FURUNO

INMARSAT B
9.6K DATA COMMUNICATION

MODEL FELCOM 80/81

(CLASSES 1 and 2)

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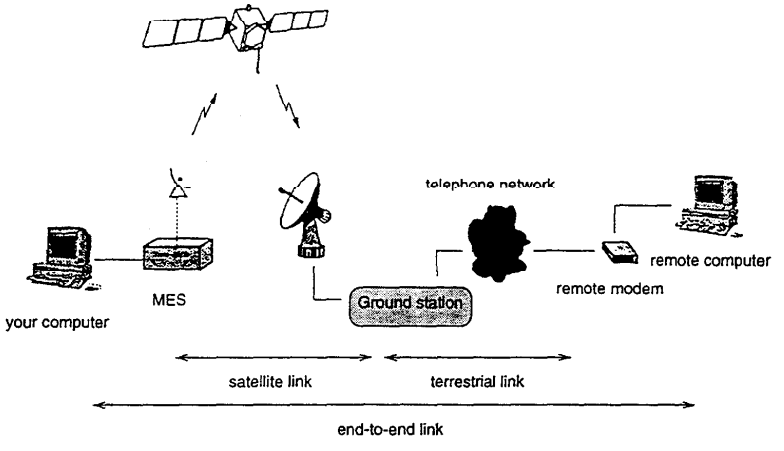
Contents

1. General

The Inmarsat B 9.6k data services (hereinafter referred to as "9.6kDATA") enables data communications between (a) a computer (DTE) connected to MES which supports the 9.6kDATA and (b) a remote computer (ground station) with a modem, which allows data communications using telephone lines.



Source: Inmarsat - M/B Data Services Users' Guide (published by Inmarsat)

Fig. 1-1 9.6kDATA system configuration

The 9.6kDATA offers the maximum communication speed of 9600 bps in duplex transmission. As shown in Fig. 1-1, there are two links involved between the two computers. One is the satellite link {from the MES to the LES (ground station)} and the other the terrestrial link (telephone line from the LES to the remote modem).

Under the 9.6kDATA, the MES can be used almost like a modem for general use and controlled with AT commands. In order to ensure the maximized efficiency of data communications, however, the above two links must be set up properly.

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2. Terminology

MES

A mobile earth station.

It means the FELCOM80 or FELCOM81 in this manual. This term may also be used to mean a communication control unit in this document.

LES

A land earth station.

DCE

Data circuit-terminating equipment.

It means a communication control unit for the FELCOM80 or FELCOM81, or a modem of an earth station at the other end.

DTE

Data terminal equipment.

It means a personal computer or similar equipment connected to the DCE.

bps

Bit per second.

It means a communication speed indicated using the number of bits transmitted per second.

<CR>

A code used to inform the MES that the character string for an AT command has been ended. If the DTE has a keyboard, this code can be sent to the MES by pressing the Enter or Return key.

3. Main Features

Flow control

Different procedures for the DTE to control the flow of data that is sent by the MES and those for the MES to control the flow of data that is sent by the DTE can be chosen. (For further details of flow control, see next section.)

Service function selection

Different sea areas and LESs can be chosen.

Communication parameters setup

Various parameters can be set including the line communication speed; the line error correction mode; the window size in the ARQ mode; and the boundary value of transmit/reception buffer.

Extended line report display

Detailed information (such as communication speeds and error corrections over the satellite and terrestrial links) can optionally be reported when a line is connected.

Non-volatile memory

The entered values can optionally be stored in the non-volatile memory when you wish to always use those values rather than the settings at the factory.

Note: *The FELCOM80/81 conforms to ITU-T V25ter, PCCA- STD-101, and Inmarsat-B SDM.*

4. Preliminary Knowledge of Data Communications

Modem

A modulator/demodulator used for data communications over a telephone line. When data communications are being carried out through the TEL port, a modem must be connected to the MES. However, this is not necessary for data communications through the DATA port (the MES itself can be regarded as a modem).

AT commands

One of the command sets used to control a modem. For further information, see "9. AT Commands."

Operation states

The following operation states are observed when the MES is used for data communications:

1. Command state

   The MES accepts AT commands when in this state. It recognizes the characters entered via the DTE as a character string. The MES is not connected to any remote station.

2. On-line data state

   In this state, the MES is performing data communications with a remote station connected to it. The characters entered via the DTE are sent to that station.

3. On-line command state

   In this state, the MES is connected to a remote station, but still accepts AT commands. The characters entered via the DTE are recognized as a character string and are not sent to the remote station.

Note: *The MES never enters the on-line data state unless it is connected to a remote station.*

- When any other terminal (telephone or facsimile) is in use for a communication, the MES accepts no character entered via the DTE. Therefore, if any AT command is entered, the MES returns no response. The AT commands entered when any other terminal is busy are stored in the command buffer. Once the terminal exits the communication, those commands are accepted.

- During a data communication, no operation can be performed on the telephones and facsimile machines. If any telephone or facsimile machine is off the hook when a data communication is in progress, a tone continuously sounds at 600 Hz to tell the user that the telephone or facsimile machine cannot be used. During a data communication, no parameter can be set via TEL1.

