619 Series of Audio Bridges

BISS Tech   customers have commented that the 619 Series of Audio Bridges has been one of our most creative and useful products. The applications are endless, however its primary function is for the combining and linking of repeaters, links and other audio sources at remote sites. Three versions are available from the 619GI with four ports, the 619EI with six ports to the 619IAB with six ports and a fully configurable intelligent matrix controller.

Each of the bridge ports is provided with four wire plus E & M to meet industry standards. Each four wire port is balanced, 600-ohm transformer coupled. The E & M facilities can be configured for relay or opto isolated input and output or link selectable pull up or pull down for easy connection to the particular brand of product being interfaced with.

The 619IAB with the intelligent matrix controller allows network operators many features such as DTMF encode and decode, CTCSS encode and decode, fast key-up of multi-hop repeater links and heartbeat pulses for voting networks. The list of features goes on.

Each model of the 619 Bridge is housed in a 1RU 19" rack-mounting format. The front of the bridge has channel activity indicators, level indicator and level adjustment. The level adjustment controls are behind a security panel to deter unauthorised and accidental changes to a network set-up.

| FEATURES	619GI	619EI	619IAB
Balanced Inputs / Outputs	Yes	Yes	Yes
Front Panel Audio Adjustments	Yes	Yes	Yes
Diagnostic / Set up LED's	Yes	Yes	Yes
Mute Disable Facility	Yes	Yes	Yes
Number of Independent Ports	4	6	6
Remote Controllable	No	Yes	Yes
Wide Input / Output Level Range	Yes	Yes	Yes
E&M Options	Yes	Yes	Yes
E&M Status LED's	Yes	Yes	Yes
On Board V23 Modem	No	No	Yes
Remote Programmable Software	No	No	Yes
CTCSS Decode Encode Function	No	No	Yes
RS232/485 DTE Communications	No	No	Yes
DTMF Capability	No	No	Yes
Opto Isolated Digital Inputs	No	No	Yes
Real Time Clock	No	No	Yes
8 Bit Processor	No	No	Yes
Flash Memory	No	No	Yes
Heartbeat Voting	No	No	Yes
On Board Tone Generator	No	No	Yes

Application Description (1 repeater – 1 link - 1 bridge)

The system below illustrates a typical repeater site with one repeater and a link connected via a 619GI Audio Bridge. This simple configuration is the bread and butter of the audio bridge.

Parts List

619GI Audio Bridge 4 Way	One
Repeater	One
Link	One
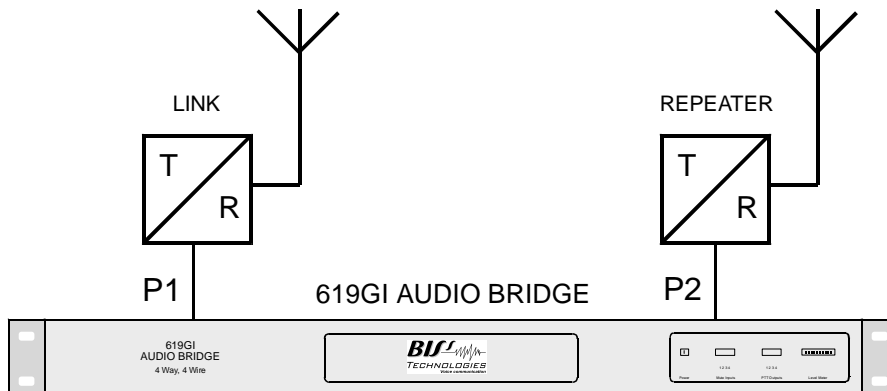
619GI Audio Bridge DIP switch settings

