS/DRTS 201 modules installed in accordance with instructions in our User's Guide and with any vacant spaces filled with front and/or rear blank panels.

#### **Applicable standards:**

Emissions	EN 55103-1: 1996
Susceptibility	EN 55103-2: 1996
Safety	EN 60950



**Issued:** 11 October 2001.

# Installation and Operation Manual

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# Important Safeguards and Notices

Information on the following pages provides important safety guidelines for both Operator and Service personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, electric shock or injury to persons.

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## WARNING



*Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.*

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## Symbols and Their Meaning in This Manual



The lightning flash with arrowhead symbol, within an equilateral triangle, alerts the user to the presence of “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle alerts the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.



This symbol represents a protective grounding terminal. Such a terminal must be connected to earth ground prior to making any other connections to the equipment.



The fuse symbol indicates that the fuse referenced in text must be replaced with one having the ratings indicated.

# *Important Warnings and Cautions*

## **Warnings**

- Heed all warnings on the unit and in the operating instructions.
- Do not use this product in or near water.
- Disconnect ac power before installing any options.
- This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the product inputs or outputs.
- Route power cords and other cables so that they are not likely to be damaged.
- Disconnect power before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as the power supplies.
- During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.
- To avoid fire hazard, use only the specified correct type, voltage and current rating as referenced in the appropriate parts list for this product. Always refer fuse replacements to qualified service personnel.
- To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.
- Have qualified personnel perform safety checks after any completed service.

## Warnings (continued)

- If equipped with redundant power, this unit has two power cords. To reduce the risk of electrical shock, disconnect both power supply cords before servicing.
- This equipment may employ laser(s). If it does, they comply with the current construction requirements of the code of Federal regulations, title 21, chapter I, subchapter J, sections 1010.2 and 1010.3 and sections 1040.10 and 1040.11.
- Do not attempt to view light output of the laser transmitter, eye damage may result. Always use an optical power meter to verify laser output.
- To prevent injury:
  - Never install telephone wiring during a lightning storm.
  - Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
  - Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
  - Use caution when installing or modifying telephone lines.

## Cautions

- When installing this equipment, do not attach power cord to building surfaces.
- To prevent damage to equipment when replacing fuses, locate and correct the trouble that caused the fuse to blow before applying power.
- Verify that all power supply lights are off before removing power supply or servicing equipment.
- Use only specified replacement parts.
- Follow static precautions at all times when handling this equipment.

## Cautions (continued)

- Leave the back of the frame clear for air exhaust cooling and to allow room for cabling. Slots and openings in the cabinet are provided for ventilation. Do not block them.
- Front door is part of fire enclosure and should be kept closed during normal operation.
- This product should be powered on as described in the manual. To prevent equipment damage select the proper line voltage at the ac input connector as described in the Installation documentation.
- To prevent damage to this equipment read the instructions in this document for proper input voltage range selection.
- To reduce the risk of electric shock, ensure that the two power supply cords are each plugged into a separate branch circuit.
- Circuit boards in this product are densely populated with surface mount and ASIC components. Special tools and techniques are required to safely and effectively troubleshoot and repair modules that use SMT or ASIC components. For this reason, service and repair of ISIS products incorporating surface mount technology are supported only on a module exchange basis. Customers should not attempt to troubleshoot or repair modules that contain SMT components. ISIS assumes no liability for damage caused by unauthorized repairs. This applies to both in- and out-of-warranty products.

## North American Power Supply Cords

This equipment is supplied with molded grounding plug (NEMA 5-15P) at one end and molded grounding connector (IEC 320-C13) at the other end. Conductors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Operation of this equipment at voltages exceeding 130 VAC will require power supply cords which comply with NEMA configurations.

## **International Power Supply Cord**

This equipment is supplied with molded grounding connector (IEC 320-C13) at one end and stripped connectors (50/5 mm) at the other end.

Connectors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Other IEC 320-C13 type power supply cords can be used if they comply with the safety regulations of the country in which they are installed.

### **Note:**

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference, in which case the user will be required to correct the interference at his own expense.