- The FELCOM80/81 does not support the automatic detection of a communication format by using AT commands. Properly set up the communication format of the FELCOM and communication software in accordance with "6. Preparations for Communications."

  Note: *If you cannot successfully set up the communication format, dial "*60#" via TEL1 to reset the format to its initial state (9600 bps; 8 bits; No parity; 1 stop bit). In this case, however, the telephone-related settings are also reset. The data in the non-volatile memory is lost. See the caution in the paragraph for "Setting communication parameters."*

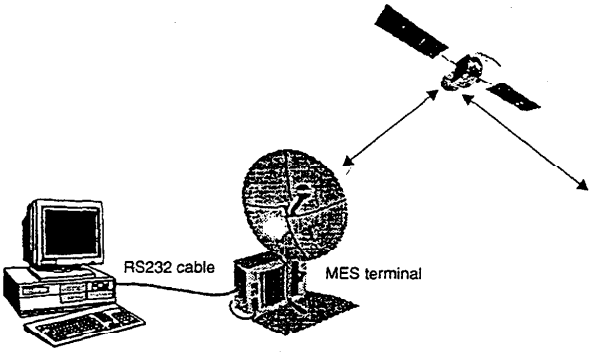
- The state of a data communication varies depending on the following factors, some of which are influenced by the time zone of the communication, the LES used, and the remote station connected, or change with each call:
  - State of the satellite link
  - State of the terrestrial link (delay due to routing; congestion of line; line state; etc.)
  - Settings of the MES, and the terminal and modem of the remote station
  - Compatibility between the modem of the LES and that of the remote station
  - Responsiveness and other similar characteristics of the DTE of the MES and a terminal (e.g., a computer) of the remote station.

  Therefore, the data transmission speed may become slower depending on the call, or the call may be even aborted. If this occurs, retry the communication. In some cases, you may need to change the settings of the MES and the remote station.

6. Preparations for Communications

Connecting a DTE to the MES

Using a straight-connection type serial cable, connect the serial port on the DTE to the "PC DATA" connector on the rear panel of the MES. No cross-connection (reverse-connection) type serial cable is applicable. The serial port located on the rear of the DTE (e.g., a computer) is identified as SERIAL or COM (if it cannot be found, refer to the instruction manual for the computer or similar equipment used as the DTE). In order to avoid external noises, the serial cable used must be shielded one.



Source: Inmarsat - M/B Data Services Users' Guide (published by Inmarsat)

Fig. 6-1 Connecting a DTE to the MES

Setting the DIP switch

This setting is not required for the FELCOM81. For the FELCOM80, set bank No. 3 of the DIP switch on the CPU2 board in the CCU to ON (set it to OFF if a card reader is used).

Procedure for initial setup

Initializing the non-volatile memory

Note: *Once the non-volatile memory is initialized, the settings for telephone and facsimile terminals are reset to the default values. If any of the default values is modified, write it down so that it can be used next time the settings are made.*

① Dial "*60#" on telephone No. 1 (local telephone).

② Let the DTE operate as a communication terminal. Select a communication speed of "9600 bps" and a communication format of "8 bits; 1 stop bit; no parity."

③ Enter "AT&F&W<CR>" via the DTE. When the DTE screen shows "OK," the initialization of the non-volatile memory is now completed.

Resetting the communication parameters

When using the communication parameters stored in the non-volatile memory:

① Let the DTE operate as a communication terminal.

② Enter "ATZ<CR>" via the DTE. When the DTE screen shows "OK," the initial setup of the communication parameters is now completed. Depending on your application, this process can be automatically carried out every time a communication is started. In this case, you do not need to perform this step.

When using the communication parameters set at the factory:

Note: *Once the communication parameters are reset, the settings for telephone and facsimile terminals are also reset to the default values. If any of the default values is modified, write it down so that it can be used next time the settings are made.*

① Dial "*60#" on telephone No. 1 (local telephone).

② Let the DTE operate as a communication terminal. Select a communication speed of "9600 bps" and a communication format of "8 bits; 1 stop bit; no parity."

③ Enter "AT&F<CR>" via the DTE. When the DTE screen shows "OK," the initial setup of the communication parameters is now completed.

Setting the communication parameters

For detailed information on each command, see "9. AT Commands." Subsequently, the initial values are indicated in parentheses.

Communication format

- AT+ICF — (AT+ICF=3,3: 8-bit data; no parity; 1 stop bit)
  Sets the format between the DTE and the MES
- AT+IPR — (AT+IPR=9600)
  Sets the speed between the DTE and the MES.
- AT+WRATE — (AT+WRATE=9600,9600)
  Sets the maximum data rate for the satellite link and that for the terrestrial link.
- Dial "*60#" via TEL1
  (9600 bps; 8-bit data; no parity; 1 stop bit)
  Resets the speed and format between the DTE and the MES to the values set at factory.