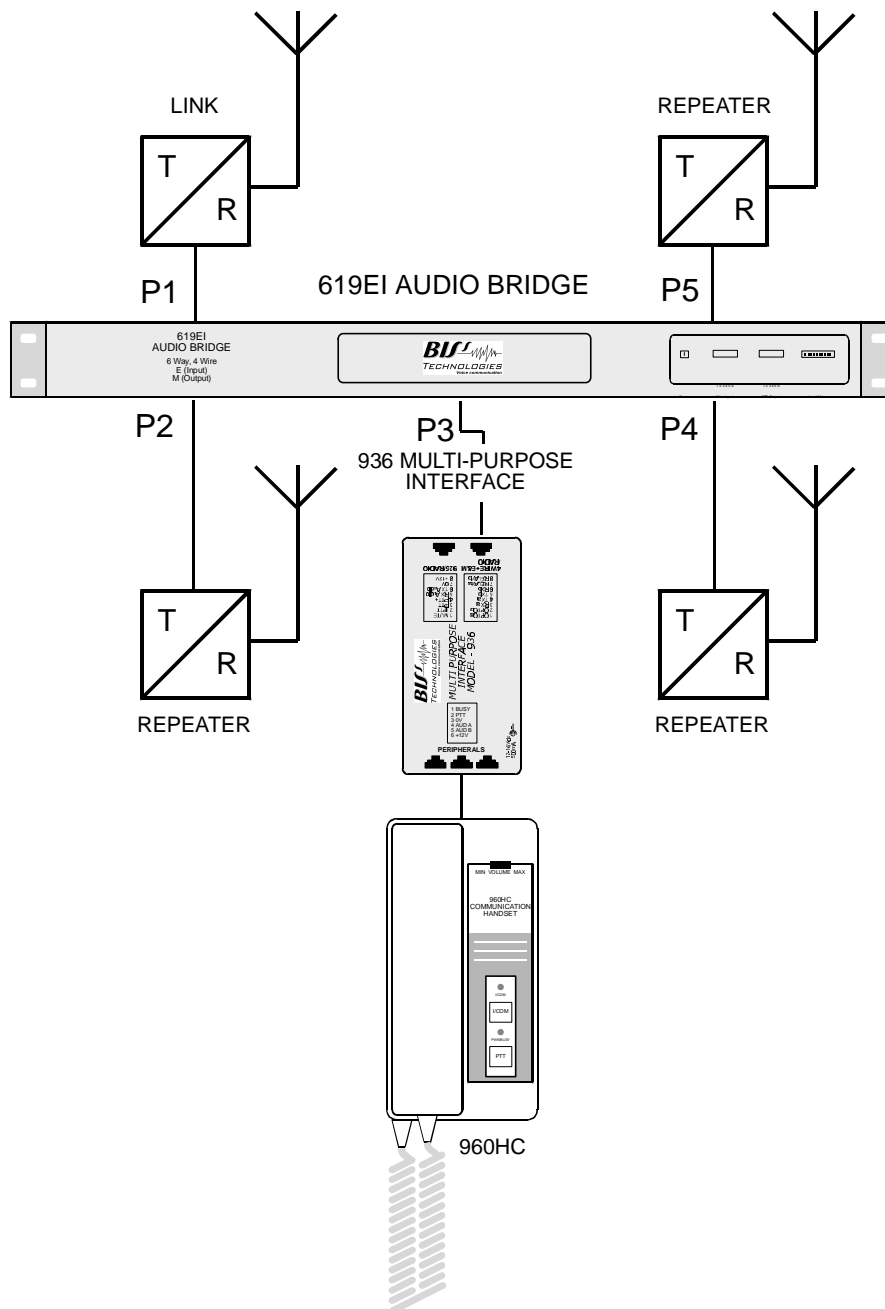| Project Description	Audio Bridge Input port No.				
Linker	I/P Port 1		On		
Repeater	I/P port 2	On	On		
	I/P Port 3				
	I/P Port 4				
		O/P Port 1	O/P Port 2	O/P Port 3	O/P Port 4

Figure 1: Basic Link & Repeater Site Installation using a 619GI audio Bridge

Application Description (3 repeaters - I link - 1 bridge)

The system below illustrates a typical repeater site with three repeaters and one link connected via a 619EI Audio Bridge. The site has a local handset connected to the system via a 936 Multi Purpose Interface module.

Parts List

619EI Audio Bridge 6 Way	One
960HC Handset	One
936MPI Multi Purpose Interface	One
Repeater	Three
Link	One

