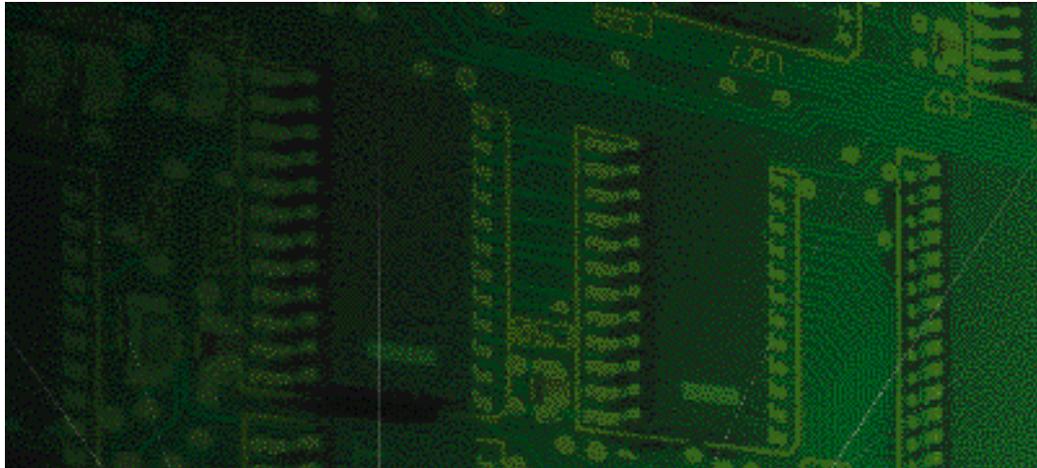


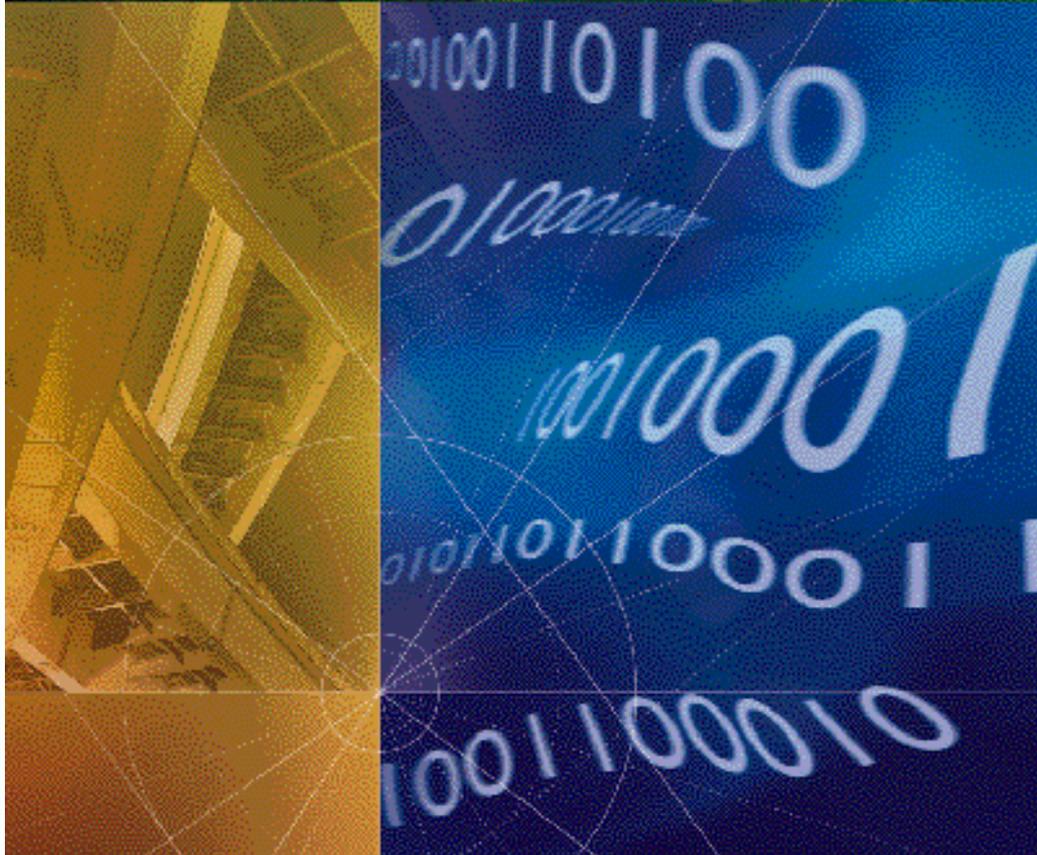


Quad Cellular Modem Card

Configuration Guide



P/N 1.024.495



About This Guide

This guide includes information necessary for using cellular modems. The information pertains to U.S. Robotics modems with cellular features *only*.

