

**Prometheus**

**COLLABORATORS**

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# Chapter 1

## Prometheus

### 1.1 Prometheus Class 2 Extended Commands

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#### COMMAND SYNTAX AND GUIDELINES

##### 7.1.1 DTE COMMANDS

The ISO 646 character set (T.50 International Alphabet 5, American Standard Code for Information Interchange) is used for the issuance of commands and responses. Only the low-order 7 bits of each character are used for commands or parameters; the high order bit is ignored. Upper case characters are equivalent to lower case characters.

For Phase C data transmission or reception, all 8 bits are needed.

#### DTE COMMAND LINES

A command line is a string of characters sent from a DTE to the DCE while the DCE is in a command state. Command lines have a prefix, a body, and a terminator. The prefix consists of the ASCII characters 'AT' (065, 084) or 'at' (097, 116). The body is a string of commands restricted to printable ASCII characters, (032-126). Space characters (ASCII 032) and control characters other than CR (013) and BS (010) in the command string are ignored. The default terminator is the ASCII <CR> character. Characters that precede the AT prefix are ignored.

#### BASIC COMMAND SYNTAX

Characters within the command line are parsed as commands with associated parameter values. The basic commands consist of single ASCII characters, or single characters preceded by a prefix character (e.g., '&'), followed by a

---

decimal parameter.

Missing decimal parameters are evaluated as 0.

#### EXTENDED COMMAND SYNTAX

The facsimile commands use extended syntax. They are preceded by the '+F' characters, and they are terminated by the semicolon ';' character (059) or by the <CR> that terminated the command line.

```
AT+FAA=0          ;+FCR 1 <CR>
```

This command instructs the DCE to answer automatically a data or fax call and also enables reception.

```
AT+FCLASS=0 <CR>      for data mode
AT+FCLASS=1 <CR>      for Service Class 1 Fax
AT+FCLASS=2 <CR>      for Service Class 2 Fax
```

In Class 2, the DCE makes and terminates calls, manages the communication session and negotiates (T.30 protocol) and transports the image data to DTE. The T.4 protocol management of image data, etc. is done by DTE.

The response to

```
AT+FCLASS=0<CR>      in Data Mode
```

or

```
AT+FCLASS=2<CR>      in Service Class 2 Fax
```

is

```
OK
```

The service class may be set by the DTE from the choices available using the '+FCLASS=<VALUE>' command.

#### GENERAL RULES

1. +Fnnn commands must be entered completely otherwise an ERROR response is sent.
2. All response messages are preceded and followed by <CR><LF>. Multiple response commands, e.g., +FDIS:+FCSI: and +FDCS, will therefore appear to have a blank line between them.
3. Fax Class 2 commands can be separated by the ";" character. The ";" can be omitted if desired. Note that non-data commands cannot be separated by ";" which is allowed as a dial modifier.
4. All class 2 commands are assumed to be the final command on a command line. Additional characters will be ignored.
5. An ERROR message will be generated if any of the following conditions:
  - a. A class 1 command is received while in Class 2.

- b. A Class 2 command is received while in Class 1.
- c. A Class 1 or Class 2 action command is received while in data modem mode ↔
- d. A Class 2 read-only parameter is given the "=" form of a +F command (e.g., AT+FAXERR=5).
- e. A class 2 action command is given the inappropriate "=" or "=?" (e.g., AT+FDR=?).

### 7.1.2 SERIAL PORT SPEED AND FLOW CONTROL

During fax mode, the DTE-DCE port speed is 19200 bps.

The DCE provides a speed buffer of 1024 bytes and provides DC1/DC3 (XON/XOFF) or RTS/CTS method of controlling the data into the buffer. This flow control is controlled by AT&K3 or AT&K4 command.

This method of data flow control is available only for DTE to DCE direction of data. There is no provision for data flow control from DCE to DTE.

### DATA STREAM TERMINATION

The DCE exchanges streams of data with the DTE while executing data transfer commands. These use data stream termination described in Section 3.2/ISO 2111.

The ASCII <DLE> character (016) is used as a special character to shield special characters. The <DLE><ETX> character pair (<106><003>) is used to mark the end of a stream. The following patterns are used:

any data....<DLE><ETX>	end of stream
any data....<DLE><DLE>	single <DLE> in data
any data....<DLE><any byte>	delete <DLE><any byte>

### DTE to DCE STREAMS

The DCE filters the data stream from the DTE, and removes all character pairs beginning with <DLE>. The DCE recognizes <DLE><ETX> as the stream terminator. The DCE recognizes <DLE><DLE> and reinserts a single <DLE> in its place.

The DTE must filter stream data to the DCE, and insert extra <DLE> characters ahead of data.

### DCE TO DTE STREAMS

The DTE must filter the data stream from the DCE, and remove all character pairs beginning with <DLE>. The DTE must recognize <DLE><ETX> as the stream terminator. The DTE must recognize <DLE><DLE> and reinsert a single <DLE> in its place.

The DCE filters stream data to the DTE, and inserts extra <DLE> characters ahead of data.

