GME COMMERCIAL

CM Series

Commercial Analog & P25 Mobile Radios

AUSTRALIAN MADE

CONTENTS

Scope

This manual describes the AT-command based messages that are used as the communication protocol between an application and the CM Series (CM40, CM50 and CM60) auxiliary port.

Note: AT-commands that require P25 Data are clearly denoted.

References

1. ITU-T V.250 Series V: Data communication over the telephone network; Control procedures; Serial asynchronous automatic dialling and control

2. ITU-T V.253 Series V: Data communication over the telephone network; Control procedures; Control of voice-related functions in a DCE by an asynchronous DTE

3. TIA-678-A: Data transmission systems and equipment – serial asynchronous automatic dialling and control for character mode DCE on wireless services

4. ETSI GSM 07.07: Digital cellular telecommunications system (phase 2+); AT command set for GSM mobile equipment (ME)

5. 3GPP TS 27.005: 3rd generation partnership project; Technical specification group core network and terminals; Use of data terminal equipment – data circuit terminating equipment (DTE-DCE) interface for short message service (SMS) and cell broadcast service (CBS)

6. 3GPP TS 27.007: 3rd generation partnership project; Technical specification group core network and terminals; AT command set for user equipment (UE)

7. ETSI EN 300 395-5: Terrestrial trunked radio (TETRA); Voice plus data (V+D) and direct mode operation (DMO); Part 5: Peripheral equipment interface (PEI)

8. ITU-T V.24: Series V: Data communication over the telephone network; Interfaces and voiceband modems; List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)

9. RFC1055: A nonstandard for transmission of IP datagrams over serial lines (SLIP)

Abbreviations and Definitions

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AT	Attention. This two-character abbreviation is always used to start a command line to be sent from TE to ME.
BDS	Basic Data Service, GME's circuit switched P25 conventional data solution.
DCE	Data circuit terminating equipment (the radio).
DTE	Data terminal equipment (the equipment connected to the radio interface).
DTMF	Dual-tone multi-frequency signalling.
DTR	Data terminal ready.
FNE	Fixed network equipment.
GSM	Global system for mobile communications.
MAC	Media access control.
ME	Mobile equipment (the radio). Same as DCE and MT.
MS	Mobile station (another radio).
MSM	Mobile signalling module.
MT	Mobile terminal (the radio).
PEI	Peripheral equipment interface.
PDP	Packet data protocol.
PPP	Point-to-point protocol.
PS	Packet domain service.
RCI	Remote control interface.
RSSI	Received signal strength indicator.
RTCS	Reliable transparent character stream.
SDS	Short data service.
SLIP	Serial line internet protocol.
SNDCP	Subnetwork dependent convergence protocol.
TCS	Transparent character stream.
TE	Terminal Equipment e.g. computer
UE	User equipment.

Auxiliary Connector
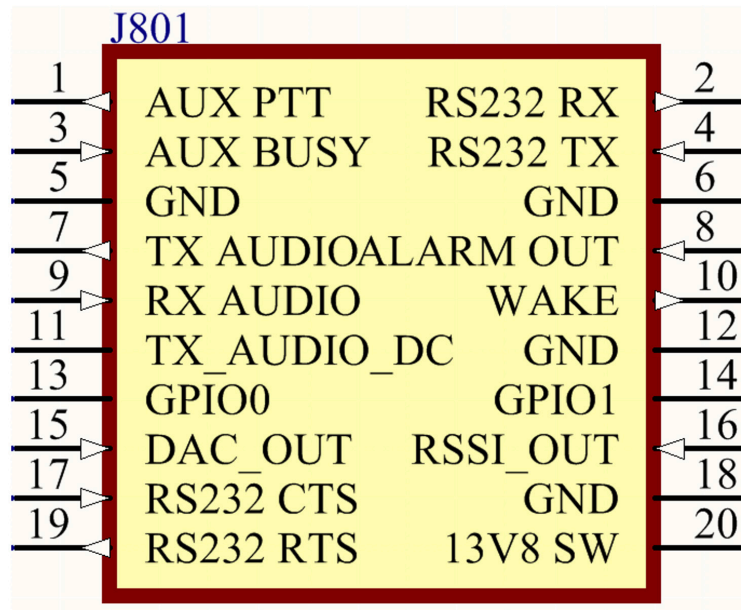
Figure 2-1 – CM Series auxiliary connector J801.

The auxiliary connector has five pins that are used for the DTE interface. All DTE pins are RS232 level.

Pin	Circuit	Description
GND (6)	V.24 102	Signal ground.
RX (2)	V.24 103	Transmit from DTE to radio.
TX (4)	V.24 104	Transmit from radio to DTE.
CTS (17)	V.24 106	Flow control from radio to DTE.
RTS (19)	V.24 105	Flow control from DTE to radio.

Line Settings

The initial line settings after reset are: 9600 baud, 8 data bits, no parity, 1 stop bit, no flow control.

Auxiliary Leads

LE111:	Ignition Sense Lead (RS232) to suit CM Series
LE112:	Ignition Sense Lead to suit CM Series
LE114:	1M Auxiliary Cable with DB25 (Male) Connector to suit CM Series
LE115:	9 Pin "D" (Female) Data Lead to suit CM Series

Note: Refer to the Auxiliary Interface section of the CM40 & CM50 Service manual for additional information of the Auxiliary Interface & Auxiliary Leads which can be used to connect an external device to the CM Series Auxiliary Interface.

Commands

There are three forms of AT Commands: Action, Question and Help. For cases where there is no stored value for the command it cannot be questioned.

Commands start with AT and finish with a carriage return (<CR>) or a line feed (<LF>) character.

Action

Action commands can take one of three forms:

AT<command><CR>	Runs a command. Radio responds with a result code.
AT<command>=<value><CR>	Runs <command> with <value>. Radio responds with a result code.
AT<parameter><value><CR>	Sets <parameter> to <value>. Radio responds with a result code.

Question

Question commands take the following form:

AT<command>?<CR>	Query the value of a parameter. Radio responds with an information text response containing the value of the parameter, followed by a result code.

Help

Help commands can take one of the following two forms:

AT<command>=?<CR>	Returns a help menu for the command.
AT=?<CR>	Lists all available commands.

Last Command

A/ or a/ is used to execute the previous command. No termination character is required.

Responses

There are two types of responses issued, information text and result codes.

Information Text Responses and Verbosity Control

Information text responses consist of three parts: a header, text and trailer.

<header><text><trailer>

The format of the header and text is determined by the V (verbosity) parameter. When set to 0 (ATV0), the default, the header is blank and the text does not contain a type prefix, only the returned value. On the other hand, if set to 1 (ATV1), the header is <CR><LF> and the text will contain a type prefix corresponding to the associated command. The trailer is always <CR><LF>.

ATV0	ATV1
<header> =	<header> = <CR><LF>
<text> = <value>	<text> = <prefix>:<space><value>
<trailer> = <CR><LF>	<trailer> = <CR><LF>

Table 3-1 - Effect of V on response text formats

The following table illustrates the difference in output for the +CNUM command which is used to query the radio's unit ID.

