RD-60

Multi-CODEC Receiver

Includes demodulator versions - ADV, LB, STD, and PRM

USER GUIDE

11.08.13 - v1.11.02

ADTEC Digital

Contents

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Adtec Digital Support & Service

Technical Support and Customer Service includes troubleshooting product/system functional operations concerning Adtec equipment, embedded systems and single device issues; Service Order generation, processing and tracking; Warranty claim processing; and on-site system evaluation and maintenance. Technical Support plans do not include customer training programs. Programs incorporating customer training are defined in the Training Services Policy. Customer Services technicians provide limited instruction during a support call/email/fax in order to facilitate checking for proper equipment operation.

Telephone and Email Support

- **Telephone:** 615-256-6619 ext. 166
- **Email:** support@adtecinc.com
- **Internet:** http://adtecdigital.com/support/support-request

Adtec Digital offers telephone, email and fax support, warranty and service related inquiries during normal business hours: 9:00am to 5:00pm Central Standard Time (CST), Monday through Friday, holidays excepted. Support Requests can also be submitted on-line. All inquiries will be processed in the order in which they are received and by the criteria outlined in the Call Response Order. Inquiries and inquiry responses made after 5:00 PM (CST) weekdays, Saturday, Sunday or on an Adtec-recognized holiday will be processed the next business day in the order received.

Callers on hold and returned calls will be prioritized by the following criteria:

- Priority-24 Subscription Customers
- Standard-Priority Subscription Customers
- All customers that have purchased Installation & Training, within 90 days of the installation.
- Adtec Certified Operators (ACO)
- Limited Level Support, Warranty & Service Requests
- Multi-device system installations that have purchased Installation & Training from Adtec
- Distributors
- System Integrators
- Multi-device systems
- Single device users

Preparing for Support

To help expedite the troubleshooting process, please be prepared to provide the following information to the support representative:

- **Product(s) affected:** Please provide a list of the Adtec Products involved including the Revision Number for each affected product.
- **Description of the Problem:** Please include a detailed description of the problem. Include the approximate time and day the problem occurred, the spot ID of the material being inserted and what the operator reported about the incident. It is also helpful to note any recent changes to the system. More information is always better than too little information.
- **Your Contact Data:** Please include contact information so we can reach you to discuss how to fix the problem, additional troubleshooting steps that are required or to gather more complete information regarding the problem. Please include your facility name (or call letters), your name, title, email address, telephone number, hours of work, and other contact persons if you are not available.

Advanced Support Plans

In addition to our basic Inquiry Response Policy, Adtec offers two advanced levels of priority inquiry support: **Standard-Priority** and **Priority-24**. The Standard-Priority & Priority-24 plans provide guaranteed* response times with the Priority-24 plan offering after hours and holiday support. Standard-Priority support is included with the Adtec Certified Operator (ACO) training. Contact Adtec Sales to upgrade your current support plan.

Standard-Priority Support Plan

Customers can improve upon our normal call processing times and can expedite inquiry support responses through our subscription Standard-Priority service plan. Under this plan all telephone inquiries are guaranteed* a telephone response of no more than 4 hours after they are received (within the designated hours of operation). Telephone inquiries received by 4:00 PM (CST) on weekdays- excluding Adtec holidays- are guaranteed a same-day telephone response. However, inquiry responses may be made after hours until 8:00 PM (CST). Email and fax inquiries are limited in scope to normal business hours, excluding holidays. Standard-Priority customers are entitled to a 10% discount on site visit and training charges after the initial system/product installation and training. Standard-Priority customers also receive a 3-day turnaround time guarantee* on warranty and non-warranty repairs on Adtec manufactured equipment, excluding Studio Encoders.

Priority - 24 Support Plan (24 Hour)

In addition to our Standard-Support plan, after hours, weekend and holiday support is available with the **Priority-24** support plan. This plan is a subscription only service available for service inquiries 24 hours a day, 7 days a week. All telephone inquiries are guaranteed* a telephone response time of no more than 2 hours. Email and fax inquiries are limited in scope to normal business hours, excluding holidays. Calls after 5:00 PM will be forwarded to a Customer Services representative on call. **Priority-24** customers are entitled to a 25% discount on site visit and training charges, after the initial system/product installation and training. **Priority-24** customers also receive a 1- day turnaround time

guarantee* on warranty and non-warranty repairs on Adtec-manufactured equipment, **excluding** Studio Encoders.

Plan Comparisons

Feature/ Plan Name	**Priority-24**	**Standard Priority**	**Limited**
Hours	24 Hours/Day; 7 Days/Week	9:00 AM – 5:00 PM, (U.S.Central Standard Time), Excludes Weekends & Holidays	
Call Response Time	Same day- 2 hours (1st in order of call list)	Same Day: 4 Hours (2nd in order of call list)	48 Hours
Discounted Site Visits	25%	10%	None
Discounted Training	25%	10%	None
Repair Service	Guaranteed* 1 Day Turnaround	3 Day Turnaround	None

* A one-month free service extension will be awarded if Adtec fails to meet its service guarantee.

Electrical Device Compliance Notices

Safety Warnings and Cautions

For your safety and the proper operation of the device:

- This unit must be installed and serviced by suitably qualified personnel only.
- Do not break the warranty seals on the device or open the lid. Only approved service technicians are permitted to service this equipment.
- Disconnect all power before servicing the unit.
- Do not expose this device to rain or other moisture. Clean only with a dry cloth.
- If not installed in an equipment rack, install the product securely on a stable surface.
- Install the product in a protected location where no on can step or trip over the supply cord, and where the supply cord will not be damaged.
- If a system is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the room ambient temperature.
- Consideration should be given to installing the unit in an environment compatible with the maximum recommended ambient temperature of 50 degrees Celcius (122 degrees Fahrenheit).
- Install the unit in a rack so that the amount of airflow required for safe operation is not compromised.
    - The recommended clearance on the top and sides of the unit is at least ½ " (one half inch/one centimeter).
- Mounting of the unit in a rack should be such that no hazardous condition is achieved due to uneven mechanical loading.
- Use only a grounded electrical outlet when connecting the unit to a power source.
- Reliable earth grounding of rack-mount equipment should be maintained.
    - Particular attention should be given to supply connection other than direct connections to the branch circuit (e.g., use of power strips).

Compliance Notices

FCC

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio

communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications to this device not expressly approved by Adtec Digital could void the user's authority to operate the equipment.

Industry Canada

This Class B digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions:(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Cet appareillage numérique de la classe B répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

European Union EMC Directive Conformance Statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Adtec Digital cannot accept responsibility for any failure to satisfy the protection requirements resulting from a user modification of the product. This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to CISPR 22 / EN 55022.

Chapter 1 - Product Introduction

Covered Equipment

RD-60: MPEG 4 / MPEG 2 Capable IRD. Transport Stream inputs standard on ALL RD models include ASI and GigE. Video outputs standard on ALL models include Composite and HD-SDI (x4 Bank A and B). Standard audio decode includes two (2) Dolby E pass-through and four (4) stereo pairs (8 mono) of MPEG 1 Layer 2 with an optional upper 4 stereo pairs (8 stereo pairs or 16 mono channels). BISS 1 / E decryption included. Includes Genlock & Redundant AC power supplies. Optional DVBS/S2 demodulator packages available.
VERSION 06 and HIGHER DOES NOT SUPPORT HDMI OUTPUT

RD-60 w/ Standard Demodulator (RD60-XX-DMOD-STD): RD60 (as configured above) + Standard Demodulator which adds Standard Adtec Demodulator. Supports L-Band, DVB-S/S2, QPSK 1 - 45 Mbaud and 8PSK 1 - 30 Mbaud.

RD-60 w/ L-Band Demodulator (RD70-XX-DMOD-LB): RD60 (as configured above) + Advanced Demodulator which adds 01 L-Band Demodulator. Supports L-Band, DVB-S 1 - 62 Mbaud, DVB-S2 1 - 65 Mbaud.
* Software Key field upgradeable to high symbol rate (>30Msym/s), 16APSK, and 32APSK.

RD-60 w/ Advanced Demodulator (RD60-XX-DMOD-ADV): RD60 (as configured above) + Advanced Demodulator which adds Advanced Newtec Demodulator. Supports L-Band, DVB-S 1 - 30 Mbaud, DVB-S2 1 - 30 Mbaud. Software Key field upgradeable to 16APSK.

RD-60 w/ Premium Demodulator (RD60-XX-DMOD-PRM): RD60 (as configured above) + Premium Demodulator which adds Premium Newtec Demodulator. Supports L-Band, DVB-S/S2, QPSK/8PSK 256kbaud - 45Mbaud*. Unit is CCT capable* (5%, 10%, and 15% roll-off).
* Software Key field upgradeable to 16APSK, 32APSK, and 45 Mbaud. CCT capability may require software update for older demodulators.

Front Panel

The front panel LCD and keypad can be used to configure and monitor your device.

Model Indicators:


Premium demodulator (PRM)


Advanced demodulator (ADV)


L-Band demdulator (LB)


Standard demodulator (STD)


No demodulator

Front Panel LCD

1) Feedback State: There are several quick view menu screens available when in regular feedback state. You can view any of these quick view status screens by using the up and down arrow buttons.

2) Disabled Product State: When the product is in a disabled state, the LCD will relay the following information. This state is generally only used when a factory restore is performed. If that is the case, note that all of the configurations have been returned to factory defaults including Network configurations. To reapply network configurations simply press the Down arrow when in this state to navigate through the network menu.

Transport LED Indicators

Indicator	Function
Decode	Off - Decoder is idle. On - Decoder is active.
ASI / IP /RF	Off - No services detected on the input. On - Services detected on the input.
Lock 1 / Lock 2	Off - Tuner is not locked On - Tuner is locked
IP Out	Off - IP Egress is idle. On - IP Egress is active. * IP Output is not applicable for RD-60 products
Bars	Off - All B/T/ID options are disabled. On - B/T/ID options are enabled.

Audio Decode Indicators

Indicator	Function
A1 through A8	Off - Audio engine is not active. On - Audio engine is actively decoding or performing pass-through. Blinking - Audio engine is in a failure mode (no pass-through or audio decoding)

System Indicators

Indicator	Function
Alarm	Off - No system alarms. On - System alarm.

	(NTP or FAN alarm)
BISS	Off - Decryption configuration is turned OFF On - Decryption configuration is set to BISS1 or BISSE
Link	Off - Network communication link not detected On - Network communication link detected
Busy	Off - No network activity On - Network traffic present

Controls

Using the **Mode**, **Select**, **Enter**, **Escape**, and directional buttons, the user can control the unit via the front panel.

Control	**Function**
Mode button	Mode will cycle through top layer menus.
Select	Select will enter into edit mode.
Enter	Enter submits any edited configurations.
Escape	Escape returns to the previous menu layer.
Cursor Arrows	Arrows will navigate you within submenus
Programming Keypad	For value entry. F1 functions as a "+" or "-" operator. F2 functions as a "." decimal or period.

