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OKI Semiconductor

MSC2121A

14.4 kbps Full Duplex Modem Chip Set With Built-in Protocols

GENERAL DESCRIPTION

The MSC2121A is a modem chip-set that provides full duplex data transmission capability of up to 14400 bits/s conforming to ITU-T Recommendation (V.32 bis, V.22 bis, V.22, and V.21) and Bell Standard (212A and 103J), and also provides facsimile transmission capability conforming to ITU-T Recommendation (V.17, V.33, V.29, and V.27 ter). The MSC2121A supports the function as a facsimile activated by FAX Class 1 Command in EIA Standard, as well as the function to set a modem and to control calls originating and terminating with AT Commands and the function as a data modem including error correction and data compression. So, the use of this chip-set enables easy implementation of terminals that have those functions, which are being widely employed in personal computer communication, as a full-duplex modem of 14400 bits/s and as a facsimile reciever and transmitter. In the MSC2121A, no external program memory will be required because the control program codes are stored in the program memories that a general-purpose MCV has. General-purpose SRAMs (which are essential) and EEPROMs (which are removable) should be used for external memories.

This chip-set comprises the following two LSIs:

MSM66507	General-purpose MCU
MSM7564-01	Single-chip modem

The above ICs are available in a FLAT or PLCC package. For details, please refer to the individual semiconductor specifications of each IC.

FEATURES

- Communication Modes

ITU-T Recommendation	V.32bis	14,400/12,000/9,600/ 7,200/4,800 bps	Full duplex, SYNC/ASYNC
ITU-T Recommendation	V.22bis	2,400 bps	Full duplex, SYNC/ASYNC
ITU-T Recommendation	V.22	1,200 bps	Full duplex, SYNC/ASYNC
ITU-T Recommendation	V.21	300 bps	Full duplex, ASYNC
BELL Standard	212A	1,200 bps	Full duplex, SYNC/ASYNC
BELL Standard	103J	300 bps	Full duplex, ASYNC
ITU-T Recommendation	V.17	14,400/12,000/9,600 /7,200 bps	Half duplex, SYNC
ITU-T Recommendation	V.29	9,600/7,200 bps	Half duplex, SYNC
ITU-T Recommendation	V.27ter	4,800/2,400 bps	Half duplex, SYNC
ITU-T Recommendation	V.21ch.2	300 bps	Half duplex, SYNC

- Command Set
  Hayes AT commands.
  EIA/TIA-578 (Class 1) fax commands

- Dial Function
  DTMF send function (tone dialing)
  DP send function (pulse dialing): 20 pps, 10 pps (Make/break ratio: 33%, 39%)

Note: The following notice shall be printed somewhere in your application such as on its container box;
"This Product is licensed under U.S. Patent 4,558,302 and foreign counterparts."

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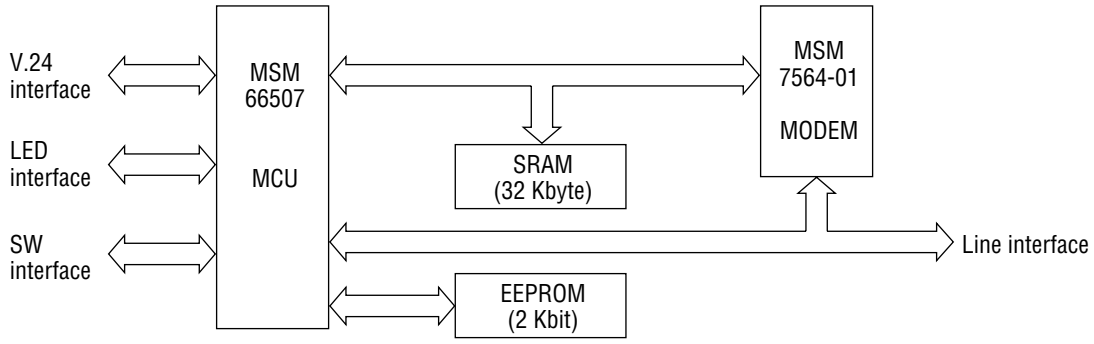

M 2121 Block iagram

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Transmission data	SD	Input	Input signal of the transmit data. Mark signal = 1, space signal = 0.
Reception data	RD	Output	Output signal of the receive data. Mark signal = 1, space signal = 0.
Request-To-Send	RTS	Input	1 = Stop receive data. 0 = Send transmit data.
Clear-To-Send	CTS	Output	1 = Data transmit disabled. 0 = Data transmit enabled.
Data Terminal Ready	DTR	Input	1 = Transmit/receive to/from the modem disabled. 0 = Transmit/receive to/from the modem enabled.
Data Set Ready	DSR	Output	1 = Modem is in transmit/receive disabled state. 0 = Modem is in transmit/receive enabled state.
Carrier Detect	DCD	Output	1 = Carrier not detected. 0 = Carrier detected.
Call Indicator	CI	Output	1 = No incoming call signal. 0 = Incoming call signal.
Transmission Timing (DTE source)	ST1	Input	Transmission timing clock from the DTE. Used in the synchronization mode.
Transmission Timing (DCE source)	ST2	Output	Transmission timing clock from the DCE. Used in the synchronization mode.
Reception Timing	RT	Output	Recieve timing clock. Used in the synchronization mode.

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ignal ame	ymbol	/	xplanation
Dial relay	RLY1	Output	Dial relay control signal. 1 = Relay ON. (Make) 0 = Relay OFF. (Break)
Hook relay	RLY2	Output	Line connection relay control signal. 1 = Relay ON. (Make) 0 = Relay OFF. (Break)
Incoming call signal input	$\overline{\text{RII}}$	Input	For input from the NCU unit incoming call signal detection circuit. 1 = No incoming call signal. 0 = Incoming call signal.
Speaker	$\overline{\text{SPK}}$	Output	Speaker control signal. 1 = Speaker ON. 0 = Speaker OFF.

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ignal ame	ymbol	/	unction
Auto answer	AA	Output	Indicates that the modem is in an auto-answer state. 1 = Auto answer state. 0 = Not auto answer state.
Error correction mode	EC	Output	Indicates connection to the remote modem made in error correction mode. 1 = Connected in error correction mode. 0 = Connected in normal mode.
High speed	HS	Output	Indicates communication at 9,600 bps or higher. 1 = High speed transmission at 9,600 bps or higher. 0 = Low speed transmission at 7,200 bps or lower.
Modem ready	MR	Output	Lights when power is turned ON. During the loopback test, cycles ON-OFF in 1 second cycles. 1 = Lamp ON 0 = Lamp OFF

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ort	ymbol	unction
P2.7	SW1	Determines the setting of the carrier transmission levels. When P2.7=1, the carrier transmission levels are set by the commands (registers S34 and S35). Refer to registers S34 and S35 requirements for more details. When P2.7=0, the carrier transmission levels are set by the ports (SW2 to SW4).
P3.0 P3.3 P4.1	SW2 SW3 SW4	When P2.7=0, the carrier transmission levels are set. SW4 SW3 SW2 Carrier transmission level. (Note1). 0 0 0 – 10 dBm 0 0 1 – 11 dBm 0 1 0 – 12 dBm 0 1 1 – 13 dBm 1 0 0 – 14 dBm 1 0 1 – 15 dBm 1 1 0 – 16 dBm 1 1 1 – 17 dBm
P4.2	SW5	Determines whether the JATE retransmission security function is provided or not. When P4.2=1, the JATE retransmission security function is not provided. When P4.2=0, the JATE retransmission security function is provided.
P4.3	SW6	Determines the command set types. When P4.3=1, typeA command set is determined. When P4.3=0, typeB command set is determined.
P7.2	SW7	P7.2 should be always set to 0, which is reserved for future use.
P7.4	SW8	P7.4 should be always set to 0, which is reserved for future use.
P7.5	SW9	Selects the nonvolatile memory types to be used. When P7.5=1, X24C02 ( ) or an equivalent is selected. When P7.5=0, AT59C22 (produced by ATMEL) or an equivalent is selected.

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P0.0 to P0.7	Input/ output		AD0 to AD7	Address bus (low order) and data bus.

ort umber	/	ctive evel	ignal ame	unction
P1.0 to P1.7	Output		A8 to A15	Address bus (high order)

ort umber	/	ctive evel	ignal ame	unction
P2.0	Output	H	RLY1	For dial relay control signal.
P2.1	Output	H	RLY2	For line connection relay control signal.
P2.2	Output	L	CI	Calling indicator
P2.3	Input	L	DTR	Data Terminal Ready
P2.4	Output	L	DSR	Data Set Ready
P2.5	Output	L	DCD	Data Carrier Detect signal.
P2.6	Output	L	CTS	Clear to Send.
P2.7	Input		SW1	For SW1 signal input.

ort umber	/	ctive evel	ignal ame	unction
P3.0	Input		SW2	For SW2 signal input.
P3.1	Input	L	$\overline{\text{RII}}$	For the incoming call signal input from the NCU circuit (Note1).
P3.2	Output	L	$\overline{\text{SPK}}$	For speaker control signal.
P3.3	Input		SW3	For SW3 signal input.
P3.4	Input		SD	For transmission data (connect to P6.6)
P3.5	Input	L	RTS	Request to send.
P3.6	Input		RT	Reception timing clock input (from the MSM7564-01).
P3.7	Input		ST2	Transmission timing clock input (from the MSM7564-01).

ort umber	/	ctive evel	ignal ame	unction
P4.0	Output		CE1	MSM7564-01 select signal.
P4.1	Input		SW4	For SW4 signal input.
P4.2	Input		SW5	For SW5 signal input.
P4.3	Input		SW6	For SW6 signal input.
P4.4	Output	H	MR	For the modem ready indicator signal.
P4.5	Output	H	HS	For the high-speed indicator signal.
P4.6	Output	H	EC	For the error correction mode indicator signal.
P4.7	Output	H	AA	For the auto answer indicator signal.

ort umber	/	ctive evel	ignal ame	unction
P5.0	Output		CS	For non-volatile memory control signal (Note2)
P5.1	Output		CLK	For non-volatile memory control signal (Note2)
P5.2	Output		DI	For non-volatile memory control signal (Note2)

ort umber	/	ctive evel	ignal ame	unction
P6.0	Input		RBTM	Reception modulation timing signal from the MSM7564-01.
P6.1	Input	L	STSCHG	STSCHG signal (from the MSM7564-01).
P6.2	Input		TxD	Reception data from the MSM7564-01.
P6.3	Output		RxD	Transmission data to the MSM7564-01.
P6.4	Input		RT	Reception timing clock input (from the MSM7564-01).
P6.5	Input		ST2	Transmission timing clock input (from the MSM7564-01).
P6.6	Input		SD	For transmission data. (connect to P34)
P6.7	Output		RD	For reception data.

ort umber	/	ctive evel	ignal ame	unction
P7.0	Output	L	$\overline{WR}$	External memory write signal.
P7.1	Output	L	$\overline{RD}$	External memory read signal.
P7.2	Input		SW7	For SW7 signal input.
P7.3	Output		MCK	Clock signal to the MSM7564-01. (3.888MHz)
P7.4	Input		SW8	For SW8 signal input.
P7.5	Input		SW9	For SW9 signal input.
P7.6	Input		R/B	For non-volatile memory control signal (Note2)
P7.7	Input		DO	For non-volatile memory control signal (Note2)

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$\overline{EA}$	Input	Connect to +5 V.
NMI	Input	Connect to digital ground.
$\overline{OE}$	Input	Connect to digital ground.
PSEN	Output	Not used (open pin).
ALE	Output	Connect to the MSM7564-01 ALE pin.
$\overline{RES}$	Input	Connect to system reset signal.

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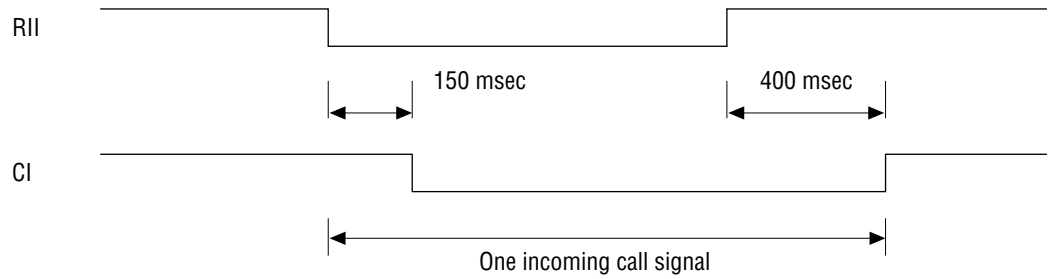

Port Number	SW9 (7.5)=0		SW9 (7.5)=1
	AT59C22 equivalent	No non volatile memory	X24C02 equivalent
P5.2	DI	connect to P7.7	connect to ground
P7.7	DO	connect to P5.2	open
P5.0	CS	open	CSL
P7.6	R/B	connect to P5.1	open
P5.1	CLK	connect to P7.6	SDA

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ommands

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	AT	Command character string	CR	LF	

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tart bit	ata bit	arity bit	top bit	haracter length
1	7	Odd/even	1	10
1	7	None	2	10
1	7	Mark/space	1	10
1	8	None	1	10

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ommand	unction	nitial Value	emarks
A/	Re-execute the immediately preceding command.		Same
A	Connect the modem to the line in the answer mode.		
Bn	Selection of ITU-T standard and BELL standard: n = 0: Modem function operates in accordance with the ITU-T standard. n = 1: Modem function operates in accordance with the Bell standard.	0	
D	Force operation into originate mode.		