### 7.1.3 AUTO ANSWER

The DCE can answer as a data DCE or as a fax DCE. It can answer the call adaptively, i.e. it can determine whether call is 'data' or 'fax'. The +FAA parameter controls this feature.

```

AT+FAA=1          ; Auto answer as a facsimile or a
                  ; data modem depending on call

CONNECT xxx      ; DCE status response if data call

+FCON            ; DCE status response if fax call

```

#### 7.1.4 IDENTIFICATION OF T.30 OPTIONS

Group 3 devices negotiate session parameters in DIS, DCS and DTC frames. These parameters are defined in table 8.2.

#### 7.1.5 SESSION STATUS REPORTING

The DCE provides reports to the DTE on the status of a session. The DCE provides following status reports:

##### 1. Connection and hang up status:

```

+FCON

+FHNG:<0-255>

```

##### 2. Requested DIS session parameters +FDIS:<string> reports remote facsimile capabilities.

```

Syntax:+FDIS:VR, BR, WD, LN, DF, EC, BF, ST

```

##### 3. +FDCS:<string> reports the negotiated parameters

##### 4. Phase C prompts:

```

XON, XOFF, DC2

```

##### 5. Phase C base status reports: depending upon copy quality and related end-of page status:

```

+FPTS:<1-5>

```

#### 7.1.6 PROCEDURE INTERRUPT NEGOTIATION

CCITT allows a station to request a procedure interruption at the end of a page. This request is passed between stations by the PIP, PIN, and PRI-Q messages.

TABLE 7-1. FAX CLASS 2 COMMANDS

Command	Function
SERVICE CLASS ID	
+FCLASS=	Service Class

CLASS 2 ACTION COMMANDS	
D	Originate a call
A	Answer a call
+FDT=	Data Transmission
+FET=N	Transmit Page Punctuation
+FDR	Begin or Continue Phase C Receive Data
+FK	Session Termination
CLASS 2 DCE RESPONSES	
+FCON	Facsimile Connection Response
+FDCS:	Report Current Session
+FDIS:	Report Remote Identification
+FCFR	Indicate Confirmation to Receive
+FTSI:	Report the Transmit Station ID
+FCSI:	Report the Called Station ID
+FPTS:	Page Transfer Status
+FET:	Post Page Message Response
+FHNG	Call Termination with Status
CLASS 2 SESSION PARAMETERS	
+FMFR?	Identify Manufacturer
+FMDL?	Identify Model
+FREV?	Identify Revision
+FDCC=	DCE Capabilities Parameters
+FDIS=	Current Sessions Parameters
+FDCS=	Current Session Results
+FLID=	Local ID String
+FCR	Capability to Receive
+FPTS=	Page Transfer Status
+FAA	Adaptive Answer
+FBUF?	Buffer Size (Read Only)
+FPHCTO	Phase C Time Out
+FAXERR	Fax Error Value
+FBOR	Phase C Data Bit Order

## 7.2 SERVICE CLASS 2 IDENTIFICATION AND SELECTION

The fax class 2 commands are summarized in Table 7-1.

Three commands report identification and selection information. Each of these three commands cause the DCE to send a message to the DTE. Each message is 20 bytes (ASCII encoded) followed by the terminating character (binary 0).

### 7.2.1 +FMFR?, REQUEST MANUFACTURER IDENTIFICATION

The +FMFR? command caused the DCE to send a message identifying the DCE product manufacturer. The default message is:

```
ROCKWELL
OK
```

### 7.2.2 +FMDL?, IDENTIFY PRODUCT MODEL



The +FMDL? command causes the DCE to send a message identifying the DCE product model. The default message is:

```
V.32AC
OK
```

### 7.2.3 +FREV?, IDENTIFY PRODUCT REVISION

The +FREV? command causes the DCE to send a message identifying the DCE product model revision number. The typical default message is:

```
V0.200 TR14-JXXX-001
OK
```

## 7.3 SERVICE CLASS 2 ACTION COMMANDS

These commands transfer data, and punctuate sessions. They also release specific T.30 messages. All action commands must be the last command on a command line. This is indicated by the terminating <CR>.

All action commands initiate processes. The modem will not accept other commands from the DTE until the modem issues a final result code (e.g. OK, CONNECT). The modem will abort the process if it receives any character before the final result code is issued.

### 7.3.1 ATD, ORIGINATE A CALL

Syntax: ATD...<CR>

The DCE can support a DTE command to originate a call using the ATD command (See Table 4-2).

If this command is unsuccessful, the DCE reports an appropriate failure or error type result code such as NO CARRIER, NO DIALTONE or BUSY (see Table 4-7).

If this call is successful, the typical DCE response is:

```
ATDnn.nn          (go off-hook, dial, get CED)
+FCON             (DCE detects flags)
[+FCSI:<remote ID string>]
+FDCS:<T.30 subparameter string>
OK
```

The DCE dials, detects call progress and generates the CNG tone. Then it waits for a DIS frame. On detection of the first Phase B preamble (V.21 ch. 2 modulated by 300 bit/s HDLC flags) it reports the "+FCON" message to the DTE. The DCE then switches to 19.2K bps.