  Note: *See page 5-1.*

Flow control

- AT+IFC — (AT+IFC=2,2: DTE → DCE = hardware control flow; DCE → DTE = hardware control flow)
  Set the flow control between the DTE and the MES
- AT+WRTL — (AT+WRTI=120,240: Lower limit = 120; Upper limit: 240)
  Sets the limits of the reception buffer for the flow control.
- AT+WTTL — (AT+WTTL=120,240: Lower limit = 120; Upper limit = 240)
  Sets the limits of the transmit buffer for the flow control.

Error correction

- AT+WS45 — (AT+WS45=1; Satellite link = With ARQ; Terrestrial link = With error corrections)
  Sets whether error corrections are made for the satellite and terrestrial links.
- AT+WKSIZE — (AT+WKSIZE=25)
  Sets the ARQ window size for communications in the ARQ mode.

Break signal

• AT\K (¥K)	(AT\K1: Clears the transmit and reception buffers and sends the break signal) Specifies the action that occurs when the break signal is received.

Signal line control

• AT&C	(AT&C1: Changes depending on the connection states) Specifies the behavior of the CD (DCD) signal.
• AT&D	(AT&D2: Disconnects the signal line if its status changes from ON to OFF) Specifies the behavior of the ER (DTR) signal.
• AT&S	(AT&S1: Changes depending on the connection states) Specifies the behavior of the DR (DSR) signal.

Display of command and result codes

• ATE	(ATE1: With echo back) Specifies whether the received command character string is echoed back.
• ATQ	(ATQ0: Returns a result code) Sets whether a result code is returned.
• ATV	(ATV1: Word format) Specifies the format for result codes
• ATX	(ATX4: Displays the communication speed) Sets whether the communication speed is displayed at connection.
• AT+WXR	(AT+WXR=0: Without extended display) Chooses the extended display of the CONNECT result code.

Settings for Inmarsat communications

• AT+WLES	(AT+WLES=000: Stores LES access codes in memory) Stores LES access codes in memory and display the currently stored ones.
• AT+WOR	(Sea area specified with telephone and facsimile terminals) Displays the currently specified sea area and changes it.
• AT+WS46	(AT+WS46=11: Uses the Inmarsat system) Chooses the use of the Inmarsat system.

Note: *The optimal values vary depending on the contents of communications, remote stations, and the states of lines. Change the settings according to the states of communications and store the modified values in the non-volatile memory.*

Some communication software can automatically store the settings. If such software is used, you do not need to store the modified values in the non-volatile memory.

A sudden failure or a similar event may cause the data in the non-volatile memory to be lost (if the data is lost, the non-volatile memory is reset to the values set at the factory). The non-volatile memory is located on the CPU2 circuit board. Therefore, if the circuit board is replaced, your own settings must be stored again in the memory. For this purpose, be sure to write down the values you have stored in the memory.

Your data stored in the non-volatile memory is not covered by our warranty.

Setting up the communication software

The setup procedure varies depending on the communication software used. This section only mentions the points you should give attention to.

Number of remote station

If an LES is specified with the +WLES command, do not specify an LES number. If not, specify this number including an LES number.

Communication format

This format varies depending on the remote station you are connecting to. Properly set the communication format according to that station.

Flow control

In principle, set this parameter to the hardware control (CTS/RTS). Choose the software control (XON/XOFF) if necessary, e.g., when the hardware control cannot be used by the terminal.

Note: *For further information, refer to the instruction manual for your communication manual.*

7. Starting and Finishing a Communication

Changing the sea area

Specify a sea area using the +WOR command.

e.g.: To change the sea area to the Pacific Ocean:

AT+WOR=2<CR>

Changing the communication parameters

According to the contents of communications, remote stations, and the states of lines, change the settings as necessary.

Outgoing calls

Specify the number of the remote station using the D command, and then make a call.

e.g.: To call 123456789 in Japan for an automatic connection via the LES of 003:

1. If no LES is specified (when AT+WLES=000), enter:
   ATD003-00-81-123456789#<CR>
2. If +WLES=003 is previously specified, enter:
   ATD00-81-123456789#<CR>

Note: *In either case, you may want to omit the character "#."*

Incoming calls

If a call is received, the DTE screen shows "RING."

1. If a call is received in the automatic reception mode (when register S0 is set to non-zero), the reception sequence is automatically started.
2. In the manual reception mode (when register S0 is set to zero), enter "ATA<CR>" after confirming the arrival of a call. The reception sequence is started.

Finishing a communication

Disconnection by the remote station

The satellite link is disconnected with "NO CARRIER" displayed. A different message may be displayed depending on your communication software.

Disconnection by the MES

To finish the communication at the MES:

1. Use the ER (DTR) signal.
   i) Previously set up the MES and communication software as follows:
      - Set up the MES so that the line is disconnected with the AT&D2 {ER (DTR)} signal.
      - Set up the communication software so that the line is disconnected with the ER (DTR) signal.
   ii) If the line is disconnected with the communication software during a communication, the communication can be finished.