For most applications, the cellular templates can be used to configure the modems to answer cellular calls. Additional parameter settings are used only in situations where the modems are used to dial out (or with dialback security) or where there are compatibility issues—usually with modems with older versions of ETC or MNP10 cellular protocols.

Modems with MNP10EC

There are slight differences in operation for modems that support MNP10EC. These differences are noted where they apply.

SNMP Management

References to *Total Control Manager/SNMP* (TCM) or SNMP MIBs apply to modems in SNMP managed installations. If your modem(s) do not have SNMP management capability or are not a part of an SNMP management installation, please disregard these references.

Functional Description

Modems with cellular support can negotiate for either of two cellular protocols: Enhanced Throughput Cellular (ETC) and MNP10. These protocols are designed to combat a variety of link establishment and data transfer problems specific to cellular calls. Some modems also include support for MNP10EC, which adds enhanced performance to MNP10.

MNP10

MNP10 modifies data transfer techniques for increased reliability over cellular links. It uses three major strategies to do so:

- *Aggressive Adaptive Packet Assembly (AAPA)* adjusts the data packet size during data transfer in response to line conditions, ensuring the maximum allowable packet size at all times.
- *Link Management Idle (LMI)* is used to monitor line conditions when no data is being sent, and helps guard against lost connections.
- *Dynamic Transmit Level Adjustment (DTLA)* changes the transmit level “on the fly” to adapt to changing line conditions and determine the best level for a cellular link.

DTLA is necessary only for calls across cellular links. In answer mode, the modem detects when an incoming call is using DTLA, and automatically activates its own DTLA. If you are originating calls from a mobile site (cell side), the modem must be set for *MNP10 Cellular* (S60.3=1) to implement DTLA.

Non-Cellular MNP10 Calls

MNP10 can be negotiated for non-cellular calls, but offers no advantage over other protocols for those calls.

Originating MNP10 Calls

When MNP10 Negotiation is enabled (S60.1=1), the modems originate using the MNP10 protocol. If you want to originate a *cellular* call, MNP10 Cellular must be enabled (S60.3=1).

NOTE: *Connections over 14.4K bps are not possible if the modem is set to originate under MNP10.* MNP10 must be disabled (S60.1=0) to originate calls under V.34, V.FC, HST, or V.32 terbo, **except** with modems that support MNP10EC (see the following).

Originating Calls for Modems with MNP10EC

Modems that support MNP10EC do *not* originate using MNP10 when MNP10 Negotiation is enabled (S60.1=1). Two additional bits, S61.4 and S61.5, are used to originate MNP10 calls. See *Originate MNP10* and *Originate MNP10EC* under the *MNP10 Parameters* section of this guide.

ETC

ETC allows the modem to alter its settings for increased performance across cellular links. The modem automatically detects when a call is from a modem using ETC, and uses ETC for that call. If the modem receives a call from a modem that is not using ETC, the call progresses normally, without ETC.

The modem must receive the special ETC calling tone from the originating modem. It is the only way for the modem to know that it is answering an ETC call. ETC also requires that the modems establish V.42 error control and a V.32 *bis*, V.32, or V.22-type connection. ETC does not function under V.34, V.FC, V.32 terbo or HST modulation.

Originating Non-Cellular Calls

With ETC enabled, the modem implements ETC settings for *all* outgoing calls. Even if it is not connecting across a cellular link, the modem forces a V.32- or V.22-type modulation and V.42 with a reduced packet size, and will not connect using V.34. It also transmits using de-emphasis and reduced transmit level, which results in reduced throughput or even dropped calls. If the modem is going to be used for originating calls across non-cellular links, we recommend using the *Disable ETC During Originate Mode* setting (S66.7=1).

Cellular Templates

Three cellular templates stored in the modem's ROM allow you to enable ETC or MNP10 with the modem settings that offer maximum performance.

A template may be loaded in one of three ways:

- By using the &Fn command if you are using AT commands to configure the modems.
- By using the *Modem Software Commands* from the Commands window if you are using *Total Control Manager/SNMP* (TCM).
- By using the Total Control Modem MIB command table if you are using other SNMP management software.

WARNING: Do not load cellular templates if you have made special configuration changes to the modem. It will **overwrite** all settings with the hardware flow control defaults. Instead, configure cellular parameters individually or use the *AT Command String* listed under the appropriate template.