The DCE generates a DCS frame based on the received DIS frame and on the previously set +FDIS parameter. A +FDT command from the DTE releases the DCE to transmit that DCS frame.

The DCE reports the initial received T.30 negotiation messages, including the DIS frame and the optional CSI ID string. The +FDIS: report is followed by the OK final result code.

---

### 7.3.2 ATA, ANSWER A CALL

The DCE can support a DTE command to answer an incoming call using the ATA command (see Table 4-2).

The DTE may issue an Answer command in response to an incoming ring.

If the Answer command is unsuccessful, the DCE will report an appropriate failure or error type result code, such as NO CARRIER (see 4-7)

#### MANUAL CALL ANSWER

If this call is successful, the typical DCE response (answer and receive) is:

```
+FCON
[+FTSI:<remote ID string>]
+FDCS: <T.30 subparameter string>
OK
(DTE should issue +FDR command here)
```

On receipt of an Answer command from the DTE, the DCE answers and generates the CED tone. The DCE then generates a DIS frame (derived from the +FDIS parameter) and hunts for the first T.30 negotiation frames. On detection of the first Phase B preamble (V.21 ch 2 modulated by 300 bit/s HDLC flags), it reports the "+FCON" message to the DTE.

The DTE should report the initial received T.30 negotiation messages, including the DCS frame. The +FCS: report will be followed by the OK final result code.

#### AUTOMATIC ANSWER

The modem provides for automatic answering of incoming calls. If configured for automatic answer, the modem answers an incoming call in compliance with T.30 and reports the same messages as described for manual answer.

#### CONNECTIONS AS A DATA MODEM

If configured to do so by the +FAA parameter, the DCE will adaptively answer as a facsimile DCE or as a data DCE. If the DCE answers as a facsimile DCE or as a data DCE. If the DCE answers as a data DCE, it resets the +FCLASS parameter to 0 and issues the appropriate final result code (e.g. CONNECT or NO CARRIER) to the DTE.

### 7.3.3 +FDT, DATA TRANSMISSION

Syntax: +FDT<CR>

The +FDT command prefixes Phase C data transmission. When the DCE is ready to accept Phase C data, it issues the negotiation responses and the CONNECT result code to the DTE.

In Phase B, the +FDT command releases the DCE to proceed with negotiation, and releases the DCS message to the remote station. In Phase C, the +FDT command resumes transmission after the end of a prior transmit data stream.

---

## INITIATE PAGE TRANSMISSION

Phase B DCE polled response:

```
[+FCSI:<remote ID string>]           ; If new CSI received
[+FDIS:<subparameters from remote station>] ; If new DIS received
+FDCS:<T.30 subparameter string>
CONNECT
<XON>                                ; When ready for data
```

After placing a call, or after finishing a document exchange, the DTE may command the DCE to re-enter T.30 Phase B to attempt to negotiate a document transmission.

## CONTINUE A PAGE

```
CONNECT
<XON>
```

The DTE may issue more than one +FDT command for a given page, so that different files may be concatenated together. These files must have the same ← format.

## PHASE C DATA FRAMING

Phase C data must be presented to the DCE in stream mode. The DCE expects Phase C data to follow until it detects <DLE><ETX> termination characters. The DCE will filter the stream as described in Section 7.1.2

The DCE will acknowledge the end of the data by returning the OK result code to ← the DTE.

If there is data underrun before the next +FDT or +FET= command, the DCE will zero-fill pad as per T.4 until the Phase C timeout (+FPHCTO) is reached, or until more data is received. The DCE appends an RTC pattern to the transmit data after an +FET= command is received from the DTE.

## PHASE C DATA FORMAT

The Phase C data will be of the format specified by the negotiated T.30 DCS frame. The +FDCS <string> response is defined in section 7.4.2. The subparameter values are described in table 7.2.

The DCE will use the negotiated minimum Scan Time parameter from the DCS frame, and insert sufficient fill bits to pad each line to the minimum scan time. This is reported in the +FDCS:ST subparameter.

If the DCE finds more than one consecutive EOL in Phase C data (e.g. RTC), it will send only one EOL.

Note 1: Phase C data must conform to T.4 specifications

Note 2: The DTE need not include a final RTC, since the DCE will append an RTC in response to an FET= command

Note 3: Some facsimile machines may treat two EOLs as an RTC

<CAN>, ESCAPE FROM TRANSMISSION

The DCE may request the DTE to halt Phase C transmission, by sending a cancel <CAN> character (024) to the DTE. In this case, the DTE should terminate Phase C transmission, issue <CAN>, and wait for the OK response code from the DCE.

