

SOFTWARE COMMUNICATION **PROTOCOL**

Communications Protocol For the following Card Readers/Encoders with RS-232 Interface:

MANUAL READER

SWIPE: SCR-560N/570N/580N/510N/530N/590N
INSERTION: SCR-962N/972N/982N/912N/932N

MOTORIZED READER/ENCODER

READER: MTM-560/570/580/510/530/590
ENCODER (LOW-CO): MTM-460/470/480/490
ENCODER (HI-CO): MTM-461/471/481/491
ENCODER (LOW/HI SWITCHABLE): MTM-464/474/484/494

MAG/IC COMBINATION READER/ENCODER

READER: MSA-560/570/580/510/530/590
ENCODER: MSA-460/470/480/490
ENCODER (HI-CO): MSA-461/471/481/491
ENCODER (LOW/HI SWITCHABLE): MSA-464/474/484/494

MAG READER/ENCODER WITH HOPPER UNIT

ENCODER (HI-CO): CH-461/471/481/491
ENCODER (LOW/HI SWITCHABLE): CH-464/474/484/494

MOTOR DRIVEN CARD TERMINAL

ENCODER (HI-CO): CT-861/871/881/891-5051/7071
ENCODER (LOW/HI SWITCHABLE): CT-864/874/884/894-5051/7071

Neuron Corporation

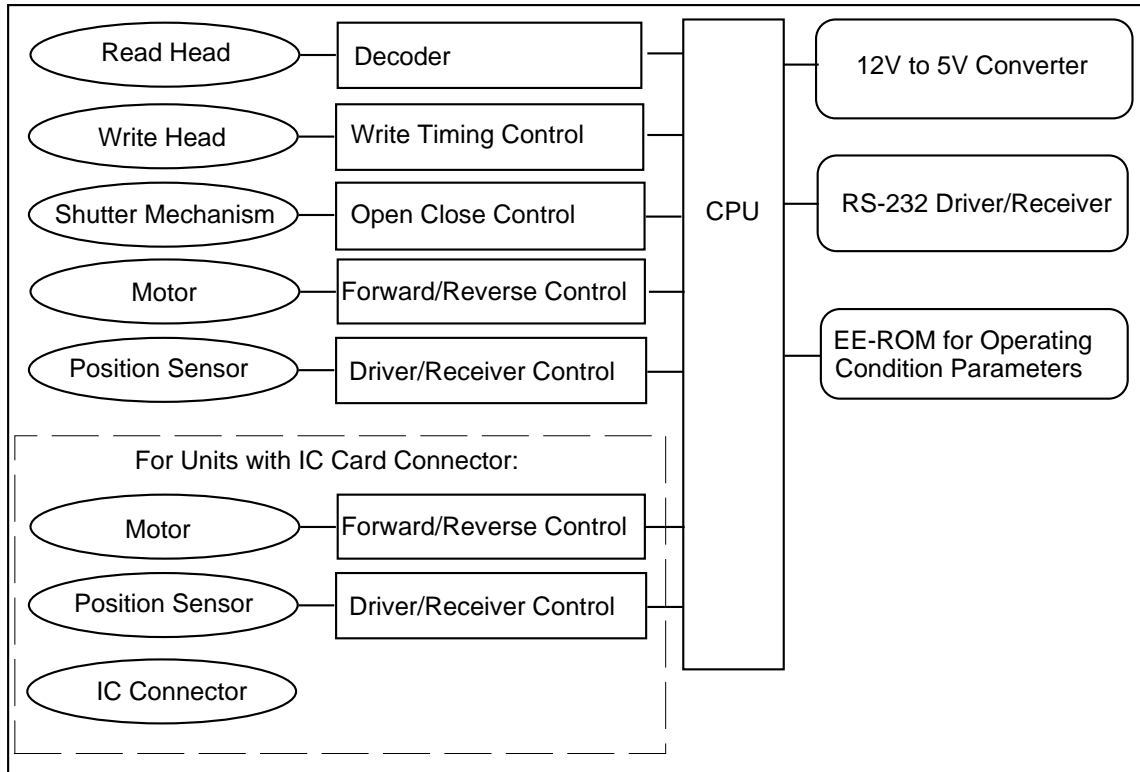
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1. BLOCK DIAGRAM

This specification describes the Communication Protocol for Neuron's Card Reader/Encoder. The full block diagram of the Reader/Encoder is as follows:



2. COMMUNICATIONS

2.1. Control Characters

Control characters for communication between HOST and the Unit are listed below.

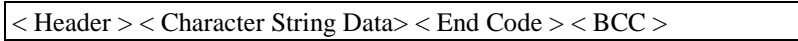
ENQ	O5	Request to connect the communication line (Inquiry)
ACK	O6	Acknowledge (Acknowledge)
NAK	I5	Negative acknowledge (Negative Acknowledge)
EOT	O4	End of communication (End of Transmission)
CAN	18	Release the communication line (Cancel)
STX	O2	Start of packet block (Header)
ETX	O3	End of packet block (Terminator)
US	1F	Data separator (Separator)

2.2. Characters used for Packet Data

All ASCII characters, except for the control characters listed in section 2.1, can be used as a character string data. Use of control characters in the Character String Data portion of the packet data may cause the Unit to malfunction.

2.3. Communications Packet Block

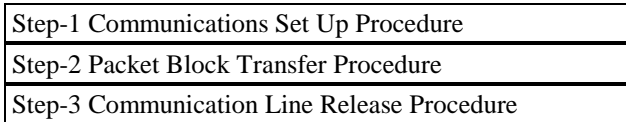
The Communications Packet consists of four blocks:



Note: BCC stands for Block Check Character. The defaults for Header and End code are 02h(STX) & 03(ETX). The header & End code can be changed Via EEprom settings if required for custom applications.

