



MUSICAM USA

Corporate Computer Systems, Inc. d/b/a MUSICAM USA

 *RoadRunner*TM

Users Guide

MUSICAM USA

 *RoadRunner*[™] Users Guide for
Software Revision 1.13

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Introduction

R*oadRunner* from MUSICAM USA contains the latest in technologies to bring you the best possible combination of features and performance available from any portable codec. Inside its rugged but lightweight enclosure, the **RoadRunner** contains a full-featured monaural audio mixer with two microphone inputs and a third input switchable between microphone and line levels. The analog audio section also contains a wide array of outputs: two individually adjustable headphone outputs, plus two unbalanced and one balanced line level output.

RoadRunner's digital section contains the widest selection of compression algorithms available in any portable codec. **RoadRunner's** premier coding algorithm is MUSICAM, MUSICAM USA's fully compatible enhancement to the ISO/MPEG Layer II encoding standard. Industry standard ISO/MPEG Layer III as well as G.722 are also included. **RoadRunner** can send and receive up to 20 kHz monaural audio transparently and is compatible with more codecs than any other similar device. **RoadRunner** can send the same audio program to two locations simultaneously. **RoadRunner** also contains ample memory to support upgrades to its algorithm suite and operating system as developments and improvements occur. You can even make software upgrades in the field, without having to return the **RoadRunner** to the factory.

RoadRunner offers more connection options than any other portable codec. With a plug-in ISDN terminal adapter (**RoadRunner's** standard configuration), **RoadRunner** can connect directly to another ISDN codec at bit rates from 56 to 128 kb/s. **RoadRunner** also accepts any of the digital interface modules available from MUSICAM USA, and can be used over any digital facility that accepts V.35, X.21 or RS422 interfaces, as well as ISDN.

RoadRunner's built-in auto-dialer can be used to make all connections when using any one of MUSICAM USA's available ISDN terminal

adapters. **RoadRunner's** speed dial directory holds up to 256 entries. Each entry not only holds the numbers to dial, but also all configuration and connection information, making the **RoadRunner** easy to use with any connection type.

Key Features

RoadRunner is a complete package. It is housed in a rugged case and includes a foldaway handle. The complete **RoadRunner** package weighs less than 9.5 pounds (4.3 kg). Inside the **RoadRunner** case is a full featured 3-channel monaural audio mixer, a 20-bit A-to-D converter, a multi-algorithm codec, a slot for available plug-in digital interface device (an ISDN terminal adapter is supplied as standard), an auto-dialer, international AC and DC power supplies, and a powerful command processor. If you choose, you can connect your **RoadRunner** to any digital transmission system through available X.21, V.35 or RS422 digital interface modules.

RoadRunner uses state-of-the-art compression technologies to provide bi-directional broadcast quality monaural audio over a single 56 or 64 kb/s line. In addition, the **RoadRunner** can provide bi-directional 20 kHz monaural audio transparently over a single ISDN line at 112 or 128 kb/s.

RoadRunner is easy to use. The **RoadRunner** front panel controls have been kept to a minimum, are simple to use, and are clearly labeled. The front panel controls include mixing levels for three inputs (two microphone and one switchable mic/line) and individual local and return level adjustments for two separate headphone outputs.

All audio connections are made through industry standard connectors, logically located on the front and rear panels. Two balanced XLR microphone inputs are located on the front panel, as are two standard ¼" headphone jacks. An additional balanced input, switchable between microphone and line levels, is located on the rear panel. Also on the rear panel is an XLR balanced line level output and two ¼" unbalanced local and return audio outputs, ideal for PA feeds, recording, etc.

The **RoadRunner** can be equipped with any of the Digital Interface Modules available from MUSICAM USA. Available modules include

internal Terminal Adapters (with or without built-in NT-1), V.35, X.21 or RS422.

Front panel indicators include Power, On line, Norm (signal level) and Clip (over level). There are also four Cue LEDs indicating the state of the internal relays.¹ The front panel keypad can be used to access all functions of the **RoadRunner** and built in Terminal Adapter, and is also used as the dial keypad. A backlit display with adjustable contrast provides menu, maintenance and dialing displays.

Since **RoadRunner** features and audio quality are implemented in software, rather than hardware, the **RoadRunner** can be upgraded in the field should improvements become available. Software can be downloaded directly from our web site (www.musicamusa.com) or we can send you an upgrade kit. This prevents your **RoadRunner** from becoming obsolete.

CODEC Compression Algorithms

There are currently three coding algorithms used in the **RoadRunner**. Each has its advantages and disadvantages. Which algorithm you use depends on a number of factors, including desired audio quality, delay and compatibility with other codecs.

ISO/MPEG Layer III

ISO/MPEG Layer III can provide full duplex, 15 kHz audio using only one 56 or 64 kb/s ISDN 'B' channel. When using 112 or 128 kb/s, transparent 20 kHz audio is possible. The inherent drawbacks of this algorithm are the long coding delay times and poor cascading characteristics.

MUSICAM and ISO/MPEG Layer II

The premier coding algorithm used in **RoadRunner** is MUSICAM, MUSICAM USA's encoding enhancement to the ISO MPEG Layer II algorithm. MUSICAM encoding is fully compatible with all MPEG Layer II decoders, and since the enhancements are a part of the encoder,

¹ Relays and optical inputs have not been activated in this release, but will be activated in future software releases.

any Layer II decoder will sound better when connected to a **RoadRunner**. MUSICAM can deliver full duplex, 10.5 kHz audio on one ISDN 'B' channel. When using 112 or 128 kb/s, transparent 20 kHz audio is possible. Although a narrower bandwidth at 56 and 64 kb/s than MPEG Layer III, audible advantages are higher transparency, lower delay, less noticeable artifacts and better results when cascading. At 112 and 128 kb/s, MUSICAM offers transparent monaural audio and better cascading than either standard ISO/MPEG Layer II or Layer III.

G.722

G.722 is one of the earliest audio coding algorithms to be standardized. G.722 is a relatively simple algorithm based on ADPCM (Adaptive Predictive Pulse Code Modulation) offering full duplex, 7.5 kHz audio over a single 'B' channel. The key advantages of G.722 are its compatibility with most other codecs and very low delay times. The main disadvantages are its limited audio fidelity, poor signal-to-noise ratio and poor cascading.

Broadcast Capabilities

The **RoadRunner** can be configured to send the same audio program to two different locations simultaneously. In addition, the **RoadRunner's** decoder can receive the return audio from both locations, and you can easily switch to monitor the return audio from either location.

You can use any supported algorithm, and can even use different algorithms for the send and return audio. For example, high quality Layer III audio can be sent to the studio from the remote location, but low delay G.722 can be used for the return audio.

Unpacking and Installing

Your **RoadRunner** comes with an AC line cord and an RJ-45 jumper cable if an ISDN terminal adapter is installed. An appropriate interface cable, available from MUSICAM USA, may be required if a non-TA module is installed. An optional carrying case is available.

Unpack your **RoadRunner** and plug it in to an appropriate power source. Please note that the **RoadRunner** has a “World” AC and DC power supplies, and can be used anywhere without changing voltage settings. **RoadRunner** can operate in any position, and may be stacked or shelf mounted if desired. However, note that **RoadRunner** is fan cooled, and that the rear mounted fan should not be blocked.

Your **RoadRunner** is shipped to you in Loopback Mode. When in this mode, you can test all audio input and output connections. When your **RoadRunner** is in the loopback mode, and all audio connections have been made properly, you should hear any audio input to the **RoadRunner** at the output of the **RoadRunner**. Please remember that for normal operation, the **RoadRunner** must *not* be in loopback mode.

RoadRunner Connections

RoadRunner's connection to the digital transmission medium is made through a Digital Interface Module (DIF). The **RoadRunner** supports one digital interface module that plugs into a slot in the rear panel. Two types of DIFs are available, Terminal Adapter (TA) and non-TA. TAs connect directly to your ISDN line and allow dialing directly from the **RoadRunner** keypad. Non-TA type modules can connect to external terminal adapters or most other digital facilities, such as dedicated lines, fractional T1 or satellite systems.

MUSICAM USA offers three different TA modules, the TA101, TA201 and TA301. The TA101 and TA201 both provide an 'S/T' interface and

require an external network interface device (NT-1) for use in North America. Elsewhere, an external NT-1 is not required. The TA301 provides a 'U' interface through its built-in NT-1 and therefore can be used only in North America.

Connect the ISDN line to your internal terminal adapter (if so equipped). Be sure that there are no alarm conditions present on the terminal adapters or the NT-1. There should be no flashing LEDs or other alarm indications for proper operation. If using an external NT-1 with your terminal adapter, the 'U' interface (the wall connector) requires a 2-conductor cable. The 'S/T' interface (the **RoadRunner** side) requires an 8-conductor cable.

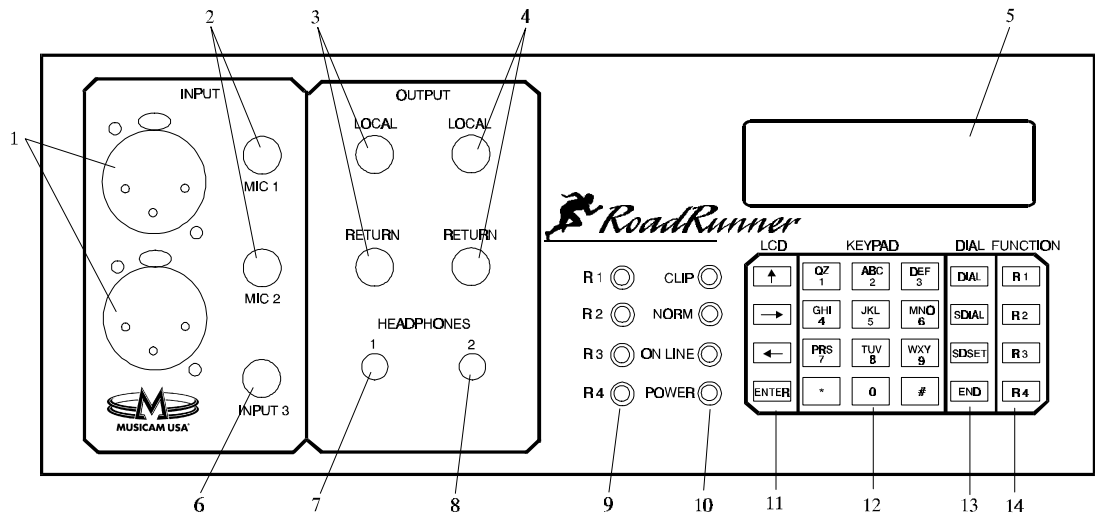
Two non-TA interfaces are also available for the **RoadRunner**. The DIF101 interface is used for connecting transmission systems using either X.21, RS422 or RS449 interfaces. The DIF102 interface connects to transmission systems using V.35 protocol.

All audio input and output is through industry standard connectors located on the front and rear panels. Two balanced XLR microphone inputs are located on the front panel as are two standard ¼" headphone jacks. An additional balanced input, switchable between microphone and line levels, is located on the rear panel. Also on the rear panel is an XLR balanced line level output for received audio from the far end unit and two ¼" unbalanced local and return audio outputs to feed recorders, PA systems, etc..

The four relay outputs (future) and optically isolated inputs (future) are accessed through the DB-25 connector, and there is a DB-9 connector for remote control and software upgrades. Connectors for AC power (100-240 VAC, 50/60 Hz) and 12 VDC power are also located on the rear panel, as is the power switch and fuse.

