Novra A75 ATSC Receiver
User Manual

Subject to change without notification

CAUTION: Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

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ATSC Receiver
User Manual

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Document version: 1.02

Important- Please read this entire manual before installing or operating this product.

Disclaimer

While reasonable effort has been made in the preparation of this document to ensure its accuracy, Novra Technologies Inc. assumes no responsibility for errors or omissions that may appear in this manual. Novra reserves the right to change the contents of this manual at any time without notice.

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1 Conventions

1.1 Text Conventions

NOTE: Information in this box will be Informative.

CAUTION: This information will be quite important and should not be ignored.

- Text appearing in `Courier` font indicates characters to be typed in; e.g. type `Shell` indicates that the word “Shell” must be entered exactly as it appears, with the first letter capitalized.
- Text appearing in Bookman Old Style font indicates a directory path or filename; e.g. c:\Program Files.
- Text appearing in SMALL CAPS and CopperPlate32BC font in an instruction indicates a button that must be clicked, or a key that must be pressed, or a field that must be entered or a particular screen; e.g. BUTTON indicates a button that must be clicked.

1.2 Applicable Models

This manual is applicable to the following A75 Models:

- Novra A75

2 Introduction

2.1 Principles of Operation

Somewhere in the world is a location that transmits your signal, along with many others, up to a terrestrial broadcast transmission tower that sends those signals to your location, and many others. Your ATSC antenna receives these signals and sends the to the A75 ATSC receiver. The A75 sifts through all the signals sent by the broadcast tower looking for your signal (an ATSC stream) and forwards to your computer the portion containing the data you want. The Ethernet card on your computer can further filter that data and pass it to other programs on your PC.

The A75 Management Console is used to configure addresses, specify channel parameters, select ATSC information streams by Program IDentification number (PID) and map audio/video PIDs to multicast address(es). Once configured, the A75 will retain its settings and continue to forward data transmitted to you by your service provider even after restarting the A75 or your PC.

The A75 Receiver does not require a computer to continue operation. Once the options have been set you will have no need to change them.

3 Getting Started

3.1 What your configuration may look like

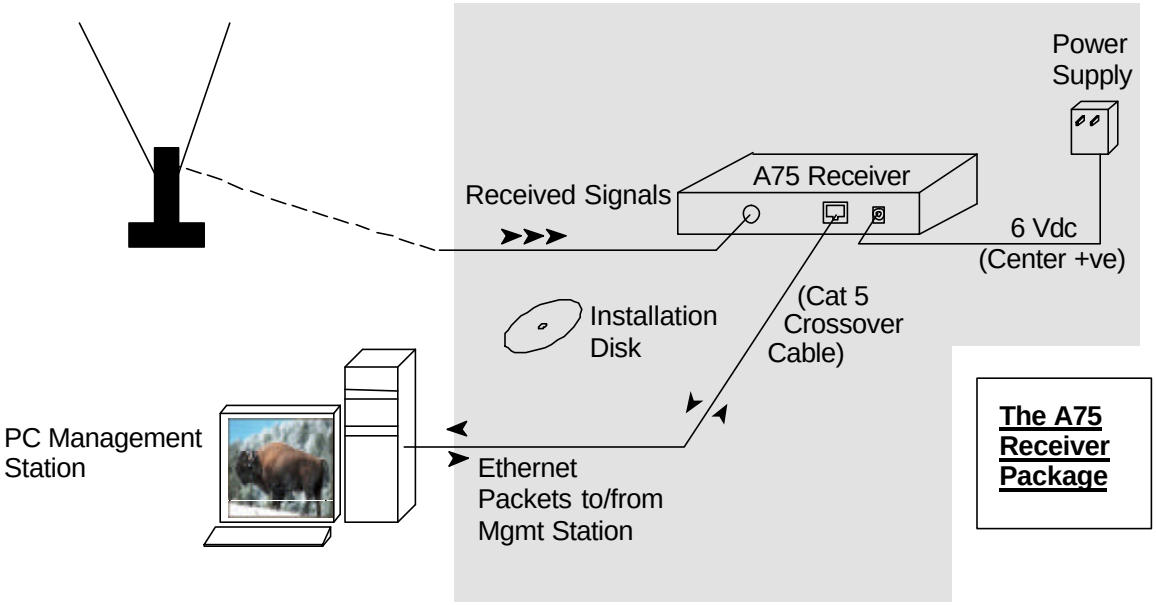


Figure 1: Typical Configuration

NOTE: - This information is needed in order for the receiver to function. It is recommended that all the information be collected before attempting to install the service.

3.2 What Information do I Need – Basic Configuration?

1. The IP Address to be assigned to your Novra A75 Receiver
    a. Example: 192.168.170.125
2. The IP Address Subnet Mask
3. The IP address of the Default Gateway for the receiver.
4. Is the receiver supposed to filter multicast traffic using IGMP?
5. The ATSC Channel number

NOTE: IGMP is an Internet standard that is used to control multicast traffic on the LAN based on the client's interest in the stream. For proper operation, all components of your network should support IGMP

3.3 SOFTWARE Installation on Windows 2000, or XP

The A75 Console software is supplied as a single executable. Therefore, it is easy to install on different systems. All you need to do is copy the executable to your working directory.