Front Panel Menu Structure

Services Menu

Item	Function	Options
Select Service	Allows service selection from a list of services per input.	ALL ASI RF1 RF2 IP
Select First Found	Allows you to configure the RD-60 to decode the first valid program found on a given input.	ASI RF1 RF2 IP

RF Rx Menu (ADV Advanced / PRM Premium)

Item	Function	Options
Select Tuner*	Selects RF1 or RF2 as the RF acquisition source	RF1 RF2
Local Oscillator	The Local Oscillator (L.O.) control specifies the frequency of the LNB local oscillator. The standard L.O. frequencies for "C" and "Ku" bands are 5150MHz and 10750MHz respectfully although, some other variants are included. If the desired L.O. frequency is not listed, select either C: Manual or Ku: Manual and enter the L.O. frequency in the Manual L.O. field.	C: 5150 KU: 11300 KU: 10750 KU: 10600 KU: 10000 KU: 9750 KU: 9600 C: MANUAL KU: MANUAL
Manual LO	Allows manual entry of the LNB Local Oscillator frequency provided that either C: Manual or Ku: Manual is selected from the Local Oscillator pulldown menu.	
Downlink	Allows the operator to enter the satellite downlink frequency. The value for the Downlink frequency is used with the Local Oscillator frequency to calculate the L-Band frequency. The Downlink and Local Oscillator frequencies can be used to determine if spectrum inversion occurs using the following rules. If the Downlink frequency is less than the Local Oscillator frequency, then spectrum inversion does occur. If the Downlink frequency is greater than the Local Oscillator frequency, then spectrum inversion does not occur.	Range dependent upon LO configuration
L-Band	Allows the operator to enter the L-Band frequency within the range from 950MHz to 2.15GHz. The value entered in this field is used with the Local Oscillator frequency to calculate the Downlink frequency using the following rules. If Downlink < Local Oscillator, then Downlink - Local Oscillator = |L-Band|. If Downlink > Local Oscillator, then Downlink - Local Oscillator = L-Band. **note:** 2150MHz may not be available on older premium demods, 1750MHz maximum.	950MHz - 2150MHz
Modulation Type	Allows the selection of the mod type.	DVBS DVBS-2
CCM Mode*	When the Constant Coding and Modulation (CCM) option is selected, the same modulation	CCM AUTO-CCM

	mode and FEC is used for all physical layer framing. The advantage of using DVB-S2 in the CCM mode is the improved protection that is achieved by utilizing the new inner and outer codes. Another advantage is the 30 percent increase in capacity that is realized while using the method. If Auto-CCM is selected, the receiver will detect and configure the Modulation Mode, Pilot, and Frame Type. Adaptive Coding and Modulation (ACM) is available for receivers with the appropriate hardware and feature key. In this mode, modulation and coding can vary on a DVB-S2 frame by frame basis. Auto-CCM is the preferred method to automatically detect modcod, pilots and frame type. **This configuration is not available via front panel at this time. note: this field is not applicable for DVB-S. Similar functionality (AUTO MODCOD detection) can be used in DVB-S by using QPSK_AUTO or 8PSK_AUTO modulation modes.	
Modulation Mode	This control allows the operator to select the desired modulation mode and FEC code rate. note: This is a configuration value. When in DVB-S2 AUTO-CCM mode, actual detected modulation can be found in the Quick View status. QPSK_AUTO and 8PSK_AUTO configurations are only valid in DVB-S. See how to appendix for automatic detection instructions.	We display all possible ranges available via our device in the Front Panel. This list will differ from the list found in the web UI as it only shows those options available based on the hardware and feature keys found. QPSK-1/2 QPSK-2/3 QPSK-3/4 QPSK-5/6 QPSK-6/7 QPSK-7/8 QPSK-1/4 QPSK-1/3 QPSK-2/5 QPSK-3/5 QPSK-4/5 QPSK-8/9 QPSK-9/10 QPSK_AUTO* 8PSK-3/5 8PSK-2/3 8PSK-3/4 8PSK-5/6 8PSK-8/9 8PSK-9/10 8PSK_AUTO* 16QAM-3/4 16QAM-7/8 16APSK-2/3 16APSK-3/4 16APSK-4/5 16APSK-5/6 16APSK-8/9 16APSK-9/10 32APSK-3/4 32APSK-4/5 32APSK-5/6 32APSK-8/9 32APSK-9/10
Symbol Rate	The number of symbols transmitted per second. The amount of data per symbol is dependant upon the modulation type, e.g. QPSK, 8PSK, etc.	Range can be determined by feature key.

Acquisition Range	Acquisition Range is defined as the range of frequencies that the tuner will scan in order to achieve carrier synchronization. Allows the operator to select the range of frequencies that the RF tuner will sweep through to acquire the carrier. e.g. If the desired carrier is at 1.080GHz and the Acquisition Range is set to 5MHz, the RF tuner will sweep through 1.080GHz ± 2.5MHz to acquire the carrier. Units are in MHz. note: Actual acquisition range available is symbol rate dependent for advanced and premium demods. If symbol rate < 5MBaud, maximum range is 1.5 * symbol rate. If symbol rate > 5Mbaud, maximum range is 7.5MHz.	0 - 7.5MHz
Rolloff	The rolloff selection will determine the shape of the input filter. The occupied bandwidth of the modulated signal is the symbol rate multiplied by (1+α) where alpha (α) is the rolloff factor (%). By using a lower alpha, carriers can be spaced closer together on a given transponder or an increased symbol rate can be realized for a given bandwidth. **note:** 5%, 10%, and 15% rolloff is only applicable in DVB-S2 with premium demodulators. AUTO is only available in DVB-S. If required for demodulators, contact support for firmware upgrade.	5% 10% 15% 20% 25% 35% AUTO*
Pilot	DVB-S2 allows the option of inserting bursts of pilot tones that are very robust and prevents the carrier recovery system from failing prematurely. However, when pilots are enabled, the total data rate throughput is reduced by approximately 3.0%. note: Pilot is not applicable in DVB-S or AUTO-CCM modes.	On Off N/A
FEC Frame Type*	When operating in DVB-S2, the Frame Type options are either Normal or Short. The Normal 64,800-bit FEC frame provides better protection but introduces more latency compared to the Short 16,200-bit FEC frame. Therefore, the Short FEC frame type should be selected in applications where latency is critical and the longer frame type should be used to optimize protection. note: FEC Frame type is not applicable in DVB-S or AUTO-CCM modes.	Short Normal N/A

LNB Menu		
LNB State	This configuration will enable or disable power on the input connector to power the LNB. If on, the user selected voltage and tone will be placed on the connector via the Polarity and Tone configurations.	ON OFF
LNB Polarity	This control is primarily used in "Universal" LNB applications. The LNB Polarity control allows for LNB polarization selection; the 13VDC source will select the Vertical polarity and the 18VDC source will select the horizontal polarity. For typical "C" and "Ku" band applications, the 18 VDC option is recommended.	H(18V) V(13V)
LNB Tone	This control is used only for Universal LNB applications. A universal LNB can route the high or low band from either polarity to the IRD. The high band is selected by enabling the 22 kHz tone and the low band is selected when the 0 Hz tone is enabled.	0KHz 22KHz
Profile Menu		
Save	Allows user to save currently running RF configuration to a profile. Press <select> then use keypad for custom name entry. Press <enter> to confirm name and save profile.	
Select	Allows user to load profile from list. Press <select> then <up> and <down> arrows to list profiles. press <enter> to load selected profile.	
Delete	Allows user to delete profile from list. Press <select> then <up> and <down> arrows to list profiles. press <enter> to delete selected profile.	

RF Rx Menu (LB L-Band)

Item	Function	Options
Tuner State	Enables or Disables RF input. **note:** When RF1 and RF2 are both enabled, maximum tuner performance is affected. Please view table in Appendix A for symbol rate and modcod resource limitations.	DISABLED ENABLED
Downlink	Allows the operator to enter the satellite	Range dependent upon LO

	downlink frequency. The value for the Downlink frequency is used with the Local Oscillator frequency to calculate the L-Band frequency. The Downlink and Local Oscillator frequencies can be used to determine if spectrum inversion occurs using the following rules. If the Downlink frequency is less than the Local Oscillator frequency, then spectrum inversion does occur. If the Downlink frequency is greater than the Local Oscillator frequency, then spectrum inversion does not occur.	configuration
Local Oscillator	The Local Oscillator (L.O.) control specifies the frequency of the LNB local oscillator. The standard L.O. frequencies for "C" and "Ku" bands are 5150MHz and 10750MHz respectfully although, some other variants are included. If the desired L.O. frequency is not listed, select either C: Manual or Ku: Manual and enter the L.O. frequency in the Manual L.O. field.	C: 5150 KU: 11300 KU: 10750 KU: 10600 KU: 10000 KU: 9750 KU: 9600 C: MANUAL KU: MANUAL
Manual LO	Allows manual entry of the LNB Local Oscillator frequency provided that either C: Manual or Ku: Manual is selected from the Local Oscillator pulldown menu.	
L-Band	Allows the operator to enter the L-Band frequency within the range from 950MHz to 2.15GHz. The value entered in this field is used with the Local Oscillator frequency to calculate the Downlink frequency using the following rules. If Downlink < Local Oscillator, then Downlink - Local Oscillator = |L-Band|. If Downlink > Local Oscillator, then Downlink - Local Oscillator = L-Band	950MHz - 2150MHz
Acquisition Range	Acquisition Range is defined as the range of frequencies that the tuner will scan in order to achieve carrier synchronization. Allows the operator to select the range of frequencies that the RF tuner will sweep through to acquire the carrier. e.g. If the desired carrier is at 1.080GHz and the Acquisition Range is set to 5MHz, the RF tuner will sweep through 1.080GHz ± 2.5MHz to acquire the carrier.	0 - 5MHz
LNB Polarity	This control is primarily used in "Universal" LNB applications. The LNB Polarity control allows for LNB polarization selection; the 13VDC source will select the Vertical polarity and the 18VDC source will select the horizontal polarity. For typical "C" and "Ku" band applications, the 18 VDC option is recommended.	OFF H(18V) V(13V)
LNB Tone	This control is used only for Universal LNB	0KHz

	applications. A universal LNB can route the high or low band from either polarity to the IRD. The high band is selected by enabling the 22 kHz tone and the low band is selected when the 0 Hz tone is enabled.	22KHz
Modulation Type	Allows the selection of the mod type.	AUTO DVBS DVBS-2
Symbol Rate	The number of symbols transmitted per second. The amount of data per symbol is dependant upon the modulation type, e.g. QPSK, 8PSK, etc. Set this field to 0 for automatic Symbol Rate.	0 = AUTO Range can be determined by feature key.
ISI	ISI (input stream identifier) is required for multistream applications. If a multistream RF source is detected, BBHeaders containing this value will be demodulated and output to the receiver. This value has no effect during single stream applications.	0 - 255
RF Stats Menu		
RF Stats	General RF Lock Status is provided via the RF quickview menu, but a detailed list of further information can be found in this menu.	