## SECTION 1

### DRTS-201

#### General description

The DRTS-201 functions as a one rack-unit input transfer system that can switch between two sets of serial digital video and audio input signals, A and B, either automatically or manually, using either a local or remote select A/B switch. When operating in the automatic switch mode, the switchover is determined by the presence of video on the in-use video input. If video goes away on the selected (in-use) input and video is present on the non-selected input, then a switch to the non-selected input will occur. If no video is present on the non-selected input then no switch will occur. In the digital DRTS-201 loss of video is not the loss of the data stream, but actually the loss of the EAV (end of active video) character. If the EAV is missing for more than two fields, then the switch will occur.

The DRTS can be operated manually by pushing the red button located inside the hole in the front cover. By removing the front cover and selecting the black button on the main board, the mode of changeover operation can be altered from automatic to manual or back.

In addition, certain characteristics of the AES audio signal may be monitored, and these may also be selected to cause the DRTS to switch from one input to the other. As noted above, the loss of the EAV bit in the video will always create a switch, but a dipswitch on the main board may be set to allow audio error bits to also switch the inputs. The audio error message is ERF, which is a combination of parity, bi-phase encoding and PLL out-of-lock messages.

Once a switchover has been completed from one input to the other, the system will not automatically return to the first input upon restoration of signal. If it is desired that the unit be operated from that first source, then the return must be accomplished manually.

There are three types of signal inputs to the DRTS-201 for each of the A and B inputs; video, GPI and audio. The video input terminates in 75 ohms and has a differential input to remove any common mode hum. There are five GPI lines, plus a dedicated line that indicates the A and B receiver's health. This dedicated line is sensed by the DRTS-201 and indicated on the External Control connector. There are four channels of AES3 (balanced 110 $\Omega$ ) or AES-3id (unbalanced 75 $\Omega$ ) audio, all of which are high impedance inputs greater than 100K ohms.

The output of the DRTS-201 will be either the A or B inputs of video, GPI and audio. During the transfer from one input to the other, all channels (video, GPI and audio) switch together. There are two 75 ohm BNC connectors for the SDI video switch output. There is one AES audio output connector for each of the four switched channels.

Some of the other features of the DRTS-201 include analog video and audio monitor outputs for the digital A and B inputs. The video monitor outputs are post-cable equalization so that they represent the actual video input of the A/B switch. The cable equalization can compensate for up to 300 meters of 8281 or equivalent cable. Also available are analog audio monitor outputs for the A and B inputs of AES channel 1 and channel 2. The DRTS provides buffered AES outputs of the A and B inputs for channel 3 and channel 4 only.

Two additional features are included in the DRTS-201 unit. Both are associated with the power-up operation. When power is applied, the unit will be set in the automatic mode of operation. Also, the A signal input will be selected as the default mode.

The audio connections are made with separate three-pin Weco-type connectors for each audio channel. The connectors have a removable mate that is wired to the audio cable with screw down compression terminals. The input and output audio connections are all the same style connectors.

All GPI connections are 9 pin 'D'. The input 'D' connectors for the GPIs are female, while the output of the switch is a 9 pin male 'D' connector. The switch between GPIs is made with relays so that the logic level passes through the switch unaltered. Pin 1 of GPI A input and pin 1 of GPI B input switch to pin 1 of GPI OUT, pin 2 switches to pin 2, and so forth.

There is an EXT CONTROL connector, which is a female 9 pin 'D'. The External Control provides for external A/B transfer and also A/B signal and power supply health monitoring of the DRTS-201.

The frame has space for two power supplies for redundancy, with the output of each supply voltage diode OR'd with the same output of the other supply. Each supply has its own AC line connection. If either supply fails or its AC line fails, then the other supply will keep the unit running.

**NOTE:** AES standards per ANSI AES3-1992 and AES-3id-1995 are supported by this product and are generally defined as follows:

AES3 - serial digital 2-channel audio with balanced  $110\Omega$  input/output at 2-7Vp-p, and usually transmitted over shielded, twisted-pair cables up to 300m.