NOTE: - You MUST be logged onto the system as Administrator.
NOTE: - Your screen resolution **MUST** be at least 800 x 600 and at least "**16 bit color**" to function properly.

3.4 A75 Startup and Main Screen

1- Start the A75 Console software. Once running you will be presented with the A75 Console main screen as shown in Figure 2 below.

NOTE: - You MUST be logged onto the system as Administrator, for the network settings function to work properly.

2- Before starting to configure your A75, you must ensure the network settings of the device make it accessible from the Windows management PC. The IP address of the device and the IP address of the management station must reside on the same subnet, or there must be a route that connects both of them through a router. For the simple case where the A75 and the management PC are connected via an Ethernet crossover cable or through an Ethernet hub, there are two different ways this may be accomplished. The A75 Console will automatically detect all A75's that are presently connected to the management PC LAN. Clicking on the Device List Icon (item [3] in Figure 2 below), will present the list of connected A75's. This list will identify the A75(s) by MAC, IP address and A75 type. Click on the one you wish to configure, and the status box of the Console main screen will be updated with the A75 information.

You must now ensure that your A75 IP address and your Management PC IP address are on the same subnet. As mentioned, this can be done in one of the two ways:

1. In the console status box, the IP address of your A75 will be displayed. Note the A75 IP address and change the IP address of your management PC Network Interface Card (NIC) (the one that's connected to the A75) to be on the same subnet as the A75. The PC NIC IP address may be changed using My Network Places in Windows. If unsure, please refer to your Windows user manual to perform this operation, OR
2. Even though your A75 and your management PC are not on the same subnet, the A75 console has been designed to be able to change the network settings of the A75. Therefore, in the A75 Console, click Configure and then Network. This will bring up the A75 network

settings, which include the receiver IP address and subnet mask, and gateway IP address. Change these address parameters to match you management PC LAN subnet. For example, if your PC NIC is set to 192.168.5.1, you may wish to change your A75 IP address to 192.168.5.2.

NOTE: - If the A75 and the management PC are not on the same subnet, you will be able to change the network settings of the A75, but will not be able to configure the Content or Channel settings.

Figure 2 - A75 Console Main Screen

The A75 Console main screen enables the operator to select, configure and view status of the selected A75. Three main buttons are provided enabling the operator to:

- Configure - configure the main parameters of the A75
- Load/Save – load and save configuration files for the A75
- Status – display the status of the A75

Also provided in the Console main screen is the following functionality/information:

1.  – Clicking this icon will close the A75 Console application
2.  – Clicking this icon will minimizes the A75 Console application to the system tray
3.  – Clicking this icon will present a list of A75's that the A75 Console application is receiving status information from. Clicking any A75 in the list will select that unit for further configuration
4. Lock – Turns green when the receiver detects an input ATSC signal at the selected frequency. This matches Lock LED on the front of unit

5. Data – Turns green when the A75 is forwarding data. This means that the receiver is able to receive the selected PID and pass the data onto the LAN.
6. **Status Box** – This status box shows details of the A75 being configured, including the A75 type, the A75 MAC address, the A75 IP address, and the device status

4 Configuring the A75

This chapter discussed how to configure the A75.

> **NOTE:** When configuring the A75, mousing over different parts of the Console screens will provide pop-up of context-sensitive help information.

4.1 Configure

Selecting the Configure button brings up the following four sub-menu items that enable the operator to:

- Network – Configure the network interface
- Channel – Configure the ATSC channel number
- Content – Configure the PID content
- Reset - Reset the A75

Figure 3 – A75 Configure Sub Menu

4.1.1 Network Button

The Ethernet network settings of the A75 may be modified by selecting the Network Button and changing the appropriate fields (as shown in the figure below).