NOTE: Only one template may be loaded at a time. If you wish to activate *both* ETC and MNP10:

1. Load the ETC Cellular Template.
2. Configure the modem with the settings or AT Command String listed for the MNP10 template.

MNP10 Cellular Template

AT Command: &F4

AT Command String: ATS60=3

TCM Command: Load MNP10 Cellular Defaults

MIB Object: loadMnp10CllulrDflt(25)

The MNP10 Cellular template includes the following settings:

- **MNP10 Negotiation**
AT Command: S60.0=1
- **Enable MNP Extended Services**
AT Command: S60.1=1

ETC Fixed Site Cellular Template

AT Command: &F6

AT Command String: ATS66=101 S7=90 S10=100

TCM Command: Load ETC Cellular Fixed Defaults

MIB Object: loadV42CllulrFxdDflt(27)

This template includes the following settings:

- **Negotiate ETC**
AT Command: S66.0=1
- **ETC Fixed Site Operations**
AT Command: S66.1=0
- **Enable ETC Calling Tone**
AT Command: S66.2=1
- **9600 DCE Startup Rate**
AT Command: S66.4=0 S66.5=1
- **Wait for Carrier 90 Seconds**
AT Command: S7=90

Lengthens the time the modem waits for a carrier to 90 seconds, since modems often take longer to establish a carrier over cellular links.

- **Loss of Carrier Disconnect**
AT Command: S10=100

Cellular links frequently receive disturbances that cause extended loss of carrier. This setting lengthens the time before the modem hangs up upon loss of carrier to 10 seconds.

ETC Mobile Cellular Template

AT Command: &F5

AT Command String: ATS66=103 S7=90 S10=100

TCM Command: Load ETC Cellular Mobile Defaults

MIB Object: loadV42CllulrMblDflt(26)

Use this template to enable ETC when the modem is answering or dialing from a cellular phone.

The settings for this template are identical to those for the ETC fixed site template (&F6), except for the following setting:

- **Enable ETC Mobile**
AT Command: S66.1=1

Enable MNP10

MNP10 Negotiation

AT Command: S60.0=n

MIB Object: mdmCeMnp10Dis

Modem answers and originates calls under MNP10. In originate mode, if answering modem does not support MNP10, modems connect using V.32 *bis*, V.32, or a V.22-type modulation. *Connections over 14.4K bps are not possible if the modem is set to originate under MNP10.*

NOTE: For modems that support MNP10EC, this setting enables MNP10 and MNP10EC in *answer* mode only. To originate MNP10 calls, see *Originate MNP10* and *Originate MNP10EC* parameters.

Settings: S60.0=0 Disabled
 S60.0=1 Enabled

MNP10 Options

The following options apply only for MNP10 calls. MNP10 must be enabled for any of the following settings to take effect. The settings do not affect normal connections.

Enable MNP Extended Services

AT Command: S60.1=1

MIB Object: mdmCeMnpXDis

Extended Services (MNPX) allows the modems to negotiate MNP10 as a part of the V.42 negotiation process. This setting is recommended.

WARNING: If MNPX is disabled, calls from modems using MNPX and V.42 connect without MNP10.

Settings: S60.1=0 MNX disabled
 S60.1=1 MNPX enabled

Disable V.42*bis* Compression

AT Command: S60.2=1

MIB Object: mdmCeComp

Disables V.42*bis* compression for MNP10 calls. When disabled, the modem negotiates for MNP5 compression, and if unsuccessful, connects without compression. Used for testing purposes only.

Settings: S60.2=0 Enable V.42*bis*
 S60.2=1 Disable V.42*bis*

MNP10 Cellular

AT Command: S60.3=1

MIB Object: mdmCeOperDis

Modem uses Dynamic Transmit Level Adjustment (DTLA) for all calls. Use this setting when originating or answering calls from a mobile (cell side) location, or if you are originating to a modem at a mobile (cell side) location. This setting is not necessary to answer cellular calls, because the modem automatically activates DTLA when it detects a call from a modem using DTLA.

Settings: S60.3=0 MNP10
S60.3=1 MNP10 Cellular

Force 1200 bps Connection

AT Command: S60.4=1

MIB Object: mdmCeLinkSpeed

Forces a V.22 1200 bps link rate for MNP10 connections. Provides stability and reliability for extremely noisy link conditions.

Settings: S60.4=0 Negotiate for highest rate
S60.4=1 Force 1200 bps

Disable MNP10 Fallback

AT Command: S60.5=1

MIB Object: mdmCeMnp10FallbackDis

Prevents the modem from falling back to lower speeds during MNP10 connections. Used for testing purposes only.