AES-3id - serial digital 2-channel audio with  $75\Omega$  input/output at .8-1.2Vp-p, and usually transmitted over  $75\Omega$  coaxial cable up to 700m. It is often used in video facilities using analog video distribution equipment.

## SECTION II

### DRTS-201

#### Specifications

##### Video:

###### Inputs: Primary and Backup

Number	2
Input type	75Ω, BNC per IEC 169-8
Signal level	800mV ±10%
Data rate	270Mb
Equalization	Automatic, >300 meters Belden 8281

###### Outputs:

Number	2
Impedance	75Ω, BNC
Signal level	800mV ±10%
Monitor output	2 analog (A and B)
Monitor level	1 volt peak-to-peak nominal

##### Audio:

###### Inputs:

Number	8 (4A and 4B)
Impedance	110Ω balanced / 75Ω unbalanced (jumper selectable)

###### Outputs:

Number	4 AES switched
Impedance	110Ω balanced / 75Ω unbalanced (jumper selectable)
Gain	Unity
Monitor output	4 analog (2A and 2B)
Monitor impedance	<10Ω
Monitor level	+22dBu maximum

Video/Audio Timing Differential	±50 μsec
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**Temperature:**

Performance	5 to 40 degrees centigrade
Operating	0 to 50 degrees centigrade
Humidity	90% non-condensing
Power requirements	115/230VAC, 50/60 Hz 20W
Size	1.75" x 19" x 10"
Weight	≈7 lbs 3 kg

\* Specifications and design are subject to change without notice.

## SECTION III

### DRTS-201

#### Installation

The DRTS-201 input transfer unit is a one rack-unit frame designed to be mounted in a standard 19" equipment rack. There are no special cooling requirements though care should be taken to ensure that extremely hot equipment not be installed directly beneath. It is also recommended that, if possible, one rack-unit of space be left above the unit.

Unless specified at the time of order, the DRTS-201 is shipped from the factory for nominal 117VAC 60Hz power. The unit comes shipped with a 120V type AC plug. If it is desired to operate at 230VAC 50Hz, a selector switch must be set on the power supply. The supply is removed from the frame, the switch set to 230VAC, and the supply replaced in the frame.

The two digital video inputs A and B are internally terminated at 75Ω. The second connector for each input, marked MON, can be used as an analog monitor of the digital input. This connector receives its signal from an internal post-equalization amplifier through a D-to-A converter, which allows the operator to confirm the signal that is being fed to the A/B video switch.

AES audio input and output cables must be wired to conform to the silk-screen on the rear of the frame. All connectors have the same orientation. Shield (or ground) is always the center of the three pins. Be careful to maintain the polarity as shown, so that input phase matches the output. The second connector, marked MONITOR, can be used as an analog monitor of the AES digital input for audio channel 1 and channel 2 only. These connectors receive their signals from internal D-to-A converters, which allows the operator to confirm the data that is being fed to the A/B audio switch.

For AES3 (balanced 110Ω) installations connect all three terminals ('+', '-' and 'GND') on both the digital audio inputs and audio outputs. For AES-3id (unbalanced 75Ω) installations use the '+' and 'GND' terminals; leave the '-' connection open. This applies to both the digital audio inputs and audio outputs. For the analog monitor outputs connect all three terminals no matter which AES standard is being used.

An internal adjustment, labeled SWITCH DELAY (S5), allows for delay of the automatic changeover from one input signal to the other. This has the effect of delaying the detection of the absence of video for up to one second. If the EAV character becomes present again on the in-use channel before the time-out,

the video presence will not indicate a loss of signal. This keeps the logic from switching to the opposite input for very short losses of video.

### **Audio Connections**

The **AUDIO INPUTS** connectors are labeled with the appropriate designations for the AES channel 1 through channel 4 inputs for both the A and B signals.

The **AUDIO OUT** connectors are labeled with the appropriate designations for the AES switched channel 1 through channel 4 outputs.