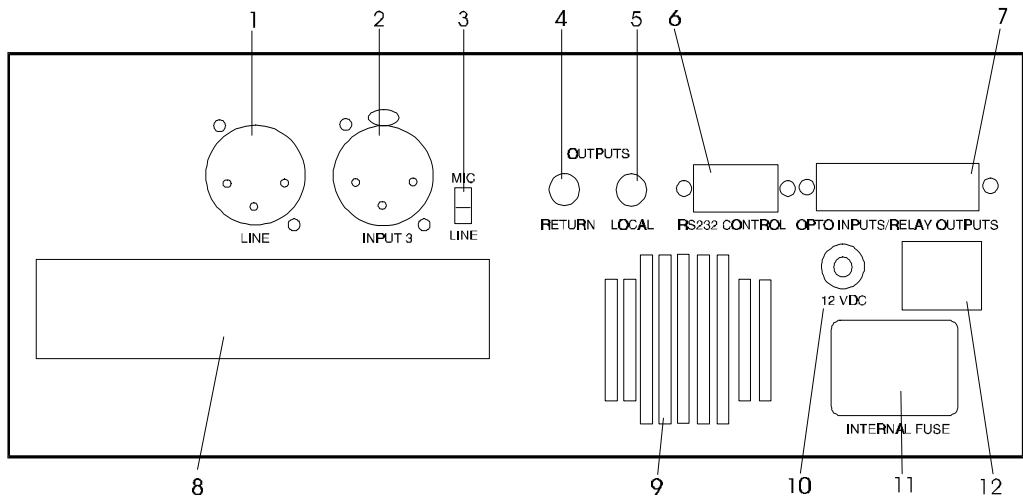
RoadRunner Overview

Front Panel Connectors and Controls



1	MICROPHONE INPUTS	Two balanced microphone inputs
2	MICROPHONE INPUT LEVEL CONTROLS	Adjusts level and mix for two microphone inputs
3	HEADPHONE 1 LEVEL CONTROLS	Adjusts send & return levels for headphone 1
4	HEADPHONE 2 LEVEL CONTROLS	Adjusts send & return levels for headphone 2
5	BACK-LIT LCD DISPLAY	Displays all control functions and modes
6	INPUT 3 LEVEL CONTROL	Adjusts level of mic/line input 3
7	HEADPHONE 1 OUTPUT	1/4" Headphone output
8	HEADPHONE 2 OUTPUT	1/4" Headphone output
9	RELAY STATUS INDICATORS	LED relay and cue status indicators
10	STATUS INDICATORS	LED RoadRunner status indicators
11	NAVIGATION KEYS	LCD Menu navigation keypad
12	ALPHANUMERIC KEYPAD	Configuration and dialing keypad
13	DIAL KEYS	Controls all dialing functions and directory maintenance
14	FUNCTION KEYS	Hot keys for one-button functions

Rear Panel Controls and Connectors



1	LINE OUTPUT	Balanced, fixed line level return audio output
2	INPUT 3	Microphone or line input 3
3	INPUT SELECTOR	Microphone or line level select for input 3
4	UNBALANCED RETURN AUDIO OUTPUT	Unbalanced line level return audio output
5	UNBALANCED LOCAL AUDIO OUTPUT	Unbalanced line level local audio output
6	RS232 CONTROL	DB-9 connector for remote control and software upgrades
7	RELAY OUTPUTS	DB-25 connector for contact closure I/O (future)
8	DIF SOCKET	Slot for digital interface module or ISDN terminal adapter
9	FAN	Cooling fan for reliable operation
10	DC POWER INPUT	Input for DC power
11	POWER CONNECTOR	AC Mains power connector
12	POWER SWITCH	Power switch

You can connect a professional quality low impedance microphone directly to either XLR microphone input on the front panel. A microphone can also be connected to the mic/line input on the rear panel, setting the level switch accordingly. High impedance microphones, or microphones with other than XLR connectors must use an external matching transformer or adapter. Phantom power is not provided. Balanced monaural line level audio is input through the XLR

Input 3 connector on the rear panel, setting the input level switch accordingly.

Mic/Line mixing is accomplished using the three input level controls located on the front panel. When audio is present, adjust the levels so that the green 'NORM' indicator illuminates and the red 'CLIP' indicator does not. It is recommended, but not necessary, to turn the level control down if an input is not connected.

Two sets of headphones with ¼" jacks can be used without adapters. When stereo headphones are used, the output will be monaural, to both ears. **Do not use monaural headphones with 2-conductor plugs.** The audio source to the headphones, local or return audio, can be adjusted using the two monitor level controls located above each headphone output. Level adjustments for each headphone are independent.

Balanced Line level return audio (audio from the far-end) is available through an XLR connector, and unbalanced line level local and return audio is available through two ¼" phone jacks. All output levels are fixed at 0 dBu relative to input levels.

A 9-pin connector for remote control and software maintenance is included, as is a 25-pin connector for the four relay outputs. There is also one slot that can hold any of the plug-in digital interface modules available from MUSICAM USA. Available modules include ISDN TAs, RS422, X.21 and V.35 interfaces. Although primarily an ISDN device, you can also use the **RoadRunner** with other digital transmission systems, such as Switched-56, dedicated lines, fractional T-1 and satellite systems using the appropriate digital interface module.

The **RoadRunner** can be used with 12 VDC or AC power. The universal AC power supply needs no jumpers, and works with 94 - 250 VAC, 50 or 60 Hz. Please note that the **RoadRunner** does require forced-air cooling, and that the rear mounted cooling fan should not be blocked.

The **RoadRunner** has a rich set of remote control commands that allow you to control it from an attached terminal or computer. A separate **RoadRunner Remote Control Command Reference Manual** is available from MUSICAM USA upon request.

Digital Interface Module

You can skip this chapter if your digital interface module or terminal adapter has been factory installed.

Installing the Digital Interface Module

A digital interface module is required to use your **RoadRunner** with a digital transmission system. Only one DIF module can be installed in the **RoadRunner** at a time. If you are using a DIF101 or DIF102 module for RS422, X.21 or V.35 interfaces use the appropriate cables, available from MUSICAM USA.

All DIFs are installed in the slot in the rear of the **RoadRunner**. You should make certain that the module has been installed correctly, not forced and has been securely fastened using the provided screws. You should not attempt to operate the **RoadRunner** if the DIF has not been properly installed and secured.

Once installed, the DIF module and interface type must be selected on the **RoadRunner** menu for proper operation.

RS422/RS449 and X.21 Using the DIF101 Digital Interface

The RS422 interface specification defines only the electrical voltages at the interface and leaves the pin-out and meaning of the pins to the hardware designer. The RS449 interface specification utilizes the electrical specifications of RS422 but specifies a mechanical connector. RS449 equipment is therefore electrically compatible with the **RoadRunner** RS422 interface when an appropriate adapter cable is used. RS449 also specifies numerous control signals besides clock and data, which are not used by the **RoadRunner**. The **RoadRunner** RS422 interface pin-out is specified in Appendix A.

The RS422 interface also has a separate clock for the transmitted and received data. The RS422 interface can also echo the transmitter clock.

If the terminal equipment clocks the encoder data with the echoed clock, the **RoadRunner** may be located up to 4000 feet (1219 meters) from the terminal equipment without concern for the encoder-to-clock skew.

The X.21 interface specification is, in general, a very complex specification. The general specification allows a mechanism for communication between the customer equipment and the network. This communication path can be used for things such as dialing. A subset of the specification, called the leased circuit, restricts the interconnection to only clock and data and a very simple control signal. The mechanical connector required is the DB15 with the pin-out specified in Appendix A. The electrical specification for X.21 is identical to those of RS422. The X.21 interface has only one clock for both the transmit and receive signals.

Since the X.21 uses the RS422 electrical interface, the **RoadRunner** can use the same connector for both interfaces. In the case of the X.21 interface, the single clock is used internally for both the transmit and receive timing. To change the hardware configuration of the DIF101 interface card between X.21 and RS422/RS449, change the position of jumper J4 on the interface module. The jumper on positions 1 and 2 is used for X.21, and when on positions 2 and 3, the card is set for RS422/RS449 operation.

V.35 Using the DIF102 Digital Interface

Each interface defines a voltage level for each of the signals. In the case of V.35 and X.21, a connector type is also defined. The large, rectangular connector defined in the V.35 specification is not used by the **RoadRunner** because of its size. Instead, a smaller DB15 connector is used. In the case of the V.35 interface, the **RoadRunner** conforms to the electrical specification but requires an adapter cable to convert the DB15 connector to the connector specified in the V.35 specification. The connector and the pin-out chosen for the V.35 interface in the **RoadRunner** are a common deviant found in many systems. An adapter cable is available from MUSICAM USA or distributors, or can be made following the diagram found in Appendix B. It is important to remember that V.35 has a separate clock for transmitted and received data.

ISDN Using the TA101 Terminal Adapter

The TA101 Terminal Adapter plugs directly into the **RoadRunner** and provides an 'S/T' interface to ISDN. The S/T interface requires an NT-1, which must be provided by the user for North American operation. Elsewhere, the service provider supplies the NT-1.

Since every country requires slightly different ISDN control and signaling information, the TA101 TA requires different ROM chips for different countries. If you have specified the country in which you will be using the **RoadRunner** when ordering, your TA101 will have the correct ROM chip installed. Please check with your local distributor, CCS Europe or MUSICAM USA if you will be taking your **RoadRunner** to foreign countries. Configuring the TA101 is discussed in later sections.

ISDN Using the TA201 Terminal Adapter

The TA201 Terminal Adapter plugs directly into the **RoadRunner** and provides an 'S/T' interface to ISDN. The S/T interface requires an NT-1, which must be provided by the user for North American operation. Elsewhere, the service provider supplies the NT-1.

The TA201 is pre-programmed with the ISDN configurations for all countries, and can be used everywhere without the need for changing ROM chips. Country selection is made in from the **RoadRunner's** menu, and will be discussed later.

ISDN Using the TA301 Terminal Adapter

The TA301 Terminal Adapter contains a built-in NT-1, providing a 'U' interface. Since outside North America, the NT-1 is supplied by the provider, and the network provides the 'S/T' interface, the TA301 can be used only in North America. Configuring the TA301 will be discussed later.

Using *RoadRunner*

After applying power to the RoadRunner, a boot sequence executes for approximately 30 seconds. This boot sequence initializes the DIF, digital signal processors, and control processor. After the boot sequence completes, the LCD display should look like this:

```
RoadRunner 1.xx
[Status] Operati
```

If a Terminal Adapter is installed in the *RoadRunner*, the ON LINE lamp may come on during the boot sequences but should extinguish upon completion. If the ON LINE lamp stays on after the boot sequence completes, re-boot the unit by turning the power off and on again. If a V.35 or X.21 interface is used, and an external TA is not selected, the ON LINE lamp will remain illuminated.

The *RoadRunner* can be fully configured and controlled using the built-in keypad and display. In addition, a full set of remote control commands is included so that your *RoadRunner* can be operated from a PC. The following sections discuss configuration and programming using the internal keypad. The remote control commands required for each operation are not included in this Users Guide. Complete remote control command syntax and options for each command can be found in the *RoadRunner* Remote Control Command Reference Manual, available upon request from MUSICAM USA.

Menu Navigation Using the Keypad and Display

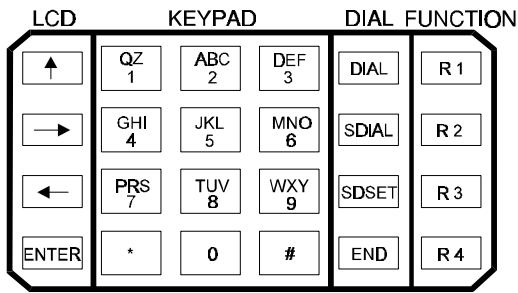
All *RoadRunner* functions can be accessed using the soft-touch keypad and LCD display.

The following discussion of menu navigation is based on the basic keypad and display as shown in the following figure. The top line of

the display is for information and prompts. The bottom line is for menu choice selection and information entry.



To use the keypad and display, press the arrow keys to move the cursor (the [] brackets) to the desired menu selection. Press the



ENTER key to execute the selection or move down to the next menu level. Pressing the (up arrow) at any time brings you up one menu level. At any given time, only a limited number of selections may be visible on the display. By using the and (left and right) arrow keys,

the display can be scrolled to show all possible options and selections.

! note:

The alphanumeric portion of the keypad is used for entering information and for dialing. Each of the 12 keys associated with the alphanumeric portion of the keypad represent up to four different characters. Multiple presses of the same key select different characters. **Please note: the QZ1 key is also the space key. Spaces are *not* entered using multiple presses of the right-arrow key.** The left and right arrow keys are used in conjunction with the alphanumeric keys to move the cursor to the desired position. After the desired character string has been formed, pressing the **ENTER** key executes or enters the string.

In the discussions that follow, the printed sequence <X><Y><Z> will be used as shorthand to mean: Use the arrow keys to move the cursor to 'X' and press , then use the arrow keys to scroll to 'Y' and press , finally, scroll to 'Z' and press .

The keys under the 'DIAL' label are used to enter and execute dialing functions such as direct dialing, speed dialing, directory maintenance and call termination. The last column of keys are 'Hot' keys. Pressing any one of these keys will execute one of the pre-programmed one-button functions.

!note:

Selecting A Digital Interface Module (DIF)

If the DIF was not factory installed, or if you change DIFs, you only need to select the Digital Interface the first time you use the **RoadRunner** with that DIF.