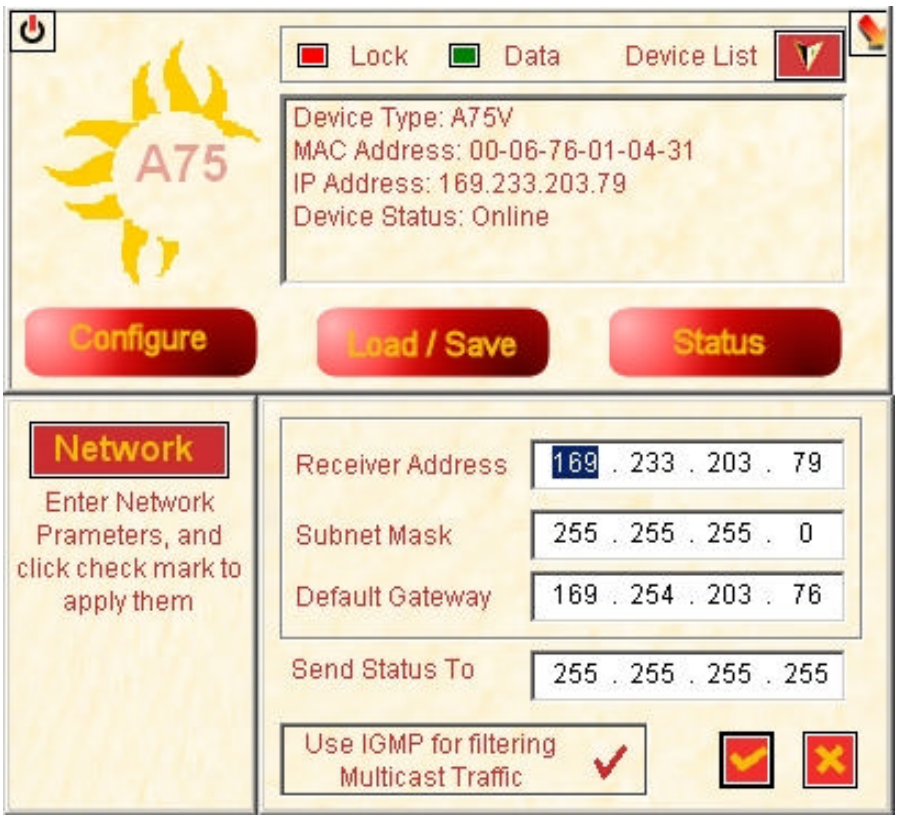


Figure 4: Network Configuration Dialog Box

1. Receiver Address - This is the IP address to be assigned to the receiver
2. Subnet Mask - This is the subnet mask that the receiver should use to determine whether an IP address belongs to the same network or not.
3. Default Gateway - This is the IP address of the router that the receiver should use whenever it wants to send traffic to a non-local address (IP address that does not belong to the local subnet).
4. Use IGMP for filtering Multicast Traffic - This check box allows the user to turn IGMP filtering on or off. IGMP controls which multicast streams will be forwarded on the LAN based on the number of clients listening to that stream.

> **NOTE:** - Proper operation of IGMP protocol requires that all devices used in the network support IGMP protocol.

5. Send Status To - This is the IP address used to send Unicast status copies for remote monitoring purposes

NOTE: - The Device status can be sent to a remote management station by configuring the status destination IP. However these settings don't affect the broadcast status messages. To turn off the unicast status, set the destination IP address to 255.255.255.255.

6.  Selecting the Check icon will send the network changes to the A75 receiver
7.  Selecting the X icon cancels the changes and exits back to the main screen

4.1.2 Channel Button

The next step in the configuration is to ensure you have the correct ATSC channel number setting. This can be accomplished by clicking on the Channel button and bringing up the channel screen as shown in the figure below.

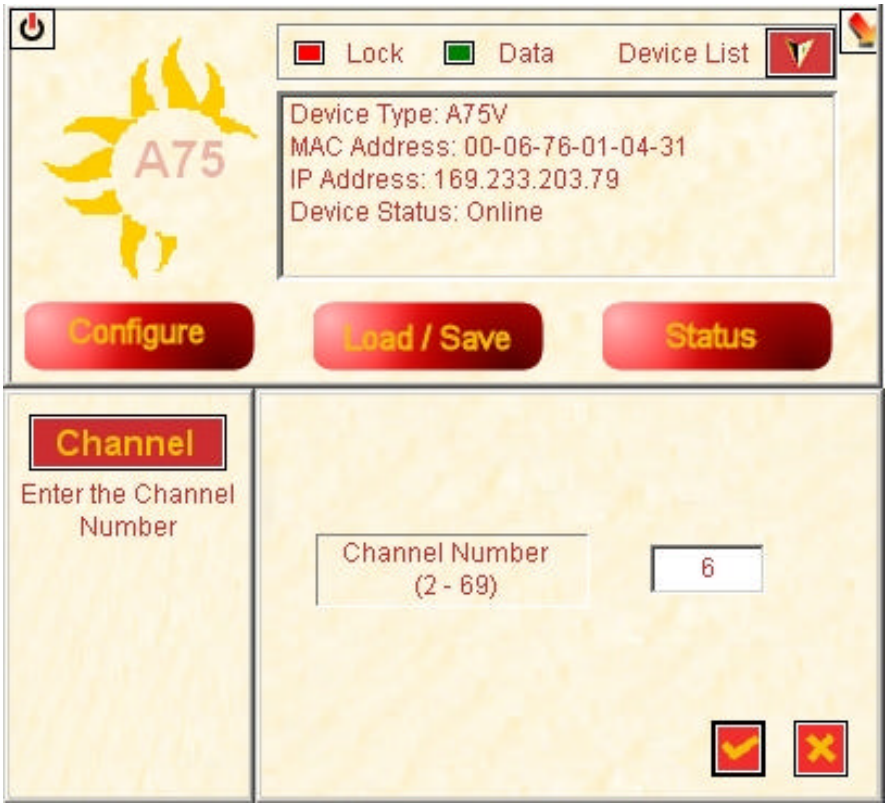


Figure 5: Satellite Configuration Dialog

1) Enter Channel Number (2-69): Enter your desired ATSC channel number

> **NOTE:** - A table of the ATSC channel number vs frequency is provided in Chapter 8

2)  Selecting the Check icon will send the channel changes to the A75 receiver

3)  Selecting the X icon cancels the changes and exits back to the main screen

4.1.3 Content Button

The Content button screen (shown below) is to be used when the A75 is to be configured to receive MPE or video data from the ATSC broadcast stream and forward this data to the appropriate IP address on the LAN. This screen is used to add (or delete) MPE Data Program IDs (PIDs) or elementary stream PIDs that enable the A75 to receive the IP or MPEG content.