The **AUDIO MONITOR** connectors are the analog monitoring signals from AES input channel 1 and channel 2 only. The designations are:

Audio Monitor 1A - AES channel 1-A left  
Audio Monitor 2A - AES channel 1-A right  
Audio Monitor 3A - AES channel 2-A left  
Audio Monitor 4A - AES channel 2-A right  
Audio Monitor 1B - AES channel 1-B left  
Audio Monitor 2B - AES channel 1-B right  
Audio Monitor 3B - AES channel 2-B left  
Audio Monitor 4B - AES channel 2-B right

The **BUFFERED** connectors provide active looping AES audio signals from channel 3 and channel 4 only. The designations are:

Buffered 1A - AES channel 3-A  
Buffered 2A - AES channel 4-A  
Buffered 1B - AES channel 3-B  
Buffered 2B - AES channel 4-B

### **Switches and jumpers**

A video fault will always induce the DRTS-201 to switch from one input to the other. A dipswitch can be set which will also allow certain audio error bits to cause all of the levels of the DRTS to switch from one input to the other.

When **S4-4** is in the OFF or OPEN position, only a video error will make the DRTS switch. ON or CLOSED will also allow certain AES audio errors to switch the inputs. The AES audio error utilized is ERF, which is a combination of parity, bi-phase coding and out-of-lock PLL errors.

The other positions of dipswitch S4 are as follows:

- S4-1** - is Select A from the remote connector
- S4-2** - is Select B from the remote connector
- S4-3** - is Remote Auto/Manual from the remote connector

When the dipswitch is OFF or OPEN, the true logic is low  
When the dipswitch is ON or CLOSED, the true logic is high

S5 provides switch-over delay adjustment. '1' = shortest delay and '9' = longest delay.

**NOTE: Under no circumstances operate the DRTS-201 with S5 in the '0' position. This could cause erroneous error indications and erratic operation.**

Audio input jumpers provide selection of either AES3 (balanced 110Ω) or AES-3id (unbalanced 75Ω) operation. Setting '0' provides for AES-3id and setting '1' provides for AES3 levels.

The specific input jumper positions are as follows:

- JP15** - Ch A, input 1
- JP16** - Ch A, input 2
- JP17** - Ch A, input 3
- JP18** - Ch A, input 4

- JP19** - Ch B, input 1
- JP20** - Ch B, input 2
- JP21** - Ch B, input 3
- JP22** - Ch B, input 4

A jumper can be added which will allow the user to select the specific AES3 audio channels that will be switched in the DRTS. With a jumper in a specific position, the unit will look only at the channel(s) selected and ignore the others.

- JP23A-B (CH1)** - activates only AES3 channel 1
- JP23B-C (CH2)** - activates AES3 channels 1 and 2
- JP23C-D (CH4)** - activates all four AES3 channels

Audio output jumpers provide selection of either AES3 (balanced 110Ω) or AES-3id (unbalanced 75Ω) operation. Setting '0' provides for AES-3id and setting '1' provides for AES3 levels.

The specific output jumper positions are as follows:

**JP24** - Ch A, buffered out 3

**JP25** - Ch A, buffered out 4

**JP26** - Ch B, buffered out 3

**JP27** - Ch B, buffered out 4

**JP28** - switched out 1

**JP29** - switched out 2

**JP30** - switched out 3

**JP31** - switched out 4

Jumpers **JP1** - **JP4** allow the muting of the audio D-to-A circuits when no signal is present, to eliminate any noise passing through to the audio monitors. ON position will mute the circuit when no signal is present and OFF allows all signals to pass through to the monitoring circuit. The default position is 'ON'.

Jumper **JP5** allows the 'Good health' output polarity to be set at 'Low = good' or 'High = good'. Default position is 'High'.

Jumpers **JP6** and **JP7** select whether the monitoring DACs are configured for NTSC or PAL operation. JP6 is the A signal input selector and JP7 is the B signal input selector. This affects only the monitoring circuit. The default is 'NTSC'.

Jumpers **JP8** and **JP9** select whether the video DAC converts and passes video signal through to the monitor output 'THRU', or whether color bars are generated locally in the DAC and passed to the monitor BNC connector 'CB'. JP8 is the A signal input selector and JP9 is the B signal input selector. These jumpers affect only the monitoring circuit. The default is 'THRU'.