See the next page for Audio Bridge DIP switch settings

619EI Audio Bridge DIP switch settings

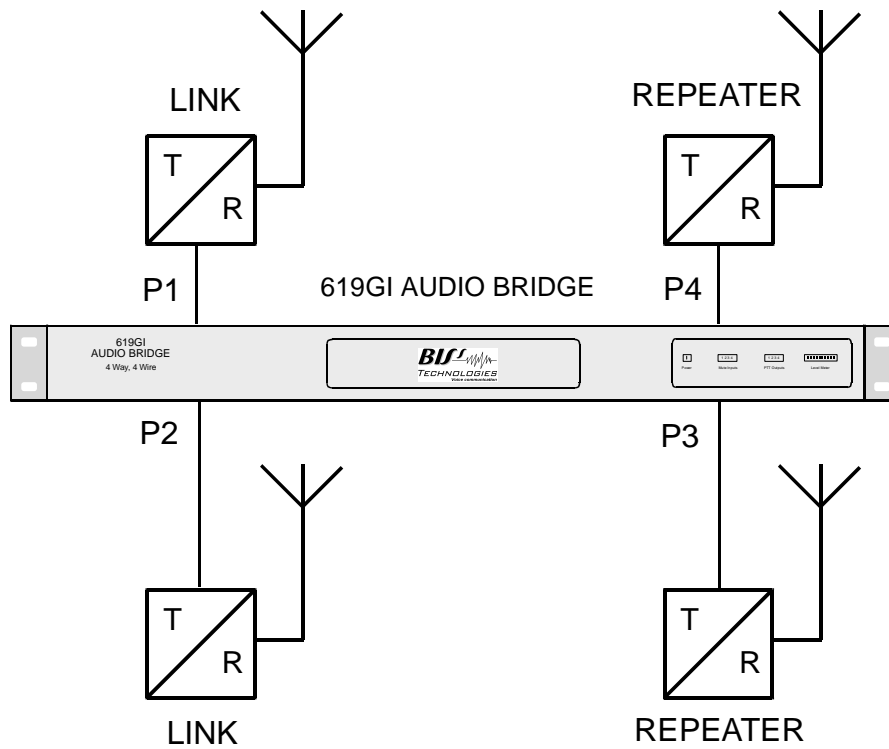| Project Description	Audio Bridge Input port No.						
Link	I/P Port 1		On	On	On	On	
Repeater	I/P Port 2	On	On				
Handset	I/P Port 3	On					
Repeater	I/P Port 4	On			On		
Repeater	I/P Port 5	On				On	
	I/P Port 6						
		O/P Port 1	O/P Port 2	O/P Port 3	O/P Port 4	O/P Port 5	O/P Port 6

Figure 2: 619EI Link & Multiple Repeater Combination with Local Handset Control

Application Description (2 repeaters - 2 links - 1 bridge)

The system below illustrates a typical repeater site with two repeaters and two links connected via a 619GI Audio Bridge.

Parts List

619GI Audio Bridge 4 Way	One
Repeater	Two
Link	Two

619GI Audio Bridge DIP switch settings

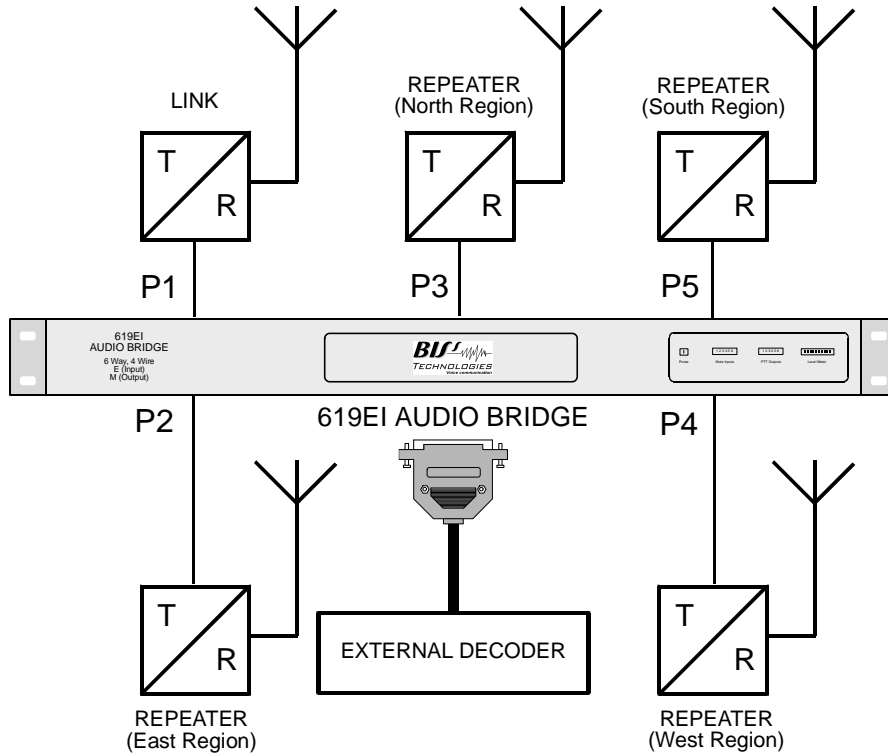| Project Description	Audio Bridge Input port No.				
Link 1	I/P Port 1				On
Link 2	I/P port 2			On	
Repeater 1	I/P Port 3			On	
Repeater 2	I/P Port 4				On
		O/P Port 1	O/P Port 2	O/P Port 3	O/P Port 4