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ommand	unction	nitial Value	emarks
Dc	The modem dials and operates in the originate mode. Dial Characters Pulse: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, (A, B, C, D, ∗, # are ignored) Tone: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, ∗, # Control Characters @ Detect silence If during the time set in the S7 register, a continuous 5-second interval of silence is detected after the ring tone, and dial string processing is not detected after that (@), a "BUSY" is returned if the call progress tone is a busy tone, and a "NO ANSWER". ! Flash The modem goes off hook for 0.5 seconds. , Pause Dialing pauses for the time set in the S8 register. ; After dialing is completed, return to command mode without disconnecting the line L Redial the last dialed telephone number If there is an L in the dial string, the last dialed dial string (telephone number) is substituted for the L and dialed. P Temporarily sets the subsequent dial string to the pulse dial format R Reverse After dialing is completed, the modem starts communication in the answer mode. An interval from after dialing until sending the answer tone can be set by inserting a pause (,) before the reverse (R). If there is an R in the dial string, subsequent chara Sn Dials the telephone number, specified by registration number n, which was stored in nonvolatile memory by the &Zn command. The value for n is specified by 0 to 3 (if there is no specification, it is interpreted as n = 0). If there is an Sn in the dial string and the character after S is 0 to 3, the dial string (telephone number) of the specified registration number is substituted for Sn and dialed. If the character after S is outside of the characters 0 to 3, or if there is T Temporarily sets the subsequent dial string to the tone dial format.		c is the dial string. The dial string comprises a combination of dial characters and control characters. The maximum number of characters is 40 (D + 39). However, if L or Sn are used, a dial string of greater than 40 characters is possible. L and Sn can store up to 63 and 33 characters, respectively. L is ignored if the telephone numbers are not in memory, such as after a reset or power ON. Sn is ignored if the telephone number is not registered in the registration number of the nonvolatile memory specified by n. If there is an L or Sn in the dial string, the dial string stored in memory is displayed when that L or Sn is executed (however, this is dependent on the Qn command).

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ommand	unction	nitial Value	emarks
Dc	W Detect a dial tone Regardless of the ATXn command entered, if a dial tone is detected during the time set in the S7 register, the next dial string is processed. If a dial tone is not detected, a "NO DIALTONE" is returned. J When MNP Class 10 is enabled, the starting communication carrier speed for the handshaking is performed at 1,200 bps (V.22). [Equivalent to AT∗H1 command.] K When MNP Class 10 is enabled, the transmission level during communication is changed temporarily according to the line conditions. [Equivalent to the AT)M1 command] (Characters other than those above are completely ignored.)		J and K are ignored if MNP Class 10 is disabled (AT-N1).

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ommand	unction	nitial Value	emarks
En	Selects whether to echo when in the command mode. n = 0 The command input characters are not echoed. n = 1 The command input characters are echoed.	1	
Hn	Controls the connection to the line. n = 0 Set the line OFF (on hook) n = 1 Set the line ON (off hook)		
In	dentification of the DCE. n = 0 Display the product code (14400) n = 1 Display the ROM checksum. n = 2 Perform a ROM check sum and display OK or ERROR. n = 19 Display the ROM version. <CR><LF>MSC2121A Vx.xx MMM.YYYY<CR><LF> <CR><LF>Copyright (C) 1995 Oki Electric Industry Co., Ltd.<CR><LF>		
Mn	Controls operation of the monitor speaker. n = 0 The speaker is always OFF n = 1 The speaker is ON from the connection to the line (off hook) until handshaking is completed. n = 2 The speaker is always ON. n = 3 The speaker is ON only during handshaking.	1	
Nn	Selects the automatic fallback function for the modem-modem communication carrier speed. The maximum communication speed is determined by the S37 register. n = 0 Disables the automatic fallback function n = 1 Enables the automatic fallback function If the automatic fallback function is enabled, the modem automatically falls back to the communication carrier speed of the remote modem when handshaking and retraining. However, if connected in the direct mode, automatic fallback is not performed when retraining regardless of the setting.	1	

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ommand	unction	nitial Value	emarks
On	Return from the on-line command mode to the data mode. n = 0 Switch from the on-line command mode to the data mode. n = 1 When switching from the on-line command mode to the data mode, execute the retraining sequence. If this command is issued from the command state after going off hook (not yet connected to the remote modem), the DCE tests the connection in the mode specified when on hook (D, A, DxxxR commands).		
P	Sets dialing to the pulse dial method.		Factory setting is pulse dial.
Qn	Selects whether to send the result code. n = 0 Send a result code. n = 1 Do not send a result code.	0	
Sr	Sets the pointer value for the S-register to the value r.		Refer to Appendix C.
Sr?	Returns the contents of the S-register indicated by r.		
Sr=d	Sets the contents of the S-register indicated by r to the value d.		
=d	Sets the contents of the S-register indicated by the current pointer value to the value d.		
?	Returns the contents of the S-register indicated by the current pointer value.		
T	Sets the dialing mode to tone dialing.		Factory setting is pulse dial.
Vn	Type of result code. n = 0 Short form result code (numeric). n = 1 Long form result code (character string/word).	1	Refer to the section on result codes.

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ommand	unction	nitial Value	emarks
Wn	Selects the connect result code. n = 0 DTE-DCE terminal speed CONNECT xxxx However, when in the direct mode or terminal speed variable mode (AT \ J1), the communication carrier speed is displayed after the CONNECT display. n = 1 Carrier speed CARRIER xxxx Protocol PROTOCOL : xxxx Data compression COMPRESSION : xxxx DTE-DCE terminal speed CONNECT xxxx n = 2 Communication carrier speed CARRIER xxxx n = 3 DTE-DCE terminal speed CONNECT xxxx/REL Displays the DTE-DCE speed and error correction connection. In the normal mode and direct mode, only CONNECT xxxx is displayed. In the terminal speed variable mode (AT \ J1), the communication carrier speed is displayed after CONNECT. Communication carrier speed: 300, 1200, 2400, 4800, 7200, 9600, 12000, 14400 Protocol LAPM, ALT, NONE Data compression V. 42bis, class5, NONE DTE-DCE terminal speed: 300, 1200, 2400, 4800, 7200 9600, 12000, 14400, 19200 28800, 38400, 57600	0	

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ommand	unction	nitial Value	emarks
Xn	Selects extended result codes. n = 0 Return basic result codes (result code numbers: 0 to 4, 8). The dial tone and busy tone are not detected and the only connect result code is CONNECT. n = 1 Return basic + extended result codes (result code numbers: 0 to n = 2 5, 8 to 80). The dial tone and busy tone are not detected. n = 3 Return basic + extended result codes (result code numbers: 0 to n = 4 6, 8 to 80). The busy tone is not detected. Return basic + extended result codes (result code numbers: 0 to 5, 7 to 80). The dial tone is not detected. Return basic + extended result codes (result code numbers: all numbers). A dial tone is detected by a continuous signal longer than 100 ms within 5 seconds after going off hook. The second dial tone is detected by a continuous signal longer than 100 ms starting from after dialing is completed (starting point of W) and during the time set n the S7 register. After the detection of a busy tone, if the tone signal turns ON and OFF every 500 ms ±150 ms continuously for 3 seconds, it is judged to be BUSY.	4	

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ommand	unction	nitial Value	emarks
Yn	Selects the call abort function. n = 0 Disables the call abort function. n = 1 Enables the call abort function. Call Abort Function If an ON → OFF change is detected in the DTR (ER) signal when an ATH (ATH0) command is received from the DTE, or when an AT&D2 command is set, the following operation is performed: If the modem is in the direct mode with the communication carrier speed at 2,400 bps or lower, a 4-second long space is transmitted to the remote modem, and the line is dropped (invalid when in a mode other than the direct mode). If the communication carrier speed is 4,800 bps or greater, a call abort signal is sent to the remote modem and the line is dropped. If the modem is in the direct mode and the communication carrier speed is 2,400 bps or below, the line is dropped if a long space of 1.6 seconds or greater is received from the remote modem (invalid when in a mode other than the direct mode). If the communication carrier speed is 4,800 bps or greater, the line is dropped, regardless of this setting, if a call abort signal is received from the remote modem.	0	
Zn	Initializes the DCE the same as when turning on the power supply. n = 0 Initializes the DCE with the contents of profile number 0 in n = 1 nonvolatile memory. Initializes the DCE with the contents of profile number 1 in nonvolatile memory.		
&Cn	Controls the DCD (CD) signal n = 0 The DCD (CD) signal is always ON. n = 1 The DCD (CD) signal is ON or OFF according to whether a carrier is detected.	0	

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ommand	unction	nitial Value	emarks
&Dn	Controls the DCE by the state of the DTR (ER) signal. n = 0 Ignore the DTR (ER) signal (DTR (ER) signal is considered to be always ON). n = 1 When in the data mode, the modem switches to the on-line command mode when the DTR (ER) signal changes from ON to OFF. n = 2 When in the data mode, the modem disconnects the line and switches to the command mode when the DTR (ER) signal changes from ON to OFF. Further, the modem does not auto answer when the DTR (ER) signal is OFF. n = 3 When in the data mode, the DCE is initialized (the same as when turning the power ON) when the DTR (ER) signal changes from ON to OFF.	0	
&F	Initializes the S-registers and commands to the factory set values.		
&Gn	Controls the guard tone. n = 0 No guard tone. n = 1 There is a 550 Hz guard tone. n = 2 There is a 1,800 Hz guard tone.	0	
&Ln	Type of line format used. n = 0 A general telephone switched line is used. n = 1 A dedicated line is used. The handshake uses only a retraining sequence, and the modem starts sending a carrier signal at the target speed one second after going off hook, regardless of whether the modem is in originate or answer mode.	0	
&Mn	Sets the data communication mode. n = 0 Asynchronous communication mode. n = 1 Synchronous mode 1 n = 2 Synchronous mode 2 n = 3 Synchronous mode 3	0	This has a higher priority than the AT\Nn command.
&Pn	Selects the mode of the pulse dial. n = 0 10 pps (39%) USA specification n = 1 10 pps (33%) UK and Japan specifications n = 2 20 pps (33%) Japan specification	1	
&Rn	Controls the CTS (CS) signal. n = 0 When in the data mode, data is output with the delay set in register S26 when an RTS is input. n = 1 The RTS signal is ignored.	0	Synchronous.
&Sn	Controls the DSR signal. n = 0 The DSR (DR) signal is always ON. n = 1 The DSR (DR) signal is sent in accordance with the ITU-T recommendation for each modem function.	0	

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ommand	unction	nitial Value	emarks
&Tn	Selects the loopback test mode. n = 0 Terminates the loopback test mode. n = 1 The DCE loops back the data from the DTE between the modulator unit and the demodulator unit and sends it to the DTE. (Local Analog Loopback test: LAL) n = 3 The DCE loops back the data received from the remote modem and transmits the data to the remote modem. (Local Digital Loopback test: LDL) n = 4 The DCE receives data from the remote modem. When a remote digital loopback (RDL) ID signal is received, a verification signal is sent to the remote modem. Afterwards, the data received from the remote modem is looped back by the digital unit and transmitted to the remote modem. When a terminate signal is received from the remote modem, the remote digital loopback test (RDL) is terminated. n = 5 Even if the remote digital loopback test (RDL) ID signal is received from the remote modem, the DCE ignores it and does not transmit a verification signal to the remote modem. n = 6 The DCE transmits the remote digital loopback test (RDL) ID signal to the remote modem. Upon reception of the verification signal from the remote modem, the DCE starts the test. If a verification test is not received from the remote modem, ERROR is displayed and the test is stopped. (Remote Digital Loopback test: RDL) n = 7 The DCE transmits the remote digital loopback test (RDL) ID signal to the remote modem. Upon receiving a verification signal from the remote modem, the DCE transmits specific data in the DCE itself to the remote modem, and the data is looped back by the remote modem. The received specific data is verified, and the errors are counted. When the test is terminated, the error count is displayed. If the verification signal is not received from the remote modem, display ERROR and stop the test. (RDL with self) n = 8 Specific data from the DCE itself is looped back between the modulator unit and demodulator unit. The specific data is verified and the errors are counted. When the test is terminated, the error count is displayed. (LAL with self)	0, 4	Valid only in direct mode.

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ommand	unction	nitial Value	emarks
&Un	Controls the enabling of trellis coding for ITU-T V.32bis at a 9,600 bps communication carrier speed. n = 0 Trellis coding enabled. n = 1 Trellis coding disabled.	0	
&V	Displays the current state of the DCE settings. Displays the current command setting, the S-registers (user, profiles 0, 1) registered in nonvolatile memory, and the transmission level.		Refer to the section on display formats.