IP Rx Menu

Item	Function	Options
Multicast Rx IP	Multicast IPA sets the multicast receive Group IP address. IP Multicast receiving is supported from compatible streamers. The range of the multicast group IP is 224.10.XXX.XXX to 239.XXX.XXX.XXX - XXX represents any number 0 through 255. This can be either regular class A, B, C IP address or a multicast IP address.	0.0.0.0 - 255.255.255.255
Multicast Rx Port	Port number are used for receiving UDP/RTP transfers in conjuction with Multicast IPA. The valid range is 0-65535. If the port number is set to 0, then no UDP transfers will take place. 2000 is default.	0 - 65535
Source Specific Multicast Address	Configures the multicast receive Source Specific IP Address. This configuration should be configured to 0.0.0.0 (any source multicast) in most IGMPv2 multicast applications. This configuration is an advanced configuration used for redundancy, security, or IGMPv3 multicast applications. It does not function for unicast reception.	0.0.0.0 - 255.255.255.255
Multicast Connector	The multicast connector configuration determines the physical port of where the IP stream will be received, the ethernet (10/100) or GigE (10/100/1000) ethernet port.	ETHERNET GIGE
Latency	Multicast Latency sets the latency delay before the decoder begins playback from the multicast source and should be argued as a millisecond value. If the MULTICASTLATENT delay time is too large, and the internal delay buffer is about to overflow, the system will start the multicast playback early to prevent the overflow. A log message is generated when this condition occurs.	
Multicast Timeout	Sets the timeout value for return to normal video playback after video multicast packets are no longer detected. The default timeout	

	value is 300 milliseconds. If the timeout value is set too low, the multicast receive may timeout during normal reception if the packet transmission is bursty.	

Video Menu

Item	Function	Options
Output Menu		
Fault Mode	Display or Modify the current SDI video fault setting. This setting sets the video resolution when in video fault. This setting will be applied on startup when no video is present. If video becomes present, the setting will be overridden by the current video setting.	480i59.94 576i50 720p59.94 720p50 1080i59.94 1080i50
Video Loss	When video is not detected on the configured input, this setting will define the output.	OFF:No video output on fault BLANK:Only blanking on fault BLANKTONES: Blanking and tones on fault BLANKOVERLAY: Blanking and overlay on fault BLANKTONESOVERLAY Blanking, tones and overlay on fault When a type with BLANK is selected, the current bars/matte setting will be applied. When a type with TONES is selected, the current tones setting will be applied. When a type with OVERLAY is selected, the current device name

		will be used.
Downscaling SDI	The Downscaling SDI setting determines whether the SDI bank (SDI Output 1 and 2) will be output natively or downscaled to SD.	OFF SD
Downscaling SDIALT	The Downscaling SDI setting determines whether the SDI bank (SDI Output 3 and 4) will be output natively or downscaled to SD.	OFF SD
Genlock Menu		
Genlock Mode	Configures the genlock operation of the decoder. SLAVE is primarily used for 3D applications and REMOTE is used in standard genlock operation.	OFF - Disables genlock SLAVE - Enable Genlock, Decode source is synchronous to SYNC IN signal REMOTE - Enable genlock, Decode source is NOT synchronous to SYNC IN signal
Horizontal Adjust	Horizontal adjustment defines the difference in the SYNC IN HSYNC and output HSYNC. Typically, this should be in the range of 0 to +1 line in clocks. For example, a 1080I output could be adjusted from 0 to 2200.	0 - 2200
Vertical Adjust	Vertical adjustment defines the difference in the SYNC IN VSYNC and output VSYNC. Typically, this should be in the range of 0 to +1 frame in lines. For example, a 1080I output could be adjusted from 0 to 1125.	0 - 1125
Pixel Phase	Pixel Phase adjustment is a very fine grain adjustment that can adjust within a single clock. The increments are 1/64th of a clock. The valid range is 0 to 63.	0 - 63
Genlock Status	Shows if GENLOCK input is currently being used for the decoder or in FREE RUN mode	
Genlock CVBS	This configuration is used	VIDEO - CVBS output is video

Out	generally with 3D applications. The ‘MASTER’ unit CVBS configuration must be configured as ‘SYNC’.	SYNC - CVBS output is black burst sync signal
Genlock Reset	Reinitializes the Genlock System.	

Audio Menu

Item	Function	Options
Audio 1-8		
Audio PID	Allows selection of available audio PID associated with program. note: Selection list only shows PIDs listed in PMT. Manual PID entry (such as IFB applications) is only available via the UI and SNMP at this time.	DISABLED AUTO * shows PID list from actively decoding program
Offset Pair	Adjusts each individual pairs of audio sync.	-50 - 800ms
DolbyD Mode	Configures the audio engine to Pass-through (COMPRESSED) or decode (2/0 STEREO) if a Dolby Digital AC3 PID is detected for the selected Audio input. Mpeg1Layer2 always decodes, and LPCM / Dolby E always Pass-through, regardless of this setting. Dolby Decode requires feature key and hardware capability (units manufactured post January 2012).	PASSTHRU DECODE - STEREO*
DolbyE Line	This is used to configure Dolby E placement in the SDI output and is configurable per audio engine. When set to AUTO (-1), the default configuration, the Dolby E line is placed within the valid line number range for the video resolution. The Dolby E line may be manually configured to a value within range. Valid ranges for Dolby E line placement are resolution and frame rate dependent. If the configured value is not valid, the system will use the valid line used by the 'AUTO' mode. The Dolby E line status information can be	-1 - 4096 -1 = AUTO

	used to see the actual Dolby E line placement. View Dolby E line table for more information.	
Analog Vol. Pair 1 & 2	Adjusts the analog volume of the first two pairs in dB increments.	-49 - 18 dBu
SDI Audio Matrix 1-8		
SDI Audio Matrix	The SDI audio matrix allows the user to route, duplicate, or disable audio pairs within the SDI embedded output.	DISABLE, Disable audio output on selected SDI pair AUTO, Invokes automatic SDI pair assignment. This is the default setting. AUDIO1, Route Audio 1 to the selected SDI pair AUDIO2, Route Audio 2 to the selected SDI pair AUDIO3, Route Audio 3 to the selected SDI pair AUDIO4, Route Audio 4 to the selected SDI pair AUDIO5, Route Audio 5 to the selected SDI pair AUDIO6, Route Audio 6 to the selected SDI pair AUDIO7, Route Audio 7 to the selected SDI pair AUDIO8, Route Audio 8 to the selected SDI pair

VBI Menu

Item	Function	Options
Time Code		
SDI Line Number	Configures the SDI ANC line output of VITC/LTC (SDI Output Port 1 and 2)	0 - Disabled 7 - 22
SDI Alt. Line Number	Configures the SDI Alternate ANC line output of VITC/LTC (SDI Output Port 3 and 4)	0 - Disabled 7 - 22

Source	If timecode is carried by a PES stream, configure the RD-60 *Timecode Source* to *PES* (default). If a PES time code PID is not available, the RD-60 can extract the time code from the GOP by configuring *Timecode Source* to *VIDEO*.	PES VIDEO
SDI Output	Configures the SDI ANC timecode output for PASS (preserve timecode type from transport stream), only output LTC, only output VITC, or output both.	PASS LTC VITC BOTH
SDI Alt. Output	Configures the SDI alternate ANC timecode output for PASS (preserve timecode type from transport stream), only output LTC, only output VITC, or output both.	PASS LTC VITC BOTH
AFD		
SDI Line Number	Configures the SDI ANC line output of AFD (SDI Output Port 1 and 2)	0 - Disabled 7 - 22
SDI Alt. Line Number	Configures the SDI Alternate ANC line output of AFD (SDI Output Port 3 and 4)	0 - Disabled 7 - 22
Closed Captions		
CVBS Line Number	Enables/Disables the CVBS/SD-SDI port line number for waveform closed captions.	0 - Disabled 21 - Output captions if present
SDI Line Number	Configures the SDI ANC line output of EIA-608/708 Closed Captions (SDI Output Port 1 and 2)	0 - Disabled 7 - 22
SDI Alt. Line Number	Configures the SDI Alternate ANC line output of EIA-608/708 Closed Captions (SDI Output Port 3 and 4)	0 - Disabled 7 - 22
Teletext		
CVBS Line Number	Enables/Disables the CVBS/SD-SDI port line number for waveform Teletext.	0 - Disabled 22 - Output teletext if present
SDI Line Number	Configures the SDI ANC line output of OP47/Teletext (SDI Output Port 1 and 2)	0 - Disabled 7 - 22
SDI Alt. Line Number	Configures the SDI Alternate ANC line output of OP47/Teletext (SDI Output Port 1 and 2)	0 - Disabled 7 - 22

CAS Menu

Item	Function	Options
Mode	Configures the current decryption setting.	OFF BISS_1 BISS_E_USER_ID_ONE BISS_E_USER_ID_TWO
Clear Session Word	The session keys used for decryption. [MODE BISS_1] uses a 12-digit hexadecimal Clear Session Word.	user-defined using the numeric keypad
Encrypted Session Word	The 16-digit hexadecimal Encrypted Session Word for use with BISS_E modes.	user-defined using the numeric keypad
User ID One	Valid in Mode BISS_E_USER_ID_ONE ONLY. The 14-digit hexadecimal User ID (injected ID) used for decryption.	user-defined using the numeric keypad
User ID Two	Valid in Mode BISS_E_USER_ID_ONE ONLY. The 14-digit hexadecimal User ID (injected ID) used for decryption.	user-defined using the numeric keypad
TS Out Decrypt	The TS Out Decrypt configuration determines if the ASI output should mirror the selected input (OFF), thus preserving any encrypted streams or if it should be decrypted / free to air (ON). OFF, the default configuration, is recommended for users needing to redistribute transport streams in their original form. The decoder will decrypt / decode the selected program with the entered BISS key, but the ASI output will remain unaltered. ON is recommended for users needing to redistribute the ASI output as a free to air SPTS/MPTS. All programs will be decrypted with the user entered BISS key. Please note that when set to ON, there are bitrate limitations when encrypted streams are present. See Appendix for more details.	OFF ON

System Menu

Login

Units ship with the front panel logged in by default. If you become logged out and are prompted for a password, use the following key sequence for access.
note: The key sequence can be remembered by using the word 'USER' for '**U**p, **S**elect, **E**nter, **R**ight'.

Action
Press **<Select>**
Press **<Up>** arrow
Press **<Select>**
Press **<Enter>**
Press **<Right>** arrow
Press **<Enter>**

Duration

The front panel also has a login duration feature. This setting allows the user to specify a time frame (in minutes) until the unit will automatically log itself out.