Figure 3: 619GI Multiple Link & Repeater Combination

Application Description (4 repeaters - 1 link - 1 bridge)
The system below illustrates a typical repeater site with four repeaters and one link connected via a 619EI Audio Bridge c/w remote.

Parts List

619EI Audio Bridge 6 Way	One
Repeater	Four
Link	One
External Decoder	One

619EI Audio Bridge DIP switch settings

Project Description	Audio Bridge Input port No.						
Link 1	I/P Port 1		On	On	On	On	
Repeater (East)	I/P Port 2	On	On				
Repeater (North)	I/P Port 3	On					
Repeater (West)	I/P Port 4	On			On		
Repeater (South)	I/P Port 5	On				On	
	I/P Port 6						
		O/P Port 1	O/P Port 2	O/P Port 3	O/P Port 4	O/P Port 5	O/P Port 6

Figure 4: 619EI Link & Multiple Repeater Combination

619 Intelligent Audio Bridge

The configuration of the 619 Intelligent Audio Bridge can be changed even while the system is operational. This is done through software control via a Windows based programming utility.

Up to eight, software configurations are programmable by the user. Once configured, six of these 'maps' can be selected dynamically on reception of a digital input, or on reception of a CTCSS tone, or when instructed to by an operator using DTMF signalling.

Fast CTCSS keying is a function that allows for immediate PTT on reception of a Mute signal. Fast CTCSS mode provides a level of protection against the effects of unwanted and spurious signals.

Using DTMF transmission the 'System Split' function allows for a change in the default set-up, from a 'Primary' to a 'Secondary' configuration. Changes to configuration settings 1 to 4 can also be made via DTMF remote transmission.

The 'Heartbeat/Voting' facility allows for the scheduling of specific periods of the day (24Hr clock) together with configurable parameters such as frequency, duration and repeat interval.

Each port has fully adjustable PTT out 'hold' periods.

Each port has fully adjustable PTT 'lead-in' delay periods.

CTCSS is easily generated on port outputs according to the configurations that are set – or with reference to an incoming CTCSS signal.

By selecting any one of three modes available, each of the two relays located within the Bridge may be configured by the user.

DTMF commands can control various functions within the Bridge.

The Intelligent Audio Bridge also provides for telemetry protocol based communications. This ability to 'talk' directly with the BISS Tech range of Argus telemetry products offers the option of using a single Bridge or group of bridges to be integrated into a telemetry system of great complexity.

All local and remote configuration of 619 Intelligent Audio bridges is easily achieved using a Windows application. All bridge 'mapping', setting of time periods and tone processing can be read, modified and re-written to a selected bridge and settings saved to disk and retrieved in the usual way.

Programming the 619 Intelligent audio Bridge can be carried out, either directly via a RS232 connection between a laptop or desktop PC and the bridge, or by remote programming via a GSM or radio modem.

619IAB Audio Bridge
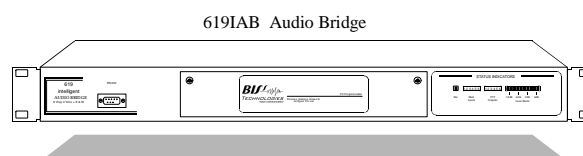
Features

The 619 Intelligent Audio Bridge is a six-port audio-switching matrix, which incorporates a variety of signal processing and control techniques, and is user configurable through software control. This document describes how to install and set up the device, and how to perform remote control and monitoring operations.

Key Hardware Features

\# A CTCSS (Continuous Tone Controlled Squelch System) decoder supporting 42 commonly used frequencies.

\# Separate CTCSS inputs to each port.

\# Dual CTCSS encoders supporting 42 commonly used frequencies.

\# Separate CTCSS outputs from each port.

\# RS-232 / 485 DTE (Data Terminal Equipment) communications.

\# V23 modem for data communications over the radio.

\# DTMF (Dual Tone Multi Frequency) remote control capability.