Once a DIF has been physically installed, you must set the **RoadRunner** to recognize the module. From the keypad, use the sequence:

<Maint><Dig I/F><Type>

and scroll through the menu to select the installed interface. The choices are:

TA101, TA201, TA301, X.21, X.21XTA, V.35, V.35XTA and RS422.

You can also use the remote control command **CI F** from a terminal or computer. Select the appropriate interface. Select V.35XTA or X.21XTA only if your external TA is capable of recognizing DTR or CON signals for call termination. This allows you to terminate a connection from the front panel of the **RoadRunner**. If your external TA cannot recognize these signals, then select V.35 or X.21.

!note:

TA Configuration

It is only necessary to configure a Terminal Adapter once, each time you connect to a different ISDN circuit.

Three different TAs are available for use in the **RoadRunner**. All must be configured properly for use with ISDN, and all require the user to have certain information, supplied by the ISDN service provider. The following information must be known before configuring TAs for use:

For TA201 and TA301, skip to page 21

North America:

- Switch Type (National ISDN-1 or Custom)
- Switch software version if switch type is Custom
- Switch manufacturer if type is National (for TA101 only)
- SPID numbers for each ISDN 'B' channel

Elsewhere:

- Switch type (if required)
- ETSI version
- Sub address (if required)

Terminal Adapter TA101 Configuration

The TA101 terminal adapter provides one 'S/T' interface for one ISDN BRI (2 x 64 kb/s) line. In North America, the Telco provides a 'U' interface; therefore, an external NT-1 must be used between the **RoadRunner** and the wall jack. Elsewhere, the Telco provides an 'S/T' interface and an external NT-1 is not needed.

! note:

The TA101 requires country specific ROM chips for use in different countries. Please contact MUSICAM USA, CCS-Europe or your local distributor for information if you plan to take your **RoadRunner** to a different country.

Probably the most confusing aspect of ISDN codecs is configuring the Terminal Adapter for the ISDN in your area. This is especially true in North America, where there are several local 'flavors' of ISDN that are all provisioned differently. Elsewhere, configuration of the terminal adapter may be as simple as insuring the proper ROM chip is installed for the country where the **RoadRunner** is being used.

In North America, the ISDN service provider must supply certain information to correctly configure the Terminal Adapter:

- Switch Manufacturer, e.g. AT&T, Seimens, Northern Telecom.
- ISDN 'flavor,' e.g., National ISDN or Custom Point-to-Point. Please note that the TA101 terminal adapter will not work with Custom Point-to-Multipoint.
- Service Provider Identification Numbers (SPID numbers). National ISDN *always* requires SPID numbers, some locations using Custom Point-to-Point *may* not require SPID numbers. If SPID numbers are required, most areas use two, but some implementations require only one.

Switch Type (North America and Germany Only)

It is necessary to tell the TA101 what type of switch protocol is being used at the Telco central office. The ISDN service provider will give this information to you. You only need to set the switch type once for each TA since the switch governs both. Use the menu branch:

```
<TA101><Setup><Sw Type>
```

then select the appropriate switch type. The **CSW** command is used for setting the switch type from a terminal.

In North America, four switch types are available:

- 5E6 is used for AT&T Custom Point-to-Point ISDN version 5E6 or earlier
- 5E8 is used for AT&T Custom Point-to-Point ISDN version 5E8 or later
- NTI is used when the switch is a Northern Telecom DMS-100 switch
- NI1 is used for all other National-ISDN-1 implementations, including AT&T.

German users have three choices: DSS1, 1TR6 and AUTO (AUTO will not work if a PBX is used). Contact CCS-Europe for information on which to use in your area.

!note:

Special Notes for Switch Type 5E6 and 5E9.1 Custom Point-to-Point (North America Only). Point-to-Multipoint is not supported:

If your service provider tells you that the switch type is an AT&T 5ESS Custom Point-to-Point with software version 6 or earlier, you cannot enter a SPID and ID number since these are not supported. Since SPID and ID numbers are not entered, you must tell the **RoadRunner** not to look for them, by setting Local Check to NONE, using the menu sequence

<TA101><Setup><Lcl Chk>

or the **CLC** command. If your service provider says your 5ESS switch is running software version 5E9.1 in Custom Point-to-Point configuration, they may give you SPID numbers. On the **RoadRunner**, select switch type 5E8, do not enter the SPID numbers, but enter the ID numbers and local check values. A TA reset may or may not result in a "SP1 BAD SP2 BAD" message. **When dialing, '1 + area code' dialing is required, even for local calls.**



Service Provider ID (SPID) Number (North America Only)

For *most* areas in North America, the TA must be told the SPID number of the *calling* ISDN line; that is, the line connected to the **RoadRunner**. The ISDN service provider in your area provides this number. **It is important to remember that every time the RoadRunner is moved, or whenever there is a change in the ISDN line, or even area code changes, the SPID and ID number, switch type and possibly other parameters for the TA setup must be updated.** You can store up to 20 ISDN SPID and location configurations for later recall.

To set the SPID number using the keypad, go down the branch

<TA101><Setup><SPID>

select the 'B' channel number, 1 or 2, and enter the provided SPID number. Please note that each TA supports 2 basic rate ISDN 'B' channels, so if your service provider gave you two SPID numbers, you must enter both of them, one for each 'B' channel. Use the **CSI** command to set the SPID number from a terminal.

Identification (ID) Number (North America Only)

If you are required to use two SPID numbers, then you must use ID numbers. For the TA101 terminal adapter, the ID number is just the last 4 digits of the ISDN line number connected to the **RoadRunner**. Use the

<TA101><Setup><ID>

branch, and enter the ID for each 'B' channel. You can use the **CLD** command from a terminal.

Multiple Subscriber Number (MSN/LDN — Europe Only)

If you have selected the DSS1 switch type in Germany, then MSNs must also be used. Use the

<TA101><Setup><ID>

or use the **CLD** command.

Local Check (North America Only)

If you are required to use ID numbers, you must also set the Local Check values. Local check tells the TA101 which internal buffers to check for the ID number. To set this parameter, branch down

<TA101><Setup><Lcl Chk>

and select the 'B' channel, then enter the number of the buffer that contains the ID number. You can use the **CLC** command from the terminal. The Local Check values for 'B' channel 1 should be 'T5' and for 'B' channel 2 should be 'T6'. If IDs are not used, local Check must be set to 'NONE.'

LLC State (United Kingdom)

In some areas of the United Kingdom it may be necessary to toggle the state of the Low Level Command mode. Use the LLC command sequence

<TA101><Setup>< LLC>

or the **CLL** command for this.

Sub Address, EAZ (Germany) And Interface Mode

The sub-address for an S/T interface TA (TA101) is set by the **CSA** command:

<TA101><Setup><Sub addr>

This command is used when a **RoadRunner** is connected to a digital PBX. If the TA101 is directly connected to an NT1, then the sub-address should be set to 0. Subaddresses are generally not used in North America. In Germany, when using the 1TR6 switch type, subaddresses are required. Use the **CSA** command to set the EAZ sub address.

The **CTF** command,

<TA101><Setup><I/F>

sets the interface mode of the internal TA101. **For North American operation the mode should always be set to IGNORE.** For operation elsewhere, initially start with the mode set to IGNORE. If you have problems making or receiving calls, then set the mode to ACTIVE.

Reset

After the above parameters have been set, it is necessary to reset the TA101 Terminal Adapter. The **CTR** command,

<TA101><Setup><Reset>

is used to reset the internal terminal adapter and to check if the SPID and ID numbers have been entered correctly for North American operation. The reset process takes from 20 to 40 seconds to complete, and the response will be flash for 2 seconds on the *top line* of the LCD display. The following responses are possible:

! note:

- SP1 OK SP2 OK SPID 1 and SPID 2 initialized properly
- SP1 OK SP 2 BAD SPID 1 initialized, SPID 2 did not
- SP1 BAD SP2 OK SPID 1 did not initialize, SPID 2 did
- SP1 BAD SP2 BAD Both SPIDs did not initialize.

If you require two SPID numbers, and if you get any response other than the first, your TA101 has not been configured properly and you will not be able to make or receive calls. If only one, or no SPID numbers are required, than any response may be OK. Try dialing and see if you can connect to another codec. If you get a bad response, or you cannot dial, please refer to the Troubleshooting Section before calling for assistance.

Terminal Adapter TA201 and TA301 Configuration for North America

The TA201 terminal adapter provides one S/T interface for one ISDN BRI (2 x 64 or 2 x 56 kb/s) line. In North America, the Telco provides a 'U' interface, therefore an external NT-1 must be used between the **RoadRunner** and the wall jack. Elsewhere, the Telco provides an S/T interface and an external NT-1 is not needed. The TA201 contains all country specific configuration and provisioning information in memory, and there is no need to change ROM chips when using your **RoadRunner** in a different country.

The TA301 is identical to the TA201 except that it contains a built-in NT-1 and connects directly to the ISDN 'U' interface provided in North America. **RoadRunner** units intended for use in North America will be shipped with the TA301 unless specified otherwise.

Probably the most confusing aspect of ISDN codecs is configuring the Terminal Adapter for the ISDN in your area. This is especially true in North America, where there are several local 'flavors' of ISDN that are all provisioned differently. Elsewhere, configuration of the terminal adapter may be as simple as insuring the proper country is selected.

In North America, the ISDN service provider must supply certain information to correctly configure the Terminal Adapter:

- ISDN 'flavor,' e.g., National ISDN or Custom.
- Service Provider Identification Numbers (SPID numbers). National ISDN *always* requires SPID numbers, but some locations using Custom ISDN may *not* require SPID numbers.

If SPID numbers are required, most areas use two, but some implementations require only one.

Selecting Country and Switch Type

It is necessary to tell the TA what type of switch protocol is being used at the Telco central office. The ISDN service provider will give this information to you. You only need to set the switch type once for each TA since it is impossible to have different switch types for the individual 'B' channels in an ISDN line. Select

<TAx01><Setup><N. America><Sw type>

then select the appropriate switch type, either National or AT&T Custom. Both the TA201 and TA301 are compatible with AT&T Custom Point-to-Multipoint ISDN service. The **CSW** command is used for setting the switch type from a terminal.

Service Provider ID (SPID) Number

For *most* areas in North American, the TA must be told the SPID number of the *calling* ISDN line, that is, the line to which the **RoadRunner** is connected. The ISDN service provider in your area provides this number. **It is important to remember that every time the RoadRunner is moved, or whenever there is a change in the ISDN line, or even area code changes, the SPID and ID number, switch type and possibly other parameters for the TA setup must be updated.** You can store up to 20 ISDN SPID location configurations for later recall.

! note:

To set the SPID number using the keypad, go down the branch

<TAx01><Setup><N. America><SPID>

selecting the desired 'B' channel, and enter the SPID number. Please note also, that each TA supports 2 basic rate ISDN 'B' channels, so if your service provider gave you two SPID numbers you must enter both of them, one for each 'B' channel. Use the **CSI** command to set the SPID number from a terminal.

Identification (ID) Number

If you are required to use two SPID numbers, than you must use ID numbers. For the TA201 and 301, the ID number is just the 7 digit ISDN line number connected to the **RoadRunner**. Use the



<TAx01><Setup><N. America><ID>

branch, and set the ID's for both 'B' channels from the keypad. Use the **CLD** command from a terminal.

The TA201 and TA301 use a 7-digit ID number for North American operation.

LLC

For North American operation the LLC must be set to ON. This lets the TA accept incoming calls at both 56 and 64 kb/s rates.

Reset

After the above parameters have been set, it is necessary to reset the terminal adapter. The **CTR** command is used to reset the internal terminal adapter.

<TAx01><Setup><N. America><Reset>

The TA201 and TA301 currently return no information after a reset.

Terminal Adapter TA201 Configuration, Non-North American Operation

The TA201 terminal adapter provides one S/T interface for one ISDN BRI (2x64 or 2x56 kb/s) line. The TA201 contains all country specific configuration and provisioning information in memory, and there is no need to change ROM chips when using your **RoadRunner** in a different country. Use the Germany setting for most of Europe, except France.

Selecting Country and Switch Type

It is necessary to tell the TA what country and switch protocol is being used by the PTT central office. The ISDN service provider will give this information to you. You only need to set the switch type once for each TA since the switch governs both "B" channels in an ISDN line. Select

<TA201><Setup>< *country* ><Sw type>

where *country* = Germany, France, UK or Japan

then select the appropriate switch type (Germany only), either DSS1 or 1TR6. The **CSW** command is used for setting the switch type from a terminal.