Action
Press mode until you see the System Menu.
Press **<Select>**
Press the **<Down>** arrow
Press **<Select>**
Using the **<Up>** and **<Down>** arrows, select the value you wish.
Press **<Enter>** to save your selection

Possible Configurations:
0 (Zero): The unit will not automatically log out.
1-9: The duration of time, in minutes, before the unit logs out, if no input is received.

Network

Item	Function	Options
Ethernet IP Address	This is the address of your device on your network specific to the Ethernet Port.	user-defined using the numeric keypad Default is 192.168.10.48
Ethernet Mask	Defines the unit relative to the rest of your network.	user-defined using the numeric keypad Default is 255.255.255.0
Ethernet DHCP	The Dynamic Host Configuration Protocol allows your device to self-locate network Ethernet parameters.	**On** (finds own DHCP Address) **Off** (defaults to last entered IP Address) Default is OFF
GigE IP Address	This is the address of your device on your network specific to the GigE Port.	user-defined using the numeric keypad Default is 192.168.20.48
GigE Mask	Defines the unit relative to the rest of your network.	user-defined using the numeric keypad Default is 255.255.255.0
GigE DHCP	The Dynamic Host Configuration Protocol allows your device to self-locate network GigE parameters.	**On** (finds own DHCP Address) **Off** (defaults to last entered IP Address) Default is OFF
Gateway IP Address	The gateway is a routing mechanism that passes traffic between different subnets and networks.	user-defined using the numeric keypad Default is 192.168.10.1
Stealth IP Address	This is a security feature that allows only the designated Stealth IP Address to communicate with the unit for FTP and other services. This control allows one-point override access to the Stealth IP Address.	user-defined using the numeric keypad Default is 0.0.0.0. Using all 0s effectively turns this function off.

Time

Item	Function	Options
Time	Defines system time	user-defined using the numeric keypad
Timezone	Defines the time zone the unit operates in	

NTP

Item	Function	Options
NTP Status	Network Time Protocol SYNC status	Read-only
NTP IP Address	IP address designated for Network Time Protocol	user-defined using the numeric keypad Default is 0.0.0.0. Using all 0's effectively turns this function off.

Alarm

Item	Function	Options
Event Record	Log of events outside of regular operating parameters	scroll up and down to view log items

SNMP Menu

Item	Function	Options
SNMP	Controls the status (ON/OFF) of the Simple Network Management Protocol (SNMP) feature. We support SNMPv2c.	OFF ON
Read-only community	The Simple Network Management Protocol (SNMP) Read-Only Password. Default Value: "adtec"	user-defined using the numeric keypad default: adtec
Read-write community	The Simple Network Management Protocol (SNMP) Read-Write Password. Default Value: "none"	user-defined using the numeric keypad default: none
Trap Community	The Simple Network Management Protocol (SNMP) trap community. Default Value: "public"	user-defined using the numeric keypad

Trap Sink	The Simple Network Management Protocol (SNMP) trap sink, destination for sending SNMP traps. Default Value: "127.0.0.1" / localhost.	user-defined using the numeric keypad

Com2

Item	Function	Options
Com2 Settings	RS-232 terminal monitor for communicating with the internal host motherboard for diagnostics.	115200 8 1 NONE 57600 8 1 NONE 38400 8 1 NONE 19200 8 1 NONE 9600 8 1 NONE Default is 38400 8 1 None

Host Name

Item	Function	Options
Host Name	The hostname of the unit. This name is be used by unit to broadcast zero-conf name and is viewable in web-browser title bar	Read-Only

Firmware

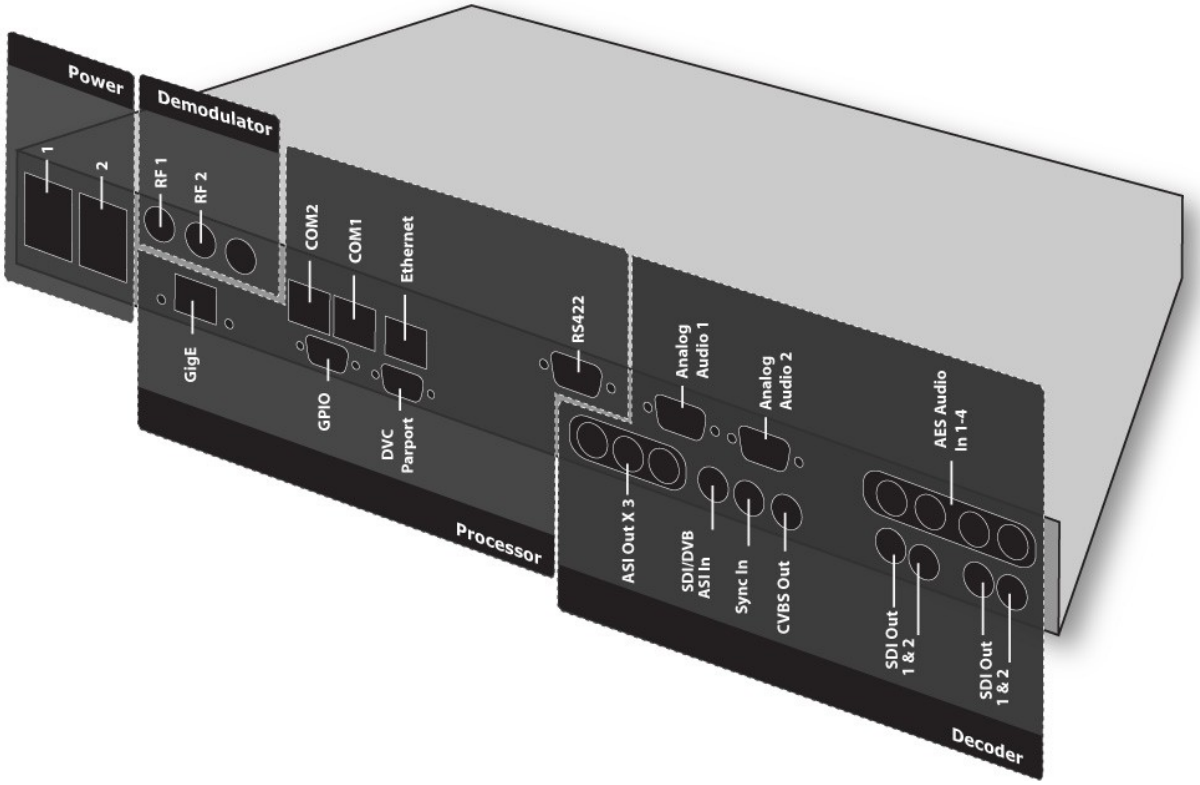
Item	Function	Options
Firmware Version	Reports the currently running firmware version of your device.	Read-Only

Feature Menu

Item	Function	Options
Permanent ID	Shows the units unique permanent identifier. This ID is required by support when purchasing unit capability keys.	Read-Only
Temporary ID	Shows the units unique	Read-Only

	temporary identifier. This ID is required by support to provide temporary unit capability keys. If all 0's, your unit is not temporary key capable.	

Back Panel



Connector	Description
Power 1 & 2	Redundant AC Power, Standard 3 pin computer power plug (Auto range 70-240 VAC Input)
GigE	UDP or RTP multicast transport ingress port (SMPTE 2022)
COM2	API Serial Communication Interface **
COM1	Serial Port Used for Troubleshooting (Terminal)
Ethernet	10/100 base T ethernet interface (Monitoring/Management)
DVC Parport	9-pin parallel I/O interface for control systems **
RS422	Not Currently Supported **
GPIO	Tally and Control Port
Decoder	
Analog Audio Out	Balanced analog audio out. Stereo pairs 1 & 2 (600 Ohm Balanced)

AES Audio Out 1-4	x4 75 Ohm AES-3 BNC
ASI/SDI In	75 Ohm terminated BNC input. SDI input features are not active at this time.
x3 ASI OUT	x3 75 Ohm BNC ASI output per EN5000839
Sync In	Standard analog video sync separation for NTSC, PAL, 480I/P, 576I/P, 720P, and 1080I/P/PsF from Composite Video (CVBS). Bi-level & tri-level sync compatible. BNC
CVBS Out	75 Ohm BNC Standard Definition Composite Video Output
HDMI Out*	SD video over HDMI is not supported.**VERSION 06 AND NEWER HARDWARE DOES NOT SUPPORT HDMI OUTPUT**
SDI Out Banks	x2 Pair of 75 Ohm Outputs from decoder: Video/Audio/VBI (SMPTE 259M-C - SD & SMPTE 292M - HD) BNC
Demodulator (Optional)	
RF 1 & 2	x2 RF Input, 75 Ohm F-Connector

DB9-M Analog audio output pinout

PIN	Designation	Function
1	NC	No Connect
2	GND	Ground
3	L+	Left +
4	R+	Right +
5	GND	Ground
6	NC	No Connect
7	GND	Ground
8	L-	Left -
9	R-	Right -

GPIO and Parport information

The GPIO port allows decoder control and TTL voltage output for monitoring systems. The GPIO feature is not enabled at this time.

The DVC Parport allows custom events to be programmed upon input pin voltage change. It contains 4 available inputs for custom commands. Please contact technical support for advanced usage in programming the parallel port.

GPIO Pinout

PIN	Designation	Function
1	NC	No Connect
2	D3	reserved for future functionality
3	D2	reserved for future functionality
4	D1	reserved for future functionality
5	D0	reserved for future functionality
6	NC	No Connect
7	5VDC	+5V DC
8	GND	ground
9	TTL Tally	reserved for future functionality

Parport Pinout

PIN	Designation	Function
1	NC	No Connect
2	D3	Data bit 3 (input)
3	D2	Data bit 2 (input)
4	D1	Data bit 1 (input)
5	D0	Data bit 0 (input)
6	NC	No Connect
7	5VDC	+5V DC
8	GND	ground
9	NC	No Connect

Chapter 2 - Getting Connected

Introduction to the Control Application

A web-based control software application comes pre-installed on the RD-60.

Compatible browsers

Firefox (recommended)
MS Internet Explorer
Safari
Chrome

Ethernet Access

To begin, you will need to connect to your RD-60 via Ethernet directly, or by adding the RD-60 to your local area network. The default address for all Adtec devices is 192.168.10.48.

To connect directly to the device, make sure that your computer and the device have IP addresses within the same IP class range.
(ex. 192.168.10.48 for the device and 192.168.10.49 for your computer).

If you need to change the IP address of the device, this can be done via the front panel, System > Network menu. Using a CAT 5 crossover cable, connect one end to your computer and the other to the Ethernet port found on the processor section of the back panel. (Some computers can auto negotiate the connection and a crossover may not be necessary.)

To add the device to a LAN, connect a standard CAT 5 Ethernet cable to your network router and then to the Ethernet port on the back of the device. If your network is DHCP enabled and you prefer that over a static IP, you can turn on DHCP for the device via the front panel, System > Network menu.

Zero Configuration Access

Adtec Digital has adopted zero-configuration networking technology, streamlining the setup and configuration processes for our products. The use of this technology enables automatic discovery of Adtec devices and services on an IP network. Used in tandem with the web-based control and configuration applications we can now provide 1-click access to any device.