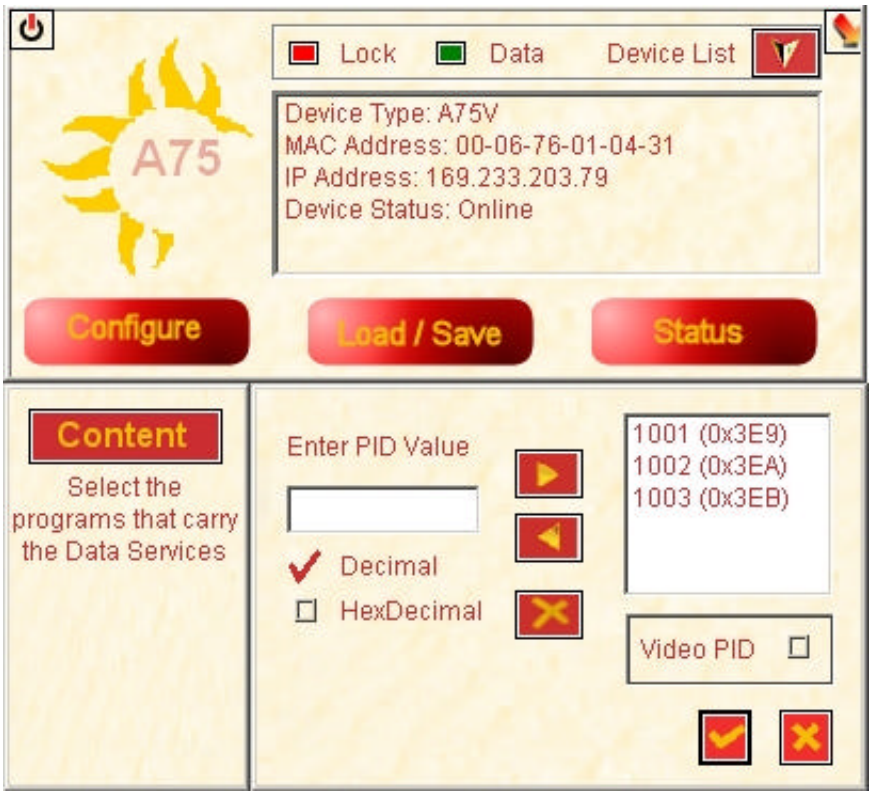


Figure 6: IP Data Content PIDs

1. Enter PID Value: Use this edit box to add a new Program ID to the list;
2. Decimal: Use this check box to enter the PID values in decimal as the default
3. HexDecimal: Select this check box to enter the PID values in Hexadecimal as the default
4. Video PID – Highlight one of the PID's and check this box to change the PID type from PID to a video PID. See Section 4.1.3.1 for further information
5.  Selecting this PID Add icon adds the content of the PID box to the PID List
6.  Selecting the PID Delete icon deletes the selected PID from the PID list

7.  Selecting the PID Delete All icon will empty the PID list

8.  Selecting the Check icon will send the PID changes to the A75 receiver

9.  Selecting the X icon cancels the changes and exits back to the main screen

NOTE: - Older builds of the A75 (Build A0100) do not support the addition of video PID's and therefore the Video PID box is not displayed in the Content screen

4.1.3.1 Adding Video PIDs

Any of the PID's added in the section above (Section 4.1.3) may be configured and received as an ATSC elementary stream PID (versus an MPE PID) and passed directly to an IP address (multicast, unicast or broadcast) on the A75 LAN. This feature enables the operator to pass television program PIDs (including audio, video and MPEG Service Information (SI) PID's) on the LAN for viewing. Section below provides a detailed description of how to configure the A75 to receive TV signals and how to setup an incoming PID as a video PID.

To start with, you simply select the PID and check the Video PID box. This will bring up the Video PID Screen as shown below.