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ommand	unction	nitial Value	emarks
&Wn	Writes the current contents of the specified S-register to nonvolatile memory. n = 0 n = 0 Writes to user profile number 0. n = 1 n = 1 Writes to user profile number 1.		Object S-register numbers: 0, 6 to 10, 12, 14, 18, 21 to 23, 25 to 27, 34 to 48, 40 to 46, 48
&Xn	Selects the communication clock used in the synchronous mode. n = 0 Use ST2 from the modem. n = 1 Use ST1 from the terminal. n = 2 Use the receive clock RT from the modem.	0	Synchronous
&Yn	Selects the user profile number in nonvolatile memory used for the default settings when turning the power ON. n = 0 When turning the power ON, initialize with the profile number 0. n = 1 When turning the power ON, initialize with the profile number 1.	0	
&Zn = c	Writes the character string (c) after the equal sign, as a telephone number, to the nonvolatile memory registration number specified by n. n = 0 Write to nonvolatile memory number 0. n = 1 Write to nonvolatile memory number 1. n = 2 Write to nonvolatile memory number 2. n = 3 Write to nonvolatile memory number 3. The character string c is a maximum of 33 characters. If it is 34 characters or greater, the characters up to the 33rd character are written to nonvolatile memory, and the 34th and beyond are ignored. If c is omitted, the contents of the specified registration number in nonvolatile memory is cleared.	(clear)	The telephone number c conforms to the Dc command.
¥An	Selects the maximum block size in MNP reliable mode. n = 0 The maximum block size is 64 bytes. n = 1 The maximum block size is 128 bytes. n = 2 The maximum block size is 192 bytes. n = 3 The maximum block size is 256 bytes.	3	

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ommand	unction	nitial Value	emarks
¥Bn	Sends a break signal to the remote modem. n = 0 Transmits a 300 ms break signal (long space). n = 1 to 9 Transmits an n × 100 ms break signal (long space). When in the data mode of the normal or reliable modes, this functions as a command which transmits a break to the remote modem. If in the data mode of the direct mode, an ERROR is returned. Note: The default value of this command is 0. Values set subsequently are stored in internal memory, but are not included in the S-registers and are not stored in nonvolatile memory. Therefore, the following explanations are for a break transmission by means of \Bn. However, even if a break signal is received directly from the DTE, the \Bn value at that time is used. Normal Mode A break (space) signal is sent to the line for an interval set by n on the transmit side. The receive side receives the break signal and the modem sends a break signal to the DTE for a fixed time of 300 ms. V.42/V.42bis Modes The break information is delivered in accordance with the break processing (\Kn) and break length (\Bn) on the transmit side. The break processing is executed on the receive side according to the frame received from the remote modem. The break signal to the DTE is sent in accordance with the break length information of the frame from the remote modem (100 to 900 ms). MNP4/MNP5 Modes When transmitting, only the break processing mode (\K) is delivered. When receiving, break processing is performed according to the information from the remote modem. The break signal to the DTE is fixed at 300 ms.		Valid only when in normal mode and reliable mode.

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ommand	unction	nitial Value	emarks
¥Cn	Selects the automatic determination in auto reliable mode. n = 0 The receive data is not buffered. If there is no reliable request n = 1 even after 8 seconds have elapsed, the modem connects in n = 2 normal mode. Two-hundred bytes or 8 seconds of receive data is buffered. If a reliable request is received during that time, the data in the buffer is discarded and the modem connects in reliable mode. If a reliable request is not received, the modem connects in normal mode and sends the data in the buffer to the DTE. The receive data is not buffered. If an auto reliable fallback character is received, or if there is no reliable request even after 8 seconds have elapsed, the modem connects in normal mode.	0	Valid only in the answer mode when the AT\N3 or AT\N7 command (auto reliable mode) is set.
¥F	Displays all telephone numbers registered in nonvolatile memory and the last dialed telephone number.		Refer to the section on display formats.
¥Gn	Sets the flow control with the remote modem. n = 0 No flow control. n = 1 Flow control based on XON/XOFF codes.	0	Valid only when in normal mode.

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ommand	unction	nitial Value	emarks
¥Jn	Sets the DTE-DCE terminal speed. n = 0 The DTE-DCE terminal speed is fixed. When in the command n = 1 mode, the speed is in accordance with the terminal speed. Follows the communication carrier speed at the time when the connection is completed. The DTE needs to reset the terminal speed according to the "CONNECT xxxx" speed displayed.	0	Valid only in the normal mode and reliable mode.
¥Kn	Sets the processing of the break signal. • If a break signal (long space) is received from the DTE: a: In the data mode state of the normal/reliable mode n = 4 The modem switches to the on-line command state without transmitting a break signal to the remote modem. n = 5 The modem transmits a break signal after transmitting he data remaining in the transmit buffer to the remote modem (nondestructive, nonexpedited). b: In the on-line command mode state of the normal/reliable mode (includes break processing based on the AT\Bn command from the DTE). n = 4, 5 The modem transmits the break information after transmitting the data remaining in the transmit buffer to the remote modem (nondestructive, nonexpedited). After processing the break signal, the modem remains in the on-line command mode state. c: Data mode state of direct mode. n = 4 The modem immediately transmits a break signal to the remote modem and switches to the on-line command mode state. n = 5 The modem immediately transmits a break signal to the remote modem and remains in the data mode. Break signals from the DTE are ignored in the on-line command state when in the direct mode. • If a break signal (long space) is received from the remote modem while in the data mode of the normal mode: n = 4, 5 The modem transmits a break signal (long space) after sending the data remaining in the receive buffer to the DTE (nondestructive, nonexpedited).	5	

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ommand	unction	nitial Value	emarks
¥Kn	Even if a break signal (long space) is received from the remote modem while in the on-line mode, it is ignored. • If a frame for a break signal is received from the remote modem while in the data mode of the reliable mode, processing is performed according to the commands in that frame. If a frame for a break signal is received from the remote modem while in the on-line command mode, it is processed when the modem returns to the data mode state. • If a break signal (long space) is received from the remote modem while in the data mode of the direct mode, the break signal (long space) is sent, as is, to the DTE. Even if a break signal (long space) is received from the remote modem while in the on-line command mode, it is ignored.	5	

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ommand	unction	nitial Value	emarks
¥Nn	Sets the operation of the modem. n = 0 Modem operates in normal mode (with buffering). V.42 and MNP are not used. n = 1 Modem operates in direct mode (without buffering). V.42 and MNP are not used. The DTE needs to reset the terminal speed according to the speed displayed in "CONNECT xxxx." n = 2 Modem operates in V.42/MNP reliable mode. The modem tries to connect using V.42 and MNP, in that order. If it cannot connect, it drops the line. n = 3 Modem operates in V.42/MNP auto reliable mode. The modem tries to connect using V.42 and MNP, in that order. If it cannot connect, the modem connects in direct mode if the \J1 command is set. Otherwise, it connects in normal mode. n = 4 The modem operates in V.42 reliable mode. If it cannot connect in V.42, it drops the line. n = 5 The modem operates in V.42 reliable mode without using the detection phase. If it cannot connect in V.42, it drops the line. n = 6 The modem operates in MNP reliable mode. If it cannot connect in MNP, it drops the line. n = 7 The modem operates in MNP auto reliable mode. The modem tries to connect in MNP. If it cannot connect, it connects in direct mode if the \J1 command is set. Otherwise, it connects in normal mode.	3	
¥Qn	Selects the DTE-DCE flow control. n = 0 No flow control. n = 1 Bidirectional flow control based on XON/XOFF codes. n = 2 Unidirectional flow control from the DCE side based on the CTS (CS) signal line. n = 3 Bidirectional flow control based on the CTS (CS) signal line and RTS (RS) signal line.	2	Invalid when in direct mode.
¥Sn	Displays the current DCE settings. n = 0 Display first screen. n = 1 Display second screen.		Refer to the section on display formats.
¥Tn	Sets the inactivity timer when in reliable mode. n = 1 to 90 (min); n = 0 indicates no timer function. If, for the above time setting, no transmit data is input from the local DTE and there is also no receive data from the remote modem, the line is dropped.	0	

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ommand	unction	nitial Value	emarks
¥Xn	Sets the transparency of the XON/XOFF codes from the DTE. n = 0 The XON/XOFF codes from the DTE are not transmitted to the n = 1 remote modem. The XON/XOFF codes from the DTE are transmitted to the remote modem.	0	Valid when AT\Q1 is set in normal mode.
%Ac	Sets the MNP fallback character. c = 0 to 127 Set by a decimal ASCII code.	0	Used when setting AT\C2 in MNP mode.
%Cn	Sets whether data is compressed. n = 0 Data is not compressed. n = 1 Data is compressed by V.42bis or MNP Class 5.	1	
%En	Sets whether auto retraining is performed. n = 0 No auto retraining. n = 1 Auto retraining.	1	
%R	Displays the current contents of all S-registers.		Refer to the section on display formats.

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ommand	unction	nitial Value	emarks
–Nn	Sets whether MNP Class 10 is enabled. n = 0 MNP Class 10 is enabled. The settings of the -Kn, ∗Hn, and) n = 1 Mn commands become enabled. MNP Class 10 is disabled. The settings of the -Kn, ∗Hn, and) Mn commands are ignored and treated as -K0, ∗H0 and)M0.	1	
–Kn	Sets whether extended MNP service is enabled. n = 0 Extended MNP service disabled. n = 1 Extended MNP service enabled. The originate-side modem monitors the MNP detection pattern (MDP) in the V.42 detection phase. The answer-side modem transmits the MDP after ODP detection, thus making MNP protocol negotiation possible. Further, the V.42bis compression function can be used in the MNP connection state.	0	
∗Hn	Selects the communication carrier speed when handshaking. n = 0 Connects at the communication carrier speed set in the DCE n = 1 and performs protocol negotiation. First connects at a communication carrier speed of 1,200 bps (V.22) when handshaking, and performs protocol negotiation. If the line conditions are judged to be good by the DCE itself, the communication carrier speed is changed to 2,400 bps (V.22bis). If the line conditions are still good, the communication carrier speed is changed to 4,800 bps (V.32bis). In the same manner, the communication carrier speed is changed to 7,200 bps (V.32bis), 9,600 bps (V.32bis), 12,000 bps (V.32bis) and 14,400 bps (V.32bis). Data communication is started. (Initial Speed-up Shift Function)	0	

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ommand	unction	nitial Value	emarks
)Mn	Sets the variation of the transmission level during communication. n = 0 DCE does not change the transmission level during communication. n = 1 DCE changes the transmission level during communication according to the line conditions. If the DCE is used in a mobile telephone, etc., the demodulation state information of the remote modem is received and, based on that information, the transmission level is changed to one most suitable for the remote modem.	0	

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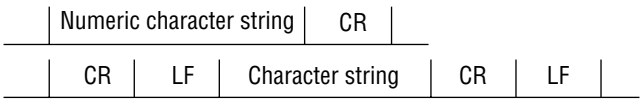

umeric haracter	haracter tring (Word)	Meaning
0	OK	Commands are executed normally; modem returns to command mode state.
1	CONNECT	Connection is established; modem switches from command mode to data mode.
2	RING	Ring signal detected.
3	NO CARRIER	Carrier not detected; carrier dropped.
4	ERROR	Command abnormal; there is an error in the command parameter.
5	CONNECT 1200	The connection is established at a DTE - DCE terminal speed of 1,200 bps.
6	NO DIALTONE	Dial tone not detected.
7	BUSY	Busy signal detected; dial oscillation spacing is inadequate.
8	NO ANSWER	Silence state not detected by the @ parameter.
10	CONNECT 2400	Connection established at a DTE-DCE terminal speed of 2,400 bps.
11	CONNECT 4800	Connection established at a DTE-DCE terminal speed of 4,800 bps
12	CONNECT 7200	Connection established at a DTE-DCE terminal speed of 7,200 bps
13	CONNECT 9600	Connection established at a DTE-DCE terminal speed of 9,600 bps
14	CONNECT 12000	Connection established at a DTE-DCE terminal speed of 12,000 bps
15	CONNECT 14400	Connection established at a DTE-DCE terminal speed of 14,400 bps
16	CONNECT 19200	Connection established at a DTE-DCE terminal speed of 19,200 bps
17	CONNECT 28800	Connection established at a DTE-DCE terminal speed of 28,800 bps
18	CONNECT 38400	Connection established at a DTE-DCE terminal speed of 38,400 bps
19	CONNECT 57600	Connection established at a DTE-DCE terminal speed of 57,600 bps
22	CONNECT 1200/REL	Connection established at a DTE-DCE terminal speed of 1,200 bps (with error correction)
23	CONNECT 2400/REL	Connection established at a DTE-DCE terminal speed of 2,400 bps (with error correction)
24	CONNECT 4800/REL	Connection established at a DTE-DCE terminal speed of 4,800 bps (with error correction)
25	CONNECT 7200/REL	Connection established at a DTE-DCE terminal speed of 7,200 bps (with error correction)
26	CONNECT 9600/REL	Connection established at a DTE-DCE terminal speed of 9,600 bps (with error correction)
27	CONNECT 12000/REL	Connection established at a DTE-DCE terminal speed of 12,000 bps (with error correction)
28	CONNECT 14400/REL	Connection established at a DTE-DCE terminal speed of 14,400 bps (with error correction)
29	CONNECT 19200/REL	Connection established at a DTE-DCE terminal speed of 19,200 bps (with error correction)

22-32 rror orrection Mode

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umeric haracter	haracter tring (Word)	Meaning
30	CONNECT 28800/REL	Connection established at a DTE-DCE terminal speed of 28,800 bps (with error correction)
31	CONNECT 38400/REL	Connection established at a DTE-DCE terminal speed of 38,400 bps (with error correction)
32	CONNECT 57600/REL	Connection established at a DTE-DCE terminal speed of 57,600 bps (with error correction)
40	CARRIER 300	Connection established at a communication carrier speed of 300 baud. (V.21/Bell 103J)
42	CARRIER 1200	Connection established at a communication carrier speed of 1,200 baud. (V.22/Bell 212A)
43	CARRIER 2400	Connection established at a communication carrier speed of 2,400 baud. (V.22bis)
44	CARRIER 4800	Connection established at a communication carrier speed of 48,00 baud. (V.32)
45	CARRIER 7200	Connection established at a communication carrier speed of 7,200 baud. (V.32bis)
46	CARRIER 9600	Connection established at a communication carrier speed of 9,600 baud. (V.32/V.32bis)
47	CARRIER 12000	Connection established at a communication carrier speed of 12,000 baud. (V.32bis)
48	CARRIER 14400	Connection established at a communication carrier speed of 14,400 baud. (V.32bis)
66	COMPRESSION : class 5	The Class 5 MNP standard is used for data compression.
67	COMPRESSION : V.42bis	The V.42bis ITU-T standard is used for data compression.
69	COMPRESSION : NONE	Data compression not used.
76	PROTOCOL : NONE	Error correction protocol not used.
77	PROTOCOL : LAPM	The V.42 LAP-M ITU-T standard is used for the error correction protocol.
80	PROTOCOL : ALT	The Class 4 MNP standard is used for the error correction protocol.
82	PROTOCOL : ALT+CELLULAR	The Class 10 MNP standard is used for the communication protocol. The Class 4 MNP standard is used for the error correction protocol.