By using the built-in Bonjour locater in Apple's Safari browser or the plug-ins readily available for IE or Firefox browsers, users can locate all of the Adtec devices on a network by referencing the serial number on the back of the device. Clicking on the unit in the Bonjour list will re-route you to a login page. If you do not wish to use Bonjour, you can

reach the device's web application by pointing your browser to the IP Address of the device. Ex. http://192.168.10.48/.

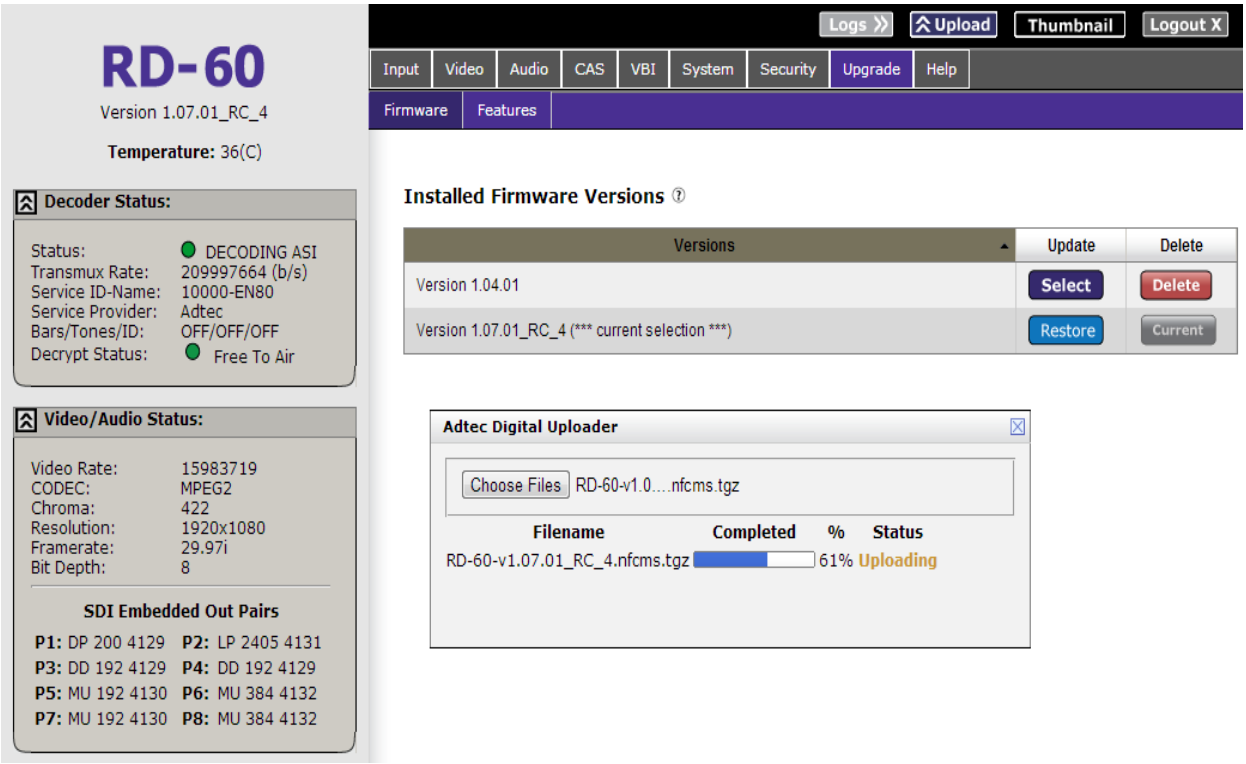
Login

Once you reach the default login page for the web-based application, you will need to login by pressing the login button. You will be prompted for a username and password. The default username is 'adtec'. The default password is 'none'.

The left-hand panel of the application will report current status in real-time while the right panel tabs will allow you to configure your device. As you navigate through the web application look for the ? icons associated with each parameter. By clicking on these question marks, you can view additional information about how the parameter is used.

Upgrading Via Web User Interface

Periodically, we will provide firmware updates to our products via our website. (http://www.adtecdigital.com) To upgrade your device, download the firmware file from our website and store it locally. Login to the web-based application and navigate to the Upgrade > Firmware tab. Click on the upload button located at the top right of the application. Select the firmware file from your local machine and wait for it to upload. Once it has finished uploading, it will appear in the Available Versions list.



Click on the Install button associated with the new file. Wait for it to completely extract and become available in the Installed Versions List. Once available there, simply click on the Select button associate with the new firmware and wait for your device to reboot.

Upgrading Via FTP & Telnet

For those times when using the web user interface is not convenient, you can upload the firmware file via ftp and then extract and select into it via Telnet.

File Transfer Protocol (FTP)

FTP connections can be made to the Adtec device using any ftp client.
Host: <ipa of the unit>
Default Username: adtec
Default Password: none
Port: 21
You will want to drop the firmware file in the media/hd0/media folder.

Telnet (standard 23 port)

To connect to your unit using a terminal session you will need to set the IP address of the unit. See earlier instructions on setting the IP via the front panel.

Using a terminal window, complete the following:

Step	Action
1	Type 'telnet x.x.x.x' in a terminal window, without quotes, where x.x.x.x is the IP address of the unit.
2	Press <Enter>.
3	When prompted for a username, enter adtec.
4	When prompted for a password, enter none.

Once you see "User 'adtec' connected", the session is open and you may issue API commands to the unit.

To extract and select into the new firmware version you have uploaded, issue the following commands.

*.sysd version search
Copy the line designating the location of the new file.

Then type:
*.sysd version extract "copied path to new file"

Wait for the extraction to complete. Once complete, type the following command:
*.sysd version

Copy the line referencing the firmware version you wish to use and then issue the following command.
*.sysd version select "copied new firmware version"

Once you press enter, this will reboot your device into the new version.

In Field Feature Upgrades

Unit features can be upgraded in the field via the web user interface. Keys can either be temporary (feature will stop working after a set amount of time) or permanent (key is good for the life of the product). To purchase a permanent key, please provide your unit serial number and product ID from the Upgrade -> Features tab to your sales representative. If a temporary key is required, the Temporary ID will also be required.

Permanent Key Instructions

A permanent unlock key can be provided via email or verbally if internet access is not available. To enter the unlock key:

Step	Action
1	Click on the 'Input Key' button next to the desired feature.
2	Enter the supplied key into the pop-up dialog box and click OK.
3	The feature status should change from 'DISABLED' to 'ENABLED'.
4	In some cases, a reboot of the unit may be required after a state change to 'ENABLED'. Reboot unit if enabled feature does not function.

Temporary Key Instructions

If a temporary key is provided, it will be in the form of an email attachment. Temporary keys are *not* entered through the 'Input Key' button. Instead, they are transferred to the unit through the use of the file transfer utility via the 'Upload' button. The 'Upload' button is found in the top right hand corner of the Web UI.

Step	Action
1	Download the temporary key file to your computer provided by your representative.
2	Click on the 'Upload' button in the top right hand corner of the Web UI.
3	Browse for the supplied 'ASC' file from the file browser pop-up and click 'Open'
4	The page should reload and feature status should change from 'DISABLED' to 'ENABLED' with a 'Days Left' count. This count determines how many days the key will function before returning to a 'DISABLED' state.
5	In some cases, a reboot of the unit may be required. Reboot unit if enabled feature does not function.

Feature Key Descriptions

Base Unit Keys
PdRD60 - This is the product key to determine
MP2-BASE-D - Adds Mpeg2 4:2:0 and 4:2:2 decode capability
MP4-CHR-420D - Adds Mpeg4/AVC/H.264 4:2:0 decode capability
MP4-CHR-422D - Adds Mpeg4/AVC/H.264 4:2:2 decode capability
10BIT-D - Adds Mpeg4/AVC/H.264 10Bit decode capability (if hardware capable)
AUD-EXP - Adds support for 4 additional pairs of audio decoding
DOLBY-DEC - Adds support for Dolby Digital decoding (stereo downmix)
AAC-AUD-DEC - Not functional at this time

note: Older units may not have hardware capability for all of the above keys. If the hardware is not capable of supporting the feature, it will not be listed as an available feature item on the Upgrade -> Features tab of the WebUI. This new RD-60 key hiding mechanism is present in 1.11.00 and later.

Chapter 3 - Operational How-Tos

DVB-S / DVB-S2 AUTO Modes (ADV and PRM)

The RD-60 Advanced and Premium demodulators support automatic modulation and coding mode detection. The minimum amount of configuration required in auto modes is downlink frequency, symbol rate, and rolloff. In DVB-S mode, selecting QPSK_AUTO or 8PSK_AUTO from modulation mode will automatically detect the coding scheme for DVB-S modulated carriers. For DVB-S2 modes, selecting AUTO-CCM from the CCM configuration will automatically detect the modulation and coding scheme for DVB-S2 modulated carriers.

DVB-S2 - Recommended use of Pilots

The use of DVB-S2 pilots are recommended under certain conditions. With the following configurations, Pilots are recommended:

- High order modulation schemes: 16APSK and 32APSK
- Low code rates QPSK: 1/4, 1/3, 2/5, 1/2, and 3/5
- Low code rates 8PSK: 3/5, 2/3, 3/4, and 5/6
- Low symbol rates: <5 Mbaud for free running DRO LNB
- Low symbol rates: <3 Mbaud for Phase Locked DRO LNB

UDP / RTP / FEC / TCP IP Rx

The RD-60 supports a number of IP based protocols for the reception of transport streams via private and public networks. The RD-60 will automatically determine if an IP stream is UDP, RTP, or a SMPTE-2022 FEC stream. TCP reception is a less common implementation for transmission of broadcast transport streams, but has recently been added to the RD-60.

UDP (User Datagram Protocol) multicast/unicast streams are commonly used for broadcast transport streams in local or private networks that contain little to no packet loss. UDP offers no protection against dropped packets or packets received out of order (usually due to packets taking a different amount of time to traverse network devices). Due to the low reliability of UDP, it is NOT recommended to be used over the public internet or in environments where the potential of packet loss, increased jitter, or out of order packets is high. If packets are lost or received out of order, service anomalies will occur. The RD-60 supports up to 100Mbps when a 7 DVB Packet payload exists for each UDP packet.