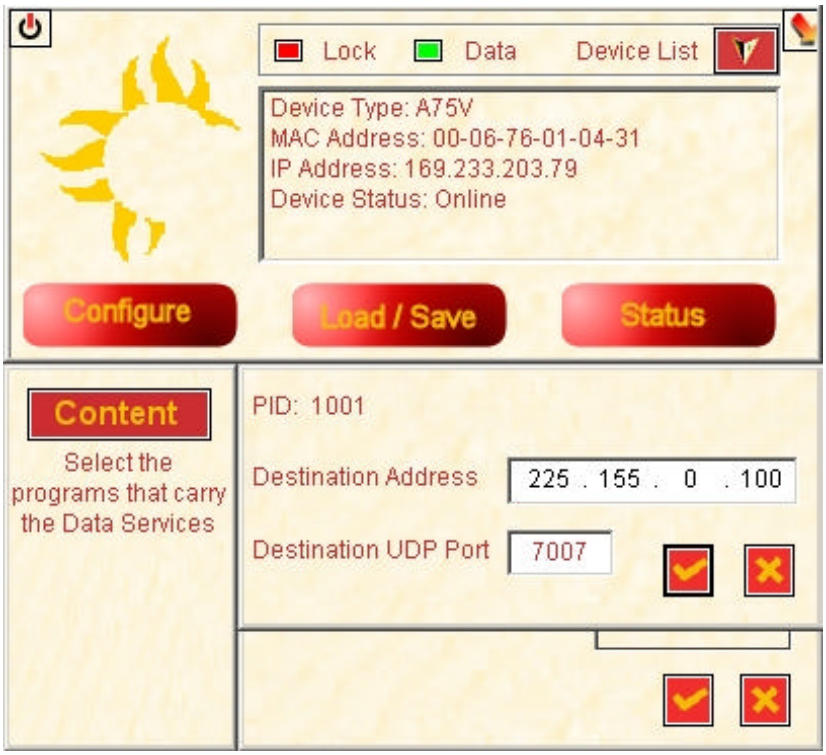


Figure 7 - Video PID Content Screen

1. Destinations Address **and** Destination UDP Port: The destination IP Address and port may be added to the individual PIDs in the PID list. In this way, received packets are mapped to different IP Addresses locations (note: this is typically a multicast IP address).

> **NOTE:** - The IP address/port specified here indicates where the PID traffic is to be sent to.

2.  Selecting the Check icon will send the Video PID changes to the A75 receiver
3.  Selecting the X icon cancels the changes and exits back to the main screen

The A75 may be configured for TV viewing. Please refer to Chapter 5 for further information on this.

4.1.4 Reset Button

Selecting this button will bring up the A75 Reset screen as shown below.

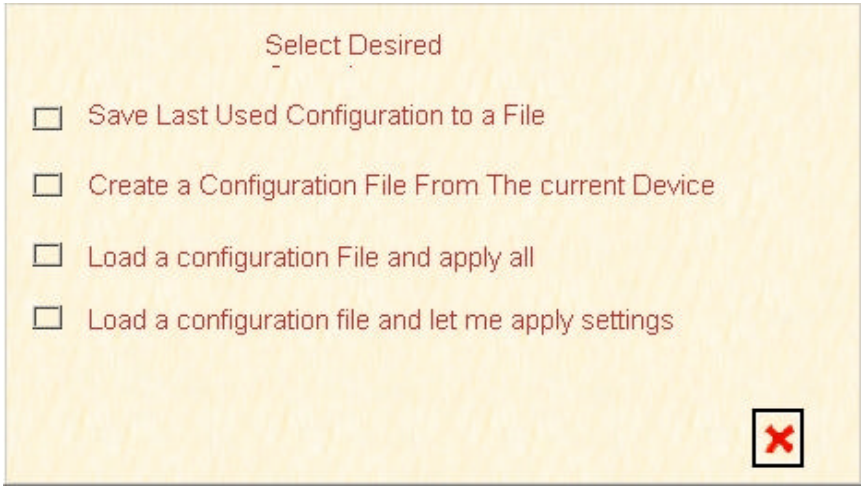
Figure 8 - A75 Reset Screen

1.  Selecting the Check icon will reset the A75 receiver
2.  Selecting the X icon cancels the reset request and exits back to the main screen

NOTE: - Selecting Reset will not reset the A75 back to factory default settings. It will simply restart the unit.

4.2 Load/Save Button

The Load/Save button enables the operator to create, save and load A75 configuration files. When selected, the Load/Save submenu screen is presented as shown below. .



The Load/Save screen provides the operator with the 4 options shown above. Selecting any one of the 4 options will bring up a further screen as described below. Selecting  will close the screen and return to the main screen.

4.2.1 Save Last Used Configuration to a File

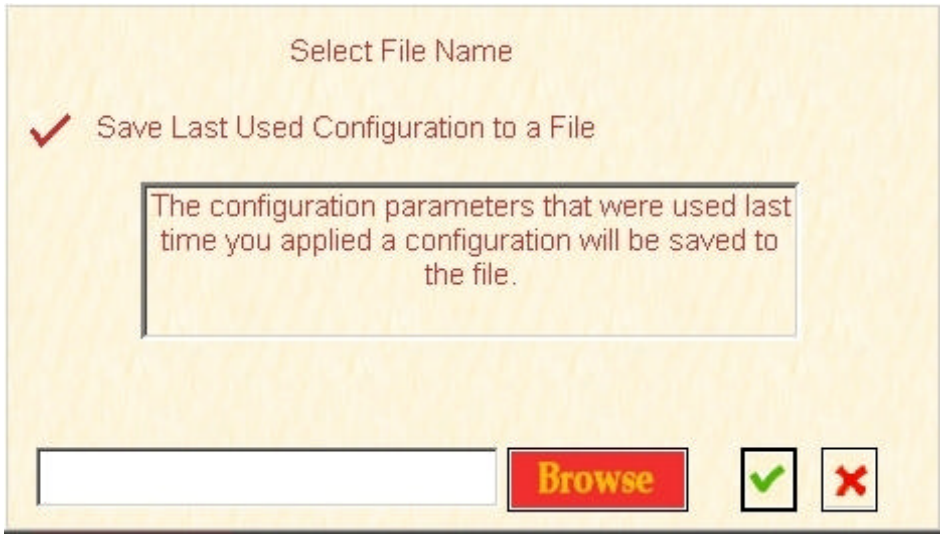


Figure 9 - Save Last Used Configuration Screen

1. Browse – Browse to the destination configuration file

2.  Selecting the Check icon will save the configuration to the destination configuration file
3.  Selecting the X icon cancels the changes and exits back to the Load/Save screen