Settings: S60.5=0 Fallback
S60.5=1 Disable fallback

Disable MNP10 Fallforward

AT Command: S60.6=1

MIB Object: mdmCeMnp10FallforDis

Prevents the modem from falling forward to higher speeds during MNP10 connections. Used for testing purposes only.

Settings: S60.6=0 Fallforward
S60.6=1 Disable fallforward

Disable MNPX Detection Pattern

AT Command: S60.7=1

MIB Object: mdmCeMnpxDetPhEna

The MNPX detection pattern expedites connections under MNP10 when connecting with other modems that support MNPX.

However, the MNPX detection pattern can cause problems when dialing to MNP10 modems without MNPX—they connect, but without MNP10. Disable the MNPX detection pattern if you experience this problem when dialing to modems without MNPX. In answer mode, the MNPX detection pattern should always be enabled.

Settings: S60.7=0 Enable detection pattern
S60.7=1 Disable MNPX detection pattern

V.42bis Short Form Negotiation Rules

AT Command: S61=*n*

MIB Object: mdmCeShortFormRules

Provides V.42bis compatibility when originating to some older MNP10 modems that do not have MNPX capabilities. The short form assumes that the maximum string length is 32 octets and the direction of compression is always bi-directional. If your modem supports MNP10EC, add 32 to the value listed when you want to originate using MNP10.

Settings:

S61=0 (32)	Normal V.42bis Compression
S61=1 (33)	Form 1 Code Words 512
S61=2 (34)	Form 2 Code Words 1024
S61=3 (35)	Form 3 Code Words 2048

Originate MNP10

(Modems with MNP10EC only)

AT Command: S61.4=1

MIB Object: mdmCcMnp10

Modem originates using MNP10. If answering modem does not support MNP10, a V.32, V.32 bis, or V.22-type connection is made. *The modem can NOT originate calls over 14.4K bps with this setting.*

NOTE: If calling across a cellular network (either your modem or the answering modem is mobile), the originating modem should be set for *MNP10 Cellular* (S61.3=1).

Originate MNP10EC

(Modems with MNP10EC only)

AT Command: S61.5=1

MIB Object: mdmCcMnp10Ec

Modem originates using MNP10EC. If answering modem does not support MNP10EC, it tries for an MNP10 connection. If MNP10 is not supported, a V.32, V.32 bis, or V.22-type connection is made. *The modem can NOT originate calls over 14.4K bps with this setting.*

NOTE: If originating calls across a cellular network (either your modem or the answering modem is mobile), the modem should be set for *MNP10 Cellular* (S61.3=1).

Enable ETC

ETC Negotiation

AT Command: S66.0=1

MIB Object: mdmCeEtcDis

Modem uses ETC when it answers a call from a modem using ETC. The modem also originates using ETC, unless the *Disable ETC During Originate Mode (S66.7)* setting is enabled.

Settings: S66.0=0 Disabled
S66.0=1 Enabled

ETC Options

NOTE: The following options apply only for ETC calls when ETC is enabled. The settings do not affect normal connections.

ETC Site Operations

AT Command: S66.1=n

MIB Object: mdmCeV42CellSite

Determines whether the modem uses a fixed site or mobile site cellular profile. The cellular profile sets transmit levels based on ETC specifications.

Settings: S66.1=0 Fixed site
S66.1=1 Mobile site

Enable ETC Calling Tone

AT Command: S66.2=1

MIB Object: mdmCeV42EtcCallToneDis

Enable the ETC calling tone when originating calls from the mobile side (cell side) of a cellular link. The calling tone is generated during link establishment, and tells the answering modem to use ETC settings.

Disable the calling tone only if you experience problems when originating calls to non-cellular modems.

Settings: S66.2=0 Disable calling tone
S66.2=1 Enable calling tone

Force ETC Settings

AT Command: S66.3=1

MIB Object: mdmCeV42EtcTxLevConDis

Some callers may be using an earlier ETC version that does not generate the ETC calling tone used as of version 1.1. In order for the modem to implement ETC when answering calls from these modems, it must be set to force ETC for every call it receives. (In this circumstance, the system administrator may wish to dedicate some modems for cellular calls only.)

Settings: S66.3=0 ETC on calling tone detect only
S66.3=1 Force ETC settings for all calls

DCE Startup Rate

AT Command: S66.4 and S66.5 (see the following table).