\# Opto-isolated digital inputs.

\# Dual analogue inputs.

\# Dual relay outputs with changeover contacts.

\# Real-time clock.

\# 8-bit low power microprocessor with Flash memory.

\# Tone generator.

Key Software features

The configuration of the 619 Intelligent Audio Bridge can be changed even while the system is operational. This is done through software control, via a Windows based programming utility.

➢ Up to 8 software configurations are programmable by the user. Once configured, six of these maps can be selected dynamically on reception of a digital input, or on reception of a CTCSS tone, or when instructed to by an operator using DTMF signalling

➢ Fast CTCSS keying is a facility that allows for immediate PTT on reception of a Mute signal. Fast CTCSS mode provides a level of protection against the effects of unwanted and spurious signals.

➢ Using DTMF transmission the "System Split" function allows for a change in the default set-up, from a Primary to a Secondary configuration. Changes to the configuration settings 1 to 4 can also be made via DTMF remote transmission.

➢ The Heartbeat/Voting facility allows for the scheduling for specific periods of the day (24Hr clock) together with configurable parameters such as frequency, duration and repeat interval.

➢ Each port has fully adjustable PTT-Out "hold" periods.

➢ Each port has fully adjustable PTT Lead-in "delay" periods.

➢ CTCSS can easily be generated on port outputs according to the configurations set, or with reference to an incoming CTCSS signal.

➢ The user can configure each of the two relays located within the Audio Bridge, by selecting any one of the three modes available.

➢ DTMF commands can be used to control various functions within the Audio Bridge.

➢ The Intelligent Audio Bridge provides for telemetry protocol based communications. This ability to "talk" directly to the BISS Tech Argus telemetry system offers the option of using a single bridge or a group of bridges to be integrated into a telemetry system, thus providing for the monitoring of a base station and remote control of sites and equipment.

➢ All local or remote Audio Bridge configuration is easily achieved using a Windows application, with a familiar Windows screen presentation. All Audio Bridge "mapping", the setting of time periods and tone processing can be read, modified and re-written to the selected bridge. The resultant data can also be saved and retrieved as a file in the usual way.

➢ Programming of the Audio Bridge can be carried out either directly using a RS-232 connection between a laptop or desktop computer and the Bridge, or by remote programming using a GSM modem or a radio modem.

Operation overview

Micro-controller

The 619IAB combines the versatility of the 619 series 6-way audio bridge, with on-board Motorola Microprocessor control. The block diagram best illustrates the essential elements of the bridge. The embedded micro-controller now allows for dynamic configuration of the 6x6 matrix and is therefore able to generate PTTs according to certain criteria.
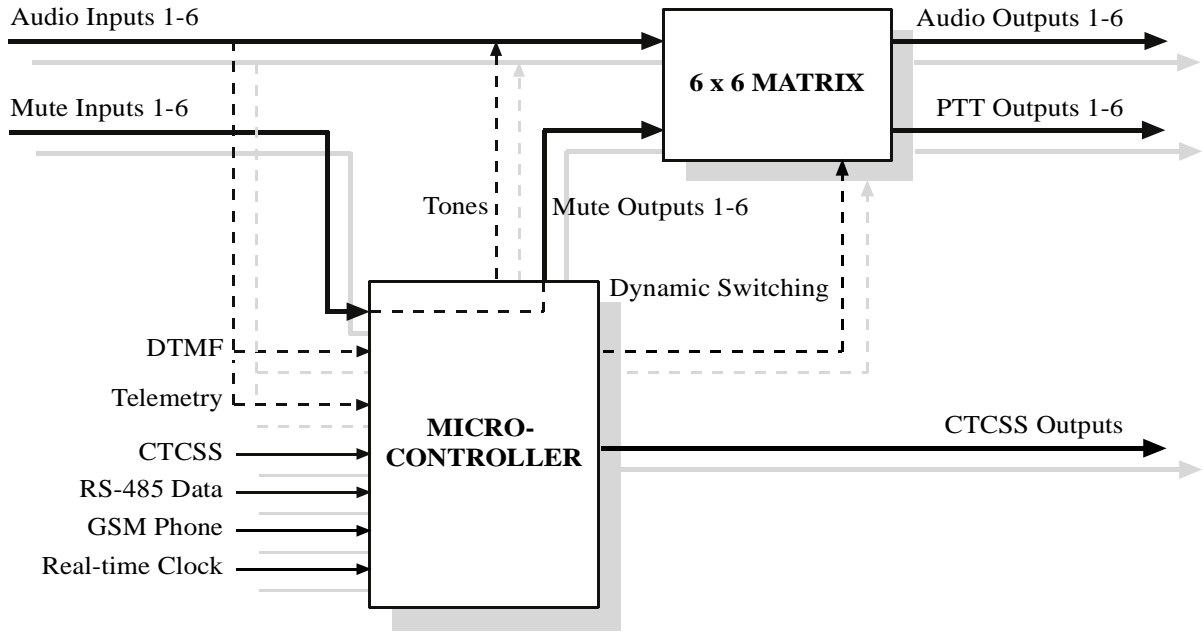
The micro-controller makes use of data and signals from several sources