Command	ATV0	ATV1
AT+CNUM?<CR>	<unit-id><CR><LF>	<CR><LF>+CNUM:<space><unit-id><CR><LF>

Table 3-2 - Example response text formats

Result Codes

The following is a list of result codes.

Response	Description
OK	Acknowledges execution of a command.
CONNECT	Connection has been established. Radio moves to online data state.
CRING	Incoming call from the network. Not used by this radio. Instead, incoming calls are indicated using an unsolicited notification. See +CRING.
NO CARRIER	Connection has been terminated or the attempt to establish a connection failed.
ERROR	Error indication. Could be command syntax error, invalid parameter or other problem.
NO DIALTONE	P25 services unavailable (no network connection).
BUSY	Channel is busy.
NO ANSWER	No response was received from the called radio.

Table 3-3 – Standard result codes.

Escape sequence

Once the radio enters online mode, it no longer responds to AT commands. To change from online mode to command mode, the escape sequence must be followed:

<guard interval>+++<guard interval>

The guard interval is one second.

The radio itself may also transmit the escape sequence to the TE under certain conditions (e.g. connection terminated).

Command Support

Radio models with P25 capability (ie. CM60 models) support all commands listed in this document. Analog only radios (CM40, CM50) do not support commands related to P25 functionality or data calls. Commands related to P25, P25 trunking or data calls may also be disabled depending on the radio's feature licensing and channel selection.

The following general commands are supported.

Command Syntax	Standard(s)	Description
Z Z0 Z1 Z2	6.1.1 – V.250	Reset to default configuration. Z or Z0: Reset AT user profile and internal file system. Z1: Reset AT user profile only. Z2: Reset internal file system only (clears any pending firmware or configuration upgrade images). Note: See Special Note below.
&F &F0 &F1 &F2	6.1.2 – V.250	Reset to factory-defined configuration. &F or &F0: Reset AT user profile and internal file system. &F1: Reset AT user profile only. &F2: Reset internal file system only (clears any pending firmware or configuration upgrade images). Note: FO (echo off for data online mode) should not be confused with &FO. See Special Note below.
&W0		Save AT user profile. Note: The currently configured values of the settings within the Special Note below are written to the user configuration.
&Y0		Recall user configuration. Also selects power-up configuration. Note: The user configuration means the vales that are stored using &W0 command.

Special Note: Default AT user profile implies the following:

1. Manual answer (i.e., ATA needed to accept the data calls)
2. Auto disconnect delay = 180 seconds
3. Escape character = '+'
4. Escape guard time = 1 second
5. Baud rate = 9600
6. Flow control = off
7. TX/RX NAC = Channel settings
8. MTU = 254 bytes
9. Extended result codes = On

Command Syntax	Standard(s)	Description	Requires P25 Data
+GMI +CGMI	6.1.4 – V.250 5.1 – GSM07.07	Request manufacturer information. Format: AT+GMI? Reply: GME	
+GMM +CGMM	6.1.5 – V.250 5.2 – GSM07.07	Request model identification. Returns the radio's model number. Format: AT+GMM? Example reply: CM60-U5	
+GMR +CGMR	6.1.6 – V.250 5.3 – GSM07.07	Request revision identification. Returns the firmware revision. Format: AT+GMR? Example reply: Firmware: v2.21 (Jun 5 2023 16:01:06)	
+GSN +CGSN	6.1.7 – V.250 5.4 – GSM07.07	Request serial number. Returns the radio serial number. Format: AT+GSN? Example reply: 40400338	
+GOI +CGOI	6.1.8 – V.250	Request the MAC address. Format: AT+GOI? Example reply: C0:F9:91:00:00:45	
S2		Escape character (e.g. '+').	Yes
S12		Escape sequence guard time in 100ms steps.	Yes
E<value>	6.2.4 – V.250	Echoes characters received ATE? Returns current value ATE1 set echo on ATE0 set echo off	
F[<value>]		Echoes characters received during data online mode. ATF? Returns current value ATF1 set echo on ATF0 set echo off	Yes
V[<value>]	6.2.6 – V.250	Response format (verbosity).	
X[<value>]	6.2.6 – V.250	Result code selection. ATX0 basic result code format for connect string (ie. "CONNECT"). ATX1 extended result code format for connect string (ie. "CONNECT <rate>" if a maximum supported line rate is known, otherwise "CONNECT").	Yes

Command Syntax	Standard(s)	Description	Requires P25 Data
S22		Bitmapped options register. Bit 0 to 5: Reserved Bit 6: Result code selection. Bit 7: Reserved AS22=0 Set extended result codes off. AS22=64 Set extended result codes on.	Yes
+INIT		Store an AT initialisation string to be executed on startup. Format: AT+INIT="<init_string>" where init_string is an AT command line of at most 128 characters. Note: - Multiple commands may be concatenated on one line by separating commands with the ';' character. - AT command lines start with 'AT' but subsequent commands on a line do not have a leading 'AT'. - Extended syntax commands (commands starting with '+') can only be the final command in a command line. - Any characters beyond 128 will be ignored. - The command line must be encapsulated in quotes. Example: AT+INIT="ATS10=30;D202" Write an initialisation string that will set S10 (automatic disconnect delay) to 10 and dial unit ID 202 on startup.	
+IPR	6.2.10 – V.250	Baud rate control. Format: AT+IPR=<baud> where baud is 1200, 2400, 4800 9600, 19200, 38400, 57600 or 115200.	
+IFC	6.2.12 – V.250	DTE-DCE flow control. Format: AT+IFC=<DCE_by_DTE>,<DTE_by_DCE> where DCE_by_DTE and DTE_by_DCE are 0 for no flow control, 1 for software flow control or 2 for hardware flow control. Notes: A – DCE_by_DTE and DTE_by_DCE must be equal on CM series radios.	

Command Syntax	Standard(s)	Description	Requires P25 Data
+WS45	5.2.4.2 – TIA-678-A	DTE-side stack selection for data interface (transmission and reception). Format: AT+WS45=<n> where n is: 0 – Transparent Character Stream (TCS), DEFAULT. 3 – SLIP standard. 100 – SLIP extended. 101 – SLIP extended 2. Notes: A – Selection shall be applicable following the entry to online data state (ATO, AT+CGDATA etc.). B – Parameter shall not be stored and should be reset to DEFAULT upon power cycle.	
+WGPOW	GME	Power on/off notification. Format: +WGPOW: <state> where state is: 0 = Booting up / power on 1 = Booted / normal operating mode 2 = Reset sequence initiated 3 = Power-down sequence initiated (unused in this radio) 4 = Power-down	
+WGRST	GME	Initiate reset.	
+WGPGM	GME	Notification format: +WGPGM: <val> - Program mode notification. Command format: AT+WGPGM=<val> - Set program mode. where val is: 0 = Program mode not active (cannot set) 1 = Program mode is active (reset to deactivate)	

CALL CONTROL COMMANDS (VOICE AND DATA)