Table 7-2 T.30 Session Subparameter Codes

Label	Function	Value	Description	
VR	Vertical resolution	0	Normal, 98 lpi	
		1	Fine, 196 lpi	
BR	Bit Rate  (See note 1)	0	2400 bit/s V.27 ter	
		1	4800 bit/s V.27 ter	
		2	7200 bit/s V.29 or v.17	
		3	9600 bit/s V.29 or v.17	
		**4	12000 bit/s V.33 or v.17	
		**5	14400 bit/s V.33 or v.17	
WD	Page Width	0	1728 pixels in 215 mm	
		1	2048 pixels in 255 mm	
		2	2432 pixels in 303 mm	
		*3	1216 pixels in 151 mm	
		*4	864 pixels in 107 mm	
LN	Page Length	0	A4, 297 mm	
		*1	B4, 364 mm	
		*2	unlimited length	
DF	Data Compression Format	0	1-D modified Huffman	
		1	2-D modified Read	
		*2	2-D uncompressed mode	
		*3	2-D modified Read	
EC	Error Correction (Annex A/T.30) (See Note 2)	0	Disable ECM	
		*1	Enable ECM, 64 bytes/frame	
		*2	Enable ECM, 256 bytes/frame	
BF	Binary File Transfer (See Note 3)	0	Disable BFT	
		*1	Enable BFT	
ST	Scan Time/ Line		VR=normal	VR=fine
		0	0 ms	0 ms
		1	5 ms	5 ms
		2	10 ms	5 ms
		3	10 ms	10 ms
		4	20 ms	10 ms
		5	20 ms	20 ms
		6	40 ms	20 ms
7	40 ms	40 ms		

```

| NOTES: 1: CCITT T.30 does not provide for the answering
|           station to specify all speeds exactly using the DIS
|           frame. Implementation of some BR codes (e.g.code 2)
|           by an answering DCE is manufacturer specific.
|
|
|           * =Not supported
|           ** =RC144AC only
|
|           2: ECM has been implemented in version 1.200C. |
|           ECM transmit works correctly, and ECM receive works, |
|           but does not tell the transmitting machine that the |
|           fax was received correctly.
|
|           3: BFT has been implemented in version 1.200C. |
|           BFT transmit works correctly, and BFT receive works, |
|           but does not tell the transmitting machine that the |
|           file was received correctly.
|
|-----|

```

#### 7.3.4 +FET=, TRANSMIT PAGE PUNCTUATION

Syntax: +FET=<ppm>[, <pc>, <bc>, <fc>]

DCE response:

+FPTS:<ppr> ; when receive from remote OK

This command is used to punctuate page and document transmission after one or more +FDT commands. This command generates T.30 Post Page Messages selected by the <ppm> code (Table 7-3)

The +FET=<ppm> command indicates that the current page is complete; no more data will be appended to it. The value indicates if there are any additional pages are to be sent and, if so, whether there is a change in any of the document parameters.

The DTE can command the DCE to generate PRI-Q messages with the +FET=<ppm> command using ppm codes 4-6 (see Table 7-3)

This command must be sent within the time out specified by +FPHCTO after sending Phase C data, or else the DCE will end the page and document transmission. If the Phase C timeout is reached, the DCE sends an EOP post page message and terminates the session

The remote facsimile station should respond to the post page message with a post page response. The DCE will report this using the +FPTS:<ppr> response (Table 7-4)

END A PAGE

The +FET= command causes the DCE to append an ETC (6 EOL) pattern as needed and enter Phase D by sending the selected T.30 Post Page message.

The +FET=1 (EOM) command signals the remote station that the next

document will have a new DCS negotiated; this causes the session to re-enter Phase ← B.

### 7.3.5 +FDR, BEGIN OR CONTINUE PHASE C RECEIVE DATA

Syntax: +FDR<CR>

Default value: 3 seconds in some places

The +FDR command initiates transition to Phase C data reception. This can occur after answering, dialing, a document is received, or a page is received.

The DCE reports the negotiated T.30 parameters, with the remote ID information if available. When the DCE is ready to commence data transfer, it issues a CONNECT response code. If the DCE cannot resume data transfer because there is no more data, it responds OK. When the DTE is ready to accept data, it issues an <DC2> character (018) to the DCE.

If the DTE issues an <XOFF> character to the DCE for flow control, the DCE signals the DTE when its buffers are empty by sending a <DLE><DC2> (<016><018>) character pair.

When the DCE delivers that last byte of a page, the DCE reports the Page Transfer Status via the +FPTS:<ppr> response (Table 7-4).

After a Page Transfer Status Report, the DCE reports the post page message from the remote facsimile station via the +FET:<ppm> response (Table 7-3) which signals the intentions of the remote station.

Table 7-3. T.30 Post Page Message Codes

ppm Code	Mnemonic	Description
1	[PPS]-MPS	Another page next, same document
2	[PPS]-EOM	Another page next
3	[PPS]-EOP	no more pages or documents
4	[PPS-]PRI-MPS	Another page, procedure interrupt
5	[PPS-]PRI-EOM	Another doc, procedure interrupt
6	[PPS-]PRI-EOP	All done, procedure interrupt
7	CTC	Continue to correct
8-15	EOR-	End of Retransmission (8)+
=8+ppm		Post Page Message (ppm code)

Table 7-4. T.30 Post Page Response Message Codes

ppr Code	Mnemonic	Description
0	PPR	Partial page errors
1	MCF	Page Good
2	RTN	Page bad, retrain requested

	3		RTP		Page good, retrain requested	
	4		PIN		Page bad, interrupt requested	
	5		PIP		Page good, interrupt requested	
-----						

The DCE holds the post page response message to the remote facsimile station (MCF, etc.), represented in the +FPTS parameter until the next +FDR command. The DTE may modify the +FPTS parameter before issuing the +FDR command which releases that message. The DTE must issue a +FDR command to release Post Page Messages.