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DTE SPEED & CHARACTER FORMAT : 9600 bps 8bit Non-Parity 1Stop-bit
ACTIVE- :   B0 E1 M1 N1 Q0 V1 W0 X4 &C0 &D0 &G0 &L0 &M0 &P1 &S0 &T4 &U0 &Y0
PROFILE     %C1 %E1 \A3 \C0 \G0 \J0 \K5 \N3 \Q2 \X0 -N1 -K0 *H0 )M0
            S00 = 000 S01 = 000 S02 = 043 S03 = 013 S04 = 010 S05 = 008 S06 = 004 S07 = 050
            S08 = 002 S09 = 006 S10 = 014 S12 = 050 S14 = 170 S18 = 000 S21 = 004 S22 = 244
            S23 = 059 S25 = 005 S26 = 001 S27 = 000 S36 = 007 S37 = 000 S38 = 020 S39 = 064
            S40 = 055 S41 = 153 S42 = 024 S43 = 000 S44 = 000 S46 = 136 S48 = 007 S49 = 000
STORED- :   B0 E1 M1 N1 Q0 V1 W0 X4 &C0 &D0 &G0 &L0 &M0 &P1 &S0 &T4 &U0
PROFILE     %C1 %E1 \A3 \C0 \G0 \J0 \K5 \N3 \Q2 \X0 -N1 -K0 *H0 )M0
No.0        S00 = 000 S06 = 004 S07 = 050 S08 = 002 S09 = 006 S10 = 014 S12 = 050 S14 = 170
            S18 = 000 S21 = 004 S22 = 244 S23 = 059 S25 = 005 S26 = 001 S27 = 000 S36 = 007
            S38 = 020 S39 = 064 S40 = 055 S41 = 153 S42 = 024 S43 = 000 S44 = 000 S46 = 002
            S48 = 007 S49 = 000
STORED- :   B0 E1 M1 N1 Q0 V1 W0 X4 &C0 &D0 &G0 &L0 &M0 &P1 &S0 &T4 &U0
PROFILE     %C1 %E1 \A3 \C0 \G0 \J0 \K5 \N3 \Q2 \X0 -N1 -K0 *H0 )M0
No.1        S00 = 000 S06 = 004 S07 = 050 S08 = 002 S09 = 006 S10 = 014 S12 = 050 S14 = 170
            S18 = 000 S21 = 004 S22 = 244 S23 = 059 S25 = 005 S26 = 001 S27 = 000 S36 = 007
            S38 = 020 S39 = 064 S40 = 055 S41 = 153 S42 = 024 S43 = 000 S44 = 000 S46 = 002
            S48 = 007 S49 = 000
LEVEL   :   TX CARRIER = -15dBm
REMAIN  :   PRODUCTION = MSC2121A
            VER = 1.00
OK
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STORED DIAL (&Z0) = 03-1234-5678
STORED DIAL (&Z1) =
STORED DIAL (&Z2) =
STORED DIAL (&Z3) =

            LAST DIAL =
OK
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REG DEC HEX   REG DEC HEX   REG DEC HEX   REG DEC HEX   REG DEC HEX
S00 000 00H   S00 014 0EH   S20 --- ---   S30 --- ---   S40 055 37H
S01 000 00H   S11 --- ---   S21 004 04H   S31 --- ---   S41 153 99H
S02 043 2BH   S12 050 32H   S22 244 F4H   S32 --- ---   S42 024 18H
S03 013 0DH   S13 --- ---   S23 059 3BH   S33 --- ---   S43 000 00H
S04 010 0AH   S14 170 AAH   S24 --- ---   S34 015 0FH   S44 000 00H
S05 008 08H   S15 --- ---   S25 005 05H   S35 009 09H   S45 000 00H
S06 004 04H   S16 000 00H   S26 001 01H   S36 007 07H   S46 002 02H
S07 050 32H   S17 --- ---   S27 000 00H   S37 000 00H   S47 --- ---
S08 002 02H   S18 000 00H   S28 --- ---   S38 020 14H   S48 007 07H
S09 006 06H   S19 --- ---   S29 --- ---   S39 064 40H   S49 000 00H
OK
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DTE Speed	9600	
DCE Speed	Off-line	
DCE Type	DATA	AT+FCLASS=0
Modem Type	ITU-T	ATB0
Line Mode	GSTN	AT&L0
Auto Answer	Off	S0=000
Dial Mode	Pulse	ATP
Dial Speed	33% 10PPS	AT&P1
Command Echo	On	ATE1
Result Code	On	ATV1
Extended CONNECT		ATW0
Extended Result		ATX4
Speaker Control		ATM1
DCD Control		AT&C0
DTR Control		AT&D0
DSR Control		AT&S0

OK

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Modem Mode	Auto V. 42/MNP	AT\N3
DTE Speed Adjust	Off	AT\J0
Block Size	256	AT\A3
Break Control		AT\K5
Break length		AT\B003
Auto Buffer		AT\C0
Fall-Back Code		AT%A000
Flow (DTE-DCE)	CTS	AT\Q2
Flow (DCE-DCE)	Off	AT\G0
Pass Xon/Xoff	Off	AT\X0
Watch timer	Off	AT\T000
Data Compression	On	AT%C1
V. 32bis trellis	On	AT&U0
Cellular	Off	AT-N1

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ommand	unction	nitial Value	emarks
+ FCLASS = ?	Returns all service classes supported by the DCE. Parameter: <0, 1> 0 = Data communication 1 = Fax communication (Class 1 fax commands)		
+ FCLASS?	Returns the service class currently set in the DCE. 0 = Data communication. 1 = Fax communication (Class 1 fax commands).		
+ FCLASS = n	Switches the DCE to the specified service class. n = 0 Data communication. n = 1 Fax communication (Class 1 fax commands).	0	

ommand	unction	nitial Value	emarks
+FTS=t	Stops transmission and returns the OK result code after the specified time. Specified time = t x 10 ms; t = 0 to 255		
+FRS=t	Detects a continuous silence for the specified time and returns the OK result code. Specified time = t x 10 ms; t = 0 to 255		
+FTM=m	Transmits fax data by the modulation method specified by m.		*1
+FTM=?	Returns all fax data modulation methods supported by the DCE. Parameter: <24, 48, 72, 73, 74, 96, 97, 98, 121, 122, 145, 146>		
+FRM=m	Receives the fax data by the demodulation method specified by m.		*1
+FRM=?	Returns all fax data demodulation methods supported by the DCE. Parameter: <24, 48, 72, 73, 74, 96, 97, 98, 121, 122, 145, 146>		
+FTH=m	Transmits the HDLC format by the modulation method specified by m.		*1
+FTH=?	Returns all HDLC format modulation methods supported by the DCE. Parameter: <3, 24, 48, 72, 73, 74, 96, 97, 98, 121, 122, 145, 146>		
+FRH=m	Receives HDLC format by the demodulation method specified by m.		*1
+FRH=?	Returns all HDLC format demodulation methods supported by the DCE. Parameter: <3, 24, 48, 72, 73, 74, 96, 97, 98, 121, 122, 145, 146>		
+FLO=?	Returns all DTE-DCE flow control methods, when in fax communication mode, supported by the DCE. Parameter: <0, 1> 0 = Bidirectional flow control based on XON/XOFF codes. 1 = Bidirectional flow control based on the CTS (CS) signal line and RTS (RS) signal line.		
+FLO?	Returns the DTE-DCE flow control method, when in fax communication mode, currently set by the DCE. 0 = Bidirectional flow control based on XON/XOFF codes. 1 = Bidirectional flow control based on the CTS (CS) signal line and RTS (RS) signal line.		
+FLO=n	Sets the DTE-DCE flow control methods, when in fax communication mode, in the DCE. 0 = Bidirectional flow control based on XON/XOFF codes. 1 = Bidirectional flow control based on the CTS (CS) signal line and RTS (RS) signal line.	0	

*1: Refer to the "Specification of the Modulation/Demodulation Method" section regarding the setting of the modulation/demodulation method.

ommand	unction	nitial Value	emarks
A	Connects the DCE to the line in the fax receive mode. The CED signal transmission and the +FTH=3 command are automatically added to the A command of the AT command.		
Dc	Dials and performs fax transmission. The CNG signal transmission and the +FRH=3 command are automatically added to the Dc command of the AT command.		
H	Disconnects the telephone line (goes on hook). If this command is executed during transmission/reception, the telephone line is disconnected (goes on hook) after stopping that transmission/reception.		

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ode	Moduration/ emoduration on Method	ommunication peed	equired onditions
3	V.21 ch.2	300 bps	It is essential to specify by the +FTH and +FRH commands.
24	V.27 ter	2400 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
48	V.27 ter	4800 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
72	V.29	7200 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
73	V.17	7200 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
74	V.17 w/st	7200 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
96	V.29	9600 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
97	V.17	9600 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
98	V.17 w/st	9600 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
121	V.17	12000 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
122	V.17 w/st	12000 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
145	V.17	14400 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.
146	V.17 w/st	14400 bps	Specify by the +FTM, +FRM, +FTH and +FRH commands.

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umeric haracter	haracter tring (Word)	Meaning
0	OK	The command executed normally and the modem returns to the command mode state.
1	CONNECT	The modem entered the data transmission state. Data input/output is performed.
2	RING	A ring signal was detected.
3	NO CARRIER	A receive carrier was not detected. Or, since the receive carrier stopped, data reception ends. However, this does not mean that the modem has changed to the on hook state.
4	ERROR	The command is abnormal or there is an error in the command parameters. Or, the command ended abnormally. The modem returns to the command mode state. There is an abnormality in the HDLC frame. Or, data is not input from the DTE during transmission even after 5 seconds have elapsed.
6	NO DIALTONE	A dial tone was not detected.
7	BUSY	A busy tone was detected. The dial interval is insufficient.
+F4	+FCERROR	A signal was received other than one specified by the AT+FRM=x or AT+FRH=x command.

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*S0	0 to 255	Count	0	Number of ring signals for the auto answer mode; 0 = auto answer OFF.
S1	0 to 255	Count	0	Number of ring signals received.
S2	0 to 127	ASCII	43	Escape sequence code.
S3	0 to 127	ASCII	13	Carriage return code.
S4	0 to 127	ASCII	10	Line feed code.
S5	0 to 32, 127	ASCII	8	Back space code.
*S6	4 to 20	Seconds	4	Pause time from off hook until the start of dialing.
*S7	1 to 50	Seconds	50	Allowable time until connection is established.
*S8	0 to 255	Seconds	2	Pause time of comma (,) when dialing
*S9	1 to 255	1/10 Second	6	Carrier detect time.
*S10	1 to 255	1/10 Second	14	Carrier loss detect time; 255 does not automatically go on hook.
*S14	—	—	170	Bit-mapped option register.
S16	—	—	0	Bit-mapped option register.
*S18	0 to 255	Seconds	0	Timer for testing.
*S21	—	—	4	Bit-mapped option register.
*S22	—	—	244	Bit-mapped option register.
*S23	—	—	63	Bit-mapped option register.
*S25	0 to 255	1/100 Second	5	Minimum time of DTR(ER) OFF detection.
*S26	0 to 255	1/100 Second	1	Delay time from RTS to CTS.
*S27	—	—	0	Bit-mapped option register.
*S34	0 to 5	dB	5	Attenuation level of the data carrier output.
*S35	0 to 5	dB	3	Attenuation level of the DTMF (tone) output.
*S36	0 to 7	—	7	Fallback option selection.
*S37	0 to 11	—	0	Maximum DCE line speed setting: 0 = based on the S23 and S45 registers.
*S38	0 to 255	Seconds	20	Time until line disconnect: 255 = line does not disconnect.
*S39	—	—	64	Bit-mapped option register.
*S40	—	—	55	Bit-mapped option register.
*S41	—	—	153	Bit-mapped option register.
*S42	—	—	24	Bit-mapped option register.
*S43	0 to 127	ASCII	0	Fallback character in the auto reliable mode.
*S44	0 to 90	Minutes	0	Inactivity timer of the \Tn command: 0 = no timer function.
*S45	0 to 32	—	32	Display of DTE-DCE terminal speed: Enabled when S23.3-1 = 7.
*S46	0 to 138	—	2	Protocol and data compression specification: Enabled when S48 = 0.
*S48	0, 7, 128	—	7	Protocol negotiation specification.
*S49	—	—	0	Bit-mapped option register.