2. Go to the on-line command mode with the break signal and then use the ATH command.
   i) Previously set up the MES as follows:
      - Using the AT\K command (to choose the break signal processing), set up the MES so that it enters the on-line command mode with the break signal.
   ii) Send the break signal from the communication software.
   iii) The MES enters the on-line command mode.
   iv) Enter the ATH command from the communication software. The communication is finished.

Note: *The first procedure is recommended.*

8. Viewing the State of MES

To view a program name and number:

- AT+GMI — Displays a manufacturer name
- AT+GMM — Displays an equipment name
- AT+GMR — Displays a program version number.

To view various settings stored in the non-volatile memory:

- AT&V — Displays the contents of the non-volatile memory.

To find the details of an error that has occurred:

- AT+WQ — Displays the details of the error when OK or CONNECT is not displayed (when ERROR or NO CARRIER is shown).

To view the brief description of a command:

- AT&H — Displays a list of commands.

To view other states:

- AT+GCAP — Displays the class of the extended AT command set.
- AT+W — Displays the command extension system for the +W command set.
- AT+WINMARSAT — Displays a list of commands that have been added by Inmarsat.

9. AT Commands

What are the AT commands?

They are model control commands that were developed by Hayes, a modem manufacturer in the United States. At present, the AT commands are adopted in a large number of modems for use with general telephone lines. The AT commands are named as such because a character string, "AT" (meaning "Attention") is prefixed to each of them.

The AT commands that can be used by the MES include:

(i) Basic commands (same as the commands that are generally used in most of the modems)

(ii) Extended commands (commands added for Inmarsat)

The data corrections and data compression (MNP, V42, and V.42bis) as used over telephone lines are not used on any satellite channel. Therefore, there is no command available for them.

To enter a command, prefix "AT" to it like "ATA" and "ATE0" (except "A/"). Except for some specific commands, you may want to describe multiple commands on a single line, like "ATV1Q0." A different command may be placed immediately after any basic command. However, a character ";" must be placed immediately after any extended command.

Any command parameter enclosed in brackets ([ ]) may be omitted. If it is omitted, the default value is assumed.

Note: *Any parameter included in a command followed by (▲) may be stored in the non-volatile memory.*

Note: *In principle, the commands that were specified in the SDM by Inmarsat are employed, but some of the added and omitted commands or parameters are different because of reasons related to the specification of equipment.*

Basic commands

Command	Description
A	Forcibly puts the MES in the ANSWER mode. If this command is entered when a call arrives, the connection sequence is started. e.g.: ATA<CR>
A/	Executes the just previously entered command again. This command is independently used without entering "AT." You do not need to enter <CR> after "/." e.g.: ATxxxxxxxxxxx (just previously entered command) (i) ... A/ The command in (i) is executed again.
D	Sends a call to a remote station with the specified number. D[dialed character string>] The following characters may be used for the dialed character string: 0-9 Used to specify the telephone number of a remote station. ( ) and – Used to delimit the telephone number. # Used to indicate the end of the telephone number (may be omitted). ; Used to return to the command mode after dialing. e.g.: 1.ATD003-00-81-123456789# (when AT+WLES=000) 123456789 in Japan is dialed for automatic connection via the LES of 003. 2. ATD00-81-123456789 (when AT+WLES is not 000) The number is dialed via the LES specified with the +WLES command. The tailing character "#" may be omitted. 3. ATD003-00-81-123456789#; This is the same as the above 1, except that the MES returns to the command mode after the number is dialed.
E▲	Specifies whether the received command character string is echoed back. E[<n>] n=0 Not echoed back n=1 Echoed back • If <n> is omitted, it is assumed as "1." e.g.: ATE1<CR>
H	Disconnects the connected line. H[<n>] n=0 Disconnects the connected data line. If a telephone or facsimile machine is in use, its communication cannot be cut off. (To cut off the communication, the MES must be in the on-line command mode.) Does nothing. n≠1<n> is omitted, it is assumed as "0." e.g.: ATH<CR>

Command	Description
O	Causes the MES to go from the on-line command mode to the off-line data mode. e.g: ATO< CR>
Q▲	Sets whether a result code is returned. Q[<n>] n=0 The MES returns a result code. n=1 The MES does not return a result code. • If <n> is omitted, it is assumed as "0." • If the Q1 command is used, no result code is returned for the subsequent commands. e.g.: ATQ0<CR>
S	Stores a value in an S register or reads data from it. For further information, see the section "S Registers." e.g.: 1. ATS3=13<CR>: Stores "13" in register S3. 2. ATS3?<CR>: Displays the contents of register S3.
V▲	Specifies the format for a result code. V[<n>] n=0 Displays a result code in the numeric format. n=1 Displays a result code in the word format. • If <n> is omitted, it is assumed as "1." e.g.: ATV1<CR>
X▲	Specifies whether the communication speed (plus BUSY/NO DIALTONE) is displayed. X[<n>] n=0 Does not display the communication speed (plus BUSY/NO DIALTONE) when a communication is established. n=1 - 4 Displays the communication speed (plus BUSY/NO DIALTONE) when a communication is established. • If <n> is omitted, it is assumed as "4." e.g.: ATX4<CR>
Z	Initializes the command parameters. The parameters stored in the non-volatile memory are initialized with its initial values. e.g.: ATZ<CR>