#### INITIATE DOCUMENT RECEPTION

The +FDR command may be issued in Phase B after an answer command, or in Phase B after a pervious document.

The DCE response in stream mode is:

```
+FCR                ; when CFR sent
[+FTSI:<remote ID string>] ; if new TSI received
+FDCS:<T.30 subparameter string>] ; if new DCS
CONNECT
(<DC2> needed from DTE here)
<Phase C data stream>
<DLE><ETX>
+FPTS:<ppr>,<lc>[,<blc>,<cbic>]
+FET:<ppm>
OK
(DTE must issue +FDR command to release post page response)
```

#### CONTINUE DOCUMENT RECEPTION

The DTE may issue a +FDR command in Phase D, which releases the post page message, and indicates readiness to receive another page after receipt of a Multipage (+FET:0) or PPS-NULL (+FET:3) message. The DCE response will be:

```
CONNECT
(<DC2> needed from DTE here)
<Phase C data stream>
<DLE><ETX>
+FPTS:<ppr>,<lc>[,<blc>,<cbic>]
+FET:<ppm>
OK
(DTE must issue +FDR command to release post page response.)
```

If done receiving:

```
+FHNG:<hangup cause code>
OK
```

Continue page reception

#### PHASE C DATA FRAMING

Phase C data may be presented to the DTE in stream mode. The DCE will transfer a stream of data to the DTE, followed by the <DLE><ETX> stream termination characters. The DCE will filter the stream as described in 7.1.2.

#### PHASE C DATA FORMAT

The received data format is negotiated under T.30 reported by the +FDCS:VR,BR,WD,LN,DF,EC,BF,ST response.

The DCE will delete the terminating RTC (6 EOLs) patterns. The DCE may strip zero ← ← fill bits from the data, to minimize storage needs.

<CAN>, ESCAPE FROM RECEPTION

>From the +FDR command until the end of Phase D Date, the DCE is in a data transfer state, and will not respond to DTE command characters. The DCE will respond to three ASCII control characters, <DC1 (017) and <DC3> (019) flow control characters, and cancel <CAN> (024).

Upon receipt of the <CAN> character, the DCE will terminate the reporting of received data by sending trailing <DLE><ETX> characters to the DTE, ← ← and will then execute an implied +FK command in order to conduct an orderly disconnection.

#### 7.3.6 +FK, SESSION TERMINATION

Syntax: +FK

The +FK command causes the DCE to terminate the session in an orderly manner. In particular, the DCE will send a DCN message at the next opportunity and hang up. At the end of the termination process, the DCE will ← ← report the +FHNG response with result code (Table 7-5).

This operation can be invoked by using the cancel <CAN> character during Phase C ← ← data reception (see prior section).

The DCE will wait until the current page completes, unless the reception is of ← ← unlimited length; in that case, the DCE may halt reception and terminate the ← ← session at any time.

### 7.4 SERVICE CLASS 2 DCE RESPONSES

The DCE sends information responses to the DTE as a facsimile session proceeds. They indicate the state of the facsimile session and convey need information. These messages are solicited messages generated in execution of DTE action commands described in section 7.3.

The DCE precedes and follows the following information responses with <CR><LF>.

The DCE provides the on-line status of several session parameters when they are available during T.30 handshaking. These include the remote ID string ← ← and the DIS/DCS parameters. These responses report the T.30 session parameter frames. The subparameters are described in Table 7-2.

#### 7.4.1 +FCON, FACSIMILE CONNECTION RESPONSE

+FCON indicates connection with a fax machine. It is released by detection of HDLC flags in the first received frame +FCON is generated in response to an Originate or Answer command.

#### 7.4.2 +FDCS:, REPORT CURRENT SESSION CAPABILITIES



Syntax: +FDCS:VR, BR, WD, LN, DF, EC, BF, ST

+FDCS:<string> reports the negotiated parameters. Phase C data will be formatted ← as described by the subparameters. This message may be generated in execution of +FDT or +FDR commands before the CONNECT result code if new DCS frames are generated or received. (See Table 7-2.)

#### 7.4.3 +FDIS:, REPORT REMOTE STATION CAPABILITIES

Syntax: +FDIS:VR, BR, WD, LN, DF, EC, BF, ST

+FDIS:<string> reports remote facsimile station capabilities and intentions. The parameters are provided in ASCII notation. (See Table 7-2.)

This message is generated in execution of Originate, Answer, +FDT, or +FDR commands.

#### 7.4.4 +FCFR, INDICATE CONFIRMATION TO RECEIVE

Syntax: +FCFR

The DCE sends a +FCFR response to the DTE upon reception of an acceptable TCF training burst and a valid DCS signal from the remote machine. This indicates that the DCE will receive Phase C data after the remote station receives the local DCE's CFR message. The +FCFR message is generated in execution of a +FDR command.