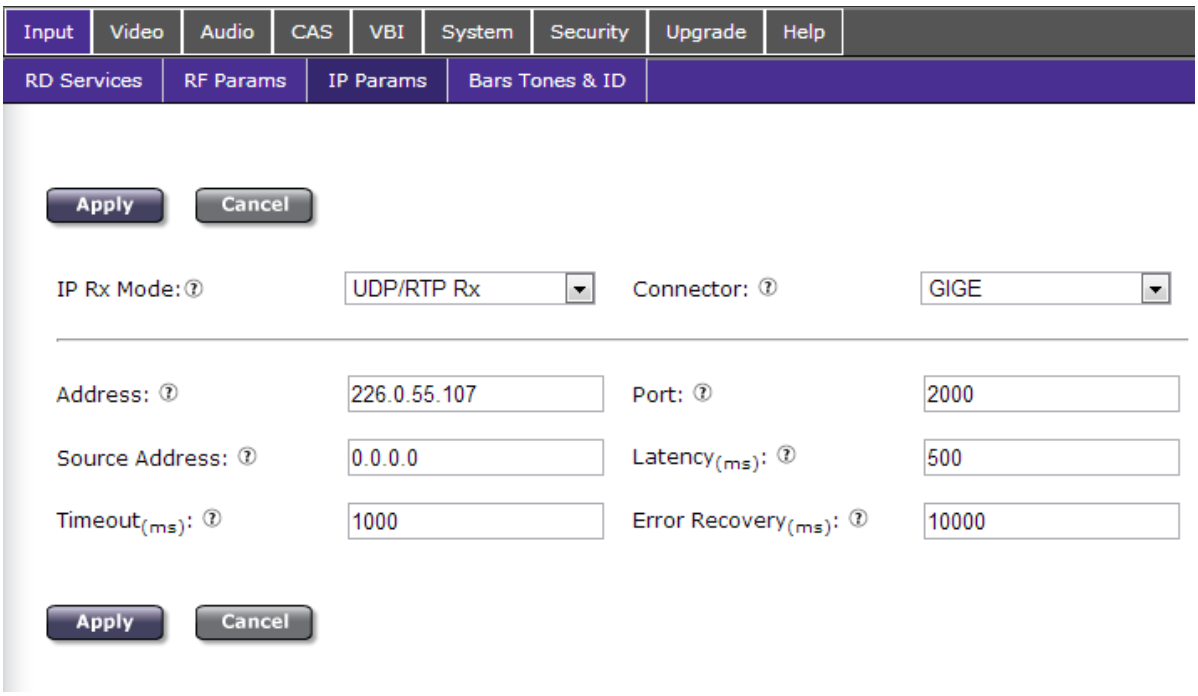
RTP (Real-time Transport Protocol) is another type of multicast/unicast stream that is better to use than UDP in some environments. RTP is built upon the building blocks of UDP, but adds packet sequence identification. Packet sequencing gives a receiver the information needed to detect and correct packets that were received 'out of order'. RTP is highly recommended when timely delivery of each consecutive packet may not be guaranteed. The RD-60 supports up to 100Mbps when a 7 DVB Packet payload exists for each RTP packet.

RTP + FEC or SMPTE-2022 is an additional method used in dealing with lost packets, where RTP alone can only tolerate packets received out of order. FEC (Forward Error Correction) streams add overhead to the overall data rate, but add protection in case of a lost packet. FEC (detection and correction of lost packets) adds latency and data overhead as opposed to UDP where no protection mechanisms exist. The amount of packet redundancy and overhead can be configured at the RTP/FEC transmitter. Each multicast/unicast FEC stream is transmitted on base port N and two FEC streams are sent on N+2 and N+4 respectively. When receiving FEC streams behind firewalls, please bear in mind that two additional ports (N+2 and N+4) must be allowed through for proper error recovery to occur. The RD-60 supports up to 45Mbps SMPTE-2022 when a 7 DVB Packet payload exists for each RTP packet.

TCP (Transmission Control Protocol) support, a connection based protocol, has recently been added at an attempt to overcome some of the fundamental limitations of UDP and RTP. UDP and RTP are 'one way street' types of protocols where the transmitter sends data and never knows if the data makes it to the destination. TCP streams generally have higher latency (takes longer to transmit data and verify data has been transmitted), but are more reliable because each packet is accounted for by the receiver. If a packet is lost, the transmitter will be informed to re-transmit the packet. The transmitter and receiver continue to communicate about the quality of the reception and attempt to adjust packet delivery accordingly. The TCP mechanism when combined with large IP receive buffers can

be more forgiving with packet loss, jitter, and out of order packets. The RD-60 supports up to 15 Mb/s when a 7 DVB Packet payload exists for each TCP packet. Multicast is *not* supported with TCP streams.

The RD-60 supports both unicast (point to point) and multicast (broadcast) streams. The RD-60 operates in UDP/RTP mode by default. To setup an IP Rx session, first configure the IP Rx operation mode. A unit reboot is required (WebUI asks for confirmation when changing) when changing between UDP/RTP Rx and TCP Rx modes.



Multicast Reception - Address

To receive a multicast (UDP/RTP/SMPTE2022) stream, place the multicast address wished to view in the 'Address' field. This address must match the same address used on the multicast transmitter. Multicast IP address ranges are 224.10.xxx.xxx to 239.xxx.xxx.xxx, where 0 <= xxx <= 255. If you are new to multicast and attempting a first time connection, 226.0.1.1 is a common address to start with. Please verify transmitter address configuration.

Optionally, the source specific multicast address (The actual IP address of the sending device) may be entered for IGMPv3 applications. Configuring the Source Address will allow multicasts to be received from the entered address and entered address only. This configuration is non-functional for Unicasts. For IGMPv2 applications the source address can be set to 0.0.0.0.

Unicast Reception - Address

To receive a unicast (TCP/UDP/RTP/SMPTE2022) stream, enter 0.0.0.0 in the 'Address' field. The unit will be 'listening' for any streams sent directly to it. Refer to your IP transmitter documentation for proper configuration of the transmitter.

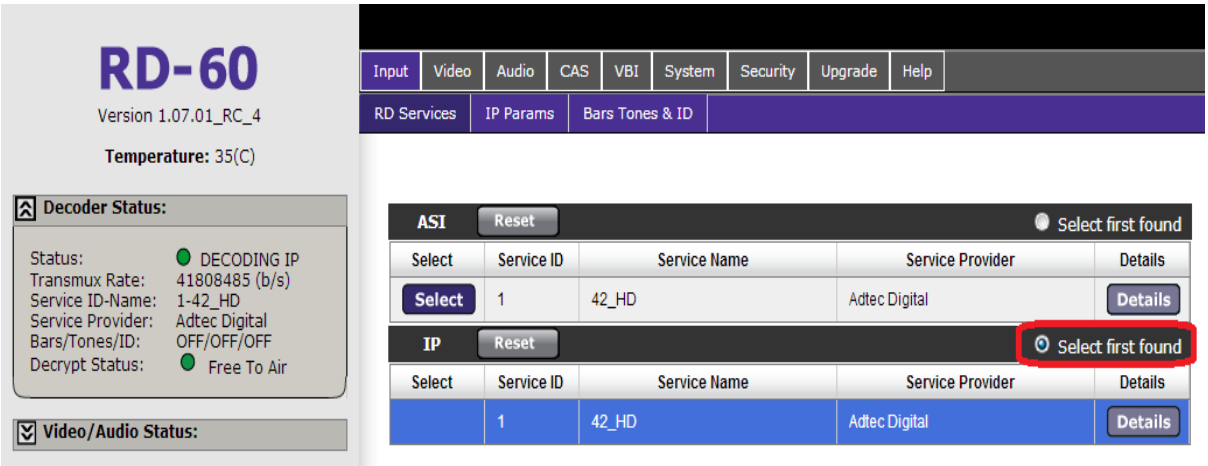
Unicast/Multicast Reception

Enter the port number in the 'port' field. The port number must match the port number used on the transmitter where the range is 0 to 65535. When 0, multicast is disabled. If you are new to multicast and attempting a first time connection, 2000 is a common port to start with. Please verify transmitter port configuration.

Choose the IP Rx 'Connector' dependent upon your network setup. Adtec recommends using the GigE port for all IP receptions.

Once IP Rx is configured, click Apply.

Visit the Input -> Service tab and click the 'Select first found' radio button to enable IP reception. IP service names will populate in the service list.



'Select first found' is also available via the Front Panel -> Services Menu -> Select First configuration. Use the left/right arrows to select [IP], press select, then press enter to start IP receiving.

Dolby E, Dolby D, LPCM, and Mpeg1Layer2

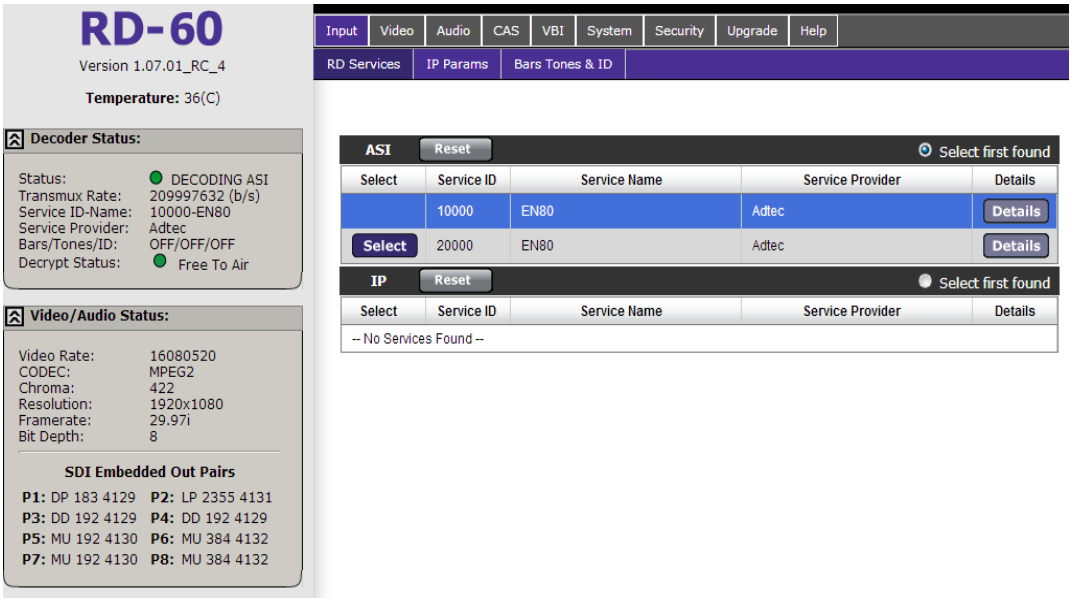
As of 1.07.01 firmware, the RD-60 supports 16 channels of SDI embedded audio output with support of up to two audio pass-throughs, up to 8 pairs (sixteen channels) of phase aligned Mpeg 1 Layer 2 audio, and up to 8 pairs of Dolby Digital decoding. An audio pass-through consists of a Dolby E 20 Bit, Dolby E 16 Bit, Dolby Digital, or a Linear PCM stream that is preserved (not decoded) from the transport stream and embedded on the SDI output.

Mpeg 1 Layer 2 decode support includes 48kHz 32 - 384kbps. Interoperability support includes stream type 0x03 and stream type 0x04, PES aligned and unaligned audio, and also includes Mono (with audio duplication feature), Dual Mono, and Stereo decoding.

Dolby Digital decode support includes a stereo output pair for each Dolby Digital Audio PID assignment (multi-channel Dolby Digital 5.1 for example is down-mixed to 2/0).