LDN / MSN Number

The MSN (Multiple Subscriber Number) allows you to connect several codecs (terminal adapters) to one ISDN bus if the DSS1 Euro-ISDN protocol is used. Each TA201 interface requires two MSN numbers, one for each 64 kb/s channel. You do not need to enter the whole MSN, you just have to enter the last different digits. For example, if your MSN for line 1 is 8115517571 and for line 2 is 8115517581, then you only need to enter '71' and '81' for the MSNs. Use the

<TA201><Setup><country><LDN>

path or the **CLD** command.

LLC (Low Level Command) State (UK Only)

Although this menu item appears under all countries, it is only necessary to set the LLC state in the United Kingdom. Different areas in the UK require different settings. If your TA201 cannot dial properly with the default setting, toggle the setting. Remember that you must set each 'B' channel to the proper state. Use the

<TA201><Setup><country><LLC>

path or the **CLL** command.

Sub-Address and Interface Mode

Sub-addresses are required when using the German 1TR6 switch protocol. Like the MSN used with DSS1, the sub-address enables you to connect several codecs (terminal adapters) to the same ISDN bus. For every terminal adapter, you need two sub-addresses (EAZ numbers), one for each 64 kb/s channel, numbers between 1 and 8.

<TA201><Setup><country><Sub addr>

or use the **CSA** command.

The **RoadRunner's** interface mode has a different meaning for the TA201 terminal adapter when not used in North America. Some ISDN implementations in some countries require LLC (Low Layer Compatibility) to be turned off. For example, some DSS1 networks in the United Kingdom require LLC and Interface to be turned OFF.

<TA201><Setup><country><I/F>

or use the **CTF** command.

Reset

After the above parameters have been set, it is necessary to reset the TA201 Terminal Adapter. The **CTR** command

<TA201><Setup><country><Reset>

is used to reset the internal terminal adapter. The TA201 and TA301 currently return no information after a reset.

Other TA Parameters — Auto Answer, Auto Reconnect, Dial Time Out and Redial Attempts

The **CAA** command,

<Maint><Dig I/F><Auto Ans>

can be used to switch the TA out of the auto answer mode. If the TA is not in the auto-answer mode, then it will not accept any incoming calls. The factory default is set to auto-answer ON. This feature is useful if you want to prevent anyone from dialing into your **RoadRunner**.

If you call another codec and the connection is lost, it is possible to have the **RoadRunner** automatically redial the connection. This is done by setting AutoReCon to YES using the **CAC** command,

<Maint><Dig I/F><AutoReCon>.

This is a very powerful feature when less than ideal lines are used. Remember, however, that when this feature is enabled, only the calling **RoadRunner** can terminate the connection. Also note that the **RoadRunner** will only attempt to redial for the number of times for which REDIAL is set.

The **CRD** command (Redial),

<Maint><Dig I/F><Redial>

sets how many times the **RoadRunner** will attempt to establish connection before giving up. The factory default is 1 redial attempt, i.e., the **RoadRunner** will dial each connection twice. The redial can be aborted by pressing the up arrow button any time after the first dial attempt.

The dial time-out command **CTO** (Dial TO)

<Maint><Dig I/F><Dial To>

! note:

sets the time that the **RoadRunner** waits for a connection to be established before giving up. You may need to set the time out to a higher value when using international dialing with long distance access codes.

Terminal Adapter TA201/TA301 Software Version

From time to time the TA201/TA301 terminal adapter software may be enhanced as features are added. Upgrading software is as simple as replacing a ROM chip on the terminal adapter. To determine the current ROM version, use the sequence

<TAx01><Setup><country><Version>

or use the **VER** command.

Using TA Configuration Memory

The **RoadRunner** has the capability to store and recall up to 20 different TA configurations. This feature is ideal if you use your **RoadRunner** from multiple locations. For example, once you have set up a TA for use in a particular venue, you have only to recall that setup the next time you return to that venue.

All relevant parameters are saved: TA type, switch type, SPID and ID numbers, local check values, sub addresses, etc.

Saving Current TA Configuration

To save the current TA configuration, use the keypad sequence:

<TA Type><Save>.

Where *TA Type* is the installed terminal adapter type, either TA101, TA201 or TA301.

When prompted, use the keypad to enter a descriptive name and press **ENTER**. From a terminal or computer, use the **CTE** command and enter a descriptive name. In either case the **RoadRunner** will return an ID number for later recall.

Loading Stored Configurations

To recall a previously stored TA configuration, use the keypad sequence

<TA Type><Recall>

view the stored table using the keypad left and right arrow keys. A sample display is shown here:

ID:5	2-7
MYOFFICE	

This display shows the ID number of the named configuration, and also shows the total number of stored configurations. In this example, the configuration 'MYOFFICE' is ID number 5, and it is the second of 7 stored configurations. Remember that the configurations are stored alphabetically.

When the desired configuration is found, press the **ENTER** key to load it.

Stored Configuration Table Maintenance

The **RoadRunner** is capable of storing up to twenty location specific TA configurations. Adding new configurations is as easy as saving the current configuration, as described above. Loading a table entry from the view menu is as easy as pressing the **ENTER** key once the desired entry is found. Viewing all of the stored entries is also simple. Load the table using the keypad sequence <TA Type><Recall> and scroll through the table entries using the left and right arrow keys.

To erase a table entry, or clear the entire table, use the keypad sequences:

<User Profile><TA Cnfr><Del entry>
or
<User Profile><TA Cnfr><Clear all>

From a terminal use the **CTD** command to clear one or all stored TA configurations.

Audio I/O and Level Adjustments

The **RoadRunner** contains a three channel audio mixer. Input 3 (rear panel input) can support both microphone and line level sources, and the input level is changed with the switch located next to the input connector. All inputs are balanced, with a maximum input level of -30 dBu for microphones and +18 dBu for line level. You can connect professional quality, low impedance microphones directly. Phantom

power is not provided, nor are unbalanced inputs. High impedance or unbalanced microphones will require external matching devices. Alternatively, you can connect unbalanced sources by connecting hot to pin 2 and ground to pin 3 of the XLR connector. In this case, you should keep the audio leads as short as possible.

Adjust the input levels so that the green 'NORM' light illuminates when audio is present and the red 'CLIP' lamp does not. It is recommended, but not necessary, to turn the level controls down on inputs that are not in use.

Two headphone outputs are available, and the mix of local and return audio can be adjusted individually for each headphone circuit. Although the **RoadRunner** is a monaural device, the headphone connectors are designed for stereo headphones, and audio is sent to both ears. Do not use monaural headphones with two conductor plugs.

Balanced line level return audio as well as unbalanced line level local and return audio outputs are available on the rear panel. The output levels are fixed at 0 dBu (at nominal input level), >600 Ohm output impedance. The unbalanced outputs use three conductor connectors, with tip and ring wired in parallel. **Do not use two conductor plugs, as these will short the output.**

! note:

Output Channel Selection (Future)

Although the **RoadRunner** is a monaural device, in many instances you will be connecting to a stereo codec. Most stereo codecs, when in monaural mode, transmit only the left channel audio. Some stereo codecs, such as the **CDQPrima** series, can switch between sending the left or right channel audio, or can even mix the left and right inputs to achieve mono.

The **RoadRunner** offers a unique feature that allows you to receive either the left channel audio or the right channel audio when connected to a stereo codec (configured in the stereo or dual mono mode). This allows you to switch between two program sources if the stereo codec is configured with different programming on the left and right channels. To use this feature, the keypad sequence:

<Advanced><Decoder><More><Audio Out><Channel>

or the command **DCS** is used.

This feature is not implemented with the current software.

Audio Output Muting

The *return* audio can be muted using the

<Advanced><Decoder><More><Audio Out><Mute>

sequence or the **DMU** command. All return audio outputs, including the headphone, are muted simultaneously.

Loopback Testing

Loopback testing is a valuable tool for adjusting audio I/O and for debugging. System loopback puts the **RoadRunner** into loopback by linking the encoder output to the decoder input. When in loopback mode, any audio fed into the **RoadRunner** will appear at the return audio outputs. System loopback can be used when the **RoadRunner** is either on-line or off-line. When on-line and in loopback, you will hear local audio, not audio from the far end codec.

Use the keypad sequence

<Sys LB><Loopback>

to set the loopback mode, or the **CSL** command to set the loopback mode from a terminal or computer. The loopback bit rate selection is automatic and determined by the current encoder bit rate.

FOR NORMAL OPERATION THE LOOPBACK MODE MUST BE SET TO NONE.

To return the **RoadRunner** to normal operation, use the keypad sequence

<Sys LB><None>

Encoder and Decoder Configuration

Since no single algorithm is ideal for all applications, the **RoadRunner** offers several different algorithm/sample rate/bit rate combinations, each with advantages and disadvantages. In addition, the full range of available algorithms insures that your **RoadRunner** can connect with the widest number of codecs. The table below compares some of the algorithm/sample rate/bit rate combinations that are available. Recommended combinations are indicated with a 📄.

Algorithm	Sample	Bit rate	Bandwidth	Delay	Cascade
-----------	--------	----------	-----------	-------	---------

! note:

	rate					
G.722	16 kHz	56/64 kb/s	7.5 kHz	very low	poor	
MUSICAM	24 kHz	56/64 kb/s	10.2 kHz	moderate	good	📄
MUSICAM	48 kHz	56/64 kb/s	8.5 kHz	moderate	fair	
Layer III	32 kHz	56/64 kb/s	15 kHz	long	poor	
Layer III	48 kHz	56/64 kb/s	15 kHz	long	poor	
MUSICAM	48 kHz	112/128 kb/s	20 kHz	moderate	excellent	📄
Layer III	48 kHz	112/128 kb/s	20 kHz	long	fair	

G.722 is an early compression algorithm based on ADPCM (Adaptive-Predictive Pulse Code Modulation). The delay of this algorithm is very low, and is ideal when talk-back or two-way, on-air conversations are required. Although G.722 has limited bandwidth and audible artifacts, and it is quite acceptable for most voice applications. G.722 does not cascade (re-compress) well and artifacts build up quickly when a decoded bit stream is re-encoded.

MUSCIAM, MUSICAM USA's enhanced version of ISO/MPEG Layer II, offers the best possible combination of fidelity, moderate delay and cascading ability at all bit rates. For best possible sound when using lower bit rates (56 and 64 kb/s), use 24 kHz sampling if it is supported by the far-end codec. At 56 or 64 kb/s using 24 kHz sampling, MUSICAM delivers a bandwidth of 10.5 kHz with exceptional signal-to-noise figures and minimal artifacts. At this bit rate MUSICAM is ideal for all voice applications and delivers satisfactory performance for many music applications.

MUSICAM cascades well and the sound quality does not degrade with post-processing and equalization. At 112 or 128 kb/s, MUSICAM is transparent and provides a bandwidth of 20 kHz with exceptional signal-to-noise performance.

!note:

Please remember that MUSICAM is a fully compatible enhancement to the ISO/MPEG Layer II standard algorithm. All enhancements are to the encoder; the decoder is defined by the international Standards organizations, and has been left unchanged. Therefore, when receiving audio from a standard Layer II codec, the audio you hear will be Layer

II, but the audio heard at the far-end will be MUSICAM. MUSICAM encoding makes *any* Layer II decoder sound better.

CCSO and **CCSN** are both MUSICAM Layer II algorithms that are used to communicate with older CCS Audio Products codecs built before MPEG Layer II standardization.

Layer III provides the widest bandwidth at low bit rates, up to 15 kHz at bit rates of 56 or 64 kb/s. Layer III is widely used at these low bit rates when wide bandwidth is required; however, the disadvantages of Layer III may outweigh this advantage. Layer III has long delay, noticeable high frequency artifacts and does not cascade well. In addition, post processing and equalization may adversely affect the final audio quality. As with MUSICAM at lower bit rates, lower sampling rates will provide better audio quality. At high bit rates (112 and 128 kb/s) Layer III can provide transparent 20 kHz monaural audio but still has the same disadvantages. Even at high bit rates, Layer III has long delay, does not cascade as well as MUSICAM, and is adversely affected by post-processing. In some applications, Layer III may provide better-perceived audio than standard Layer II, but in most applications, MUSICAM has been judged to be the superior algorithm.