eneral - egisters

egister o.	unction
S0 Default: 0 Profile: Yes	• Specifies the number of ring signals to be received when auto answering. • Specify in the range of 0 to 255 (Units: Number of rings). • 0 specifies no auto answer. • 1 to 255 specifies the number of ring signals received until the start of auto answer.
S1 Default: 0 Profile: No	• Counts the number of ring signals received when there is an incoming call. • This register clears 8 seconds after the ring signals stop.
S2 Default: 43 Profile: No	• Specifies the escape sequence code character. • Specify in the range of 0 to 127 in ASCII code (decimal). • The default "43" displays a "+" code.
S3 Default: 13 Profile: No	• Specifies the carriage return code character. • The specified character is used in commands and result codes. • Specify in the range of 0 to 127 in ASCII code (decimal). • Uses the default <CR> code (ASCII 13).
S4 Default: 10 Profile: No	• Specifies the line feed code character. • The specified character is used in commands and result codes. • Specify in the range of 0 to 127 in ASCII code (decimal). • Uses the default <LF> code (ASCII 10).
S5 Default: 8 Profile: No	• Specifies the backspace code character. • The specified character is used in commands. • Specify in the range of 0 to 32, 127 in ASCII code (decimal). • Uses the default <BS> code (ASCII 8).
S6 Default: 4 Profile: Yes	• Sets the pause time from off hook to the start of dialing. • Specify in the range of 4 to 20 (Units: Seconds). • Used when dial tone detection is not performed during dialing.
S7 Default: 50 Profile: Yes	• Specifies the maximum time until a carrier signal is detected. • Disconnects the line if a carrier signal is not detected within the specified time. • In originate mode: the time from the end of dialing until carrier signal detection. In answer mode: the time from off hook until carrier signal detection. • Specify in the range of 1 to 50 (Units: Seconds).
S8 Default: 2 Profile: Yes	• Specifies the pause time of the dial control character (comma ",") used in the ATD command. • Specify in the range of 0 to 255 (Units: Seconds). • No pause when set to 0.
S9 Default: 6 Profile: Yes	• Specifies the carrier signal detection time. • If the carrier signal duration is shorter than the specified time, it is not detected. • Specify in the range of 1 to 255 (Units: 1/10 second).
S10 Default: 14 Profile: Yes	• Specifies the carrier signal loss detection time. • If a carrier signal loss longer than the specified time is detected, the line is automatically disconnected. • If 255 is specified, automatic line disconnect is not performed. Therefore, the DTE must go on hook at the DTR(ER) signal or by the H command. • Specify in the range of 1 to 255 (Units: 1/10 second).

egister o.	unction
S18 Default: 0 Profile: Yes	• Specifies the measurement time of the loopback test. • Specify in the range of 0 to 255 (Units: Seconds).
S25 Default: 5 Profile: Yes	• Specifies the timespan to detect that DTR(ER) is OFF. • Specify in the range of 0 to 255 (Units: 1/100 second).
S26 Default: 1 Profile: Yes	• The delay time until the CTS (CS) signal is turned ON when the RTS(RS)signal changes from ON to OFF. • Specify in the range of 0 to 255 (Units: 1/100 second).
S34 Default: 5 Profile: Yes	• Sets the attenuation level for the data carrier output line. • Specify in the range of 0 to 5 (Units: dB).
S35 Default: 3 Profile: Yes	• Sets the attenuation level for the DTMF (tone) output line. • Specify in the range of 0 to 5 (Units: dB).
S36 Default: 7 Profile: Yes	• Specifies the fallback options. • This register operates when the S48 register is 128, and the V.42 link could not be connected. • If an invalid value is specified, the value itself is accepted, but actual operation takes place as though the default was input. • Specify in the range of 0 to 7. 0: DCE disconnects the line. 1: DCE establishes a direct mode connection. 2: Reserved. 3: DCE establishes a normal mode connection. 4: The DCE tries to make an MNP link connection. If the connection fails, the line is disconnected. 5: The DCE tries to make an MNP link connection. If the connection fails, then a connection is established in direct mode. 6: Reserved. 7: The DCE tries to make an MNP link connection. If the connection fails, then a connection is established in normal mode.

egister o.	unction
S37 Default: 0 Profile: Yes	• Specifies the maximum communication carrier speed of the DCE. • When S40.5 = 0, tries to connect to the remote modem at the specified communication carrier speed. When S40.5 = 1, tries to connect with the remote modem at a high communication carrier speed which is supported by both modems, but not exceeding the range of the specified communication carrier speed. • If an invalid value is specified, the value itself is accepted, but actual operation takes place as though the default was input. • Specify in the range of 0 to 13. 0: Communication carrier speed is specified according to the local DTE terminal speed. Based on bits 3, 2, 1 of the S23 register and the S45 register: S23 bits: b3 b2 b1 0 0 0 V.21 or Bell 103J 300 bps 0 1 0 V.22 or Bell 212A 1200 bps 0 1 1 V.22bis or Bell 224 2400 bps 1 0 0 V.32 4800 bps 1 0 1 V.32 or V.32bis 7200 bps 1 1 1 and S45 = 8, V.32bis 9600 bps 1 1 1 and S45 = 16, V.32bis 12000 bps 1 1 1 and S45 = 17 or greater, V.32bis 14400 bps 1: V.21 300 bps 2: V.21 or Bell 103J 300 bps 3: V.21 or Bell 103J 300 bps 5: V.22 or Bell 212A 1200 bps 6: V.22bis or Bell 224 2400 bps 7: V.32 4800 bps 8: V.32bis 7200 bps 9: V.32 or V.32bis 9600 bps 10: V.32bis 12000 bps 11: V.32bis 14400 bps
S38 Default: 20 Profile: Yes	• Specifies the time until the line is disconnected. • When in error correction mode if a disconnect command is received, or the DTR(ER) goes from ON to OFF, or data appears in the buffer, the DCE will lose its data, or it will wait the specified amount of time, disconnect the line and discard the data. • If a value from 0 to 254 is specified, waits the specified amount of time before disconnecting the line, or sends all data. • If a value of 255 is specified, the line is not disconnected until all the data is sent. • Specify in the range of 0 to 255 (Units: Seconds).
S43 Default: 0 Profile: Yes	• Specifies the fallback character used in the auto reliable mode. • Specify by the AT%Ac command. • Specify in the range of 0 to 127 ASCII code (decimal).

egister o.	unction
S44 Default: 0 Profile: Yes	• Sets the inactivity timer. • If 0 is specified the timer does not function. • When connecting in reliable mode, if there is no data transmission or reception even if a time longer than the specified time has elapsed, the line is disconnected. • Set by the AT\Tn command. • Specify in the range of 0 to 90 (Units: minutes).
S45 Default: 32 Profile: Yes	• Displays the DTE-DCE terminal speed. • Set by automatic recognition of "AT" or "SET." • When bits 1 to 3 of the S23 register are all "1," this register is enabled, and the DTE-DCE terminal speed is displayed. • Displayed by a numeric value in the range of 0 to 32. 0 Terminal speed is indicated by bits 1 to 3 of the S23 register. 8: 7,200 bps 16: 12,000 bps 17: 14,400 bps 19: 19,200 bps 23: 28,800 bps 27: 38,400 bps 32: 57,600 bps
S46 Default: 2 Profile: Yes	• Specifies the communication protocol and data compression when the S48 register is specified as "0." • If an invalid value is specified, the value itself is accepted, but actual operation takes place as though the default was input. • Displayed by a numeric value in the range of 0 to 138. 0: Only normal mode connection. 1: Only MNP Class 3, 4 connection. 2: Only LAPM or V.42bis connection. 3: Only MNP Class 5 connection. 136: Only LAPM connection. 138: Only V.42bis connection.
S48 Default: 7 Profile: Yes	• Sets the negotiation of the communication protocol with the remote modem. • For negotiation with the remote modem, this register is referred to with maximum priority, and the communication protocol of the link connection is determined based on this register. • Specify as 0, 7 or 128. 0: Communication protocol of the link connection is determined by the S46 register. 7: Communication protocol of the link connection is determined by the AT\Nn command. 128: Communication protocol of the link connection is determined by the AT\Nn command. However, if the link connection fails with V.42, the modem operates according to the S36 register.

Bit-mapped - egisters

egister o.	Bit osition	Bit tate	unction	elevant ommands
S14 Default: 170 Profile: Yes	0		Reserved (bit state is "0").	
	1	0	• No echo back when in command mode.	E0
		* 1	• Echo back when in command mode.	E1
	2	* 0	• Result codes.	Q0
		1	• No result codes.	Q1
	3	0	• Digit form result code (numeric).	V0
		* 1	• Word form result code (character string).	V1
	4	* 0	• Pulse dialing speed 10 pps.	&P0, &P1
		1	• Pulse dialing speed 20 pps.	&P2
	5	0	• Sets tone dialing as the default.	T
		* 1	• Sets pulse dialing as the default.	P
	6		Reserved (bit state is "0").	
	7	0	• Answer mode.	A
		* 1	• Originate mode.	D
S16 Default: 0 Profile: No	0	* 0	• Local analog loopback test (LAL) disabled.	&T0
		1	• Local analog loopback test (LAL) enabled.	&T1
	1		Reserved (bit state is "0").	
	2	* 0	• Local digital loopback test (LDL) disabled.	&T0
		1	• Local digital loopback test (LDL) enabled.	&T3
	3	* 0	• The RDLB from the remote modem stops.	(&T4)
		1	• The RDLB from the remote modem is in operation.	
	4	* 0	• Remote digital loopback test (RDL) disabled.	&T0
		1	• Remote digital loopback test (RDL) enabled.	&T6
	5	* 0	• RDL disabled by the self diagnostic.	&T0
		1	• RDL enabled by the self diagnostic.	&T7
	6	* 0	• LAL disabled by the self diagnostic.	&T0
		1	• LAL enabled by the self diagnostic.	&T8
	7		Reserved (bit state is "0").	
S21 Default: 4 Profile: Yes	0		Reserved (bit state is "0").	
	1		Reserved (bit state is "0").	
	2	0	• Responds to the RTS(RS) and controls the CTS(CS).	&R0
		* 1	• Ignores the RTS(RS).	
	4, 3	* 0, 0	• Ignores the DTR(ER).	&D0
		0, 1	• Returns to the command mode by DTR(ER) ON → OFF.	&D1
		1, 0	• Disconnects the line by DTR(ER) ON → OFF.	&D2
		1, 1	• Initializes by DTR(ER) ON → OFF.	&D3
	5	* 0	• The DCD(CD) is always ON.	&C0
		1	• The DCD(CD) depends on the presence of the receive carrier.	&C1
	6	* 0	• The DSR(DR) is always ON.	&S0
		1	• The DSR(DR) follows the various ITU-T recommendations.	&S1
	7	* 0	• Line does not disconnect by a break signal.	Y0
		1	• Line disconnects by a break signal.	Y1

egister o.	Bit osition	Bit tate	unction	elevant ommands
S22 Default: 244 Profile: Yes	0		Reserved (bit state is "0").	
	1		Reserved (bit state is "0").	
	3, 2	0, 0	• Monitor speaker is always OFF.	M0
		* 0, 1	• Monitor speaker is ON until a carrier signal is detected.	M1
		1, 0	• Monitor speaker is always ON.	M2
		1, 1	• Monitor speaker is ON only during handshake.	M3
	6, 5, 4	0, 0, 0	• Returns a basic result code.	X0
		0, 0, 1	Reserved.	
		0, 1, 0	Reserved.	
		0, 1, 1	Reserved.	
		1, 0, 0	• Returns a basic + extended (no busy or dial detection).	X1
		1, 0, 1	• Returns a basic + extended (no busy tone detection).	X2
		1, 1, 0	• Returns a basic + extended (no dial tone detection).	X3
		* 1, 1, 1	• Returns a basic + extended (all functions are enabled).	X4
	7	0	• Uses pulse dialing with make/break ratio of 39%.	&P0
		* 1	• Uses pulse dialing with make/break ratio of 33%.	&P1, &P2
S22 Default: 244 Profile: Yes	0	0	• Refuses remote digital loopback test.	&T5
		* 1	• Permits remote digital loopback test.	&T4
	3, 2, 1	0, 0, 0	• Local DTE terminal speed: 0 ~ 300 bps.	
		0, 0, 1	Reserved.	
		0, 1, 0	• Local DTE terminal speed: 1,200 bps.	
		0, 1, 1	• Local DTE terminal speed: 2,400 bps.	
		1, 0, 0	• Local DTE terminal speed: 4,800 bps.	
		1, 0, 1	• Local DTE terminal speed: 9,600 bps.	
		1, 1, 0	Reserved.	
		* 1, 1, 1	• Local DTE terminal speed is displayed by the S45 register.	
	5, 4	0, 0	• Even parity.	
		0, 1	• Space parity.	
		1, 0	• Odd parity.	
		* 1, 1	• Mark or no-parity.	
	7, 6	* 0, 0	• No guard tone	&G0
		0, 1	• 550 Hz guard tone.	&G1
		1, 0	• 1,800 Hz guard tone.	&G2
		1, 1	Reserved.	

egister o.	Bit osition	Bit tate	unction	elevant ommands
S27 Default: 0 Profile: Yes	1, 0	* 0, 0	• Specifies the asynchronous mode	&M0
		0, 1	• Specifies synchronous mode 1.	&M1
		1, 0	• Specifies synchronous mode 2.	&M2
		1, 1	• Specifies synchronous mode 3.	&M3
	2	* 0	• Specifies general public switched line.	&L0
		1	• Specifies dedicated line.	&L1
	3		Reserved (bit state is "0").	
	5, 4	0, 0	• ST2 clock setting.	&X0
		0, 1	• ST1 clock setting.	&X1
		1, 0	• RT clock setting.	&X2
		1, 1	• Not used.	
	6	* 0	• Modem operation based on ITU-T recommendations.	B0
		1	• Modem operation based on BELL standards.	B1
	7		Reserved (bit state is "0").	
S39 Default: 64 Profile: Yes	2, 1, 0		Reserved (bit state is "000").	
	3	* 0	• Extended MNP is disabled.	–K0
		1	• Extended MNP is enabled.	–K1
	4	* 0	• Connects at the specified communication carrier speed.	∗H0
		1	• Connects at a communication carrier speed of 1,200 bps (V.22).	∗H1
	5	* 0	• Does not change transmission level during communication.	)M0
		1	• Changes transmission level during communication.	)M1
	6	0	• MNP 10 protocol is enabled.	–N0
		* 1	• MNP 10 protocol is disabled.	–N1
	7		Reserved (bit state is "0").	