The RD-60 automatically configures the audio engines upon acquisition of a program when engines and sdi matrix are configured to 'AUTO'. The audio is automatically output based on ascending audio PID order from the selected program. The left hand status panel of the Web UI shows current active SDI audio output. The current left hand status panel audio type codes are as follows:

MU - Configured for Mpeg1Layer2 decoding (stream type 0x03 / 0x04)
DD - Configured for Dolby Digital decoding (stream type 0x81 / 0x06)
DP - Configured for Dolby Digital pass-through (stream type 0x81 / 0x06)
LP - Configured for LPCM pass-through
DE - Configured for Dolby E pass-through (16 / 20 Bit support)
AA - Configured for AAC decoding (AAC-LC, AAC-HEv1, AAC-HEv2)



Advanced configuration is available via the Audio tab to users that need to select custom PID's, disable audios, and duplicate audio pairs.

Dolby E line placement is handled automatically to meet Dolby Labs specification. Some users may need custom line placement. If the customer Dolby E line placement is out of specification, the RD will revert line placement to the automatic in range value. Please see table in notes for Dolby E line placement recommendations.

Notes:

- Encoder must support phase alignment for phase aligned audio feature.
- Pass-through audio bit-rates are now displayed on the left hand status panel. Please note that these are live calculated bit-rates and will not show a static number.

Dolby Labs - Dolby E recommended line position table

	625 25	1080i 50	1080p 50	720p 50	525 29.97	1080i 59.94	1080p 59.94	720p 59.94
Earliest	8	13	26	17	12	18	35	23
Ideal -80us	11	19	37	25	13	21	42	28
Ideal +- 80us	12	21	42	28	14	24	47	32
Ideal +80us	13	23	103	31	16	26	52	35
Latest	30	53	105	70	26	48	95	63
Adtec Auto	19	30	42	35	19	30	47	40

AFD - Active Format Description

Active Format Description (AFD) contains aspect ratio and handling information utilized to aid in picture presentation of downstream devices. This is used most often by down-converters and set top boxes.

AFD carriage can be carried within a transport stream as a unique ANC PID (ancillary pid), within the video elementary stream as SEI data (H264), or user data (MPEG2). The RD-60 does not support AFD via an ANC PID at this time.

The RD-60 AFD implementation preserves the native AFD code from the video elementary stream and is inserted into the SDI ancillary data output. SDI line number for AFD carriage is configurable via the VBI tab. The DID/SDID, AFD code, and aspect ratio flag can be seen in the VBI Output table via the VBI tab.

VBI Stats

SDI

Type	Line	DID/SDID	Present	More
captions	9	0x6101	TRUE	**Count**:12556274
afd	0	0x4105	TRUE	**Code**:0x08 **AR Flag**:1
vitc		0x0000	FALSE	**PID**:0x0031

Alt SDI

Type	Line	DID/SDID	Present
captions	9	0x6101	TRUE
afd	0	0x4105	TRUE
vitc		0x0000	FALSE

CVBS

Type	Line	DID/SDID	Present
captions	9	0x6101	TRUE
afd	0	0x4105	TRUE
vitc		0x0000	FALSE

Genlock System

The RD-60 can synchronize its SDI and CVBS outputs to an external sync signal using the SYNC IN input and the Genlock control system. The SYNC IN input signal's frame synchronization is used to generate SDI and CVBS output pixel clocks, frame synchronization and audio clocks that are locked to the SYNC IN reference. The video decoder will automatically skip or repeat video frames as needed to adjust to differences between the SYNC IN clock and the decoder source clock (which is synchronized to the stream's PCR data). The audio system uses a sample rate converter to adjust to differences between the decoder source clock and the SYNC IN clock for the lower four pairs of audio output.

The Genlock system will automatically cross lock for all resolutions within the 60 HZ standard, all resolutions within the 59.94 Hz standards or all resolutions within the 50 Hz standards. It does not cross lock between 50 HZ, 60 and 59.94 Hz standards at this time. This allows the SYNC IN signal to be valid for compatible decoded streams (EG: An NTSC black burst SYNC IN signal can be used to Genlock a 1080I59 feed).

The Genlock system can be configured in two modes. Genlock SLAVE mode is used when the SYNC IN signal is synchronous with the decoded stream (both signals are using the same 27 MHz source clock). This mode allows two RD-60's to be used for receiving 3D signals, or when the decoded source is using the same clock base as the SYNC IN. This mode bypasses the need for the audio sample rate converters. Genlock REMOTE mode is used when the SYNC IN signal does not use the same 27 MHz clock source as the decoded stream. This mode enables the audio sample rate converters for the lower four pairs of audio output. The upper four pairs can still be used, but there may be an audible artifact as the clock phase differences are resolved.

The SYNC IN input will accept standard analog video sync for NTSC, PAL, 480I/P, 576I/P, 720P, and 1080I/P from Composite Video (CVBS). The input can accept Bi-level and Tri-level sync signals. The signal is processed to create synchronous audio and video clocks and to frame align the SDI and CVBS outputs with the input sync signal. Generally, the output will be automatically aligned within a few pixel clocks of the input.

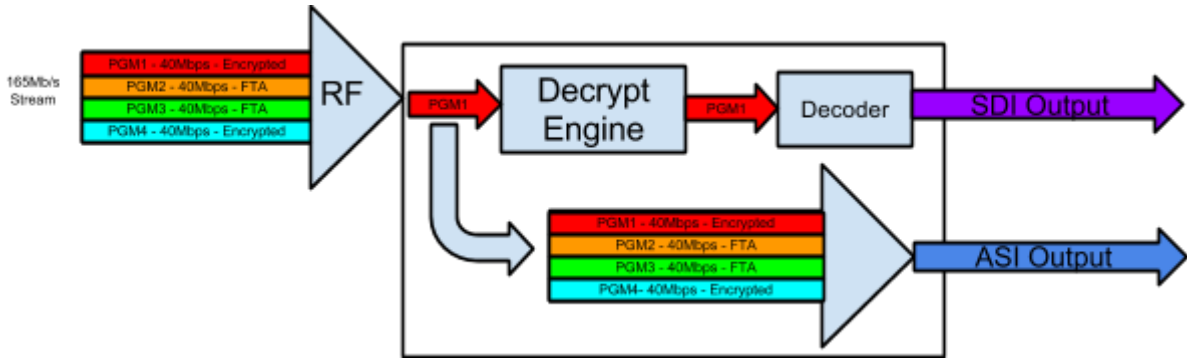
If the Genlock system is locked, and the SYNC IN is removed, the system will attempt to maintain the clocks and frame reference with the last known locked frequency. There may be some clock drift over time. If the decoder is stopped and restarted in this mode, the Genlock system will use the decode source clock and operate in a 'free-run' mode until the reference is re-applied. The video and audio will be lost for a short time when the SYNC IN reference is restored.

When the Genlock mode is changed, the Genlock system will automatically be reset. This will cause a brief disturbance of the video and audio outputs.

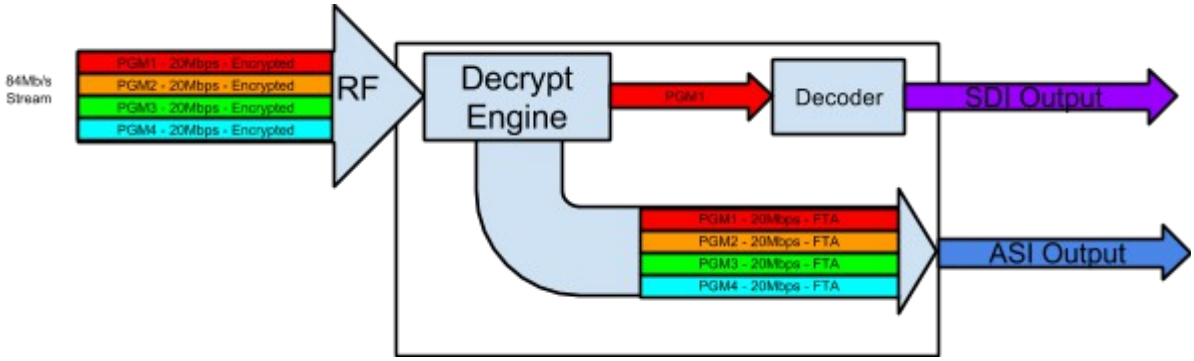
TS Out Decrypt

TS Out Decrypt is a new feature of the RD product line that determines how BISS encrypted transport streams are processed. This configuration provides end users flexibility in how the RD is used. The TS Out Decrypt configuration determines if the ASI output should mirror the selected input (OFF), thus preserving any encrypted streams or if it should be decrypted / free to air (ON).

TS Out Decrypt should be set to OFF, the default configuration, if the IRD is to be used in a confidence decode / turn around application. A confidence decode / turn around application can involve the IRD being used a turn around device (IP to ASI or RF to ASI) where the user wants to preserve encryption on the ASI output, but also wants to decode one of the programs coming. This configuration also allows the RD to ingest encrypted MPTS streams that may be over the 120Mb/s limit. A sample diagram of how the transport stream is passed to the ASI output through the system is shown below.



If the user wants to use the IRD as a decoder and decrypter, the TS Out Decrypt configuration should be set to ON. All programs will be decrypted with the user supplied BISS key and transported to the ASI output. This application is useful for users that want to redistribute the stream to other non-BISS devices, such as transport stream analyzers or third party decoders. Please note that when in this mode, total transport stream throughput must not exceed 120Mb/s at this time.