Quick Setup

The **RoadRunner** offers three ways of configuring the encoder and decoder: Quick Setup, Advanced Setup and pre-programmed Quick Configurations. Quick Setup is ideal when all encoder and decoder parameters are the same. Quick Setup assumes that the decoder is not independent of the encoder, and that the encoder and decoder bit rate and line formats are the same. You can use this Quick Setup routine when connecting to any MUSICAM USA or CCS Audio Products codec. You must use the Advanced Setup sequence when connecting to other manufacturer's codecs, since the decoder independent mode must be used.

Using the Quick Setup is easy. Select

<Operation><algorithm><Setup>

where *algorithm* = MPEGL2, MPEGL3, G.722, CCSO or CCSN

Once in the setup sequence, enter the bit rate, sample rate and line format. Once configured, activate the algorithm using the

!note:

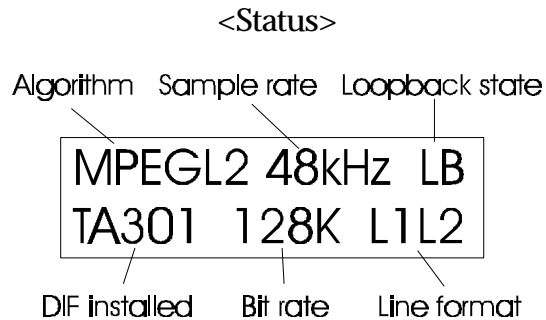
<Operation><algorithm><Activate>

Sequence.

For compatibility with European telephones manufactured by PKI, there are three modes of operation when using the G.722 algorithm. Select NORMAL when connecting to a standard G.722 codec. When connecting to a PKI telephone, you must select either NEWPKI or OLDPKI, depending on the age of the telephone.

Quick Status

The **RoadRunner** offers a status screen that enables the user to confirm the current configuration at a glance. The status screen, an example is shown here, is accessed by pressing the **[F1]** button or by using the keypad sequence:



The top line shows the selected encoder algorithm (which may be different from the decoder algorithm), the sample rate and the loopback state. LB indicates the **RoadRunner** is in loopback, blank indicates normal operation.

The bottom line shows which DIF is installed, the selected encoder bit rate and line format. Flashing lines indicate that the line is selected but not connected.

Advanced Encoder and Decoder Configuration

When connecting to non-MUSICAM USA or CCS Audio Products codecs, when using different algorithms and/or line formats for send and return programming or when broadcasting to two locations, it is necessary to use the Advanced Setup sequence. Using the Advanced Setup is no more difficult than the Quick Setup, only more information is required for complete configuration.

Encoder Configuration

To configure the encoder algorithm, line format and sample rate, use either the Quick setup, as described above, or a Quick Configuration as discussed later. The advanced encoder configuration is only used to set the Sine detector, ACE error concealment and header bits.

To access the advanced encoder configuration menu, select

<Advanced><Encoder>

and follow the sequence to select error concealment (ACE), sine detector and header bits. The following choices are available:

ACE:	ON or OFF
Sine Detector:	ON or OFF
ISO Header:	Individually selectable—Copyright, Emphasis, Original, Protect and Private

ACE (ESP) — ACE (Advanced Concealment of Errors) uses scale factor protection to add another layer of error correction to the already robust MUSICAM algorithm. ACE should be used when less than ideal ISDN lines are used, or when occasional audio artifacts caused by line errors cannot be tolerated. Scale factor protection is *not* supported by all codecs. Only MUSICAM USA's **CDQPrima** Series and **RoadRunner** codecs support ACE. ACE is also *not* bi-directional. If you enable scale factor protection on your encoder, the far end decoder must also enable scale factor protection or audio will be muted.

Sine detector (ESD) — The encoder sine detector is used only when using test equipment to evaluate codec performance. **For normal operation, the sine detector should be OFF. However, Factory default is ON**

ISO Header bits — There are five user settable ISO header bits: Copyright (**ECR**), Emphasis (**EEP**), Original (**EOR**), Protect, (**EPR**) and Private (**EPI**). These bits can be used as signaling bits by the far end decoder. The state of these bits is can be observed using the decoder status bits on all **CDQPrima** and **RoadRunner** codecs.

Decoder Configuration

To access the advanced decoder configuration menu, select

<Advanced><Decoder>

and follow the sequence to select independent operation, algorithm and line format. Other advanced configuration parameters are available using

!note:

!note:

To manually configure the decoder algorithm, bit rate and line format, you must first select Decoder Independent YES

the menu sequence. Other selections include mute, channel select, ACE (scale factor protection) and status bits. The following choices are available:

Independent:	YES or NO
Bit Rate:	56, 64, 112 or 128 kb/s (if independent selected)
Algorithm:	MPEG Layer 2 (MUSICAM), MPEG Layer 3 or G.722 (if independent selected)
Line format:	1 line (line 1 or line 2) or 2 line (lines 1 and 2) (if independent selected)
Mute:	ON or OFF
Channel:	LEFT or RIGHT
ACE:	ON or OFF
Status bits:	Monitor the state of the user header bits

! note:

Decoder Independent (DIN) — Codecs manufactured by MUSICAM USA and CCS Audio Products contain decoders that are normally slaved to the encoder format, making separate encoder and decoder setups unnecessary. **Codecs manufactured by anyone else, including Telos and Comrex, not have this decoder/encoder interaction. It is therefore necessary to run the decoder independently from the encoder when connecting your RoadRunner to other manufacturer's codecs. It is also necessary to run the decoder independently when the decoder configuration is not the same as the encoder configuration. The decoder bit rate, algorithm and line format setup sequence will load only when decoder independent is selected.**

Decoder bit rate (DBR) — For best results, you should select the highest bit rate available end-to-end and appropriate to your application. When the decoder is independent from the encoder, it is possible to select a different bit rate for each direction of transmission as long as the basic clock rate is the same. For example, you can send audio at 64 kb/s, and receive audio at 128 kb/s, but not at 112 kb/s, since a different basic rate is used. You cannot mix 56 and 64 kb/s basic rates.

Decoder algorithm (DAL) — A detailed discussion of the available algorithms can be found in an earlier section. When operating independently, the algorithm used can be different for each direction of transmission.

Decoder line format (DLI) — With an internal terminal adapter or when using the G.722 algorithm, you must use a single line format when using a

bit rate of 56 or 64 kb/s. When using 112 or 128 kb/s bit rate with an internal terminal adapter, use the two-line format. The two line format requires two connections be made to the far-end codec; that is, both ISDN 'B' channels are used. When connected to two far end codecs simultaneously, you can switch the return audio between the two units by changing the Line Format from Line 1 to Line 2.

Decoder Mute (DMU) and **Channel Select (DCS)** — These decoder parameters have been discussed in an earlier section.

ACE (DSP) — ACE is discussed in detail in the Encoder Configuration section. If the far end encoder has ACE enabled, you must enable your decoder ACE.

Status bits (DRS) — The status bits are used to 'read' the status of the user selectable encoder header bits.

Broadcasting

With a single **RoadRunner**, it is possible to send the same audio program to two different locations simultaneously. In addition, it is also possible to monitor the return audio from either of the two locations, and instantly switch between them. You can even send the audio from one far end location to the other!

Set the encoder to the desired algorithm and sample rate. You must use either 56 or 64 kb/s, and set the encoder line format to Line 1. Set the decoder parameters to match your application (remember, the return audio algorithm does not have to be the same as the send algorithm) and the decoder to Independent. Setting the decoder line format to Line 1 enables you to monitor the return audio from location 1, and setting the decoder line format to Line 2 monitors return audio from location 2. To send audio from one location to another, just loop the **RoadRunner**'s audio output to the audio input.

Speed Dial and Quick Configuration directory

The **RoadRunner** has a Speed Dial directory capable of holding up to 256 entries. Each entry contains all the information required to completely configure the **RoadRunner**'s encoder and decoder sections, as well as (optionally) storing up to two ISDN 'B' channel telephone numbers for establishing the connection.

Pre-Programmed Quick Configurations

Your **RoadRunner** shipped from the factory with many of the most common configurations pre-programmed into the speed dial directory. Using these pre-programmed configurations insures trouble free communications with all MUSICAM USA and CCS Audio Products codecs, and most other compatible codecs. Please note that some early Telos Zephyr codecs may not be compatible *in all modes* with the **RoadRunner**.

The following configurations have been pre-loaded into **RoadRunner**. When connecting to a non-MUSICAM USA or CCS Audio Products codec, you must use a 'Decoder Independent' configuration. If connecting to a **CDQPrima**, use the Prima equivalent Quick Configuration on the **CDQPrima**, setting the encoder to mono for joint stereo configurations.

ID	Description	Bit Rate	Sample Rate	Algorithm	Line format	Decoder Independent	Prima Equiv.
0	L2/56/24NO:QS	56	24	MPEGL2	Line 1	No	16
1	L2/56/24YES:QS	56	24	MPEGL2	Line 1	Yes	
2	L2/56/32NO:QS	56	32	MPEGL2	Line 1	No	
3	L2/56/32YES:QS	56	32	MPEGL2	Line 1	Yes	
4	L2/56/48NO:QS	56	48	MPEGL2	Line 1	No	9
5	L2/56/48YES:QS	56	48	MPEGL2	Line 1	Yes	24
6	L2/64/24NO:QS	64	24	MPEGL2	Line 1	No	0
7	L2/64/24YES:QS	64	24	MPEGL2	Line 1	Yes	
8	L2/64/32NO:QS	64	32	MPEGL2	Line 1	No	
9	L2/64/32YES:QS	64	32	MPEGL2	Line 1	Yes	
10	L2/64/48NO:QS	64	48	MPEGL2	Line 1	No	8
11	L2/64/48YES:QS	64	48	MPEGL2	Line 1	Yes	25
12	L2112/32NO:QS	112	32	MPEGL2	2 Line	No	23
13	L2112/32YES:QS	112	32	MPEGL2	2 Line	Yes	
14	L2112/48NO:QS	112	48	MPEGL2	2 Line	No	21
15	L2112/48YES:QS	112	48	MPEGL2	2 Line	Yes	26
16	L2128/32NO:QS	128	32	MPEGL2	2 Line	No	22
17	L2128/32YES:QS	128	32	MPEGL2	2 Line	Yes	
18	L2128/48NO:QS	128	48	MPEGL2	2 Line	No	20

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19	L2128/48YES:QS	128	48	MPEGL2	2 Line	Yes	27
20	L3/56/24NO:QS	56	24	Layer 3	Line 1	No	
21	L3/56/24YES:QS	56	24	Layer 3	Line 1	Yes	
22	L3/56/32NO:QS	56	32	Layer 3	Line 1	No	
23	L3/56/32YES:QS	56	32	Layer 3	Line 1	Yes	
24	L3/56/48NO:QS	56	48	Layer 3	Line 1	No	28
25	L3/56/48YES:QS	56	48	Layer 3	Line 1	Yes	30
26	L3/64/24NO:QS	64	24	Layer 3	Line 1	No	
27	L3/64/24YES:QS	64	24	Layer 3	Line 1	Yes	
28	L3/64/32NO:QS	64	32	Layer 3	Line 1	No	
29	L3/64/32YES:QS	64	32	Layer 3	Line 1	Yes	
30	L3/64/48NO:QS	64	48	Layer 3	Line 1	No	29
31	L3/64/48YES:QS	64	48	Layer 3	Line 1	Yes	31
32	L3112/32NO:QS	112	32	Layer 3	2 Line	No	
33	L3112/32YES:QS	112	32	Layer 3	2 Line	Yes	
34	L3112/48NO:QS	112	48	Layer 3	2 Line	No	
35	L3112/48YES:QS	112	48	Layer 3	2 Line	Yes	
36	L3128/32NO:QS	128	32	Layer 3	2 Line	No	
37	L3128/32YES:QS	128	32	Layer 3	2 Line	Yes	
38	L3128/48NO:QS	128	48	Layer 3	2 Line	No	
39	L3128/48YES:QS	128	48	Layer 3	2 Line	Yes	
40	G.722/56NO:QS	56	16	G.722	Line 1	No	6
41	G.722/56YES:QS	56	16	G.722	Line 1	Yes	
42	G.722/64NO:QS	64	16	G.722	Line 1	No	7
43	G.722/64YES:QS	64	16	G.722	Line 1	Yes	
44	G.722/H.221:QS	64	16	G.722/H.221	Line 1	No	
45	MUSICLINE56	56	24	MPEGL2	Line 1	No	*
46	MUSICLINE64	64	24	MPEGL2	Line 1	No	*
47	MUSICLINE112	112	48	MPEGL2	2 Line	No	*
48	MUSICLINE128	128	48	MPEGL2	2 Line	No	*

To load a Quick Configuration, press the **SDIAL** button, enter the ID number and press **ENTER**. You can also use the **CSD** command from a terminal.