#### 7.4.5 +FTSI:, REPORT THE TRANSMIT STATION ID

Syntax: +FTSI:"<TSI ID string>" Transmit Station ID

This response reports the received transmit station ID string, if any. This message is generated in execution of Originate, Answer, +FDT, or +FDR commands.

#### 7.4.6 +FCSI:, REPORT THE CALLED STATION ID

Syntax: +FCSI:"<CSI ID string>" Called Station ID

This response reports the received called station ID string, if any. This message is generated in execution of Originate, Answer, +FDT, or +FDA commands.

#### 7.4.7 +FPTS:, RECEIVE PAGE TRANSFER STATUS

Syntax: +FPTS:<ppr>, <lc>[, <blc>, <cblc>]

The +FPTS:<ppr> is generated by the DCE at the end of Phase C data reception in execution of a +FDR command.

The <ppr> is generated by the DCE; it depends on the DCE capabilities at T.4 error ← checking. See Table 7-4 for <ppr> values.

The receiving DCE will count the lines and may optionally generate bad line counts. These values are:

<lc> = line count  
 <blc> = bad line count  
 <cblc> = <consecutive bad line count

A receiving DTE may inspect <ppr> and write a modified value into the +FPTS parameter. The DCE will hold the corresponding Post Page Response message until released by a +FDR command from the DTE.

#### 7.4.8 +FET:, POST PAGE MESSAGE RESPONSE

Syntax: +FET:<ppm>

The +FET:<post page message> response is generated by a receiving DCE after DCE after the end of Phase C reception on receipt of the post-page message from the transmitting station. The +GET:<ppm> response is generated in execution of a +FDR command. The <ppm> codes respond to the T.30 pst page messages (Table 7-3)

#### 7.4.9 +FPTS:, TRANSMIT PAGE TRANSFER STATUS

Syntax: +FPTS:<ppr>

The +FPTS: response reports a <ppr> number representing the copy quality and related post page message responses received from the remote DCE.

The set of valid <ppr> values are defined in Table 7-4.

The +FPTS:<ppr> response is generated in execution of a +FET=<ppm> command.

#### 7.4.10 +FHNG:, CALL TERMINATION WITH STATUS

Syntax: +FHNG:<hangup status code>

+FHNG indicates that the call has been terminated. The hangup cause is reported and stored in the +FAXERR parameter for later inspection. The <hangup status code> values are described in Table 7-5.

+FHNG:<hsc> is a possible intermediate result code to any DTE action command described in Section 7.3. It is always followed by the OK final result code.

Upon termination of a call, the DCE determines the cause of termination and reports it as part of the FHNG:<hsc> response. It also stores this <hsc> code in the +FAXERR parameter for later inspection.

The hangup values are organized according to the phases of the facsimile transaction as defined by T.30. A COMREC error or RSPREC error indicates that one of two events occurred. 1) a DCN (disconnect) signal was received, or 2) an FCS error was detected and the incoming signal was still present after 3 seconds.

The table values are in decimal notation. Leading zero characters are optional.

Table 7-5 Hangup Status Codes

Code	Cause Description
0-9	CALL PLACEMENT AND TERMINATION
0	Normal and proper end of connection
1	Ring Detect without successful handshake
2	Call aborted, from +FK or AN
3	No Loop Current
10-19	TRANSMIT PHASE A & MISCELLANEOUS ERRORS
10	Unspecified Phase A error
11	No Answer (T.30 T1 timeout)
20-39	TRANSMIT PHASE B HANGUP CODES
20	Unspecified Transmit Phase B error
21	Remote cannot receive or send
22	COMREC error in transmit Phase B
23	COMREC invalid command received
24	RSPEC error
25	DCS sent three times without response
26	DIS/DTC received 3 times; DCS not recognized
27	Failure to train at 2400 bps or +FMINS P value
28	RSPREC invalid response received
40-49	TRANSMIT PHASE C HANGUP CODES
40	Unspecified Transmit Phase C error
43	DTE to DCE data underflow
50-69	TRANSMIT PHASE D HANGUP CODES
50	Unspecified Transmit Phase D error
51	RSPREC error
52	No response to MPS repeated 3 times
53	Invalid response to MPS
54	No response to EOP repeated 3 times
55	Invalid response to EOM
56	No response to EOM repeated 3 times
57	Invalid response to EOM
58	Unable to continue after PIN or PIP
70-89	RECEIVE PHASE B HANGUP CODES
70	Unspecified Receive Phase B error
71	RSPREC error
72	COMREC error
73	T.30 T2 timeout, expected page not received
74	T.30 T1 timeout after EOM received
90-99	RECEIVE PHASE C HANGUP CODES
90	Unspecified Receive Phase C error
91	Missing EOL after 5 seconds

	92		Unused code	
	93		DCE to DTE buffer overflow	
	94		Bad CRC or frame (ECM or BFT modes)	
	----- -----			
	100-119		RECEIVE PHASE D HANGUP CODES	
	----- -----			
	100		Unspecified Receive Phase D errors	
	101		RSPREC invalid response received	
	102		COMREC invalid response received	
	103		Unable to continue after PIN or PIP	
	----- -----			
	120-255		RESERVED CODES	
	----- -----			

## 7.5 SERVICE CLASS 2 PARAMETERS

All Service Class 2 parameters can be read, written, and tested for range of legal values by the DCE. The general syntax is described in Section 7.1.