Chapter 4 - Appendix

Appendix A - GNU General Public License

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Appendix B - Technical Specifications

Base Model (RD60-08)

Inputs

DVB-ASI
Use: Input available for Decode or Pass to ASI outputs.
Standard: Asynchronous Serial Interface per EN500083-9
Input Rates: DVB-ASI 210Mb/s for free-to-air 188/204/208 Byte Transport streams (SPTS and MPTS). If TSO (TS Out Decrypt) option is OFF and transport stream contains BISS encrypted programs, up to 210Mb/s at this time. If TSO option is ON and transport stream contain BISS encrypted programs (SPTS and MPTS), up to 120Mb/s. See TSO article in Appendix A for more information.
Connector: BNC (75 Ohm)

IP
Use: Input available for decode, but may also be used for control
Standard: MPEG 2 RTP v2 transport (RFC 3550)
Input Rates: 1 - 100Mbps (188 byte DVB packet size, 7 per IP packet)*
Standard: MPEG 2 UDP transport
Input Rates: 1 - 100Mbps (188 byte DVB packet size, 7 per IP packet)*
Standard: RTP SMPTE 2022-1 2007 FEC
Input Rates: 1 - 45Mbps (188 byte DVB packet size, 7 per IP packet)*
Connection speed: GigE (100/1000BaseT)
*Supported bandwidth decreases with streams that have not been created with 7 DVB packets per IP packet. 1 DVB Packet per IP Packet does not utilize the same data efficiency / throughput as 7. The amount of DVB packets per IP payload is a multicast transmitter configuration and is automatically detected by the receiver. To utilize full IP receive throughput, use of the GigE port with packetization of 7 DVB packets per IP packet is recommended.
**The user has the ability to receive IP streams via the GigE or 10/100 management port. When receiving streams via the 10/100 management port, throughput is limited.
Connector: 8 pin RJ45

RF (optional)
Use: Input available for decode.
Standard: DVBS & DVB-S2 QPSK/8PSK with 16APSK and 32APSK options available.
188/204/208 byte packet size
Connector: Two Female F connectors (75 Ohm)

Outputs

HD-SDI / SD-SDI
Two banks (two mirrored SDI outputs per bank) of SDI Outputs from Decoder
Standard: Video & Audio SMPTE 259M - SD & SMPTE 292M - HD
Up to 16 Channels of Embedded audio
SDI Ancillary support for Closed Captioning, AFD and Teletext

SDI Ancillary data and OSD overlay have unique configuration for each SDI bank
Connector: Four BNC (75 Ohm) - Two per bank

CVBS
SD NTSC or PAL D1 Composite Video Output (downscaled from HD source)
Supports Closed Captioning and Teletext
Connector: BNC (75 Ohm)

DVB-ASI
Standard: Asynchronous Serial Interface per EN500083-9
ASI Mirrored from DVB-ASI Input, IP Input, or RF Input with purchase of optional tuner package. All streams are output as 188 byte packets.
Connector: Three BNC (75 Ohm)

AES Audio
Standard: AES3
4 pairs of decoded audio (pass-through audio is not supported on AES at this time)
Connector: Four BNC (75 Ohm)

Analog Audio
Two balanced pairs via DB9 connector. (1 pair per DB9)
Connector: Two DB9 (600 Ohm)

Communications

COM2 Serial Port
Use: API Serial Communication Interface
Default Baud Configuration: 38,400 bps 8 data bits 1 stop bit no parity
Connector: 8 pin RJ45

COM1 Serial Port
Use: Serial Port Used for Troubleshooting (Terminal)
Connector: 8 pin RJ45 (supplied with DB9 to RJ45 adapter)
Baud Configuration: 115,200 bps 8 data bits 1 stop bit no parity

Ethernet Port
Use: ethernet port used for network control, but can be used for IP receive
Format: Ethernet 10/100BaseT
Communication Methods: WebUI, SNMP, Telnet, XCP
Connector: 8 pin RJ45

DB9 Parallel Port
Use: DB9 parallel port used for custom triggering / integration
Connector: DB9 Male

GPIO Port
Use: not used as this time
Connector: DB9 Male

Video and Audio

Video Decode
MPEG-2 SD (ISO/IEC 13818-2) Decode:
Format: 480i59.94, 576i50
Profiles: MP@ML, SP@ML, 422P@ML

MPEG-2 HD (ISO/IEC 13818-2) Decode:
Format: 720p50, 720p59.94, 1080i50, 1080i59.94
Profiles: 422P@HL, MP@H14L, MP@HL, SP@H14L, SP@HL

MPEG-4 SD (ISO/IEC 14496-10) Decode:
Format: 480i59.94, 576i50
Profiles: Baseline, Main (support 8 bits only)

MPEG-4 HD (ISO/IEC 14496-10) Decode:
Format: 720p50, 720p59.94, 1080i50, 1080i59.94
Profiles: High, High422 (support 8 bits only)
Max Level: 4.1

Audio Decode
MPEG 1 Layer 2 audio (8 pairs)

Audio Pass-through
Supports up to two Dolby-E 16/20 bit, Dolby Digital AC3 16 bit, and/or Linear PCM 16/20/24 bit pass-through sessions. 24 bit input samples are truncated to 20 bits. Each SDI output contains all active pass-through sessions.

Physical and Operational

Physical / Environmental
1 RU - 18D X 19W X 1.65H
Weight – 9-14lbs. Dependent on RF Option

Power
Input Voltage: Redundant auto switching dual 100 - 240 VAC 50/60Hz (Standard)
Power Consumption Start-up: 53 Watts
Operational: 49 Watts
(base consumption, actual consumption depends on installed options)

Operational
- Ambient operating temperature: -20 C to 40 C.
- Ambient storage temperature: -30 C to 80 C.
- Non-condensing relative humidity range: 30% to 85%

Certification / Compliance
RoHS Compliant

10-Bit Decode Base Model (RD60-20)

Inputs

DVB-ASI
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*Supported bandwidth decreases with streams that have not been created with 7 DVB packets per IP packet. 1 DVB Packet per IP Packet does not utilize the same data efficiency / throughput as 7. The amount of DVB packets per IP payload is a multicast transmitter configuration and is automatically detected by the receiver. To utilize full IP receive throughput, use of the GigE port with packetization of 7 DVB packets per IP packet is recommended.
**The user has the ability to receive IP streams via the GigE or 10/100 management port. When receiving streams via the 10/100 management port, throughput is limited.
Connector: 8 pin RJ45

RF (optional - see STD, ADV, PRM options)
Input available for decode.
Standard: DVBS & DVB-S2 QPSK/8PSK with 16APSK and 32APSK options available.
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Use: DB9 parallel port used for custom triggering / integration
Connector: DB9 Male

GPIO Port
Use: not used as this time
Connector: DB9 Male

Video and Audio

Video Decode
MPEG-2 SD (ISO/IEC 13818-2) Decode:

Format: 480i59.94, 576i50
Profiles: MP@ML, SP@ML, 422P@ML

MPEG-2 HD (ISO/IEC 13818-2) Decode:
Format: 720p50, 720p59.94, 1080i50, 1080i59.94
Profiles: 422P@HL, MP@H14L, MP@HL, SP@H14L, SP@HL

MPEG-4 SD (ISO/IEC 14496-10) Decode:
Format: 480i59.94, 576i50
Profiles: Baseline, Main (support 8 bits only)

MPEG-4 HD (ISO/IEC 14496-10) Decode:
Format: 720p50, 720p59.94, 1080i50, 1080i59.94
Profiles: High, High422 (support 8 bit and 10 bit)
Max Level: 4.1-4.2 (CABAC:50Mbps, CAVLC:150Mbps)
Supported tools support Baseline except ASO, FMO

Audio Decode
MPEG 1 Layer 2 audio (8 pairs)

Audio Pass-through
Supports up to two Dolby-E 16/20 bit, Dolby Digital AC3 16 bit, and/or Linear PCM 16/20/24 bit pass-through sessions. 24 bit input samples are truncated to 20 bits. Each SDI output contains all active pass-through sessions.

Physical and Operational

Physical / Environmental
1 RU - 18D X 19W X 1.65H
Weight – 9-14lbs. Dependent on RF Option

Power
Input Voltage: 100VAC - 240VAC 50/60Hz

Operational
- Ambient operating temperature: -20C to 40C.
- Ambient storage temperature: -30C to 80C.
- Non-condensing relative humidity range: 30% to 85%

Certification / Compliance
RoHS Compliant

Premium Demodulator (PRM option)

note: Software keys are required to unlock full hardware support.
Modulation Scheme support: QPSK / 8PSK / 16APSK / 32APSK
Supported Code Rates:

DVB-S QPSK: 1/2, 2/3, 3/4, 5/6, 6/7, 7/8
DVB-S 8PSK: 2/3, 5/6, 8/9
DVB-S2 QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S2 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
DVB-S2 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S2 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S symbol rate range: 1 - 45 Mbaud
DVB-S2 symbol rate range: 0.256 - 45Mbaud (QPSK / 8PSK / 16APSK)
DVB-S2 symbol rate range 1 - 33Mbaud (32APSK, normal frames only)
frequency range: 950 - 2150MHz
min. input level: -70dBm
max. input level: -25dBm
Carrier acquisition Range: up to 7.5MHz
(if symbolrate < 5 Mbaud: 1.5 x baudrate . if symbol rate > 5 Mbaud: 7.5MHz)
LNB Power and Control:
11.5 - 14V (vertical polarisation)
16 - 19V (horizontal polarisation)
22kHz ± 4kHz (band selection according to universal LNB for ASTRA satellites)
Clean Channel Technology Capable (extended 5%, 10%, 15% roll-off capability)

Advanced Demodulator (ADV option)

note: Software keys are required to unlock full hardware support. Early units running fw v1.03 supported DVB-S2 3 - 45Mbaud. Please contact Adtec for field upgradable firmware if unit does not support less than 3Mbaud.
Modulation Scheme support: QPSK / 8PSK / 16APSK
DVB-S2 symbol rate range: 1 - 45Msym/s
DVB-S symbol rate range: 1 - 45Msym/s
frequency range: 950 - 2150MHz
min. input level: -70dBm
max. input level: -25dBm
Carrier acquisition Range: up to 7.5MHz
(if symbolrate < 5Msym/s: 1.5 x baudrate . if symbol rate > 5Msym/s: 7.5MHz)
LNB Power and Control:
11.5 - 14V (vertical polarisation)
16 - 19V (horizontal polarisation)
22kHz ± 4kHz (band selection according to universal LNB for ASTRA satellites)

L-Band Demodulator (LB option)

note: Software keys are required to unlock full hardware support.
RF Inputs: Dual RF inputs capable of simultaneous lock
Modulation Scheme support: QPSK / 8PSK / 16APSK / 32APSK
Supported Code Rates:
DVB-S QPSK: 1/2, 3/5, 2/3, 3/4, 5/6, 7/8
DVB-S2 QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S2 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
DVB-S2 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S2 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S symbol rate range: Up to 62Msym/s*
DVB-S2 symbol rate range: 1 - 65Msym/s (QPSK / 8PSK / 16APSK / 32APSK)*

frequency range: 950 - 2150MHz
min. input level: -65dBm**
max. input level: -25dBm**
LNB Power and Control:
13V (vertical polarisation)
18V (horizontal polarisation)
22kHz (band selection according to universal LNB for ASTRA satellites)

**input level dependent on function of MODCOD and baudrate
* Maximum supported baud rate is dependent on both tuners active state. One must be disabled to achieve maximum symbol rate capabilities. View table below for symbol rate capabilities.

Modulation	Single Tuner (Msym/s)	Dual Tuner (Msym/s)
QPSK	65	65
8PSK	65	45
16APSK	65	33
32APSK	54	27

Standard Demodulator (STD option, discontinued)

Modulation Scheme support: QPSK / 8PSK
Supported Code Rates:
DVB-S QPSK: 1/2, 2/3, 3/4, 5/6, 7/8
DVB-S2 QPSK: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S2 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
DVB-S symbol rate range: 1 - 45Mbaud
DVB-S2 symbol rate range: 1 - 30Mbaud
frequency range: 950 - 2150MHz
min. input level: -70dBm
max. input level: -23dBm
Carrier acquisition range: +/- 10MHz
LNB Power and Control:
13V (vertical polarisation)
18V (horizontal polarisation)
22kHz (band selection according to universal LNB for ASTRA satellites)