! note:

If you do not know the ID number, you can scroll through the directory pressing the **SDSET** key and selecting the <View Dir> option. Use the arrow keys to view the directory. Once the desired entry is found, press the **ENTER** key *twice* to execute the configuration.

Please note that your **RoadRunner** is pre-programmed with MUSICAM USA's 24 hour Music Line numbers. Speed Dial entries 45 through 47 will automatically dial into our Music Line if your **RoadRunner** is equipped with an internal terminal adapter and is connected to an active ISDN line. The Music Line numbers are programmed for North American use, with no PBX or access codes. For testing outside North America, or when connecting through a PBX system, the numbers will have to be edited.

Creating Quick Configurations and Speed Dial Entries

Once you have configured the encoder and decoder to your satisfaction, you can save the configuration for later recall. To automatically create your own Quick Configuration using the current settings, simply press the **SDSET** button, and select the <Save Current> option. You will be prompted to enter a descriptive name, up to 20 characters. Terminate the name by pressing the **ENTER** key. **RoadRunner** will return an ID number that can be used to recall the configuration. Alternatively, you can use the

<User Profile><Speed Dial><Save CRNT>

sequence, or the **CSE** command from a terminal.

Saving the current configuration when the **RoadRunner** is not connected to another codec (off-line) creates a non-dialing Quick Configuration. Saving the current configuration when the **RoadRunner** has dialed into and is on-line with another codec saves the configuration *and* the phone numbers, thus creating a Speed Dial entry.

Using and editing Quick Configurations and Speed Dial entries will be discussed in a later section.

You can also manually add an entry into the Speed Dial table using the

<User Profile><Speed Dial><Add entry>

sequence. Follow the prompts, entering all information in sequence. The **RoadRunner** will return the ID number of the new entry. If you

enter the '#' character as the phone number, the entry will be saved as a non-dialing Quick Configuration.

Deleting and Editing Quick Configurations

Although the Quick Configuration/Speed Dial directory can hold up to 256 entries, the table can quickly become full of no longer used entries. To delete the entries that are no longer used, press the **SDSET** button, select <Delete entry> from the menu and enter the ID number of the entry to delete. You will *not* be prompted to verify your selection before the **RoadRunner** deletes it. You can also use the **CDS** command from a terminal. If you do not know the ID number of the entry you want to delete, scroll through the directory by pressing the **SDSET** button and selecting the <View Dir> option.

You can also delete the entire Speed Dial table although this is not recommended since the 47 preloaded configurations will also be lost.

To edit an entry, press the **SDSET** button and select the <Edit entry> option from the menu. Using the left and right arrow keys, locate the entry you wish to change. Press **ENTER**. Use the arrow keys to scroll through the parameters. Once the parameter you wish to change is displayed, press **ENTER** to change it. Pressing the up arrow will save the change and overwrite the current parameter value. Note that the ID number will not be changed.

Speed Dialing and Using Quick Configurations

The only difference between speed dialing and Quick Configurations is that the Speed Dial entries have phone numbers associated with them and Quick Configurations do not. As with Quick Configurations, all Speed Dial entries set all relevant encoder and decoder parameters, but they also dial out to other codecs. Therefore, unlike Quick Configurations, speed dialing works only when an internal terminal adapter is used.

To load a Quick Configuration or Speed Dial, press the **SDIAL** button, enter the ID number assigned by the **RoadRunner** and press **ENTER**. You can also use the **CSD** command from a terminal.

If you do not know the ID number, you can scroll through the directory using the keypress sequence **SDSET** <View Dir> and use the arrow keys to view the directory. Once the desired entry is found, press the **ENTER**

key twice to execute the configuration or dial. Remember that Speed Dial entries share the same directory as Quick Configurations.

Manual Dialing

It is easy to use the front panel dialing keypad to make all connections. Once you have selected the encoder and decoder parameters (or used a Quick-Configuration), simply press the **DIAL** button. The **RoadRunner** will prompt whether to dial both lines, line 1 or line 2. Once selected, just enter the phone number and press the **ENTER** key. If you have selected 112 or 128 kb/s operation or 2-line dialing, you will be prompted to enter a second number. **RoadRunner** remembers the last number dialed on each line is remembered until power is removed.

You can abort the dialing sequence at any time by pressing the up arrow key before the connection is established. Once the connection has been established, press the **END** key followed by the **ENTER** key to hang up.

Setting the encoder bit rate also sets the connection bit rate. Remember that you can use the front panel keypad for dialing only with an internal terminal adapter. To dial from a terminal, use the **CDI** command, and use the **CHU** command to hang up.

Call Termination

No matter how a connection was established, manually, using Speed Dial, or initiated from a far end codec, a call is terminated by pressing the **END** button, selecting the lines to drop, and the pressing the **ENTER** button.

Advanced Features

Remote Control

The **RoadRunner** can be connected to a computer or terminal for remote control operation. Any terminal emulation program for PC, Macintosh or Sun can be used as long as VT-100 emulation, no parity, 8 data bits and 1 stop bit is supported. A standard, 9-pin RS232 data cable can be used to connect your PC's Com port to the **RoadRunner's** remote control connector. X-ON/X-OFF protocol is not supported. See appendix C for the connector pin-outs.

There are well over 50 commands that can be used to operate all **RoadRunner** functions. On-line command syntax help is available for all remote control commands, and can be accessed from the terminal by typing

HELP *command* where *command* is the 3-letter command name.

All commands are divided into categories, such as common, encoder, decoder, etc. Command categories are listed by the command

HELP ?

Commands within each category are displayed by typing

HELP *number* where *number* is the command category number.

A complete list of all remote control commands, showing command syntax and descriptions is available from MUSICAM USA for a nominal shipping and handling charge.

Configuring the rear panel remote control port is accomplished from the front panel keypad using the sequence:

<Maint><Rmt Ctl>.

The options available are Port Baud (**CRB**), Protocol (**CPC**) and Command Echo (**CRE**). Baud rates from 1,200 to 38,400 bps are supported. For normal operation, Protocol should be set to NO and Echo should be set to YES. It may be necessary to set Protocol to YES if you are controlling the **RoadRunner** from within another program or application.

Software Maintenance and Upgrading

If any single feature can be highlighted that sets the **RoadRunner** apart from all other similar codecs available today, it is the **RoadRunner's** ability to easily upgrade not only the control software, but also the software controlling the audio compression algorithms. The software that controls all processors within the **RoadRunner**, including the powerful control processor and all DSPs, is contained in non-volatile flash-RAM. This allows the software to be easily updated as advances are made, without having to return the **RoadRunner** to the factory.

The current command processor version is always displayed after the **RoadRunner** boots, and this and all other software module versions can be displayed at any time using the

<Maint><General><Version>

sequence, or the **MVN** command. Please remember that not all software modules have the same version number.

Upgrading your **RoadRunner**'s software is easy, and requires only an IBM compatible PC and a remote control cable. Windows is not required since all downloads are performed from the DOS prompt. MAC download routines are not available, but we have found that some Windows and DOS emulation programs for the MAC do work for this application. If a PC is not available, software can be downloaded from the factory over the same ISDN line used for audio transmission.

To determine if new or upgraded software is available, contact MUSICAM USA or CCS Europe. You can also log on to our Web Page at www.musicamusa.com and follow the links to Technical Support for the **RoadRunner** and check the current software version. You can download the most current versions directly from our Web Page. A full software upgrade takes about 30 minutes.

Hot Keys

Your **RoadRunner** has four user programmable 'Hot' keys on the keypad that can be programmed to execute any single command. The **F1** button has been pre-programmed to load the status screen. The other function buttons can be programmed as you wish. For example, you can program a button for decoder independent YES and another button for decoder independent NO. This makes single button selection of decoder independent operation.

Rebooting and Resetting Factory Defaults

It may sometimes be necessary to re-boot the **RoadRunner**. Re-booting is as simple as turning the **RoadRunner** off and then on again. The **RoadRunner** remembers the last configuration loaded, and will re-boot using the last known configuration. Please remember that if an invalid configuration was loaded before the re-boot, then the same invalid configuration will be loaded after the re-boot.

It may sometimes be necessary to return your **RoadRunner** back to a factory default configuration. Although not likely, it is possible to configure your **RoadRunner** in such a way that it may not function properly. It is often easier to start over by reloading factory defaults than to figure out what is wrong with the configuration.

!note:

Factory defaults can be reloaded using the keypad sequence

<Maint><General><Set dflts>,

using the **CDF** command or by performing a '1' reset. This will restore all factory default settings and will restore a default configuration that is known to work. The '1' reset is used when the keypad does not respond, and is performed by the following steps:

- Turn the **RoadRunner** off.
- Turn the **RoadRunner** on while pressing the '1' button.
- Release the '1' button only after the display flashes "RESET
PARAMETER REQUEST.
- Let the **RoadRunner** continue the reboot cycle.

After a '1' reset, your **RoadRunner** will be configured in loopback, 128kb/s, and will have no DIF or terminal adapter modules installed. Information that is required by the internal terminal adapter is *not* lost.

You will note that the factory default settings do not include programming to define the installed digital interface module. You must now re-enter what type of DIF modules is installed. Note that if you are using an internal terminal adapter you must tell the **RoadRunner** that it is installed using the

<Maint><Dig I/F><Type>

sequence, but the TA parameters (SPID, ID, etc.) do not need to be re-entered.

Keypad Beeper and Display Brightness

The **RoadRunner** contains a keypad beeper that provides feedback to the user by emitting a short chirp sound each time a key is pressed. In some applications, it may be necessary to mute this beep, and this can be done using the keypad sequence

<Maint><Beeper>

or the **MBX** command.

The display contrast can also be adjusted over a wide range for ease of viewing at any angle and under varying lighting conditions. Use the keypad sequence

<Maint><Contrast>

or the **CCV** command to adjust the display.

Troubleshooting

As complex as any audio codec may be, when combined into a complete system of multiple codecs, terminal adapters or network adaptation electronics and transmission facilities, it's a wonder anything works at all.

But what do you do if something doesn't work? The first instinct may be to blame what you can see, that is, the **RoadRunner**. Before you kick the cat, or even kick the **RoadRunner**, you will need to determine just what part of the complete system is giving you problems. Although against your first instincts, you really must consider everything in the entire system, including the wires, the transmission medium, the terminal adapters or CSU's, the local and long distance telephone companies, the user at the other end, and even pilot error.

Before we step through the process of isolating the problem, there are a few basic procedures to get out of the way. First, whenever experiencing any problems, you should reboot not only your **RoadRunner**, but the codec at the other end as well. If rebooting does not clear the problem, try resetting to factory defaults and reconfiguring.

Audio Problems

No Audio in Loopback

Since a '1' reset of all factory defaults sets your **RoadRunner** into a known, working configuration and also puts it into loopback mode, you should hear your own audio. If you do have audio I/O in loopback, you can skip to the next section.

If you have not already performed a factory default reset (see above), do so now. After a reset, your **RoadRunner** should be framed, and since it is in loopback, audio that is present at the input should be present at the output.

Symptom	Possible cause	Solution
No audio in loopback	—Bad cables	1. Check all cables, disconnect I/O cables from RoadRunner , and connect together. If no audio, replace cables.
	—Output muted	1. Check decoder muting (<Decoder><Audio Out> <Mute>)
	—Input/output levels not set properly.	2. Check level settings

No Audio when Connected to Another Codec

After you are certain that you have established a connection with a far end codec at the proper bit rate, you should have framed, bi-directional audio. To determine if you are framed to the far end codec, the ON LINE LED should be illuminated.

Hint:

If you have connected to another **RoadRunner**, you should both use the same Quick Configuration to insure setup compatibility. If connected to a *CDQPrima*, you should insure that an appropriate configuration is used. When connecting to a codec not manufactured by MUSICAM USA or CCS Audio Products, you must use a decoder independent configuration.