**NOTE:** For color bars to be internally generated by the DAC, a video input signal is required.

Jumpers **JP10** - **JP14** are set to provide either high or low status indication as follows:

**JP10** - A Rcvr Health/Video present

**JP11** - B Rcvr Health/Video present

**JP12** - Power supply status

**JP13** - Input Selection Status

**JP14** - Number of Inputs

Use the pull-up position '1' (default) for 'low = true' output.

## SECTION IV

### DRTS-201

#### Circuit Description

##### GPI Path:

The A and B GPI inputs enter on female 9 pin 'D' connectors. The output GPI connector is a 9 pin 'D' male connector. The A and B GPI's each go to opposite sides of a form C relay with the common pin of the relay going to the output GPI connector. In the relaxed position, the A input is passing through the relay to the output connector. The relay is controlled by a logic level to the input of U15:H. The output of U15:H is an open collector output which saturates to ground. When the collector is turned on, it turns on relays K1 through K3, which will select the B GPI inputs. One of the GPI lines is dedicated to input health function, which is monitored by the logic on board and reported on one of the EXT CONTROL outputs.

##### Status Outputs:

Status is available for different functions on the External Control GPI connector. Each output is an open collector output with a jumper-selectable pull-up resistor of 1K ohms to +5 volts. There are five such outputs. The first one is A input health and A video present, which will go to a high state if input health is bad or video is not present. Second output is the same as the first but for the B input health and B video present. The third output indicates the health of the power supplies in the frame. If either supply goes down then the output goes high. The fourth status output is for switch selection status. A low on this output indicates the A is selected and a high indicates B is selected. The final output indicates the number of inputs, where a low indicates one input and a high indicates two inputs. This indication is changed with a front edge slide switch, S3.

##### Power Supply / Regulators:

The unregulated voltage to the voltage regulators on the main board comes from either of two power supplies that can be removed at the front of the RTU frame for service and replacement. Each unregulated supply has an input fuse and a 115/230VAC selector switch, and contains the circuitry that monitors the positive and negative outputs, and reports the power supply condition on one pin to the main board. A dual color LED on the front of the power supply

displays its health. Green indicates normal operation, or healthy condition. Red indicates either no AC present, or a problem with that supply. The output of the supply is diode OR'd to its respective supply bus.

There are four regulators on the main board, one for each of the voltages. Three of the regulators are linear voltage regulators. U65 controls the +12 volts, U70 the -12 volts and U66 controls the -5 volts. The +5 volts is controlled by a switching regulator U69.

**SECTION V**  
**DRTS-201**  
**Calibration procedure**

Equipment required:

Digital voltmeter.

**General.**

In order to satisfactorily complete this procedure the DRTS-201 must be operating correctly. Before attempting to calibrate the unit ensure that all audio and video paths, from input to output, are present, and that all logic and tally functions are correct. Check that all LEDs on the front panel illuminate correctly and that the EXT CONTROL connector functions are present and correct.

**1. Power supplies.**

The voltages shown on the main board test points are nominal. The circuits employed in the DRTS-201 are not voltage level sensitive and the voltage values are not adjustable.

Remove the PS#2 power cord from the source of AC.

Measure the +12v TP, +11.5v to +12.5v.

Measure the -12v TP, -11.5v to -12.5v.

Measure the +5v TP, +4.8v to +5.2v.

Measure the -5v TP, -4.8v to -5.2v.

Replace the PS#2 power cord and remove the PS#1 power cord from the source of AC.

Measure the +12v TP, +11.5v to +12.5v.

Measure the -12v TP, -11.5v to -12.5v.

Measure the +5v TP, +4.8v to +5.2v.

Measure the -5v TP, -4.8v to -5.2v.

Replace the PS#1 power cord.