Command Syntax	Standard(s)	Description	Requires P25 Data
D	6.3.1 – V.250	Dial a data call.	Yes
A	6.3.5 – V.250	Answer an incoming data call.	Yes
H +CHUP +CUTXC	6.3.6 – V.250 6.5 – GMS07.07	Hangup a data call.	Yes
O	6.3.7 – V.250	Return to online data state.	
+WGBCNLON	GME	Open a connection-less data session and go to the online state. Format: AT+WGBCNLON Target SUID is set to the broadcast address. Format: AT+WGBCNLON=<suid> Target SUID is set to the provided address where suid is: 1-16777214: Target SUID. 16777215: Broadcast address.	Yes
S0	6.3.8 – V.250	Automatic answer. Standard voice and group calls will always be auto-answer.	Yes
S10	6.3.12 – V.250	Automatic disconnect delay.	Yes
+CRING	6.11 – GSM07.07 6.3.4 – V.250	Incoming data call indication. Supported types are: ASYNC <addr_type>,<addr>,<chan_id> This is the default ring notification.	
+WGPTT	GME	PTT notification/activation/deactivation Command format: AT+WGPTT=<ptt_src>, <ptt_state> where <ptt_state> is: 0 = released 1 = pressed Notification Format: +WGPTT: <ptt_src>, <ptt_state> where <ptt_src> is: 0 = Default (comes from configuration) 1 = Front mic 32 = Auxiliary mic 64 = Rear mic	

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGCS	GME	Call state notification. Format: +WGCS: <state> where state is: 0 = No call 1 = Incoming call setup 2 = Outgoing call setup 3 = Outgoing call wait (queued) 4 = In call 5 = Incoming call alerting 6 = Incoming call wait (queued)	Yes
+WGBSY	GME	Busy state notification. Format: +WGBSY: <state> where state is: 0 = Not busy 1 = Busy	
+WGECS	GME	Emergency call notification. Format:+WGECS: <state> where state is: 0 = Normal call 1 = Emergency Call	Yes
+CLIP	6.11 – GSM07.07	Calling Line Identification. Indicates the unit ID, selcall ID or phone number of the calling party for an incoming voice call. Format: +CLIP: "<number>",<type>,,,"<alpha>",<validity> Where number is the P25 unit ID, selcall number or phone number of the calling party. Type is: 128 = Unknown 145 = Phone Number 185 = Network Specific Number (P25 ID or Selcall number). Alpha is the alphabetic name of the calling party, based on the receiving unit's contact list entries. Formatted as an alphanumeric character string. An empty string ("") indicates that there are no contact list entries for the calling unit. Validity is: 0 = CLI information is valid 1 = CLI information was withheld by the caller 2 = CLI information not available due to networking configuration or problem.	

Command Syntax	Standard(s)	Description	Requires P25 Data
+CNUM	7.1 – GSM07.07	Subscriber number. Returns P25 unit ID or selcall ID. Format: AT+CNUM? Example reply: 525	
+WGSU	GME	Read the radio trunked subscriber unit ID. Only valid on trunked channels. Format: AT+WGSU? Example reply: 00003002000209	
+CREG	7.2 – GSM07.07	Network registration status. Unsolicited notifications will be sent when the radio is on a trunking network. Format: AT+CREG? The following possible responses are supported: 0 = Idle (not on trunked network) 1 = Scanning 4 = Registering 5 = Affiliating 6 = On trunked network 7 = Deregistering 8 = Refused 9 = Suspended	Yes
+CSQ	8.5 – GSM07.07	Signal quality. Value is RSSI in dBm.	
+WGEMR	GME	Emergency notification/activation/deactivation. Command format: AT+WGEMR=<state> where <state> is 0 = deactivate emergency 1 = activate emergency Notification format: +WGEMR: <state>,<source> where <state> is: 0 = not in emergency mode 1 = emergency mode active and <source> is: 0 = radio button (function key) 1 = auxiliary function key 2 = AT command 3 = timeout (deactivate only) 4 = PTT press (deactivate only)	

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGHUNT	GME	Force a hunt for a P25 control channel when the radio is on a trunking network. Format: AT+WGHUNT=<hunt type> where hunt type is: 1 = Force a short hunt 2 = Force an extended hunt	Yes
+WGIGN	GME	Ignition-sense switch state notification. Format:+WGIGN: <state> where state is: 0 = OFF 1 = ON	
+WGCHS	GME	Set/get current channel. Format: AT+WGCHS=<channel> Where <channel> is the channel number. Notification format: +WGCHS: <channel>,<-type>,"<name>" Where: <channel> is the channel number. <type> is one of the following channel types: 1 - Analog channel 2 - Conventional P25 channel 3 - Trunked P25 channel 4 - Group channel <name> is the channel name	
+WGCHR	GME	Read a channel. Format: AT+WGCHR=<channel> where channel is the channel number.	
+WGCHL	GME	List channels. Format: AT+WGCHL?	

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGSCTR	GME	Log received selcall digits. Command format: +WGSCTR=<state> where <state> is 0 = don't log received selcall digits 1 = log received selcall digits Notification format: +WGSCTR: <format>,<to>,<from> where <format> is 1 for analog selcall, 2 is digital selcall <to> is the first digits received up to the configured selcall ID length <from> is received selcall digits after the configured selcall ID length	
+WGSTR	GME	Periodically log signal quality. Command format: +WGSTR=<state> where <state> is the period to report signal quality in seconds. 0 is do not log. Notification format: +WGSTR: <time>,<RSSI>dBm where <time> is elapsed time since last report in seconds.milliseconds and <RSSI> is the RSSI in dBm.	
+WGFTR	GME	Track frequency changes. Command format: AT+WGFTR=<state> where state is: 1 = Tracking on. 0 = Tracking off. Notification format (when state is 1): +WGFTR: <mode>, <seconds>.<milliseconds>, <frequency> where: mode = TX or RX seconds.milliseconds = the time of the event in decimal seconds frequency = frequency in MHz. WARNING: Diagnostic use only. May interfere with normal operation, particularly at low baud rates.	Yes

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGZS	GME	Set/get current zone. Format: AT+WGZS=<zone> where zone is the zone number.	
+WGZR	GME	Read a zone. Format: AT+WGZR=<zone> where zone is the zone number.	
+WGZL	GME	List zones. Format: AT+WGZL?	
+WGTXPWR	GME	Set/get global TX power limit Get format: AT+WGTXPWR? Example reply: 5, 10 Where "5" is the TX power of the current channel and "10" is the global limit. The lower of the two values will be used on transmit. Set format: AT+WGTXPWR=<pwr> Where <pwr> is the new value of global TX power limit in Watts, which can be any of "1"," 5", "10" and "25" for 25W models, or either "1" or "5" for 5W models. Note that changes to the global TX power limit are stored persistently.	