4.2.2 Create a Configuration File from the Current Device

Figure 10 - Create a Configuration File from Current Device Screen

1. Browse – Browse to the destination configuration file
2.  Selecting the Check icon will save the configuration file based on the current device setting
3.  Selecting the X icon cancels the changes and exits back to the Load/Save screen

4.2.3 Load a Configuration File and Apply All

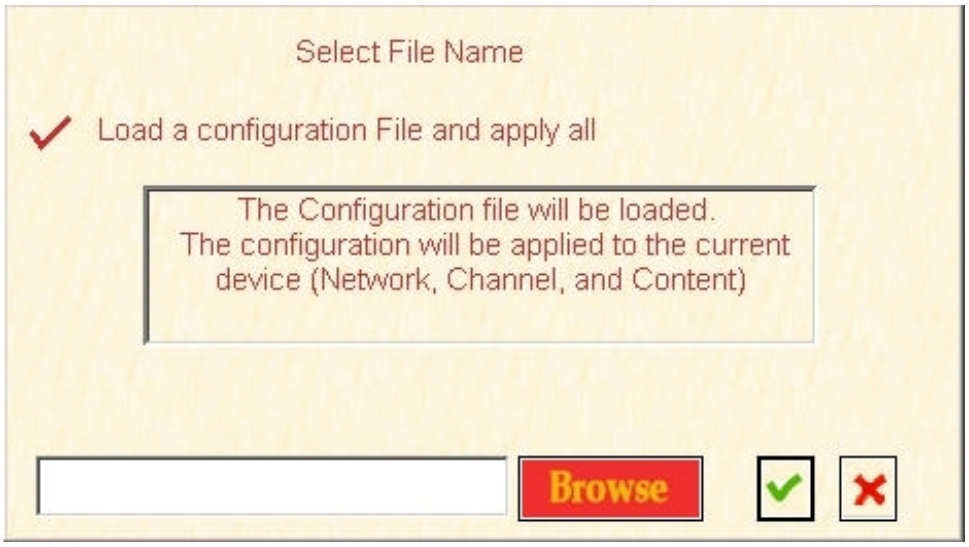


Figure 11 - Load Config and Apply Screen

1. Browse – Browse to the configuration file to be loaded
2. Selecting the Check icon will load and apply the configuration
3. Selecting the X icon cancels the changes and exits back to the Load/Save screen

4.2.4 Load a Configuration File

Figure 12 - Load a Configuration File Screen

1. Browse – Browse to the configuration file to be loaded
2.  Selecting the Check icon will load the configuration
3.  Selecting the X icon cancels the changes and exits back to the Load/Save screen

4.3 Status Button

Selecting the Status button will bring up the status panel as shown below. Included in the status panel is:

1. A listing of the Selected PIDs
2. The current ATSC channel number
3. The Signal to Noise Ratio of the received signal
4. The Default Gateway IP address, and
5. A checkmark indicating that Multicast Filtering (IGMP) is enabled (or not)

NOTE: It is important to note that the status panel shows the user the current the current configuration parameters that are programmed into the A75. These parameters may or may match the configuration parameters that are present in the A75 Configuration application.