Command	Description
&C▲	Specifies the behavior of CD (DCD) signal. &C[<n>] n=0 The CD signal is always ON. n=1 The CD signal varies depending on how the MES is connected to the LES • If <n> is omitted, it is assumed as "1." e.g.: AT&C1<CR>
&D▲	Specifies the behavior of the ER (DTR) signal. &D[<n>] n=0 Ignores the ER signal. n=1 If the ER signal changes from ON to OFF during a connection, the MES returns to the on-line command mode. n=2 If the ER signal changes from ON to OFF during a connection, the line is disconnected. • If <n> is omitted, it is assumed as "2." e.g.: AT&D2<CR>
&F	Initializes the command parameters. All of the parameters are initialized to the values set at the factory. However, the contents of the non-volatile memory remain unchanged. (To initialize the contents of the non-volatile memory, enter the AT&F command and then enter AT&W.) e.g.: AT&F<CR>
&H	Displays a list of commands. &H[<n>] n=0 Displays a list of basic commands. n=1 Displays a list of extended commands. n=2 Displays a list of values in the S registers • If <n> is omitted, it is assumed as "0." e.g.: AT&H1<CR>
&S▲	Specifies the behavior of the DR (DSR) signal. &S[<n>] n=0 Always keeps the DR signal ON. n=1 Follows the sequence of the communication protocol. n=2 Follows the CD signals. • If <n> is omitted, it is assumed as "1." e.g.: AT&S1<CR>
&V	Displays the contents of the non-volatile memory. e.g.: AT&V<CR>
&W	Stores the currently set parameters in the non-volatile memory. **Note:** Ensure that the power never be turned OFF for approximately 10 seconds after this command is executed. Otherwise, the data may not be successfully written to the non-volatile memory. **Note:** If the parameters stored in the non-volatile memory are not correct when the power is turned ON, they are reset to the values set at the factory. e.g.: AT&W<CR>

Command	Description
\K▲	(For a Japanese-language terminal on which "\" cannot be entered, substitute this command with "¥K.") Specifies the action that occurs when the break signal is received. \K[<n>] n=0,1 Clears the data in the transmit/reception buffer and sends the break signal. n=2,3 Skips the data in the buffer and takes priority in sending the break signal. • When n=0,2, the MES sends the break signal and then enters the on-line command mode. • If <n> is omitted, it is assumed as "1." e.g.: AT\K1<CR>
\Q▲	(For a Japanese-language terminal on which "\" cannot be entered, substitute this command with "¥Q.") Sets the flow control between the DTE and the MES (further detailed settings can be made using the +IFC command). \Q[<n>] n=0 No flow control (equivalent to +IFC0,0) n=1 XON/XOFF flow control (equivalent to +IFC1,1) n=2 RS/CS flow control (equivalent to +IFC2,2) n=3 CS flow control (equivalent to +IFC0,2) n=4 Mono-directional XON/XOFF flow control (equivalent to +IFC0,1) • If <n> is omitted, it is assumed as "2." e.g.: AT\Q1<CR>

Extended commands

Command	Description
+GCAP	Displays the class of extended AT command set supported by the MES. +GCAP +GCAP=? Once this command is accepted, the following character string is displayed: +GCAP: +W e.g.: AT+GCAP<CR>
+GMI:	Displays a manufacturer name. Once this command is accepted, the following character string is displayed: FURUNO Electric Co., Ltd. Copyright(C) 1996-97 All rights reserved. e.g.: AT+GMI<CR>
+GMM	Displays an equipment name. Once this command is accepted, the following character string is displayed: FELCOM 81, Inmarsat-B Mobile Earth Station e.g.: AT+GMM<CR>

Command	Description
+GMR	Displays a program version number. **e.g.:** AT+GMR<CR>
+ICF▲	Sets the communication formation between the ETE and the MES. +ICF=[<format>[,<parity>]] format=3 8-bit data; without parity; 1 stop bit format=4 7-bit data; without parity; 2 stop bits format=5 7-bit data; with parity; 1 stop bit • If <format> is omitted, it is assumed as "3." parity=0 Odd-number parity parity=1 Even-number parity parity=3 Space parity • If <parity> is omitted, it is assumed as "3." +ICF? • Displays the currently set value as follows: +ICF:<format>,<parity> +ICF=? • Displays the effective ranges of parameters for this command as follows: +ICF: (3-5),(0,1,3) **e.g.:** AT+ICF=3,0<CR>
+IFC▲	Sets the flow control between the DTE and the MES. +IFC=[<DTE→DCE>[,<DCE→DTE>]] <DTE→DCE> specifies how the data transmission from the DCE is controlled by the DTE. DTE→DCE=0 Does not perform the flow control. DTE→DCE=1 Performs the flow control with DC1(XON)/DC3(XOFF). DC1/DC3 is not transmitted to the LES. DTE→DCE=2 Performs the flow control with RFR(RTS). DTE→DCE=3 Performs the flow control with DC1(XON)/DC3(XOFF). DC1/DC3 is transmitted to the LES. • If <DTE→DCE> is omitted, it is assumed as "2." <DCE→DTE> specifies how the data transmission from the DTE is controlled by the DCE. DCE→DTE=0 Does not perform the flow control. DCE→DTE=1 Performs the flow control with DC1(XON)/DC3(XOFF). DCE→DTE=2 Performs the flow control with CTS. • If <DCE→DTE> is omitted, it is assumed as "2." +IFC? • Displays the currently set value as follows: +IFC: DTE→DCE,DCE→DTE +IFC=? • Displays the effective ranges of parameters for this command as follows: +IFC: (0-3),(0-2) **e.g.:** AT+IFC=2,2<CR>