Command Syntax	Standard(s)	Description	Requires P25 Data
+CMGS	3.5.1 – 3GPP27.005 6.13.2 – EN300 392-5	Send message. Format: AT+CMGS=<type>,<id>,<unit_id>,<wacn_id>,<system_id> where <type> is one of the following: 0 = P25 message 1 = P25 status update 2 = P25 emergency alarm (not used) 3 = P25 set status (status not sent just stored locally) <id> is the message or status ID <unit_id> is the target unit ID <wacn_id> is the target WACN ID (not used, set to 0) <system_id> is the target system ID (not used, set to 0)	
+CMSS	3.5.2 – 3GPP27.005 6.12.6 – EN300 392-5	Outgoing message/status notification. Notification format: +CMSS: <type>,<id>,<unit_id>,<wacn_id>,<system_id>,<result> where <type> is one of the following: 0 = P25 message 1 = P25 status update 2 = P25 emergency alarm (not used) 3 = P25 set status (status not sent just stored locally) <id> is the message or status ID <unit_id> is the target unit ID <wacn_id> is the target WACN ID (not used) <system_id> is the target system ID (not used) <result> is one of the following: 0 = general failure 1 = success 2 = failed – no channel 3 = failed – timeout 4 = request is outstanding 5 = failed – unsupported	

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGBMTU	GME	Set the maximum transmission unit (MTU) size for BDS data. Format: AT+WGBMTU=<mtu> where mtu is the maximum transmission unit size in bytes.	Yes
+WGBRXNAC	GME	The P25 network access code (NAC) that will be used to filter received BDS data. Unsolicited notifications will be sent if a user configured value has been set and the currently active receive NAC changes. Command format: AT+WGBRXNAC=<NAC>,<chan> Where: <NAC> is the 12-bit NAC that received BDS data will be matched against. A NAC value of: 3966 (0xF7E) indicates all received NACs should be accepted. 4096 indicates the current channel's TX NAC should be used for BDS data (default). 3967 (0xF7F) is reserved. <chan> defines the behaviour of the configured NAC on channel change: 0 = Use the channel's RX NAC on channel change (default). 1 = Keep specified BDS RX NAC across channel change (ignored if NAC = 4096), where possible. Notification format: AT+WGBRXNAC: <NAC> where <NAC> is the currently active NAC for received BDS data. Notes: A – For the BDS receive NAC to be applied the currently selected channel must be configured with the 'Accept all NACs' RX NAC of 3966 (0xF7E).	Yes

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGBTXNAC	GME	The P25 network access code (NAC) that will be used for BDS data transmission. Unsolicited notifications will be sent if a user configured value has been set and the currently active transmit NAC changes. Command format: AT+WGBTXNAC=<NAC>,<chan> Where: <NAC> is the 12-bit NAC to be used for transmitted BDS data. NAC values of 3966 (0xF7E) and 3967 (0xF7F) are reserved. A value of 4096 indicates the current channel's TX NAC should be used for BDS data (default). <chan> defines the behaviour of the configured NAC on channel change: 0 = Use the channel's TX NAC on channel change (default). 1 = Keep specified TX NAC across channel change (ignored if NAC = 4096). Notification format: AT+WGBTXNAC: <NAC> where <NAC> is the currently active NAC for transmitted BDS data.	Yes
+WGBCNLIND	GME	Enable/disable asynchronous notifications for received connection-less data while in the command offline state. Format: AT+WGBCNLIND=<enable> Where enable defines whether connection-less data notifications are enabled or disabled on this console: 0 = no notifications for received connection-less data (default). 1 = receive notifications for received connection-less data. Changed value will not persist across power cycles.	Yes

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGBCNLTX	GME	Transmit connection-less data to the specified SUID from command offline state. Format: AT+WGBCNLTX=<suid>,"<data>" Where: suid is a valid P25 SUID and 16777215 is the standard P25 broadcast address: 0 = reserved. 1 to 9999999= target SUID. 16777215 = broadcast. data is the data to transmit over the air as an ITU V.250 string constant. Non alpha-numeric values can be sent by escaping them as a backslash ("\") character followed by two hexadecimal digits.	Yes
+WGBCNLRXIND	GME	Notification of connection-less data received in command mode when notification is enabled. Format: +WGBCNLRXIND: <suid>,"<data>" Where: suid is the source SU address. data is the data received over the air as an ITU V.250 string constant. Non alpha-numeric values will be shown as a backslash ("\") character followed by two hexadecimal digits.	Yes
+WGBCNLTXIND	GME	Notification of the result of the last connection-less data transfer from this console. +WGBCNLTXIND: <result> Where result is 0 for success or a non-zero error code.	Yes

Command Syntax	Standard(s)	Description	Requires P25 Data
+CGACT	10.1.10 – 3GPP27.007	PDP context activate or deactivate. Format: AT+CGACT=<state>,<cid> The context ID <cid> is fixed to 1 where the interface state <state> is 0 = deactivated 1 = activated	Yes
+CGDATA	10.1.12 – 3GPP27.007	Enter data state. Equivalent to ATO. Format: AT+CGDATA or AT+CGDATA=<state> where <state> is 0 = offline 1 = online	Yes
+CGPADDR	10.1.14 – 3GPP27.007	Show PDP addresses. Format: AT+CGPADDR? Example reply: 10.1.0.26	Yes
+CGREG	10.1.20 – 3GPP27.007	SNDCP network interface status. Unsolicited notifications will be sent when the radio is on an SNDCP network. Format: AT+CGREG? The following possible responses are supported: 0 = Up 1 = Down 2 = Available 3 = Starting 4 = Unknown	Yes
+CGDIND		SNDCP data transfer status notification. Format:+CGDIND: <status> where status is: 0 = Success 1 = Failure	Yes

Note: The CM60 Series currently only works with a single context (context ID 1 in the radio programmer). +CGACT must always be passed with context ID 1.

The context ID maps directly to the network NSAPI.

TETRA COMPATIBLE COMMANDS

Command Syntax	Standard(s)	Description	Requires P25 Data
+CMTI	6.12.7 – EN300 392-5	Incoming message/status notification. Format: +CMTI: <type>,<id>,< unit_id>,<wacn_id>, <system_id> where <type> is one of the following: 0 = P25 message 1 = P25 status update 2 = P25 emergency alarm (not used) 3 = Reserved	
+CTCC	6.15.2 – EN300 392-5	Answer the incoming call.	

GME SPECIFIC COMMANDS

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGUSR	GME	Read a section of the user storage area. Format is: AT+WGUSR=<start_addr>,<length>,<format> where start_addr = start address [0-255] length = number of bytes/characters to read [0 < start+length-1 <= 255] format = format of the returned data: 0 = string 1 = hex encoded data Any invalid parameters return 'ERROR' or '+CEER: Invalid parameter <param_name>'. The reply has the following format: AT+WGUSR=<start_addr>,<length>,<format>,<data> Example 1: DCE -> AT+WGUSR=0,8,0 DTE -> AT+WGUSR=0,8,0,"ABCD1234" Example 2: DCE -> AT+WGUSR=0,8,1 DTE -> AT+WGUSR=0,8,1,4142434431323334	

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGUSW	GME	Write to a section of the user storage area. Format is: AT+WGUSW=<start_addr>,<length>,<format>,<data> where start_addr = start address [0-255] length = number of bytes/characters to read [0 < start+length-1 <= 255] format = format of the returned data: 0 = string 1 = hex encoded data data = formatted data Any invalid parameters return 'ERROR' or '+CEER: Invalid parameter <param_name>'. The reply should be an 'OK' if successful. On error, return 'ERROR' or '+CEER: <reason>'. Example 1: DCE -> AT+WGUSW=0,8,0, "ABCD1234" DTE -> OK Example 2: DCE -> AT+WGUSW=0,8,1,4142434431323334 DTE -> OK	
+GHT	GME	Query connected control head type: 0 = None. No head device connected. 1 = Remote or local control head. 2 = UIC extended control head.	
+WGHMS	GME	Query external host mode state. Command format: AT+WGHMS? Result format: +WGHMS: <features> features - Bit mask of connected host mode features where: Bit 0: Etherstack Proprietary Digital Interface.	