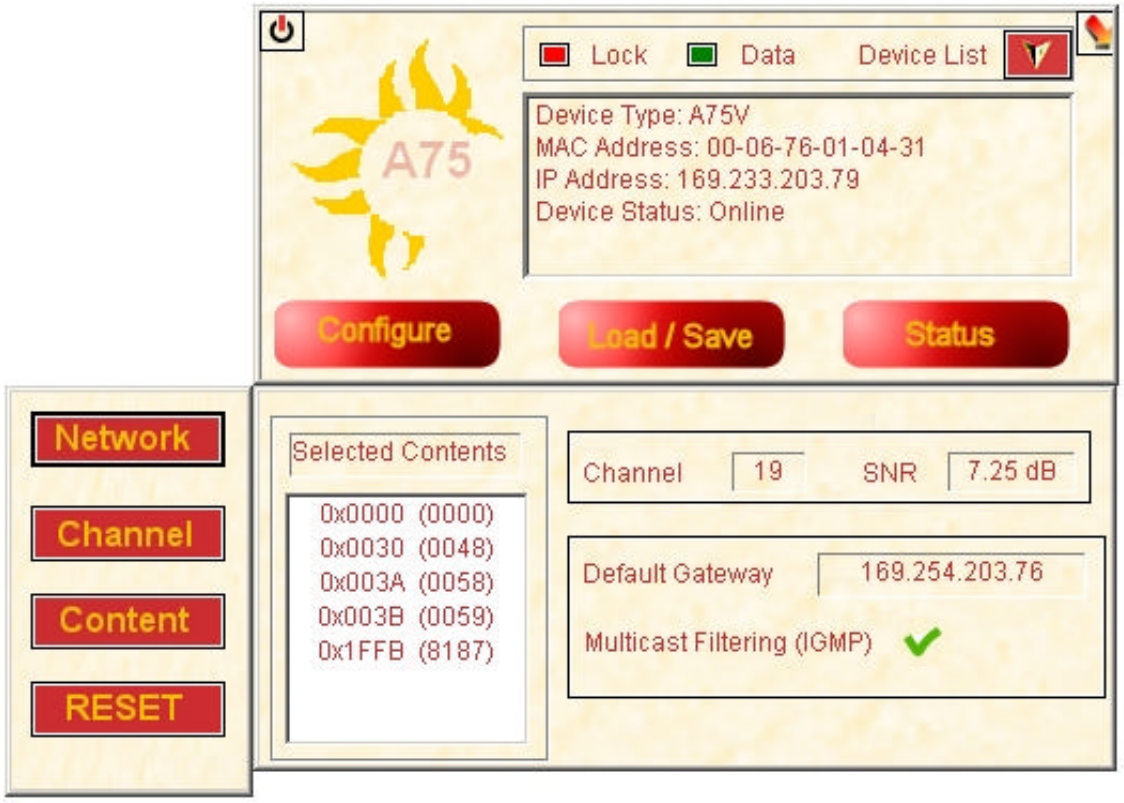


Figure 13 - A75 Status Screen

5 How to Configure the A75V for TV Viewing

This Section provides a step-by-step procedure for viewing TV programs using the A75.

Prior to configuring the A75 for TV viewing, you will need to know on which PID's TV program is being sent on. A typical TV program will contain 4 PIDs, including:

- Video PID
- Audio PID
- Program Mapping Table (PMT) PID
- Program Association Table (PAT) PID

The A75 will need to be configured to pass each of these PID's to the correct IP address on the LAN.

NOTE: Stream Analyzer programs for the PC, such as TSReader, may be used to help determine the PIDs in use for the video

Also, it should be pointed out that the A75 provides an Ethernet output (not a video output). It therefore cannot generally be connected directly to your TV. You can, however, pass the Ethernet signal to an MPEG-over-IP set top box (which would be used to drive video to your TV), or you can view the TV program(s) directly on your PC using a software video player, such as VLC.

To configure the A75 for watching TV, please do the following:

1. Configure the Novra software.
    a. Determine the IP address of the box by clicking on the device list pointer. Set host PC up on the same IP address class for configuration. This can be changed back after Novra is configured.
    b. Set channel to tune to the correct frequency. Refer to Chapter 8 to see the table showing frequency vs channel number.
2. Using TSReader or another stream analyzer, determine the PIDs in use for video stream. An example of 3 TV programs that are coming down in one MPEG stream might be:
    a. PAT - (usually PID 0)
    b. Video PID(s) - (i.e. 31, 41, and 51)
    c. Audio PID(s) - (i.e. 34, 44, and 54)
    d. PMT - usually the base number for the audio and video (i.e., 30, 40, and 50)
    where PIDs 0, 30, 31, 34 would be one TV program, PIDs 0, 40, 41, 44 would be another and PIDs 0, 50, 51, 54 would be the third program.

3. Add all of the above PIDs into the Content section of the A75 Console Application (Refer to Section 4.1.3).

4. Check the video PID box for each of the above PIDs, including the video, audio, PAT and PMT. After checking the video box, a destination address and port box opens (Refer to Section 4.1.3.1). Type the same multicast IP destination address in for each unique program stream. Do the same thing for destination port. Give each program stream you want to watch (group of 4 PIDs) a unique IP address and port.

NOTE: You can make up the IP address based on knowing that no other multicast streams are using that address and port on your network. All multicast streams must be in the 224.X.X.X to 239.X.X.X address space. For example 224.0.0.10, port 3030.

6. Set up VLC player to render the stream by
    a. Select File, Open Network Stream
    b. Enter the multicast address and port you specified in step 4 in the UDP/RTP multicast section
    c. VLC will then start playing the television programming

6 Troubleshooting

This section can help you resolve most of the common problems when installing the A75.

1) **I connected the receiver and when I start the Console, it says it can't detect any A75 Receivers?**
   - Make sure the unit is physically connected to the same LAN that your computer (running A75 Console) is connected to. The best way to rule that out is to use a cross over cable.
   - Make sure the unit is powered up and the Ethernet link is established. The green LED on the back of the Ethernet connector should be on solid, and the yellow light should be blinking.
   - If you are using a hub, make sure there is only one A75 unit connected.

2) **Why won't the receiver lock to my settings?**
   - Is the RF cable connected?
   - Are you using the correct channel number?

3) **The receiver is locked to my signal and there is no Data, why?**
   - Do you have the right PID selected?
   - Are you sure you are on the right channel?
   - Is the default gateway on the receiver set correctly?
   - Does the ATSC MAC address of the traffic match the MAC address of your unit? (unicast)
   - Are you using IGMP and are the network clients joining the group? (multicast)
   - Are you sending your video PIDs to the correct IP address?