Command	Description
+IPR▲	Sets the communication speed (fixed speed at the DTE) between the DTE and the MES). +IPR=[<n>] n=1200 Sets 1200 bps. n=2400 Sets 2400 bps. n=4800 Sets 4800 bps. n=9600 Sets 9600 bps. n=14400 Sets 14400 bps. n=19200 Sets 19200 bps. • If <n> is omitted, it is assumed as "9600." +IPR? • Displays the currently set value as follows: +IPR: n +IPR=? • Displays the effective ranges of parameters for this command as follows: +IPR: (1200,2400,4800,9600, 14400, 19200) e.g.: AT+IPR=0<CR>
+W	Displays the command extension system supported by the MES. +W +W=? Once this command is accepted, the following character string is displayed: "101","+WINMARSAT" e.g.: AT+W<CR>
+WINMARSAT	Displays a list of the commands in the +W<text> format, which have been added by Inmarsat. +WINMARSAT +WINMARSAT=? Once this command is accepted, the following character string is displayed: "+WKSIZE","+WLES","+WOR","+WQ","+WXR","+WRATE","+WRTL","+WTTL" e.g.: AT+WINMARSAT<CR>
+WKSIZE▲	Sets the ARQ window size that is used for communications in the ARQ mode. Normally, this command requires no modification. +WKSIZE=[<n>] • Sets the ARW window size to "n." • If <n> is omitted, it is assumed as "25." +WKSIZE? • Displays the currently set ARW window size as follows: +WKSIZE: n +WKSIZE=? Displays the effective ranges of parameters for this command as follows: +WKSIZE: (1-63) e.g.: AT+WKSIZE=25<CR>

Command	Description
+WLES▲	Stores the LES's access code used for a data call, in the MES. +WLES=<nnn> • Specifies the LES whose access code is <nnn>. If any value other than 3-digit one is entered, an error is generated. • <nnn> cannot be omitted. If it is omitted, an error occurs. • If "000" is entered, the leading three digits of the D command are assumed as the LES's access code. If you enter any 3-digit value other than "000," you do not need to specify the LES's access code in the D command. The access code entered here is used. +WLES? • Displays the currently specified access code for the LES as follows: +WES: nnn +WLES=? • No particular response is returned by the MES. e.g.: AT+WLES=000<CR>
+WOR	Changes the currently specified sea area or displays it. +WOR[=<n>] Enter a new sea area to <n> by choosing its value from: 0: The appropriate sea area is automatically chosen (Auto). 1: Eastern Atlantic Ocean (AOR-E) 2: Pacific Ocean (POR) 3: Indian Ocean (IOR) 4: Western Atlantic Ocean (AOR-W) 5–8: Currently not used (the sea area is not changed) If <n> is omitted, the currently specified sea area is displayed as follows: +WOR: n +WOR=? Displays the effective range of parameter for this command as follows: +WOR: (0-8) **Note:** The usage of this parameter differs from that in the SDM. e.g.: AT+WOR=0<CR>