Group 3 FAX devices negotiate session parameters in DIS, DCS, and DTC frames. The following parameters are provided to condition the facsimile DCE for the capabilities it will offer and to report the session settings negotiated.

The three primary T.30 session parameters are +FDCC, +FDIS and +FDCS. They are compound parameters, using values listed in Table 7-2. Figure 70-1 ← illustrates their relationships.

### 7.5.1 +FDCC, DCE CAPABILITIES PARAMETERS

Write Syntax: +FDCC:VR,BR,WD,LN,DF,EC,BF,ST

Valid values See Table 7-2

Default values 0,3,0,2,0,0,0,0 (RC96AC)  
0,5,0,2,0,0,0,0 (RC144AC)

+FDCC allows the DTE to sense and constrain the capabilities of the facsimile DCE from the choices defined in CCITT t.30 Table 2. When +FDCC is modified by the DTE, the DCE copies +FDCC into +FDIS.

### 7.5.2 +FDIS, CURRENT SESSIONS CAPABILITIES PARAMETERS

Write Syntax: +FDIS:VR,BR,WD,LN,DF,EC,BF,ST

Valid values See Table 7-2

Default values 0,3,0,2,0,0,0,0 (RC96AC)  
0,5,0,2,0,0,0,0 (RC144AC)

The +FDIS parameter allows the DTE to sense and constrain the capabilities used for the current session. The DCE uses +FDIS to generate DIS or DTC messages directly, and uses +FDCS and received DIS messages to generate DCS messages.

The DCE initializes the +FDIS parameter from the +FDCC parameter on initialization, when +FDCC is written, and at the end of a session.

#### 7.5.4 +FLID=, LOCAL ID STRING

Write Syntax +FLID="<local ID string>"

Valid values: 20 character ASCII string

Default value: Empty

If FLID is not a null string, it generates a TSI or CSI frame. Table 3/T.30 includes digits 0-9, "+" and space.

If the DCE supports use of Table 3/t.30 only, the response to a +FLID=? command is ← "<20)(32, 43, 48-57)". If the DCE supports printable ASCII <, the response is ← "(20)(32-127)<CRLF>" The first "(20)" represents string length: the second ( ← character values) field reports supported string values.

Notes: 1. The string is saved in RAM.  
2. Non-numeric characters are not filtered out.

#### 7.5.5 +FCR, CAPABILITY TO RECEIVE

Write Syntax: +FCR=<value>

Valid values: 1,0

Default values 0

+FCR=0 indicates that the DCE will not receive message data. This can be sued when the DTE has insufficient storage. The DCE can send and can be polled ← for a file.

+FCR is sampled in CCITT T.30 Phase A and Phase D

#### 7.5.6 +FPTS=, PAGE TRANSFER STATUS

Write syntax: +FPTS=<ppr>

Valid Values: 1,2,3,4,5

Default value: 0

#### 7.5.7 +FCQ, COPY QUALITY CHECKING

Write Syntax: +FCQ=<value>

Valid Values: 0

Default Value: 0

This parameter controls Copy Quality checking by a receiving facsimile DCE.

---

The DCE returns +FCQ=0 which indicates the DCE does no quality checking. The DCE ←  
will generate Copy Quality OK (MCF) responses to complete pages, and set +FPTS ←  
=1.

#### 7.5.8 +FPHCTO, DTE PHASE C RESPONSE TIME-OUT

Write Syntax: +FPHCTO=<value>

Valid Values: 0-255, 100 millisecond units

Default Value: 30

The +FPHCTO command determines how long the DCE will wait for a command after ←  
reaching the end of data when transmitting in Phase C. When this time-out is ←  
reached, the DCE assumes there are no more pages and no documents to send. It ←  
then sends the T.30 EOP response to the remote device.

#### 7.5.9 +FAXERR, T.30 SESSION ERROR REPORT

Read Syntax: +FAXERR=<table value>, read only

Valid values: 0-255, see table 7-5 for meaning

This read-only parameter indicates the cause of the hangup. Table 7-5  
shows the valid values for this parameter as well as the meaning of the each value ←  
. +FAXERR is set by the DCE at the conclusion of a fax  
session. The DCE resets +FAXERR to 0 at the beginning of Phase A off-  
hook time.

#### 7.5.10 +FBOR, DATA BIT ORDER

Write Syntax: +FBOR=<value>

Valid Values: 0,1

Default value: 0

This parameter controls the mapping between PSTN facsimile data and the DTE-DCE ←  
link. There are two choices:

DIRECT: The first bit transferred to each byte on the DTE-DCE link is  
the first bit transferred on the PSTN data carrier.

REVERSED: The last bit transferred of each byte on the DTE-DCE link is the first ←  
bit transferred on the PSTN data carrier.

There are two data types to control:

This command controls Phase C data (T.4 encoded data) transferred during execution ←  
of +FDT or +FDR commands.

The following two codes are supported.