+WGHME	GME	Notification of a change in external host mode state.
		
		Notification format:
		+WGHME: <feature>,<state> where:
		 feature - Host mode feature the event occurred for:
		        1 = Etherstack Proprietary Digital Interface.
		 event - Event that occurred where:
		        0 = Disconnected.
		        1 = Connected.
		        2 = Connecting.
		        3 = Disconnecting.	

Command Syntax	Standard(s)	Description	Requires P25 Data
+WGAUXDITM	GME	Sets/queries a list of items that can be displayed in the radio menu tree (see Settings>Aux. Device on the radio). Query syntax lists all previously set items, set syntax sets one item per command. Command format: AT+WGAUXDITM=<idx>,0,"<label>","<val>",0,0 where: idx – Index of the item to set. Items appear in index order in the menu. Value should be between 0 and 3. label – Label text to display in the menu. val – Value text to display when the labelled item is selected from the menu. For example, to create a menu with the following structure, use the commands below: Menu structure: SETTINGS: AUX DEVICE: STATUS: "Online" SETTINGS: AUX DEVICE: ADDRESS: "10.1.0.103" SETTINGS: AUX DEVICE: RSSI: "-97dBm" Commands: AT+WGAUXDITM=0,0,"STATUS","Online",0,0 AT+WGAUXDITM=1,0,"ADDRESS","10.1.0.103",0,0 AT+WGAUXDITM=2,0,"RSSI","-97dBm",0,0	
+WGWFEN	GME	Enable/disable the Wi-Fi module and query the Wi-Fi module state. Query format: AT+WGWFEN? Command format: AT+WGWFEN=<en> Where: en - 0: Disabled, 1: Enabled, 2: Not Present (note '2: Not Present' cannot be set, only returned in queries)	
+WGSD	GME	Initiate a selective call using the current channel's selcall format (analog or digital selcall). Command format: AT+WGSD=<format>,<id> where: format – Format of id. 0: index into the selcall contact list, 1: selcall digit string. id – ident to send to, interpreted according to format.	

EEPROM USER STORAGE AREA

An area of the EEPROM is set aside for user (3rd party integrator) storage. This information is accessed by AT commands as raw bytes. There is no formatting or structure imposed by the radio on this area.

As per the following figure, the EEPROM address range from 0 up to, including, 255 is available for user storage. This is a total of 256 bytes.

The user storage area is accessed by the +WGUSR and +WGUSW commands.

User EEPROM Section	
Addr 0x00 (0)	
Addr 0xFF (255)	
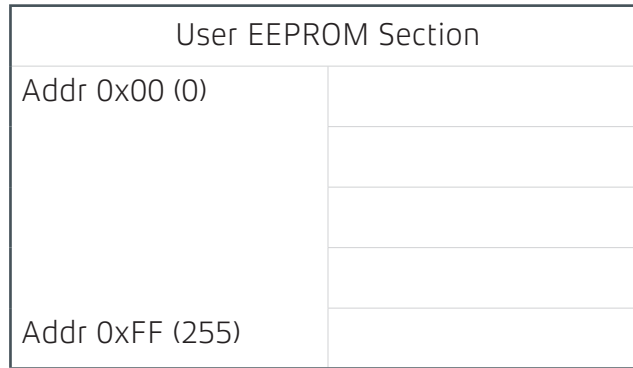
PROTOCOL DESCRIPTIONS

SLIP

SLIP [9] is a simple standard originally developed to enable framing of IP datagrams over a serial interface.

The beginning and end of each SLIP frame contains an END character, 0xC0. SLIP also has an escape character, ESC 0xDB used to escape special character in the middle of the frame.

The original SLIP protocol only allowed for escaping END and ESC characters. The sequence ESC ESC_END, or 0xDB 0xDC, means an END data byte and ESC ESC_ESC, or 0xDB 0xDD, means an ESC data byte.

SLIP Extended

To facilitate using software flow control with SLIP framing, an extension to the SLIP protocol has been implemented which allows for escaping of flow control characters within SLIP framed data. As per un-framed software flow control, the flow control XON byte has the value 0x11 and XOFF is 0x13. When software flow control is enabled these values will be interpreted locally by the CM Series radio as flow control characters and not sent as data over-the-air. To send data within a SLIP frame containing 0x11 or 0x13 values the SLIP Extended framing can be used and the XON/XOFF characters escaped – the escape sequence for XON is ESC ESC_XON, or 0xDB 0xDE, and for XOFF is it ESC ESC_XOFF, or 0xDB 0xE0.

Note that the interface's flow control mode must also be enabled using the AT+IFC command for software flow control to be active.

SLIP Extended Control Byte

A further extension to the SLIP protocol has been implemented (including escaping XON/XOFF characters as described in 13.2) using an additional control byte in the beginning of the SLIP frame. This control byte allows additional information to be passed 'out of band' between the DTE and DCE as a bitfield.
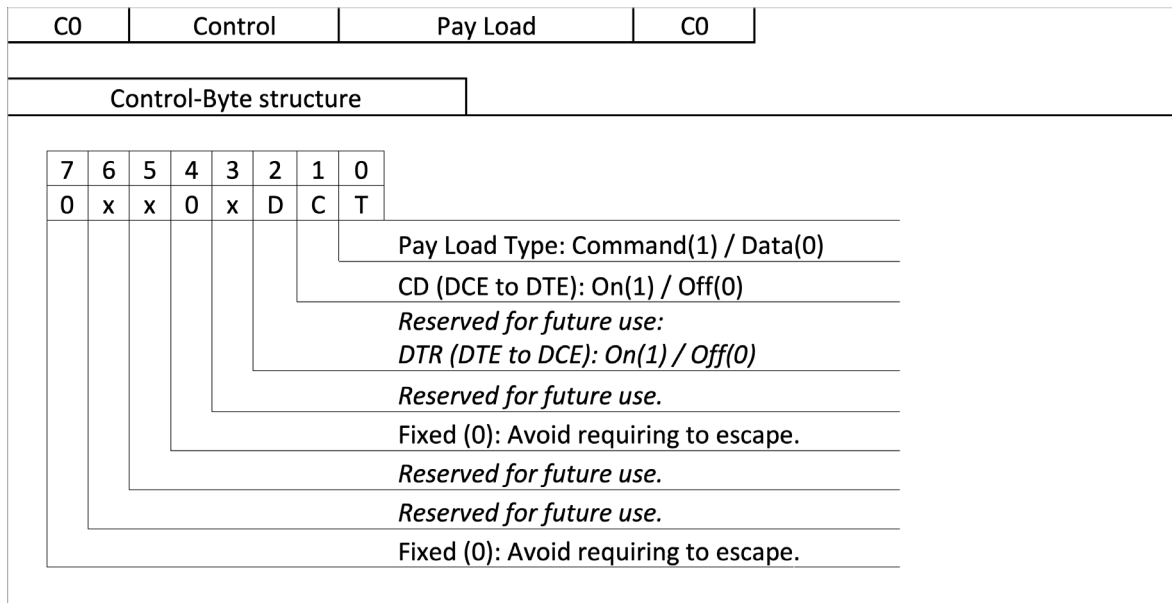
The bits of the control byte are defined as follows:

#	Name	Description
Bit 7	-	Fixed at 0 to avoid escaping of the control byte. Both DTE and DCE should always set to 0.
Bit 6:5	-	Reserved for future use. Defaults to 0.
Bit 4	-	Fixed at 0 to avoid escaping of the control byte. Both DTE and DCE should always set to 0.
Bit 3:2	-	Reserved for future use. Defaults to 0.
Bit 1	CD	CD bit is cleared low to indicate a loss of connection after which both TE and ME will switch back to command mode.
Bit 0	Pay Load Type	When the Pay Load Type bit is set the SLIP frame will contain a command mode message. When cleared the SLIP frame will contain data. Used to provide unsolicited notifications during data online mode (e.g. trunked registration state).

All unsolicited notifications during data operation will have the parameter Pay Load Type = Command (1). |

Fields marked 'reserved for future use' should be ignored on receive and set to their default value on transmit.

Below are some example scenarios from DCE to DTE communication:

C0	02	DATA	C0

Received an SNDCP Data Packet

C0	03	+CGREG: 0	C0

Unsolicited SNDCP interface notification.

C0	01	+CREG: 7	C0
NO CARRIER\n\r			

Unsolicited network registration status with return to command mode.

NO CARRIER\n\r

Return to command mode with no preceding notification.

13 2 - SLIP Extended2 examples.

Basic Data Service (P25 Conventional)

Outgoing GME P25 Basic Data Service Setup

```
DTE                              MT                              FNE/MS
        →ATD12345 →                    → CAI_DATA(SYN)→
        ←CONNECT←                      ← CAI_DATA(SYN,ACK)←
                                       → CAI_DATA(ACK)→

        ----------------------- MT is in Data Online Mode -----------------------
        ←"HELLO"←                      ← CAI_DATA("HELLO")←
```

Incoming GME P25 Basic Data Service Setup

```
DTE                              MT                              FNE/MS
    ←+CRING: ASYNC 176,12347,1←          ← CAI_DATA(SYN)←
        →ATA→                         → CAI_DATA(SYN,ACK)→
        ←CONNECT←                      ← CAI_DATA(ACK)←
        ----------------------- MT is in Data Online Mode -----------------------
        →"HELLO"→                      → CAI_DATA("HELLO")→
```

Outgoing GME P25 Basic Data Service Hang Up

```
DTE                              MT                              FNE/MS
        ----------------------- MT is in Data Online Mode -----------------------------
        →+++→
        ←OK←
        ----------------------- MT is in Command Online Mode -----------------------
        →ATH→                          → CAI_DATA(RST)→
        ←NO CARRIER←                    ← CAI_DATA(RST,ACK)←
        ----------------------- MT is in Command Offline Mode -----------------------
```

Incoming GME P25 Basic Data Service Hang Up

```
DTE                          MT                         FNE/MS
      ----------------------- MT is in Data Online Mode --------------------------------
                                              ← CAI_DATA(RST)←
          ←NO CARRIER←              → CAI_DATA(RST,ACK)→
      ----------------------- MT is in Command Offline Mode ------------------------
```
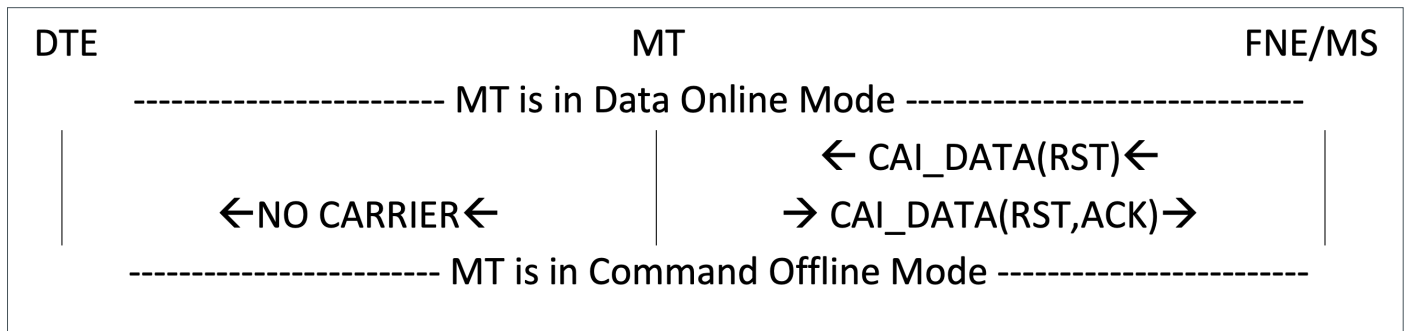
Exit Data Online Mode to Command Online Mode and Return to Data Online Mode

```
DTE                          MT                         FNE/MS
      ----------------------- MT is in Data Online Mode -------------------------------
              →+++→
              ←OK←
      ----------------------- MT is in Command Online Mode ------------------------
              →AT?→
              ←OK←
              →ATO→
          ←CONNECT←
      ----------------------- MT is in Data Online Mode -------------------------------
          →"HELLO AGAIN"→              → CAI_DATA("HELLO AGAIN")→
```
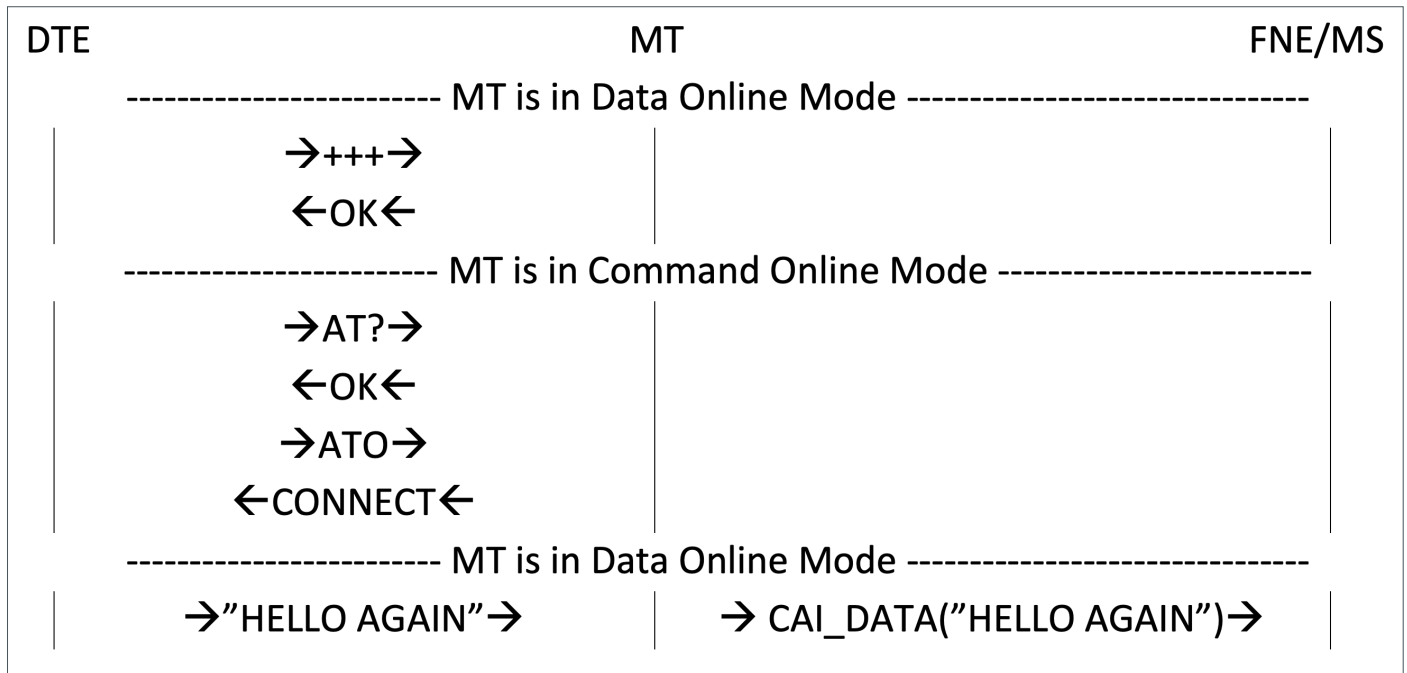
Basic Data Service – Connection-Less Mode (P25 Conventional)