Command	Description
+WQ	Queries error information. +WQ[=<n>] • The following information is displayed in accordance with the just previous result cord: 1. If the result code is NO CARRIER, BUSY, or NO ANSWER, a cause code is displayed in the hexadecimal notation. 2. If the result codes is ERROR or NO DIAL TONE, an error state is displayed in the decimal notation. 3. If the result code is OK, CONNECT, CONNECT<text>, or RING, nothing is displayed. • The following error information is displayed in accordance with the value for <n> : Decimal notation <m> when n=0 +WQ: <m>,<text> when n=1 <m>: A value showing the error state <text>: A text showing the error state Hexadecimal notation <xxxx> when n=0 +WQ: <xxxx>,<text> when n=1 <xxxx>: A cause code <text>: A text showing the error state • If <n> is omitted, it is assumed as "1." • For the value for <m>, see the section for "Extended Error Codes"; for the value for <xxxx>, see the section for "Cause Codes." +WQ=? Displays the effective ranges of parameters for this command as follows: +WQ: (0,1) e.g.: AT+WQ=1<CR>
+WRATE▲	Sets the maximum data rate for the satellite link and that for the terrestrial link. +WRATE=<sat_rate>[,<ter_rate>] <sat_rate> Data rate for satellite link <ter_rate> Maximum data rate for terrestrial link • If <ter_rate> is omitted, it is assumed to be the same as <sat_rate>. +WRATE? • Displays the currently set data rate as follows: +WRATE: sat_rate,ter_rate +WRATE=? Displays the effective ranges of parameters for this command as follows: +WRATE: (9600),(1200-14400) e.g.: AT+WRATE=9600,9600<CR>
+WRTL▲	Sets the limits for the reception buffer, which are used for the flow control. Normally, you do not need to set this parameter. +WRTL=[<LOW>[,<high>]] <low> Value for lower limit (0-511) <high> Value for upper limit (1-512) • If <high> is omitted, it is assumed to be <low>+120. • If <low> is also omitted, it is assumed to be 120 with <high> assumed as 240. • If any value that does not fall within the effective ranges is specified, an error is generated regardless of whether that value is entered by the user or automatically calculated as a default value. In this case, the previous value remains valid. +WRTL? • Displays the currently set values as follows: +WRTL: low, high +WRTL=? Displays the effective ranges of parameters for this command as follows: +WRTL: (0-511),(1-512) e.g.: AT+WRTL=120,240<CR>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+WS45▲</td><td>Sets whether error corrections are made over the line.
+WS45=[<n>]
•Sets whether error corrections are made for the satellite and terrestrial links as follows:
<table><tr><th>Value for <n></th><th>Satellite link</th><th>Terrestrial link</th><th>End-to-end</th></tr><tr><td>0</td><td>Without ARQ</td><td>Without error corrections</td><td>NARQ</td></tr><tr><td>1</td><td>With ARQ</td><td>With error corrections</td><td>ARQ</td></tr><tr><td>200</td><td>Without ARQ</td><td>Without error corrections</td><td>NARQ</td></tr><tr><td>201</td><td>With ARQ</td><td>With error corrections</td><td>NARQ</td></tr></table>• If <n> is omitted, it is assumed as "1."
• The error corrections include those specified in ITU-T V.42 and others (such as MNP) and differ depending on how they are used over the terrestrial link.
+WS45?
•Displays the currently set value as follows:
+WS45:n
+WS45=?
Displays the effective ranges of parameters for this command as follows:
+WS45:(0,1,200,201)

e.g.: AT+WS45=1<CR></td></tr>
<tr><td>+WS46▲</td><td>Specifies the radio system used. Normally, you do not need to set this parameter.
+WS46=<n>
Only 11 (showing Inmarsat) is valid for <n>. If you try to set this parameter to any other value, an error is generated.
+WS46?
•Displays the currently set value as follows:
+WS46:11
+WS46=?
Displays the effective range of parameter for this command as follows:
+WS46:(11)

e.g.: AT+WS46=11<CR></td></tr>
</table>

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>+WTTL▲</td><td>Sets the limits for the transmit buffer, which are used for the flow control. Normally, you do not need to set this parameter.
+WTTL=[<low>[,<high>]]
<low> Value for lower limit (0-511)
<high> Value for upper limit (1-512)
• If <high> is omitted, it is assumed to be <low> + 120.
• If <low> is also omitted, it is assumed to be 120 with <high> assumed as 240.
• If any value that does not fall within the effective ranges is specified, an error is generated regardless of whether that value is entered by the user or automatically calculated as a default value. In this case, the previous value remains valid.
+WTTL?
• Displays the currently set values as follows:
+WTTL: low, high
+WTTL=?
Displays the effective ranges of parameters for this command as follows:
+WTTL: (0-511),(1-512)

e.g.: AT+WTTL=120,240<CR></td></tr>
<tr><td>+WXR▲</td><td>Sets the extended display of the CONNECT result code.
+WXR=[<n>]
<table>
<tr><th>Value for <n></th><th>Extended information</th><th>Display of CONNECT result code</th></tr>
<tr><td>0</td><td>None</td><td>CONNECT <DTE-DCE rate></td></tr>
<tr><td>1</td><td>Included</td><td>CONNECT <DTE-DCE rate></td></tr>
<tr><td>2</td><td>None</td><td>CONNECT <DCE-DCE rate> <ARQ\NARQ></td></tr>
<tr><td>3</td><td>None</td><td>CONNECT <DCE-DCE rate></td></tr>
</table>
• If <n> is omitted, it is assumed as "0."
• <DTE-DCE rate> shows the terminal speed at the MES.
• <DCE-DCE rate> shows whichever smaller value of the communication speed from the MES to the LES and that from the LES to the remote station.
• For <ARQ\NARQ>, see the description of the +WS45 command.
• If INCLUDED is chosen for the extended information, the following information is displayed when a communication is established:
+WXSR: <rate>,<ec> State of satellite link
+WXTR: <rate>,<ec> State of terrestrial link
+WXKR: <k> ARQ window size
CONNECT <DTE-DCE rate>
• <rate> shows each communication speed and <ec> whether error corrections are made.
• This is only valid when you specify Q0, V1, or X1 that causes "CONNECT" to be indicated.
+WXR?
• Displays the currently set value for <n> as follows:
+WXR: n
+WXR=?
Displays the effective range of parameter for this command as follows:
+WXR: (0-3)

e.g.: AT+WXR=0<CR></td></tr>
</table>

S registers

AT Sm=<n>

- Stores the value "n" in the S register located in the 'm'th position.