\# Mute inputs from the line audio ports.

\# DTMF and V.23 tones, also from the line audio ports.

\# Digital and analog CTCSS signals from separate sources.

\# RS-232 or RS-485 connection for control and monitoring.

\# Time of day from a real-time clock (with battery backup).

In addition to having the capability to generate separate CTCSS output tones, the micro-controller can also generate the following signals back into the matrix.

\# DTMF response tones.

\# V.23 telemetry tones.

\# Heartbeat/Voting tones.

\# PTT control for the line audio ports.

By routing the Mute inputs via the micro-controller, rather than directly to the Bridge matrix, the PTT outputs at each port are set according to the software configuration.

CTCSS encode/decode

Encode/decode

As shown in the diagram below, the CTCSS decode and encode functions are supported using separate input and output signals.

```
CTCSS Rx Audio 1-6  →  ┌──────────┐        ┌──────────┐        ┌──────────┐
                        │  Audio   │   →    │  CTCSS   │   →    │          │
                        │   or     │        │ Decoder  │        │          │
CTCSS Mutes 1-6    →    │ Digital  │                            │          │
                        │          │   ─────────────────────→   │  Micro-  │
                        │ (619A12) │                            │ Controler│
                        └──────────┘                            │          │
                                                                │          │
                        ┌──────────┐        ┌──────────┐        │          │
                        │          │   ←    │  CTCSS   │   ←     │          │
CTCSS Tx Audio 1-6 ←    │  Audio   │        │Encoder-1 │        │          │
                        │ Outputs  │                            │          │
                        │          │   ←    ┌──────────┐   ←    │          │
                        │ (619A12) │        │  CTCSS   │        └──────────┘
                        └──────────┘        │Encoder-2 │
                                            └──────────┘
```
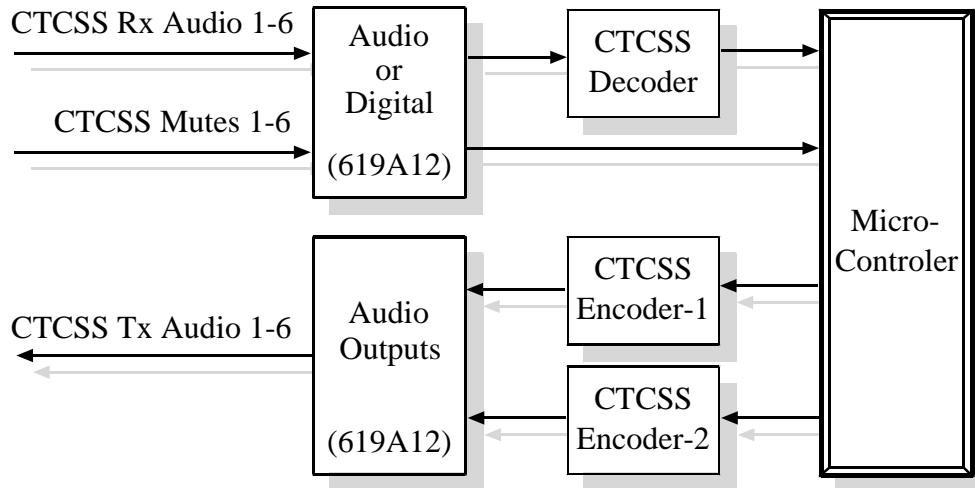
The micro-controller can accept and work with both digital and audio CTCSS signals. The selection of the type of signal to be processed is made through a combination of on-board links and software set-up.

Received CTCSS audio is summed from switched input sources and fed into a predictive decoder. Transmitted CTCSS audio is generated by two separate encoders. Each decoder output can be selected during a PTT output cycle.