GME P25 Connection-Less Data Setup

```
DTE                          MT                         FNE/MS
      →AT+WGBNCLON=<suid>→
          ←CONNECT CNLESS←
      ----------------------- MT is in Data Online Mode -----------------------
          →"HELLO" →                  → CAI_DATA("HELLO") →
          ←"HI THERE"←                ← CAI_DATA("HI THERE")←
```
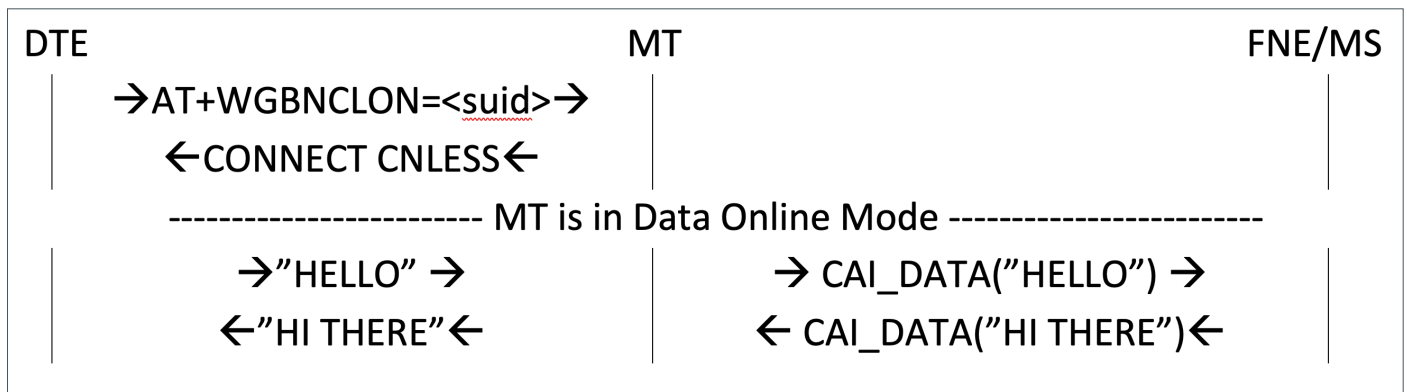
GME P25 Connection-Less Data Hang Up

DTE	MT	FNE/MS
------------------------ MT is in Data Online Mode --------------------------------		
→+++→		
←OK←		
------------------------ MT is in Command Offline Mode ------------------------		
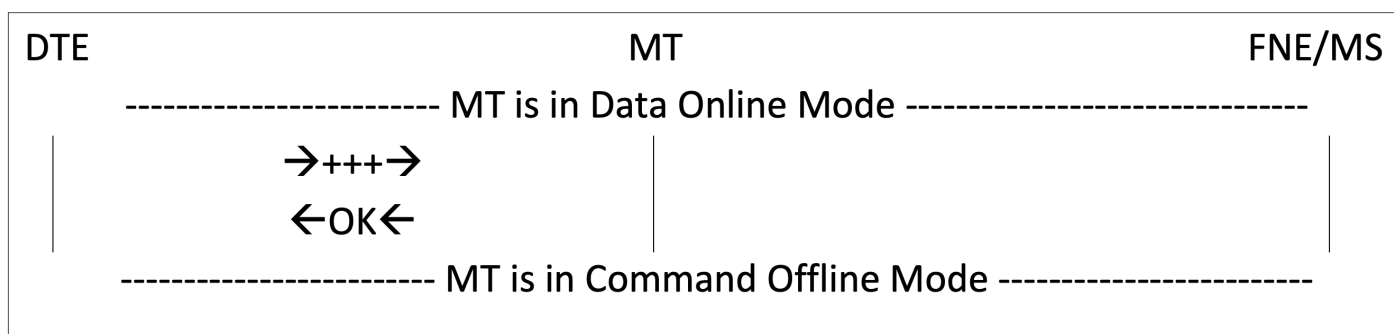
PDP Data Service (P25 Trunked Data)

Outgoing IP PDP Service Setup (SLIP Extended2)