AT Sm?

- Reads the value from the S register located in the 'm'th position.

Register name	Description	Initial value
S0 ▲	Specifies whether an incoming call is automatically accepted. Setting range: 0 Not automatically accepted 1–255 Automatically accepted	0
S1	(Reserved)	–
S2	(Reserved)	–
S3 ▲	Specifies a CR code. Setting range: 0–127	13
S4 ▲	Specifies a LF code. Setting range: 0–127	10
S5 ▲	Specifies a BS code. Setting range: 0–32, 127	8
S6	(Reserved)	–
S7	(Reserved)	–
S8	(Reserved)	–
S10	(Reserved)	–
S12	(Reserved)	–

Note: *Do not modify any value stored in the reserved S registers and the S registers that are not listed here. The operation under any modified value is not covered by our warranty*

Result codes

Result codes are used to represent responses to a command from the DTE or the states of the MES. They are shown in the word or numeric format, which can be specified with the V command. The meanings of result codes are listed below:

Word format	Numeric format	Meaning	+WQ command response
OK	0	The communication procedure has been successfully completed.	None
CONNECT	1	The line has been connected.	None
RING	2	The incoming call has been displayed.	None
NO CARRIER	3	The line has been cut off (the connection has not been successfully completed or the communication has been finished).	Cause code (hexadecimal)
ERROR	4	Command error	Extended error code
NO DIALTONE	6	The outgoing call has failed.	Extended error code
BUSY	7	The line is busy (e.g., a telephone or facsimile machine is in use or the remote station is busy).	Cause code (hexadecimal)
NO ANSWER	8	No response has been returned to the attempted outgoing call.	Cause code (hexadecimal)
CONNECT 1200	5	The communication has been established at 1200 bps.	None
CONNECT 1200 ARQ	5	The communication has been established at 1200 bps. (ARQ mode)	None
CONNECT 2400	10	The communication has been established at 2400 bps.	None
CONNECT 2400 ARQ	10	The communication has been established at 2400 bps. (ARQ mode)	None
CONNECT 4800	11	The communication has been established at 4800 bps.	None
CONNECT 4800 ARQ	11	The communication has been established at 4800 bps. (ARQ mode)	None
CONNECT 9600	12	The communication has been established at 9600 bps.	None
CONNECT 9600 ARQ	12	The communication has been established at 9600 bps. (ARQ mode)	None
CONNECT 19200	20	The communication has been established at 19200 bps.	None
CONNECT 19200 ARQ	20	The communication has been established at 19200 bps. (ARQ mode)	None
CONNECT 38400	21	The communication has been established at 38400 bps.	None
CONNECT 38400 ARQ	21	The communication has been established at 38400 bps. (ARQ mode)	None
CONNECT 1200 NARQ	30	The communication has been established at 1200 bps. (non-ARQ mode)	None
CONNECT 2400 NARQ	31	The communication has been established at 2400 bps. (non-ARQ mode)	None
CONNECT 4800 NARQ	32	The communication has been established at 4800 bps. (non-ARQ mode)	None
CONNECT 9600 NARQ	33	The communication has been established at 9600 bps. (non-ARQ mode)	None
CONNECT 19200 NARQ	34	The communication has been established at 19200 bps. (non-ARQ mode)	None
CONNECT 38400 NARQ	35	The communication has been established at 38400 bps. (non-ARQ mode)	None

+WQ cause codes

Cause codes are used to indicate the states of communications. They are sent by the LES. If the NO CARRIER, BUSY, or NO ANSWER result code is generated, its details can be displayed with the +WQ command.

+WQ extended error codes

Extended error codes are used to show the details of any error that has occurred (with the ERROR or NO DIALTONE result code generated). The details of the error can be displayed using the +WQ command. The values and meanings of extended error codes are listed below:

Value	Text	Meaning
100	syntax error	There is a syntax error in the command line.
101	invalid parameter	There is an invalid parameter in the command line.
102	missing mandatory parameter	There is a missing parameter in the command line.
103	too many parameters	There are too many parameters in the command line.
104	*invalid parameter length*	*The length of any parameter is invalid (+WLES, +WTNID).*
200	facility unavailable	The entered command is unavailable.
201	no call announcement	An "A" command has been entered when there is no incoming call.
202	not connected	The data communication failed after an "O" command was entered.
300	MES busy	The MES is busy (e.g., a telephone is in use or the MES is not synchronous with the TDM).
301	MES unavailable	The MES is not properly functioning.
302	MES not responding	There is no response from the MES.
400	satellite not found	The MES has failed in synchronizing with the NCS TDM in the sea area.
401	invalid LES	The MES has failed in accessing the specified LES.
402	invalid TNID	The MES has failed in accessing the specified TNID.
1000–		Reserved.
2000–		Reserved.

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