Symptom	Possible cause	Solution
Connection established, no audio, not framed. There may be relay chatter	—Bit rate / connection rate mismatch.	1. Checks connect rate and encoder/decoder bit rate. Encoder/decoder bit rate must be multiple of connect rate.
	—Incompatible line formats	1. Internal TA cannot communicate using 2 lines to ADTRAN ISU128 terminal adapter
	—Incompatible connect rate	1. Connect data rate not supported at both locations 2. Try connecting to our Music Line (732-706-1437, 56 or 64kb/s, single line).
	—Non MUSICAM USA codec at far end	1. Decoder must be set to Independent YES when connecting to non-MUSICAM USA codecs.
	—Algorithm mismatch	1. Check encoder/decoder

	—Invalid bit rate / sample rate combination	<p>algorithms match on both ends</p> <ol style="list-style-type: none"> 1. Insure combination is supported. Low sample rate with high bit rate is not supported
<p>Connection established, framed in one direction, may have audio in one direction</p>	—Decoder independent	<ol style="list-style-type: none"> 1. Check that decoder parameters match the far-end encoder parameters on both sides of the connection. If one end is a CDQ200x, DIP switch 6 on CDQ200x decoder must be down.
	—Sample rate not valid.	<ol style="list-style-type: none"> 1. CDQ2000 only supports 48 kHz sampling.
	—Bit rate not supported by service.	<ol style="list-style-type: none"> 1. With ISDN it is possible that 64K is not supported in both directions. Try connecting at another bit rate.
	—Line format mismatch.	<ol style="list-style-type: none"> 1. Check both ends are using the same line format. 2. Quick configurations default to Line 1. If you connect using Line 2, the selected lines must be changed.
<p>RoadRunner connects and frames in both directions, does not pass audio or passes audio in only one direction</p>	—Scale factor protection mismatch.	<ol style="list-style-type: none"> 1. If encoder scale factor protection is enabled, <i>far-end</i> decoder scale factor protection <i>must</i> be enabled.
	—Decoder independent setting mismatch.	<ol style="list-style-type: none"> 1. Decoder should be dependent for most applications. Must be independent to frame to non-CCS/MUSICAM USA products.
	—Wrong input channel selected	<ol style="list-style-type: none"> 1. On stereo codecs, only left input is used for mono. Check copy/swap mode, if available.
	—Output muted	<ol style="list-style-type: none"> 1. Check decoder mute mode

Connection Problems (ISDN)

Connection problems are harder to troubleshoot since more than the codecs are involved. Connection problems may be the fault of the codecs, but can also be related to the terminal adapters, wires, local telephone network, long-distance service provider, etc.

Symptom	Possible cause	Solution
RoadRunner connects, line(s) drop after time.	<ul style="list-style-type: none"> —NT1 failure. —ISDN problem —External terminal adapter. 	<ol style="list-style-type: none"> 1. Replace NT1 if so equipped. 1. See text below. 1. Older external terminal may be incompatible with certain ISDN configurations
RoadRunner can place calls or receive calls, not both.	<ul style="list-style-type: none"> —ISDN not provisioned properly. 	<ol style="list-style-type: none"> 1. Check SPID and ID numbers 2. Contact service provider and check provisioning. See Appendix D.
RoadRunner can only connect locally (North American operation)	<ul style="list-style-type: none"> —No long distance carrier specified when ordering ISDN service. 	<ol style="list-style-type: none"> 1. Contact service provider and specify a long distance carrier. You may have to open an account with the selected carrier.

If your **RoadRunner** connects and frames, but the line drops after time (several minutes to several hours) this may be a problem with the ISDN service or with the NT1 (North American operation). We have seen this before, we have even replaced codecs, terminal adapters, and NT1's, and except for a few instances where replacing the NT1 cleared the problem, it always turns out to be ISDN related. Remember that it is highly unlikely that a codec works sometimes and not other times. We have also seen these symptoms when using certain older terminal adapters, either internal or external, which have software that is incompatible with certain ISDN configurations.

If replacing the NT1 does not clear the problem, contact your service provider, They will perform a BERT test, which will most likely show no errors. Unfortunately, a standard BERT test is only run for 15 minutes, and will only show 'background' errors, which do not affect the performance of the **RoadRunner**. Burst errors, or errors on the

signaling channel (the 'D' channel) will cause problems, and are not found easily. Ask your service provider to run a BERT test for at least two hours, overnight if possible (to find burst errors), and to test the whole BRI, including the 'D' channel.

Unfortunately, any tests performed locally will only test the condition of your local loop and central office. If the problem is at the other end of the connection, with an intermediate central office, or with your long-distance company, your local service provider cannot help. Do not attempt to use our 'Music Line' as a troubleshooting tool, since this connection is automatically terminated after 15 minutes. Do try using a different long distance service provider, this has worked clearing the problem in several instances. You can also ask your service provider or MUSICAM USA for a loopback number.

You can sectionalize the problem yourself which will help when calling your service provider. Dial from your first line to your second line and see if the connection drops. If it does not, this indicates that your local loop is working properly. Try dialing a connection to another local codec or a local loop-back number. If this works, your local switch is working properly. If it fails, then the problem is on the outbound side of your local switch. If this works, try dialing to a long distance loop-back number. If this fails, the problem is most likely with your long-distance provider. MUSICAM USA will provide you with a list of long-distance loopback numbers, both domestic and international, upon request.

Please note that in North America, you must specify a long-distance carrier when ordering ISDN service. If you do not, you will not have long distance service. You may also have to sign up directly with that carrier to open an account.

Another thing to request from your service provider, and they may be reluctant to do this, is a circuit trace. The central office switch makes a record of all call transactions, including setup and termination requests, and call setup errors. With this information, it may be possible to isolate the cause of the trouble, or at least which end of the connection is requesting the termination.

Connection Problems (Non-ISDN)

The **RoadRunner** can be used with non-ISDN transmission systems, such as dedicated 56 kb/s or 64 kb/s lines, fractional T1 and satellite. When using multiple lines to get higher transmission rates, it is imperative that the lines be ordered and configured properly.

When ordering the lines, you should inform the service provider that all lines will be used together to achieve a single, higher bit rate path. For example you must tell the service provider that you will use two 64 kb/s dedicated lines to achieve a 128 kb/s link. You must make sure that all lines are in contiguous channels in the same di-group *at both ends*.

A di-group is a group of four consecutive channels that share the same circuit card in the central office channel bank. Since they share the same card, they share the same clock source. When using multiple line it is important that all lines use the same clock, since any clock drift between lines will cause problems with the **RoadRunner**. As an example, dedicated lines 3 and 4 are contiguous and on the same di-group, but channels 4 and 5, although contiguous, are not on the same di-group and may not work. You must verify that you were given consecutive channels in the same di-group for *both ends of the connection*, since crossovers are normal.

We have seen instances where the brand of CSU/DSU makes a difference. For example, in several locations, only 'Brand A' CSU/DSUs worked, and in other locations, only 'Brand B' worked. We can offer no explanation for this, but we have seen this in many different locations.

Regardless of what brand CSU/DSU you are using, the following settings must be selected:

- CS (Clear to Send) must be forced ON
- CS Delay must be SHORT
- Antistream Timer must be disabled
- CD (Carrier Detect) must be NORMAL
- SR (Data Set Ready) must be forced ON
- Scrambler (64 kb/s only) must be ON

If configured correctly, the CS, RD, TD and CD indicators should be illuminated, and the RS indicator should not.

If you can connect and frame on each line individually, but not when using multiple lines, than you should verify the above with your service provider before calling MUSICAM USA for assistance.

TA101 Setup

The most common problems that **RoadRunner** users experience is with terminal adapter setup. Most problems are due to improper provisioning of your ISDN service, or improper TA configuration. The easiest way to be sure your service is provisioned properly is to FAX Appendix C to your service provider.

In order to set up the TA101 terminal adapter properly in North America, you *must have* the following information (For non-North American configuration, contact your sales representative):

- Service Provider Identification number (SPID number) for all 'B' channels.
- Switch type.
- Software version if switch type is AT&T 5ESS.
- National ISDN or Custom Point-to-Point.

5ESS, National ISDN: If your SPID number begins with '01', then it must end in '000'. Some service providers will give a SPID number that begins with '01' and ends with only one '0'. Add two more zero's, for a total of three, then enter the SPID number into **RoadRunner**. You must enter 'NI1' as the switch type.

If you have been given only one SPID number, enter this number for the first 'B' channel only. Do not enter any ID numbers, and set the Local Check to NO. The TA reset may result in "SP1 OK SP2 BAD". This is the normal response since only one SPID has been entered.

5ESS, Custom: If you service provider says you have 'Custom ISDN', you must have 'point-to-point'. 'Point-to-multipoint' will not work with the TA101 terminal adapter.

Software version 5E6 or earlier:

Set the switch type to 5E6. SPID numbers are not used, your ID number is the last 4 digits of your 7 digit ISDN number. Local check should be set to NONE. A TA reset *may* result in "SP1 BAD SP2 BAD" since SPIDS are not used.

Software version 5E8 or later:

SPID numbers are in the format '01' + 7 digit number + '000' and are used. Set switch type to 5E8.

Software version 5E9.1:

SPID numbers may be provided but are not used or entered. Set switch type to 5E8. A TA reset *may* result in "SP1 BAD SP2 BAD" since SPIDS are not used. **NOTE: 1 + area code + 7 digit number dialing is required for all calls, even local. 5E9.1 National ISDN is not supported by the TA101.**

DMS-100, National ISDN: SPID numbers are always used and begin with the area code + 7 digit number. The SPID number may end with '00', '01', '0100' or other suffix. Enter the SPID number as provided by your service provider, do not put a '1' in front of the SPID number. Select NTI as the switch type.

TA201 / TA301 Setup

The most common problems that **RoadRunner** users experience is with terminal adapter setup. Most problems are due to improper provisioning of your ISDN service, or improper TA configuration. The easiest way to be sure your service is provisioned properly is to FAX Appendix F to your service provider.

The TA201 is an international terminal adapter that can be used anywhere ISDN is supported without changing ROM chips. The TA301 is similar to the TA201 except that it contains a built-in NT-1 and therefore is for North American operation only.

In order to set up the TA201/301 terminal adapter properly in North America, you *must have* the following information (For non-North American configuration, contact your sales representative:

- Service Provider Identification number (SPID number) for all 'B' channels, if required.
- National ISDN or Custom ISDN protocols.

National ISDN: If your SPID number begins with '01', then it must end in '000'. Some service providers will give a SPID number that begins with '01' and ends with only one '0'. Add two more zero's, for a total of three, then enter the SPID number into **RoadRunner**. You must enter 'NI1' as the switch type.

If you have been given only one SPID number, enter this number for the first 'B' channel only.

5ESS, Custom: If your service provider says you have 'Custom ISDN', you can have 'point-to-point' or 'point-to-multipoint'. In either case, set the switch type to 5ESS Custom.

DMS-100, National ISDN: SPID numbers are always used and begin with the area code + 7 digit number. The SPID number may end with '00', '01', '0100' or other suffix. Enter the SPID number as provided by your service provider, do not put a '1' in front of the SPID number. Select NI1 as the switch type.

In any of the above cases, if SPID numbers are used, ID numbers are also used. You must use a seven-digit ID number when using a TA201/TA301.

Very early versions of the TA201/301 did not support 56 kb/s operation. MUSICAM USA will be happy to upgrade any of these early units if you require 56 kb/s connectivity.