+FBOR=0 selects direct bit order for Phase C data

+FBOR=1 selects reversed bit order for Phase C data

---

Note that this parameter does not affect the bit order of control characters generated by the DCE.

#### 7.5.11 +FAA, ANSWER PARAMETER

Write syntax: +FAA=<value>

Valid values: 0,1

Default value 0

+FAA=0 constrains the DCE to answer as set by +FCLASS

+FAA=1 indicates that the DCE can answer and automatically determine whether to answer as a Class 2 facsimile DCE or as a data modem. If the DCE automatically switches, it modifies FCLASS appropriately.

Class 2 adaptive answer is implemented as follows:

First, a data mode handshake is attempted. If the DCE has been configured for automode detection (using the A command), the DCE may try several protocols before terminating attempts to make a data mode connection. This can take as long as 6-8 seconds. ↔

If the data mode connection attempt fails, a facsimile Class 2 connection is assumed. When a connection is made, a result of the adaptive answer, the DCE issues the D or FAX result code before the CONNECT or +FCC message to inform the DTE of the connection type. A making a class 2 connection, the DCE stays on-line rather than going into the command mode as with a Class 2 connection.

#### 7.5.12 +FBUF?, BUFFER SIZE

Read syntax: +FBUF?

DCE response syntax <bs>,<xoft>,<xont>,<bc> where:

<bs> = total buffer size  
 <xoft> = XOFF threshold  
 <xont> = XON threshold  
 <bc> = current buffer byte count

The +FBUF parameter allows the DTE to determine the characteristics of the DCE's data buffer. Data buffers are used for flow control. Use of the reported values allow the DTE to transfer data without provoking XOFF. ↔

## 7.6 EXAMPLE SESSIONS

Table 7-6 and 7-7 show the typical command and responses for sending and receiving two pages respectively. ↔

Table 7-6 Send two pages, 1-D data, no errors

DTE COMMAND	DCE RESPONSE	LOCAL DTE ACTION	REMOTE STATION ACTION

AT+FCLASS=2	OK	Set Class 2	
-----	-----	-----	-----
AT+FLID=			
<local id>	OK	Set local ID	
-----	-----	-----	-----
AT<dial str>		off hook, dial	answer
		send CNG	send [CED],
	+FCON	detect flags	v.21 flags
	+FDIS:<csi>	get CSI	CSI
	+FDIS:<codes>	get DIS	DIS
	OK		
-----	-----	-----	-----
AT+FDT		send TSI	get TSI
		send DCS	get DCS
		send TCF	get TCF
	+FDCS:<codes>	get CFR	send CFR
	CONNECT	send carrier	receive carrier
	<XON>		
<1st page>		send page data	receive page data
<DLE><ETX>	OK		
-----	-----	-----	-----
AT+FET=0		send RTC	get RTC
		get MPS	send MPS
	+FPTS:1	get MCF	send MCF
	OK		
-----	-----	-----	-----
AT+FDT	CONNECT	send carrier	receive carrier
	<XON>		
<2nd page>		send page data	receive page data
<DLE><ETX>	OK		
-----	-----	-----	-----
AT+FET=2		send RTC	get RTC
		send EOP	get EOP
	+FPTS:1	get MCF	send MCF
	+FHNG:0	send DCN	get DCN
	OK	hangup	hangup
-----	-----	-----	-----

Table 7-7 Receive two pages, 1-D data, no errors

DTE COMMAND	DCE RESPONSE	LOCAL DTE ACTION	REMOTE STATION ACTION
-----	-----	-----	-----
AT+FCR=1	OK	Enable reception	
-----	-----	-----	-----
AT+FLID=			
<local id>	OK	Set local ID	
-----	-----	-----	-----
	RING <-	detect ring <-	Dials[, send CNG]
-----	-----	-----	-----
ATA		off hook	
		send CED	get CED
		send CSI	get CSI
		send DIS	get DIS
	+FCON	detect flags	send v.21 flags
	[+FTSI:"<tsi>"]	[get TSI]	[send TSI]
	+FDCS:<codes>	get DCS	send DCS



	OK	begin TCF receive	start TCF	
-----	-----	-----	-----	
AT+FDR		accept TCF	finish TCF	
	+FCFR	send CFR	get CFR	
	[+FDCS:<codes>]			
	CONNECT	get page carrier	send page carrier	
<DC2>		get page data	send page data	
	<page data stream>			
	<DLE><ETX> <-	detect RTC <-	send RTC	
	+FPTS:1,<lc>		drop carrier	
	+FET:0 <-	get MPS <-	send MPS	
	OK			
-----	-----	-----	-----	
AT+FDR		send MCF	get MCF	
	CONNECT	get page carrier	send page carrier	
<DC2>		get page data	send page data	
	<page data stream>			
	<DLE><ETX> <-	detect RTC <-	send RTC	
	+FPTS:1,<lc>		drop carrier	
	+FET:2 <-	get EOP <-	send EOP	
	OK			
-----	-----	-----	-----	
AT+FDR		send MCF	get MCF	
	+FHNG:0 <-	get DCN <-	send DCN	
	OK	hangup	hangup	
-----	-----	-----	-----	