DTE	MT	FNE/MS
→AT+WS45=101 →		
←OK←		
→AT+CGACT=1,1→		
←OK←		
←+CGREG: 3←	→SN_DATA_CHN_REQ→	
...	←SN_DATA_CHN_GNT←	
...	→SN_ACTIVATE_CTXT_REQ→	
←+CGREG: 0←	←SN_ACTIVATE_CTXT_ACCEPT←	
←+CGPADDR: 1,10.1.0.25←		
→AT+CGDATA=1→		
←OK←		
------------------------ MT is in Data Online Mode --------------------------------		
→SLIP(IP DATA)→	→SN_DATA_CHN_REQ→	
	←SN_DATA_CHN_GNT←	
	→CAI_DATA(IP DATA)→	
...	...	
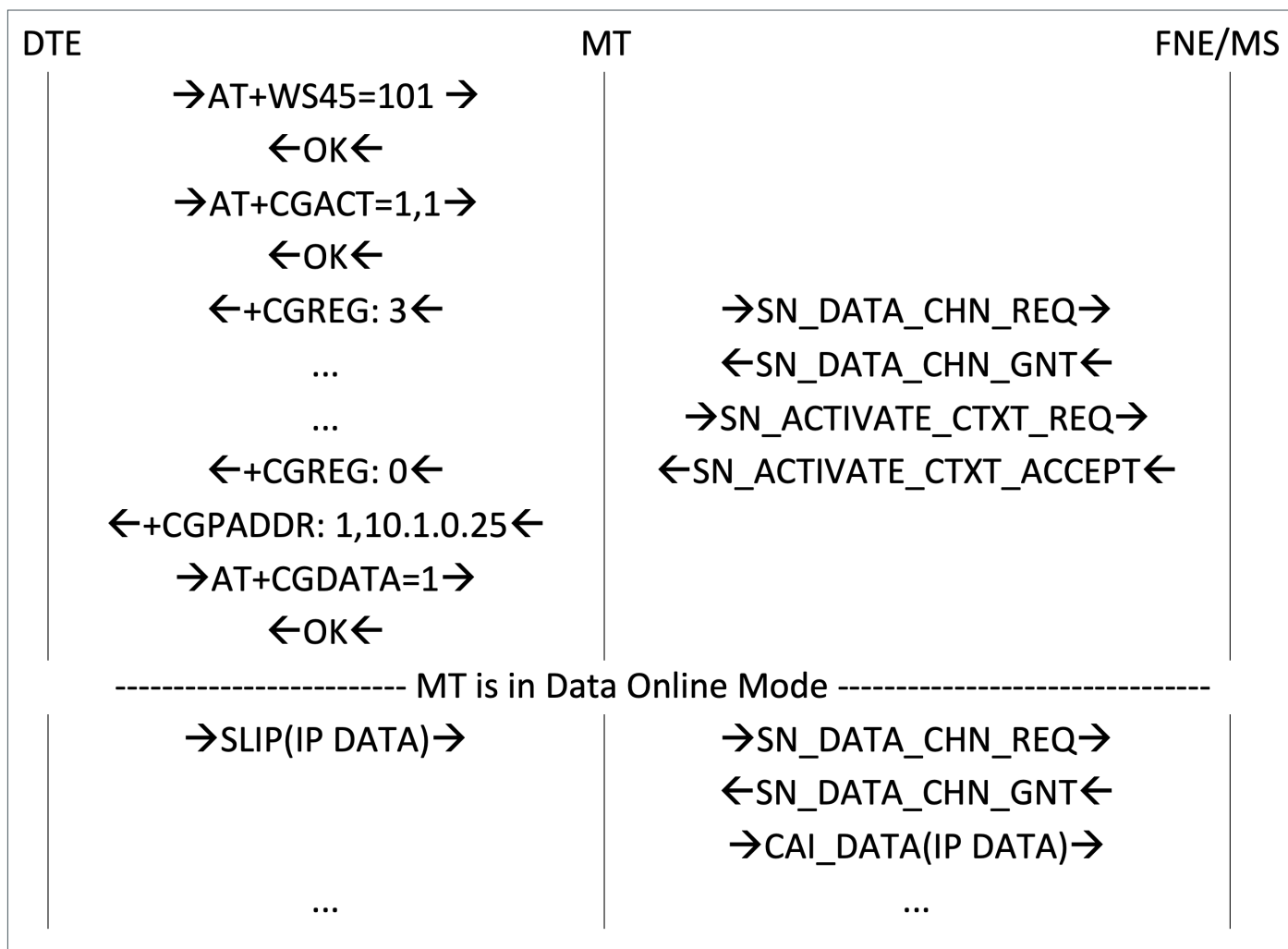
IP PDP Service Hangup Due to Channel De-Selection, in Coverage (Slip Extended2)

```
DTE                               MT                          FNE/MS
      ------------- MT is in Data Online Mode, Channel Change Initiated -------------
        ←SLIP(+WGCHS=1,2,"1")←
          ←SLIP(+CREG: 7)←              → U_DEREG_REQ →
          ←NO CARRIER←

                                             ...
          ←+CGREG: 1←               ← U_DE_REG_ACK←
          ←+CREG: 0←
      ----------------------- MT is in Command Offline Mode -----------------------
```
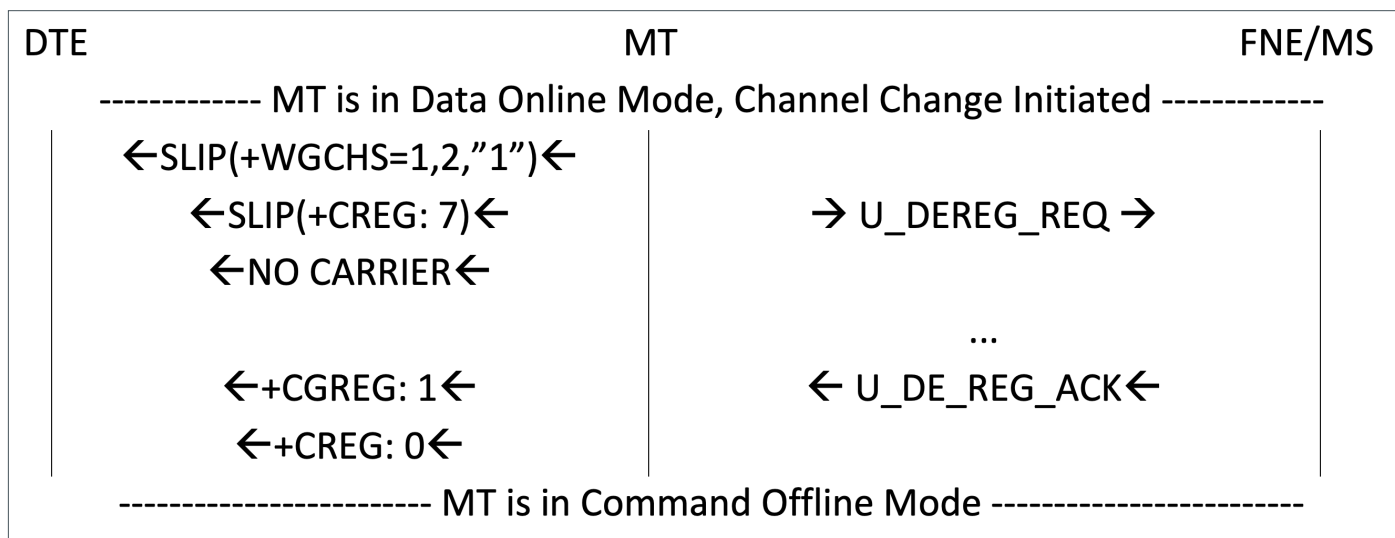
IP PDP Service Hangup Due to Channel De-Selection, Out of Coverage (SLIP Extended2)

```
DTE                               MT                          FNE/MS
      ------------- MT is in Data Online Mode, Out of Coverage and Hunting -------------
          ←SLIP(+CREG: 1)←
          ←SLIP(+CREG: 0)←
          ←SLIP(+CREG: 1)←
          ←SLIP(+CREG: 0)←
      ----------------------- Channel Change Initiated -----------------------
        ←SLIP(+WGCHS=1,2,"1")←
          ←NO CARRIER←
      ----------------------- MT is in Command Offline Mode -----------------------
```

COMMERCIAL