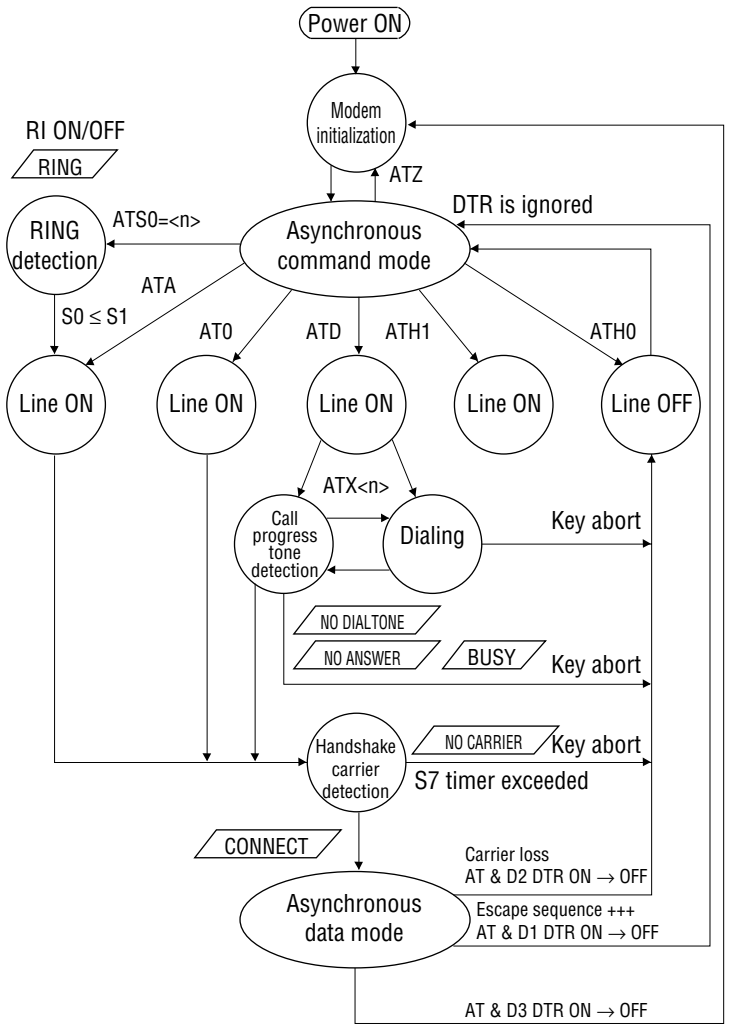
egister o.	Bit osition	Bit tate	unction	elevant ommands
S40 Default: 55 Profile: Yes	1, 0	0, 0	• Uses normal mode.	\N0
		0, 1	• Uses direct mode.	\N1
		1, 0	• Uses reliable mode.	\N2, 4 to 6
		* 1, 1	• Uses auto reliable mode.	\N3, \N7
	4, 3, 2	0, ×, ×	Reserved.	
		1, 0, 0	• Uses break mode 4.	\K4
		* 1, 0, 1	• Uses break mode 5.	\K5
		1, 1, ×	Reserved.	
	5	0	• Inhibits auto fallback function.	N0
		* 1	• Enables auto fallback function.	N1
	7, 6	* 0, 0	• Reports terminal speed.	W0
		0, 1	• Reports communication carrier speed, protocol data compression and terminal speed.	W1
		1, 0	• Reports communication carrier speed.	W2
		1, 1	• Report appends to the terminal carrier speed whether there is error correction (/REL).	W3
S41 Default: 153 Profile: Yes	0	0	• No auto retrain.	%E0
		* 1	• Auto retrain.	%E1
	1	* 0	• Does not perform flow control between the modem and the remote modem.	\G0
		1	• Performs flow control based on XON/XOFF codes.	\G1
	2	* 0	• Does not send XON/XOFF codes to the remote modem.	\X0
		1	• Sends XON/XOFF codes to the remote modem (transparent).	\X1
	4, 3	0, 0	• Maximum block length is 64 bytes.	\A0
		0, 1	• Maximum block length is 128 bytes.	\A1
		1, 0	• Maximum block length is 192 bytes.	\A2
		* 1, 1	• Maximum block length is 256 bytes.	\A3
	6, 5	* 0, 0	• No buffering.	\C0
		0, 1	• Buffers until an SYN or ODP is received, until 200 characters are received, or until 8 seconds of reception.	\C1
		1, 0	• Received data is discarded until the auto reliable fallback character is received, or until a maximum of 8 seconds of reception.	\C2
		1, 1	Reserved.	
	7	0	• No data compression.	%C0
		* 1	• Data compression.	%C1

egister o.	Bit osition	Bit tate	unction	elevant ommands
S42 Default: 24 Profile: Yes Bits 3 and 2 are only valid when in data modem mode. Bits 5 and 4 are only valid in facsimile DCE mode.	0	* 0	• V.32bis at 9,600 bps; trellis coding.	&U0
		1	• V.32bis at 9,600 bps; no trellis coding.	&U1
	1		Reserved.	
			Reserved.	
	3, 2	0, 0	• No flow control between the DTE and the modem.	\Q0
		0, 1	• Flow control based on XON/XOFF codes.	\Q1
		* 1, 0	• Flow control based on the CTS(CS) signal of the modem.	\Q2
		1, 1	• Flow control based on the CTS(CS)/RTS(RS) signals.	\Q3
	5, 4	0, 0	Reserved.	
		* 0, 1	• Flow control based on XON/XOFF codes.	+FLO=0
		1, 0	• Flow control based on the CTS(CS)/RTS(RS) signals.	+FLO=1
		1, 1	Reserved.	
	6	0	Reserved (bit state is "0").	
	7	* 0	• Terminal speed during communication is the same as during commands.	\J0
		1	• Terminal speed during communication matches the carrier speed.	\J1
S49 Default: 0 Profile: Yes (Bits 7 and 6 cannot be written to a profile.)	2, 1, 0	* 0, 0, 0	• Data modem using asynchronous AT commands.	+FCLASS=0
		0, 0, 1	• Facsimile DCE using Class 1 fax commands.	+FCLASS=1
		0, 1, 0	Reserved.	
		0, 1, 1	Reserved.	
		1, 0, 0	Reserved.	
		1, 0, 1	Reserved.	
		1, 1, 0	Reserved.	
		1, 1, 1	Reserved.	
	3		Reserved (bit state is "0").	
	4		Reserved (bit state is "0").	
	5		Reserved (bit state is "0").	
	7, 6	* 0, 0	• FAX/DATA automatic switching disabled.	+FAA=0
		0, 1	• FAX/DATA automatic switching enabled.	+FAA=1
		1, 0	Reserved.	
		1, 1	Reserved.	

ppendix
ommand Mode and ata Mode

V V W

Y H M



• Originate Mode
The modem dials by the ATD (ds) command. If there is a response from the remote equipment and the modem connects successfully, the CONNECT result code is returned indicating that the modem has switched to the data mode.
• Answer Mode
To set the auto answer mode, enter a command such as ATS0=2. With this command, the modem will auto answer if 2 rings are received. To set the manual answer mode, enter the ATS0=0 command. After verifying the ring, enter the ATA command to answer the call.
If the modem connects with the remote equipment, a CONNECT result code is returned indicating that the modem has switched to the data mode.
• Switch From Data Mode to Command Mode
If DTR ON→OFF is detected by & D1 mode, the OK result is returned indicating that the modem has returned to the command mode. At this point, commands can be used freely with the modem still connected to the line.
• Switch From Command Mode to Data Mode
By inputting the ATO command, the CONNECT result code is returned indicating that the modem has switched to the data mode again.
• Drop the Line Connection (ATH0 command)
Normally, the ATH0 command is input in the state where the modem has switched to the command mode. The line is turned OFF and the OK result code is returned.
At this point, the remote side detects the carrier loss, turns the line OFF and returns the NO CARRIER result code. At this point, some garbage characters may accompany the signal and change to a result code.
If both sides input the ATY1 command to each other beforehand, the line disconnect operates by sending a break signal. The remote side can thus drop the line normally with an OK result code.
• Drop the Line Connection (DTR)
If the AT&D2 command is set, the line is disconnected if the DTR makes a transition from ON to OFF, and the modem returns to the command mode.
• DTR Function
By entering the AT&D<n> command, the modem performs the functions shown in the figure at left.

Y H M

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verview of ynchronous Mode 1 (Y / Y mode)

verview of ynchronous Mode 2

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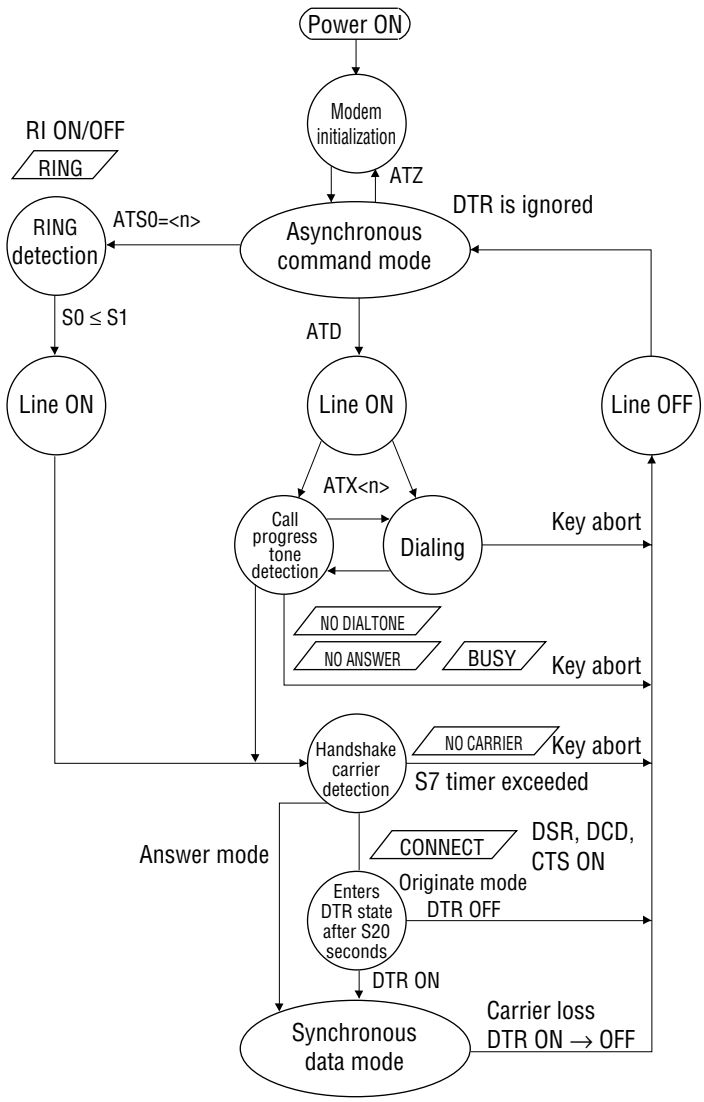
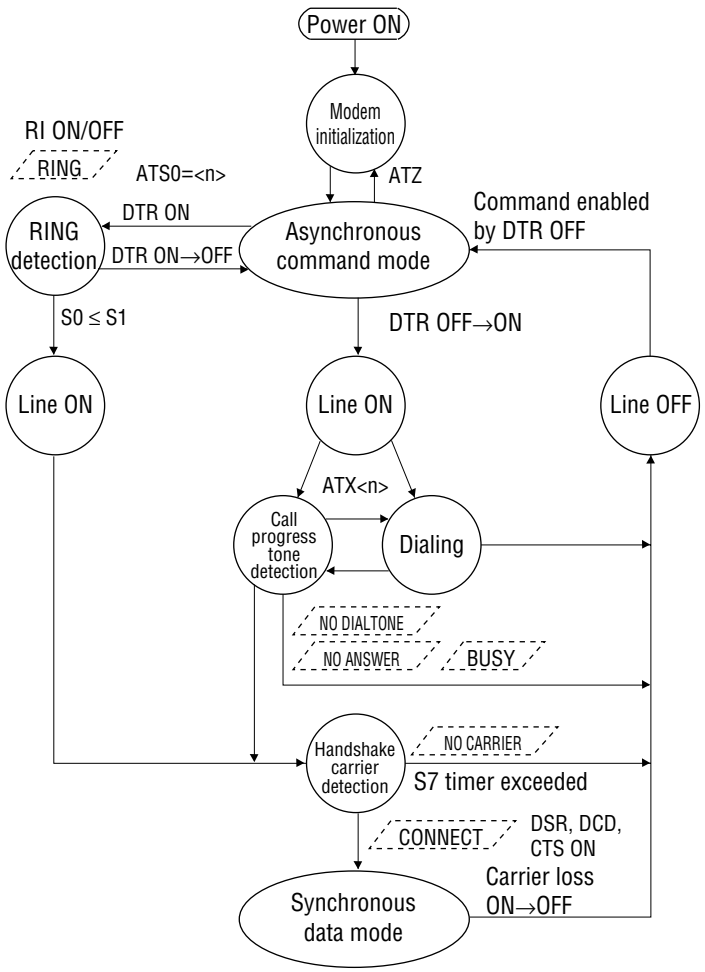
verview of ynchronous Mode 3