## **SECTION V**

### **DRTS-201**

#### **Diagrams**

External Control Connector Pin Assignments

GPI A & B Connector Pin Assignments

RTU Block Diagram

**DRTS-201**  
**EXTERNAL CONTROL CONNECTOR**  
**9-PIN 'D'**

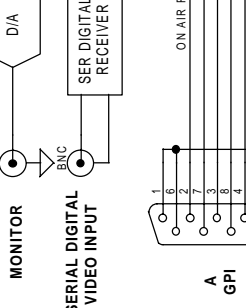
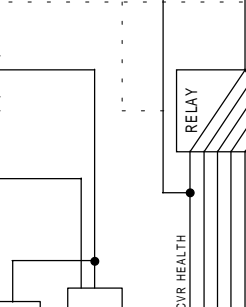
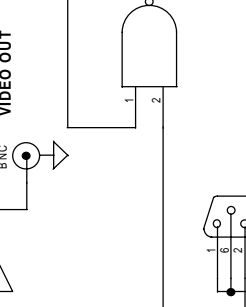
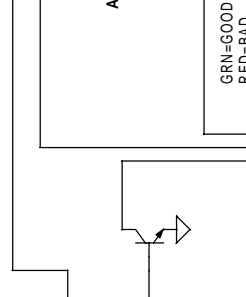
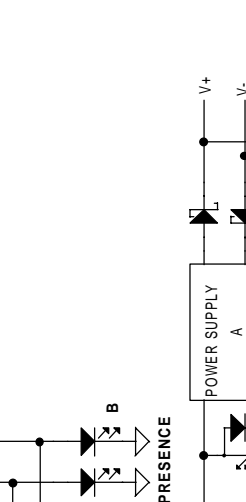
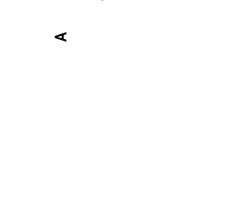
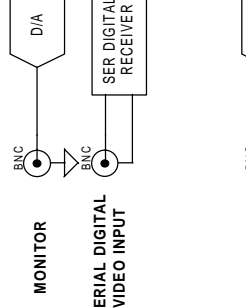
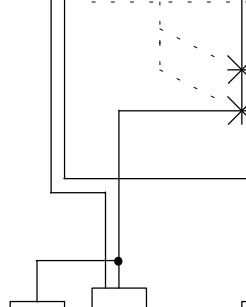
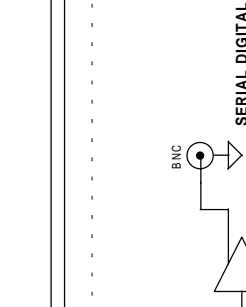
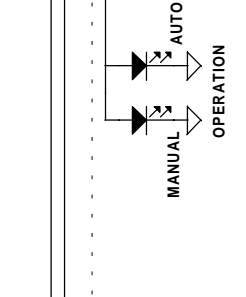
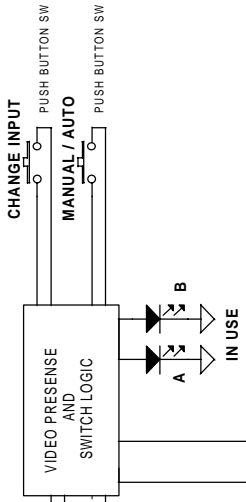
1	Power Supply Health (Low = Healthy)
2	Input B Video Present/Input Health (Low = Video Present and Input Healthy)
3	Number of Inputs (Low = 1 Input)
4	Select Input A (Active Low, Momentary Pulse)
5	GND
6	Input A Video Present/Input Health (Low = Video Present and Input Healthy)
7	Input Selection Status (Low = Input A Selected)
8	Auto Switch Disable (Low = Auto Switching Disabled)
9	Select Input B (Active Low, Momentary Pulse)

**Note:**

Status outputs are provided with jumper-selectable 1K pullups to +5 volts to allow one or more outputs to source current into optocouplers.

**DRTS-201**  
**GPI A, B and Output CONNECTOR**  
**9-PIN 'D'**

1	GND
2	Receiver Health
3	GPI 2
4	GPI 4
5	GND
6	GND
7	GPI 1
8	GPI 3
9	GPI 5



**The ISIS Group, Inc**  
Grass Valley, CA

Title: DIRECTV DIGITAL RTU BLOCK DIAGRAM

Sheet: 1 of 1

Rev: 3

Document Number: DRTS-201

Date: Sunday, January 10, 1999