7 Specifications

7.1 Receiver Characteristics

Receiver

Receiving Frequency:	55 to 806 Mhz
ATSC Channels:	2 to 69
Input Signal Level:	-80 dBm to 0 dBm
Channel Bandwidth:	6 Mhz
Phase Noise:	-89 dBc/Hz @ 10 KHz
Demodulation:	8VSB
Channel Bitrate:	19.38 Mbps
FEC:	Reed Soliman and Viterbi
Noise Figure:	8 dB
Image Rejection:	70 dBc

Data

DSM-CC Multiprotocol Encapsulation per ATSC A/90

Throughput:	19.38 Mbps

MAC filter
Section Packing
LLC-SNAP

Configuration Points

IP Address
PID Selection
RF Channel

Status Indicators

Power:	Red LED
Packet Error:	Amber LED
Lock:	Green LED

Ethernet Link and Transmit

7.2 Minimum System Requirements

Your computer must operate with any one of the following operating systems to successfully use the Novra A75 Receiver:

- Windows 2000, with Service Pack 4
- Windows XP

Your computer must have **at least** the following:

- Processor: Pentium 566 MHz
- RAM: 32 MB
- Free disk space: 40 MB
- Video: card and driver that support 256 or more colors
- CD drive (required for software installation only)
- Ethernet network interface card (NIC): 100 Mbps (100 BaseT)

NOTE: - Performance may be dependant on other applications that your PC is running.

NOTE: - To avoid minor graphic distortion of the A75 console screens, please ensure the small Windows font size is selected (typically this may be found in one of the Windows Display Properties sub menus).

7.3 Supplied Equipment

Please confirm you have received all the equipment listed below.

- Novra A75 Receiver
- Cross-over cable or Ethernet cable
- Power supply (120 Vac to 6 Vdc)
- A75 Receiver Software CD
- Novra A75 Receiver User Manual (Soft Copy on CD)

8 ATSC Channel vs Frequency

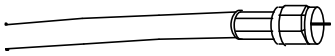
Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
2	57	24	533	47	671
3	63	25	539	48	677
4	69	26	545	49	683
5	79	27	551	50	689
6	85	28	557	51	695
7	177	29	563	52	701
8	183	30	569	53	707
9	189	31	575	54	713
10	195	32	581	55	719
11	201	33	587	56	725
12	207	34	593	57	731
13	213	35	599	58	737
14	473	36	605	59	743
15	479	37	611	60	749
16	485	38	617	61	755
17	491	39	623	62	761
18	497	40	629	63	767
19	503	41	735	64	773
20	509	42	641	65	779
21	515	43	647	66	785
22	521	44	653	67	791
23	527	45	659	68	797
		46	665	69	803

APPENDIX

Terms, Definitions, and Other Tidbits of Information

ATSC — The Advanced Television Systems Committee, Inc., is an international, non-profit organization developing voluntary standards for digital television.

Crossover Cable — A crossover cable is a cable that is used to connect two computers by reversing, or crossing over, the cable pin contacts. This eliminates the need to use a hub when connecting two PCs. It is also referred to as a "Null Modem" cable.

Coax Cable — Looks like this: 

The coaxial cable is most commonly used for Cable TV feeds inside a house or apartment. This form of cable allows the high frequencies of TV, and Satellite type signals to move from one place to another with a minimal amount signal loss.

DVB — Digital Video Broadcasting (DVB) is a set of standards that define digital broadcasting using satellite, cable, and terrestrial infrastructures.

IP — The Internet Protocol (IP) is a network communication protocol used on Ethernet networks and the Internet.

IP Address — The 32-bit computer address defined by the Internet Protocol. It is usually represented in dotted decimal notation. Example: 192.168.111.112.

LO — The Local Oscillator (LO) is a circuit that creates a tone of a very specific frequency. These units have many applications in electronics. This important thing to remember is that there is an LO in the LNB (Low Noise Block-converter) and it is part of the circuit that converts the received satellite RF Frequencies to the more user friendly L-Band Frequencies. Typical values include 9.75, 10.60, 10.75, 11.00 and 11.25 GHz for the Ku band and 5.15 GHz for the C Band of satellite frequencies.

MAC Address — The Media Access Control (MAC) address is the unique hardware address for any piece of electronic equipment attached to a network. The MAC Address for your Novra A75 Receiver is displayed on a sticker on the bottom of the receiver.

Mbps — Mega bits per second. (Million bits per second)

MBps — Mega Bytes per second. One "Byte" in computer terms is the same as 8 bits. It is often referred to as a word.

1 Mbps = 8 Mbps = 1 million Bytes (Words) per second = 8 million bits per second.

Msps — Mega symbols per second. Suppose you have four symbols, call them A, B, C & D. Let the Symbol A represent two bits of data with the value 00.

Let B represent two bits of data with the value 01
Let C represent two bits of data with the value 10
Let D represent two bits of data with the value 11

	This means that if the signals we are interested in consist of 1.0 Msps (That's 1 Million symbols per second), and each symbol represents two bits of data, then our signal has a data rate of 2.0 million bits per second (2.0 Mbps). The important point to remember is that satellite systems send and receive symbols which are then converted into data. The A75 takes the resulting data and forwards it to your computer in bursts called "packets."
Packet	A packet is the unit of data that is routed between an origin and a destination. When any file is sent from one place to another (the Internet as an example) it is divided into "chunks" of an efficient size for routing. Each of these packets is separately numbered and includes the Internet address of the destination.
PID	The Packet Identification Code (PID) is used by the receiver to sift through the different packets of the transport stream. The transport stream contains data representing many different signals. The A75 software running on your PC uses the PID number to find only those packets of data that contain the information you have requested.
RAM	Random access memory. Used for short term storage of information requiring quick access on a computer. Information stored in RAM can be accessed by the computer much faster than information on the Hard Drive can be accessed.
Subnet	A portion of a network, which may be a physically independent network segment, and which shares a network address with other portions of the network.