Y H M 1



• Setup
Synchronous mode 1 is set by the AT&M1 command, and appropriate settings are made with the ATX<n> and ATQ<n> commands according to the intended purpose. With ATQ1, result codes are returned but communication is completely in asynchronous mode. Set the S25 register to a value suitable for the following purposes (factory setting is 5 seconds).
If switching from the asynchronous mode to the synchronous mode is performed on the application side, the DTR may momentarily turn OFF. However, in order not to recognize this change as signal to drop the line, the DTR state is inspected S25 seconds after the connection is completed.
The DTR is ignored in the asynchronous command mode state. However, since the ON/OFF changes of the DTR affect the connection, the DTR is generally set to the ON state ahead of time when making a connection.
• Originate Mode
The number is dialed by the ATD<ds> or ATDS command. The modem switches to the synchronous mode upon completing the connection to the remote modem. However, the DTR state is inspected after the time set in S25 has elapsed. If the state is OFF, the line is dropped and the modem returns to the asynchronous command mode.
• Answer Mode
If <n> in the ATS0=<n> command is not 0, and the modem receives <n> rings, the modem will auto answer the call. The modem switches to the synchronous data mode when the connection with the remote modem is completed (there is no S25 function).
• Drop the Line
If the carrier is not detected for the time set in S10 (factory setting: 1.4 seconds), or if the modem detects a DTR change from ON to OFF, the modem drops the line and returns to the asynchronous command mode.
If S10 = 255, the line is not dropped due to a carrier loss. At this point, the carrier state can be monitored by the CD LED. Further, a change in the DTR from ON to OFF is not recognized for the time set in S25 (factory setting: 100 seconds).
• Drop the Connection State [TN: "Drop" should probably be "Observe"]
If the modem is in the ATX4, ATQ0 or ATV1 state, result codes such as RING, BUSY, NO DIALTONE, CONNECT 1200, CONNECT 2400 and NO CARRIER are returned in the asynchronous mode.
DSR turns ON upon receiving an answer tone from the remote modem.DCD turns ON when the data carrier is detected. The CD LED also turns ON.
The CTS turns ON if the RTS of the DTE is ON. The operation of RTS and CTS is related to the AT&R<n> command. If n = 0,
the CTS turns ON with a delay of time as set in S26 (factory setting: 100 seconds) after RTS turns ON.
If n = 1, the CTS is always ON during synchronous data mode, regardless of RTS.
DSR, DCD and CTS are all ON in states where synchronous communication is possible.

Y H M 2



• Setup
Synchronous mode 2 is set by the AT&M2 command. The telephone number of the remote modem is written to nonvolatile memory by the AT&Z<ds> command.
If this mode is always used, store the current settings in nonvolatile memory by the AT<...Q1E0>&W command ("..." is the required command string).
By storing the current settings, the S registers are automatically set to the values stored in nonvolatile memory the next time power is turned ON, thus setting this mode.
To change the settings or test using new ones, set the DTR to the OFF state and use the asynchronous command mode to make the changes.
With ATQ0E1, the result codes are returned and the commands are echoed back.
Further, if setting the modem as mentioned above, the result code notations in the figure to the left will differ from the normal codes.

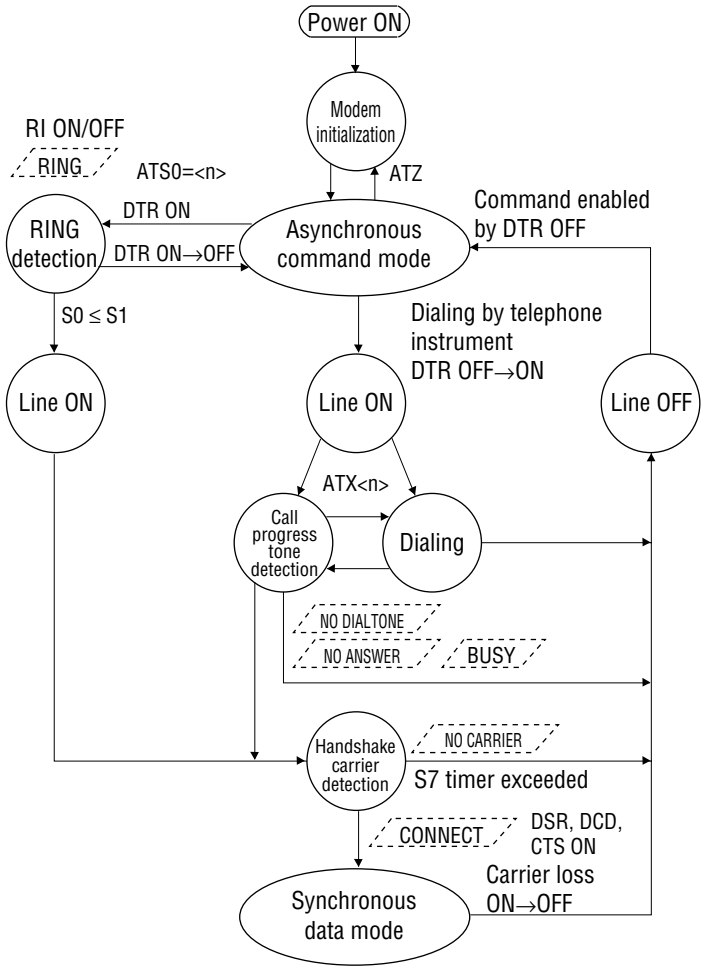
• Originate Mode
This mode dials the stored telephone number when the DTR changes from OFF to ON.
At this point, the line noise can be heard on the monitor speaker if the ATL2M1 command is set.
If the line does not connect normally, the line is turned OFF and the modem returns to the asynchronous state.

• Answer Mode
The modem is set to the auto answer mode by the ATS0=<n> command. When DTR is ON, the modem starts auto answer when the ring count reaches n (S0 = S1). If S0 > S1, DTR turns OFF and the modem stops auto answering 8 seconds after the last ring. Conversely, if a ring is received even if DTR is turned OFF, the modem auto answers if DTR is turned ON again within 8 seconds. After this interval is exceeded, turning DTR ON starts the originate mode.

• Drop the Line
Same as for synchronous mode 1.

• Observe the Connection State
Same as for synchronous mode 1.

Y H M 3



• Setup
Synchronous mode 3 is set by the AT&M3 command. If this mode is always used, store the current settings in nonvolatile memory by the AT<...Q1E0>&W command ("..." is the required command string).
By storing the current settings, the S registers are automatically set to the values stored in nonvolatile memory the next time power is turned ON, thus setting this mode.
To change the settings or test using new ones, set the DTR to the OFF state and use the asynchronous command mode to make the changes.
With ATQ0E1, the result codes are returned and the commands are echoed back.
Further, if setting the modem as mentioned above, the result code notations in the figure to the left will differ from the normal codes.

• Originate Mode
The DTR is turned OFF beforehand. Dial the remote modem using an auxiliary telephone instrument.
The connection will start when the DTR changes from OFF to ON.
At this point, the line noise can be heard on the monitor speaker if the ATL2M1 command is set.
If the line does not connect normally, the line is turned OFF and the modem returns to the asynchronous state.

• Answer Mode
Same as for synchronous mode 1.

• Drop the Line
Same as for synchronous mode 1.

• Observe the Connection State
Same as for synchronous mode 1.

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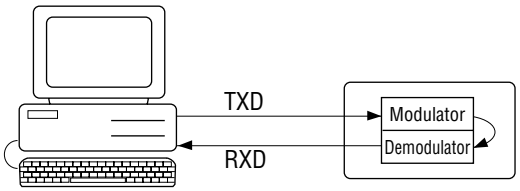

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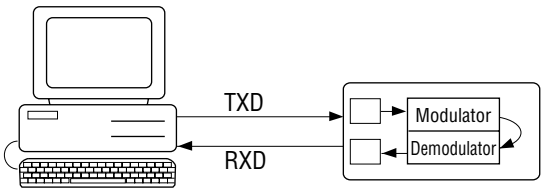

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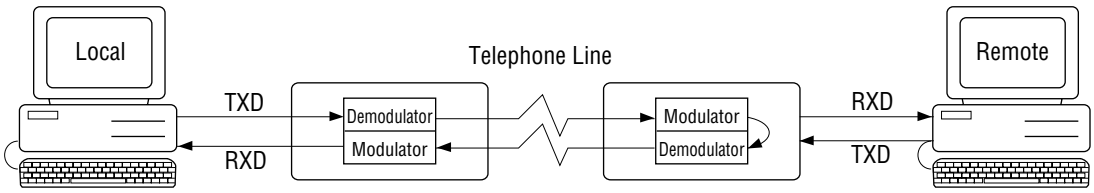

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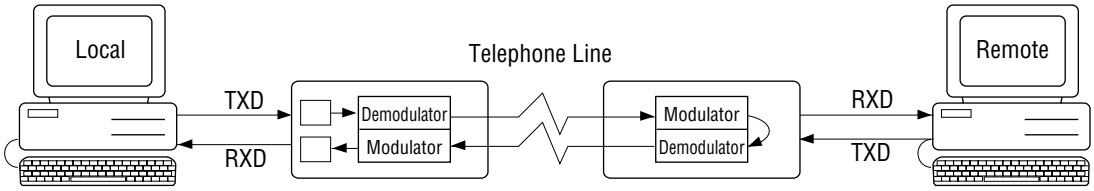

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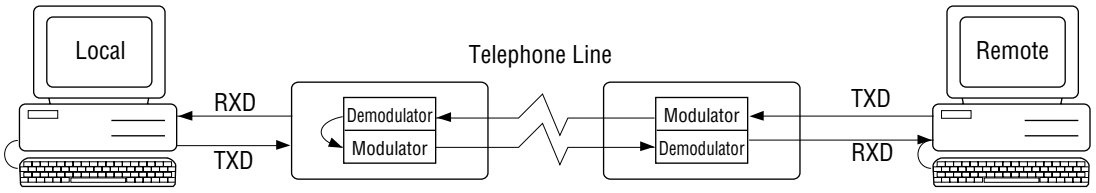

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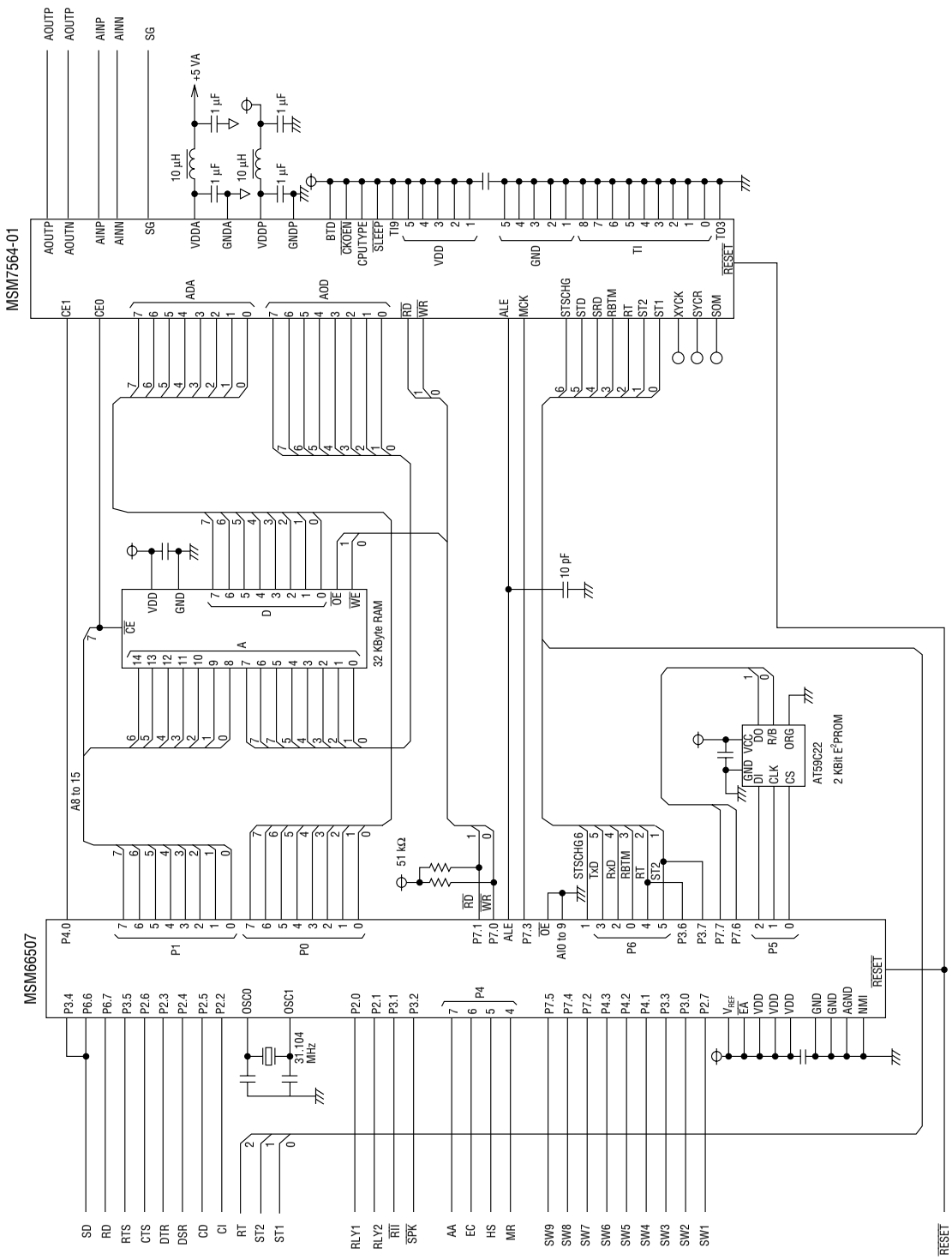