Control Problems

Symptom	Possible cause	Solution
Keypad not responding		1. Reset to factory defaults
Not responding to remote terminal control	<ul style="list-style-type: none">—Improper cable.—Incorrect port setting.—Incorrect protocol mode.	<ul style="list-style-type: none">1. Use standard RS232 cable1. Check settings match terminal or computer.1. Insure RS232 protocol is 'OFF' for terminal control, 'ON' for program control.
"Arguments Bad" error message when configuring or speed dialing	<ul style="list-style-type: none">—Incorrect number of arguments for command—Incorrect line/bit/sample rate/algorithm mode combination	<ul style="list-style-type: none">1. Check command syntax1. Insure correct settings



Appendix A — DIF Pin Out

DIF 101—X.21 / RS449

DB15F connector, both connectors on card wired as follows:

Pin	Function	Pin	Function
1	Frame Ground	8	GND
2	TD A	9	TD B
3	CON A	10	CON B
4	RD A	11	RD B
5	IND A	12	IND B
6	RET A	13	RET B
7	BYT A	14	BYT B
		15	not connected

DIF 102—V.35

DB15F connector, both connectors on card wired as follows:

Pin	Function	Pin	Function
1	Frame Ground	8	GND
2	TD A	9	TD B
3	RTS	10	DTR
4	RD A	11	RD B
5	not connected	12	RLSD
6	RET A	13	RET B
7	TET A	14	TET B
		15	CTS

Appendix B — Rear Panel Pin Outs

Relay outputs and opto-inputs (future):

1	Relay A, normally open	8	OPA+
2	Relay A, normally closed	21	OPA-
14	Relay A, common	10	OPB+
		22	OPB-
15	Relay B, normally open	11	OPC+
16	Relay B, normally closed	23	OPC-
3	Relay B, common	12	OPD+
		24	OPD-
4	Relay C, normally open		
5	Relay C, normally closed		
17	Relay C, common		
18	Relay D, normally open		
19	Relay D, normally closed		
6	Relay D, common		

20, 25 Ground

12, 13 +5 VDC

Remote Control / Software Upgrade:

2	TD
3	RD
5	Gnd

Appendix C — ISDN Ordering and Provisioning

North American ISDN Ordering Contacts

Ameritech	800-TEAMDATA
AT&T	800-222-7956
Bell Atlantic	800-570-ISDN
Bellcore	800-992-ISDN
BellSouth	800-428-ISDN
Cincinnati Bell	800-566-DATA
GTE	800-888-8799
MCI	800-MCI-ISDN
Nevada Bell	702-333-4811
NYNEX	800-GET-ISDN
Pacific Bell	800-4PB-ISDN
Rochester Telephone	716-777-1234
SNET	203-553-2369
Sprint	913-624-4162
Stentor Canada	800-578-ISDN
Southwestern Bell	800-992-ISDN
US West	800-246-5226 or 303-896-8301
Wiltel	918-588-5069

North American ISDN Provisioning

In an effort to make ISDN ordering and provisioning as easy as possible, we recommend faxing the following five pages to your ISDN service provider. If provisioned as shown on these pages, your ISDN circuit will work with your **RoadRunner**, regardless of terminal adapter used. If given a choice between AT&T Custom or National ISDN, we recommend National ISDN. Also note that **when ordering ISDN service, you must ask for long distance service and specify a carrier.** Unlike regular telephone service, long distance is not automatically provided.

AT&T 5ESS Custom

Request from the telephone company an ISDN line in a “Point To Point” configuration with 2B1Q line code. Your ISDN line must be configured to allow circuit switched data on both B-channels and signaling on the D-channel. Request that the Telephone Company program your ISDN line with the following attributes:

- Maximum terminals set to 1 (this tells the switch that there is 1 terminal active on this line.)
- Maximum B-channels set to 2; Actual User settings (this tells the switch that you are an actual user and may use both B-channels simultaneously.)
- Circuit switched data set to 2; circuit switched data channel set to any (this tells the switch that you may use both B-channels simultaneously. The “Any” tells the switch that either B-channel can be used for data.)
- Terminal type is Type A - Basic Terminal (this tells the switch you are a basic ISDN terminal.)
- Display set to Yes (this tells the switch that you have display capabilities.)
- Call appearance quantity set to 1 (this tells the switch that you want 1 appearance of your primary telephone number.)
- Call appearance preference set to Idle (this tells the switch that your software will make a positive choice of which call appearance it will use to initiate a call.)

The Telephone Company will also need to know any additional voice features that you require on your ISDN lines. Examples of these features are Caller ID and Call Forwarding. PLEASE REMEMBER TO SPECIFY A LONG DISTANCE CARRIER.

AT&T 5ESS - National ISDN 1

Request from the telephone companies a National ISDN 1 ISDN line in a “multipoint” configuration with 2B1Q line code. The optional “multipoint” configuration will allow you to have a separate telephone number for each B-channel; however, it will physically be only one ISDN line. The Telephone Company should supply you with a different telephone number and SPID (Service Profile Identification) for each B-channel in a multipoint arrangement. Your ISDN line must be configured to allow circuit switched data on both B-channels and signaling on the D-channel. Request that the Telephone Company program your ISDN line with the following attributes:

- Maximum terminals set to 2 (this tells the switch that there are 2 terminals active on this line.)
- Maximum B-channels set to 2; Actual User settings (this tells the switch that you are an actual user and may use both B-channels simultaneously.)
- Circuit switched data set to 2; circuit switched data channel set to any (this tells the switch that you may use both B-channels simultaneously. The “Any” tells the switch that either B-channel can be used for data.)
- Terminal type is Type A - Basic Terminal (this tells the switch you are a basic ISDN terminal.)
- Display set to Yes (this tells the switch that you have display capabilities.)
- Circuit switched data limit set to 2 (this tells the switch that you may receive 2 data calls.)
- Call appearance preference set to Idle (this tells the switch that your software will make a positive choice of which call appearance it will use to initiate a call.)

The telephone company will also need to know any additional voice features that you require on your ISDN lines. Examples of these features are Caller ID and Call Forwarding. PLEASE REMEMBER TO SPECIFY A LONG DISTANCE CARRIER.

FAX-PAGE 3

AT&T 5ESS — Custom

- 2B1Q line code
- 2B&D line - Point To Point
 - B1 - circuit switched voice/data
 - B2 - circuit switched voice/data
 - D - signaling only
 - set MTERM to 1
 - set MAXB CHNL to 2; ACT USR to Y
 - set CSD to 2; CSD CHL to ANY
 - set TERMTYP to TYPE-A; DISPLAY to Y
 - set CA QTY to 1
 - set CA PREF to I
- list any additional data features required
- specify long distance carrier

AT&T 5ESS — National ISDN

- 2B1Q line code
- 2B&D line - Standard
 - B1 - circuit switched voice/data
 - B2 - circuit switched voice/data
 - D - signaling only
 - set MTERM to 2
 - set CHNL to 2; ACT USR to Y
 - set CSD to 2; CSD CHL to ANY
 - set TERMTYP to TYPE-A; DISPLAY to Y
 - set CSD limit to 2
 - set CA PREF to I
- Optional - multipoint; different DN for each B-channel, but same OE (office equipment.)
- list any additional data features required
- specify long distance carrier

Northern Telecomm DMS-100 BC-35 National ISDN 1

Request from the telephone companies a National ISDN 1 ISDN line with 2B1Q line code. Your ISDN line must be configured to allow circuit switched data on both B-channels and signaling on the D-channel. The telephone company should supply you with a separate telephone number and SPID (Service Profile Identification) for each B-channel; however, it will physically be only one ISDN line. Request that the Telephone Company program your ISDN line with the following attributes:

B1 and B2 should be set as follows:

- Set the circuit switch option to Yes; set the barrier restriction option to no packet mode data (NOPMD) only (this tells the switch that you require circuit switch ability on your B-channel, The bearer restriction on your line means that you are not allowed packet data on your B-channel.)
- Set protocol to function version 2; (PVC2) (this tells the switch that your CPE software is using National ISDN 1 protocol.)
- Set the service profile identification (SPID) suffix to 1 (this tells the switch that the digit following your telephone number will be 1. The SPID format is *area code + 7 digit number + 1 + 00*.)
- Set the Terminal Endpoint Identifier (TEI) to Dynamic (this tells the switch that you can accept any TEI value from 64 to 126.)
- Set Ring to Yes (this tells the switch to send an alerting message to your CPE when there is an incoming call.)
- Set the maximum keys to 10 (this tells the switch how much memory to allocate for features.)
- Set Key system (EKTS) option to No (this tells the switch that you are not a key system.)
- Place the lower layer compatibility option for data on the B-channels (this tells the switch that your CPE may utilize the lower layer compatibility information element for data on the B-channels.)
- Place calling subaddress option for data on the B-channels (this tells the switch that your CPE will send a subaddress.)
- Place called subaddress option for data on the B-channels (this tells the switch that your CPE can receive a subaddress.)

The Telephone Company will also need to know any additional data features that you require on your ISDN lines.

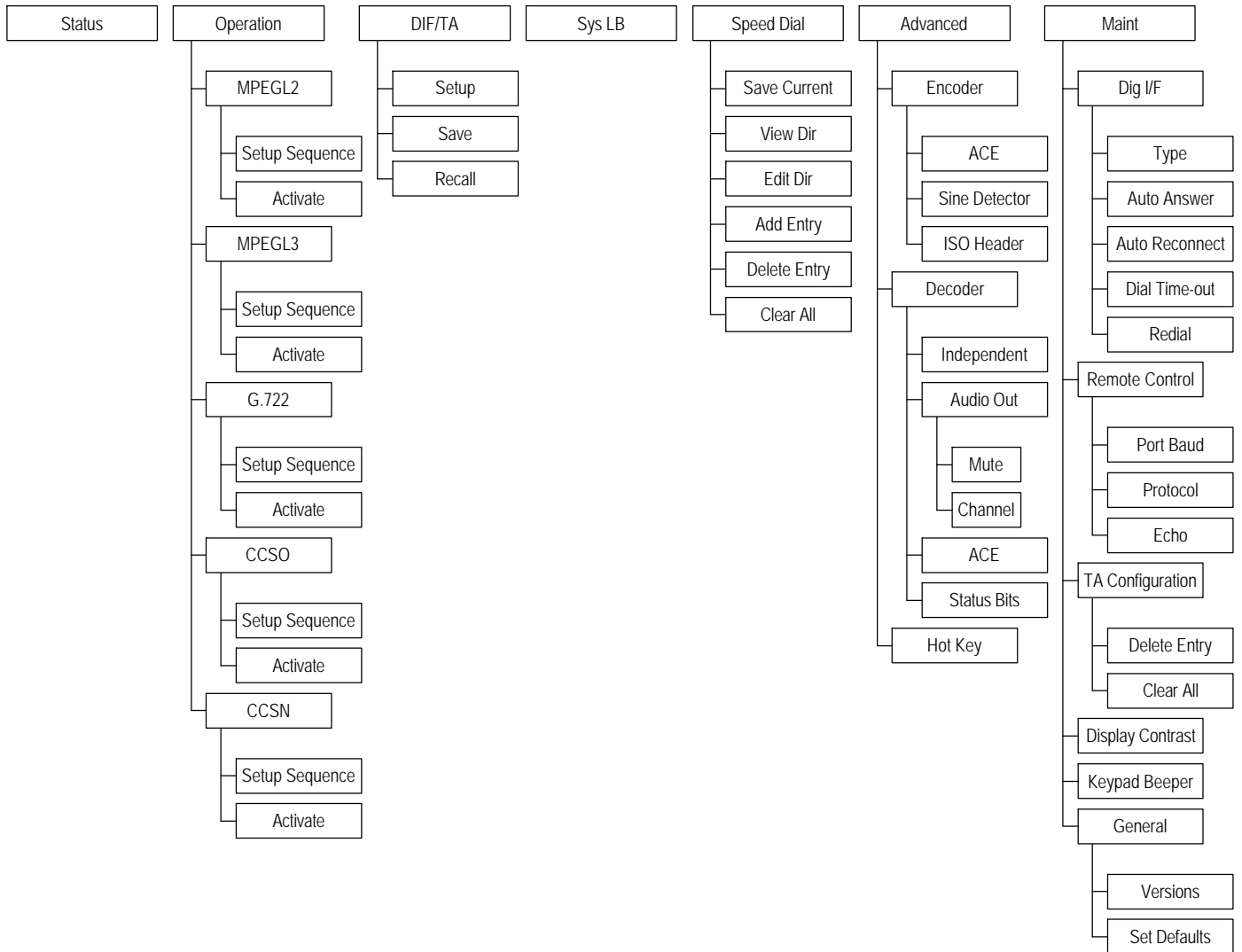
FAX-PAGE 5

Northern Telecomm DMS-100 BC-35 National ISDN 1

- 2B1Q line code
- 2B&D line
- B1 - set circuit switch to YES; set BEARER RESTRICTION to NOPMD (no packet)
 - functional version 2; (PVC 2)
 - set SPID-SUFFIX to 1
 - set TEI to DYNAMIC
 - set RING to YES
 - set MAXKEYS to 10
 - set EKTS to NO
 - set data option: PROVLLC CMDATA (lower layer compatibility)
 - set data option: PROVCGS CMDATA (calling subaddress)
 - set data option: PROVCDs CMDATA (called subaddress)
- B2 - set circuit switch to YES; set BEARER RESTRICTION to NOPMD (no packet)
 - functional version 2; (PVC 2)
 - set SPID-SUFFIX to 1
 - set TEI to DYNAMIC
 - set RING to YES
 - set MAXKEYS to 10
 - set EKTS to NO
 - set data option: PROVLLC CMDATA (lower layer compatibility)
 - set data option: PROVCGS CMDATA (calling subaddress)
 - set data option: PROVCDs CMDATA (called subaddress)

List any additional data features required for B1 and B2

Appendix D — Menu Tree



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