MIB Object: mdmCeDceStartRate

Some cellular links may be so poor that calls are dropped even before the modems can initialize modulation and error control negotiation. To reduce the number of dropped calls, the modem should be set to a 9600 bps startup rate. The modems negotiate at the lower and more stable link rate, and after the link has been established, raise the link rate to the higher levels afforded by ETC.

S66.4=	S66.5=	Startup Rate
0	0	Auto
1	0	4800
0	1	9600
1	1	<i>Reserved</i>

Enable Transmit De-emphasis

AT Command: S66.6=1

MIB Object: mdmCeV42DceTxDemDis

Transmit de-emphasis is recommended when connecting over a cellular link, whether the modem is on the fixed site or mobile site. When enabled, transmit de-emphasis is automatically implemented whenever the modem receives an ETC call.

Settings: S66.6=0 Disabled
 S66.6=1 Enabled

Disable ETC During Originate Mode

AT Command: S66.7=1

MIB Object: mdmCeDbNoEtcDis

This setting disables ETC when originating calls, yet allows it to negotiate ETC in answer mode. If the modem is used to place outgoing calls to non-cellular modems, use this setting to disable ETC during originate mode.

Settings: S66.7=0 Originate ETC
 S66.7=1 Disable ETC during
 originate

Set Maximum Link Rate

AT Command: S64

MIB Object: mdmCeDceBitraLim

Prevents modem from connecting or falling forward to link rates higher than that specified. Lowering the maximum link rate to 9600 bps can provide more stability for cellular calls under adverse conditions. However, higher throughput is sacrificed for calls over stronger cellular links that can support higher link rates.

Settings: S64=0 Modem selects maximum link rate.

Register 64, settings 4-8

To set maximum rate, see the following table. Selecting values not listed is invalid and leaves the setting unchanged.

Setting	Max Rate
S64=4	4800 bps
S64=5	7200 bps
S64=6	9600 bps
S64=7	12000 bps
S64=8	14400 bps

Set ETC Transmit Level

AT Command: S65

MIB Object: mdmCeDceTxLev

A reduced transmit level is required for data transfer across cellular links. When ETC is established for a call, the modem automatically reduces its transmit (TX) level to the value specified by this parameter.

With the default setting, the modem sets the TX level according to ETC specifications based on whether it is transmitting over T1 or analog lines and whether the modem is set for fixed site or mobile. We do not recommend changing this setting.

Settings: S65=0 Modem controls TX level
S65=*n* TX level fixed to *n* for ETC calls, where
 n=10-25 (negative dBms)

Cellular Parameter Summary

MNP10 Parameters

S-Register	Recommended Setting		Function
	Fixed Site	Mobile	
S60	3	11	(Sets S60 bits 0-7 as below)
S60.0	1 (ON)	1 (ON)	Enables MNP10 Negotiation
S60.1	1 (ON)	1 (ON)	MNP Extended Services
S60.2	0 (OFF)	0 (OFF)	Disables V.42bis
S60.3	0 (OFF)	1 (ON)	MNP10 Cellular (DTLA)
S60.4	0 (OFF)	0 (OFF)	Force 1200 bps Connect
S60.5	0 (OFF)	0 (OFF)	Disables MNP10 Fallback
S60.6	0 (OFF)	0 (OFF)	Disables MNP10 Fallforward
S60.7	0 (OFF)	0 (OFF)	Disables MNPX Detection Pattern
S61	0	32*	V.42bis Short Form Negotiation Rules
S61.4*	0 (OFF)	1 (ON)	Originate MNP10
S61.5*	0 (OFF)	1 (ON)	Originate MNP10EC

* For modems that support MNP10EC only. Otherwise, leave at 0.

ETC Parameters

S-Register	Recommended Setting		Function
	Fixed Site	Mobile	
S66	101	103	(Sets S66 bits 0-7 as below)
S66.0	1 (ON)	1 (ON)	Enables ETC Negotiation
S66.1	0	1	Site Operations (0=Fixed/1=Mobile)
S66.2	1 (ON)	1 (ON)	ETC Calling Tone
S66.3	0 (OFF)	0 (OFF)	Force ETC Settings
S66.4	0 (9600)	0 (9600)	DCE Startup Rate (Combine bits 4&5) 0/1=9600, 1/0=4800, 0/0=AUTO
S66.5	1	1	
S66.6	1 (ON)	1 (ON)	Transmit De-emphasis
S66.7	1 (ON)	0 (OFF)	Disables ETC During Originate Mode
S64	0 (Auto)	0 (Auto)	Maximum Link Rate
S65	0 (Auto)	0 (Auto)	ETC Transmit Level