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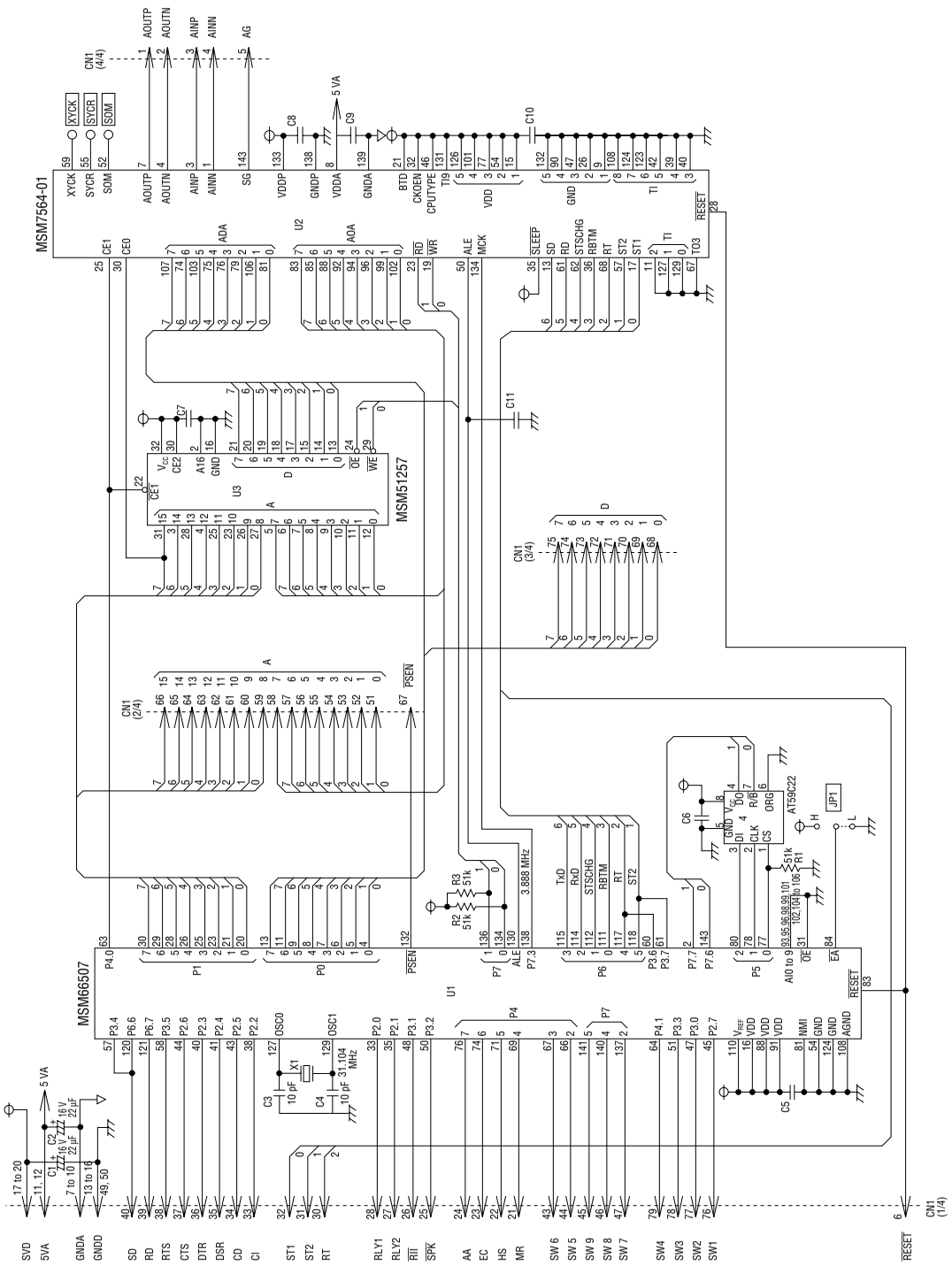

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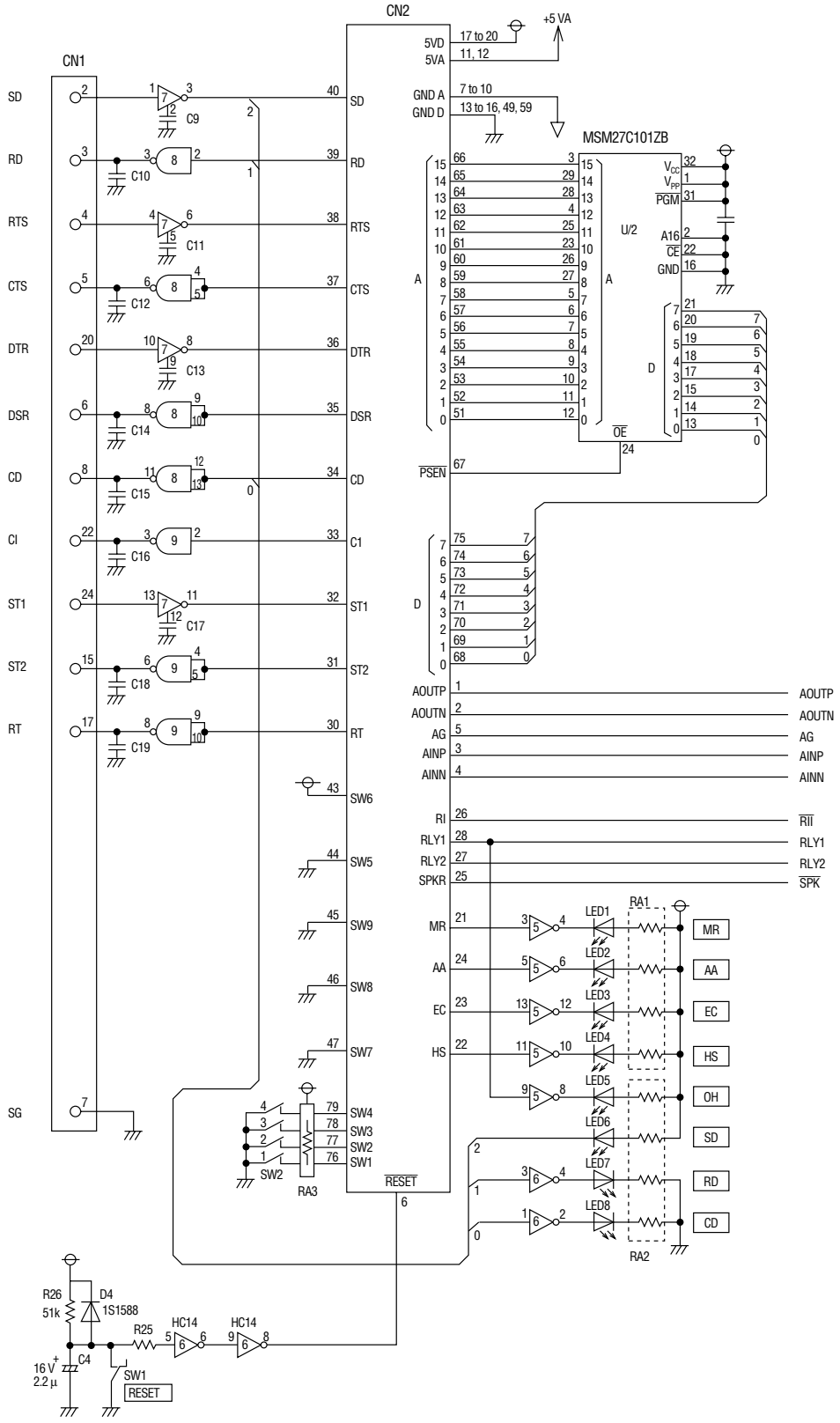

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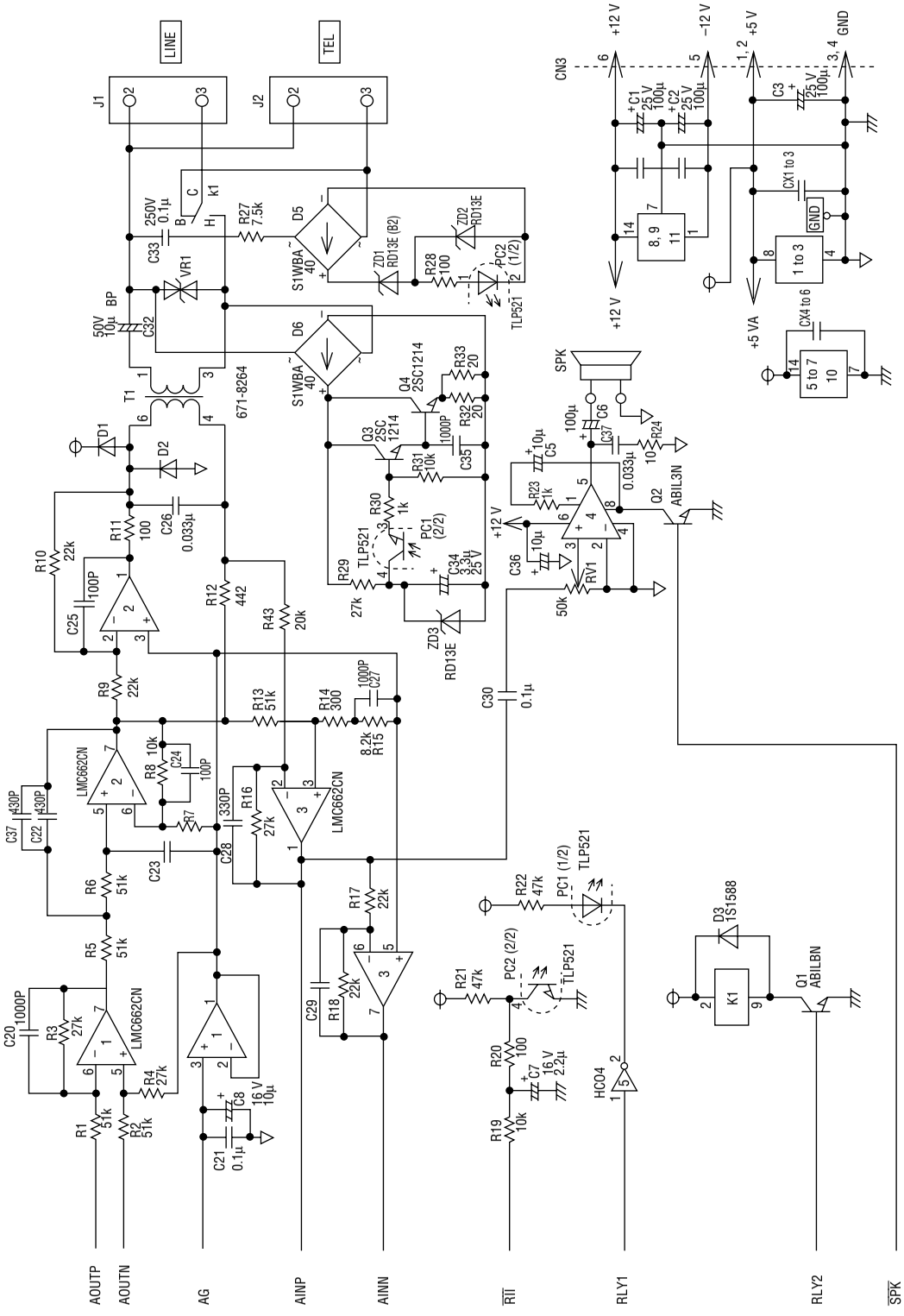

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REVISION HISTORY

Document No.	Date	Page		Description
		Previous Edition	Current Edition	
FEDL2121A-02	Oct. 1999	–	–	Second edition
FEDL2121A-03	July 12, 2002	1	1	Added “Note”
		–	–	Added “Revision History”

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