2.4. Communications Protocol

Communications protocol consists of three-step procedure.



2.4.1. Communications Line Set Up Procedure

ENQ is sent from the transmitter to the receiver to set up the communication line. If the receiver is in ready status, ACK is returned to the transmitter. If the receiver is not in a ready status, NAK is returned to the transmitter. When NAK is returned, the transmitter must send ENQ again before further communications can take place.

2.4.2. Packet Block Transfer Procedure

The Communications packet consists of Header, character string data, End Code and BCC. The receiver inspects the data by referring to BCC. If the BCC is correct, ACK is returned to the transmitter. If the BCC is incorrect, NAK is returned.

When an inter-packet-block time-out error occurs, or if a NAK is returned three times, a CAN is then returned to the transmitter. The receiver then enters the ENQ waiting mode. When the CAN character is received, the transmitter must repeat the Communications Line Set Up Procedure to resume communications.

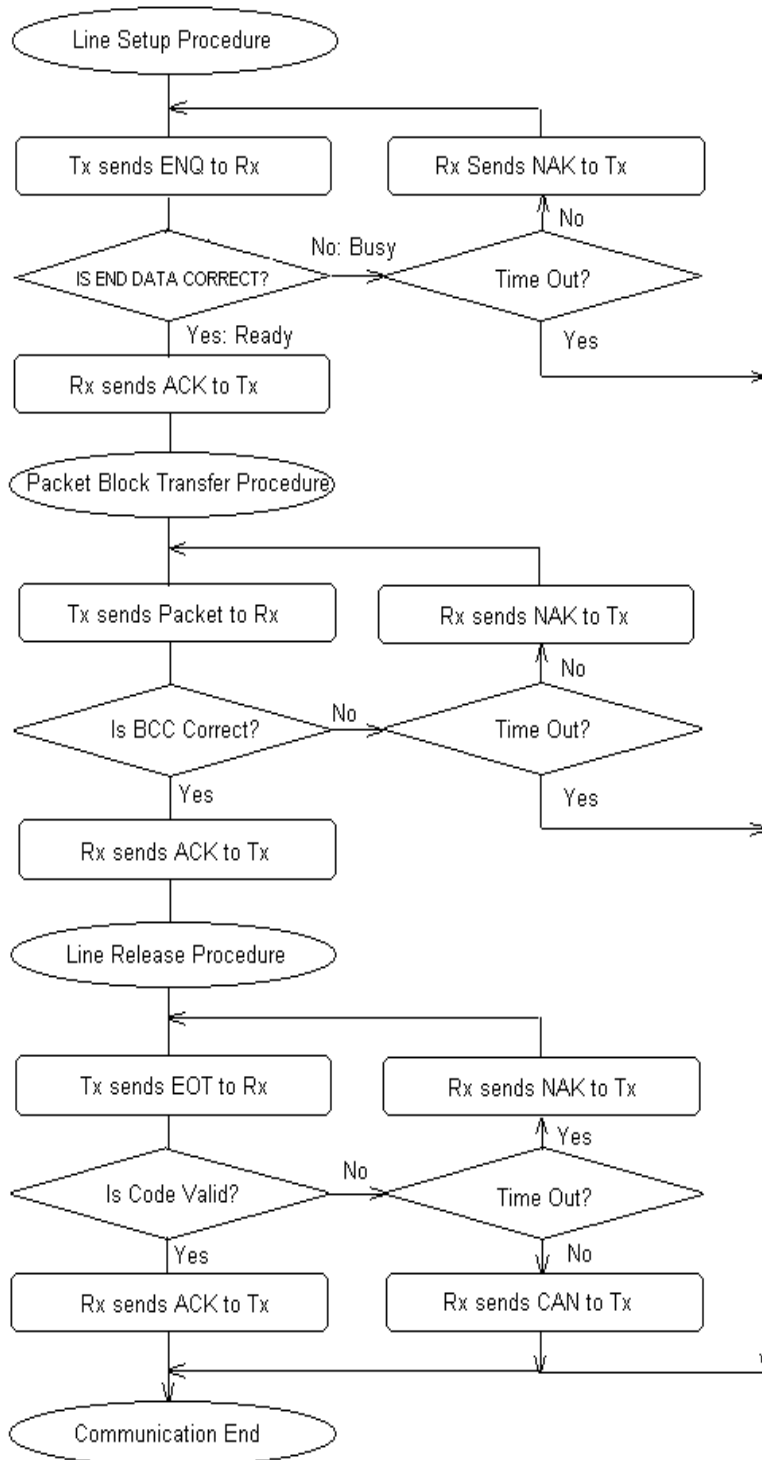
2.4.3. Communications Line Release Procedure

Upon completion of step 2.4.2 (receipt of an ACK from the Receiver) the transmitter sends an EOT to the receiver. The receiver then returns an ACK to the transmitter if an error is not detected. This indicates the completion of communications processing, and the line is released.

Unit Error Processing is as follows:

- Case 1: When the HOST is the transmitter and the Unit is the receiver:
When the Unit receives an EOT, the Unit analyzes the command and the packet data. ACK or NAK is returned based on the result of analysis. NAK is returned when an illegal command or illegal packet data format is detected.
- Case 2: When the Unit is the transmitter and the HOST is the receiver.
If an ACK is not returned to the Unit after EOT has been sent, the Unit sends CAN to cancel the communications.

COMMUNICATIONS PROCEDURE



2.5 ASCII and Control Code Table

6 Bit Character Set (Standard Track One, IATA)

0	1	2	3	4	5	6	7	8	9
A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z	SP!	"	#	-
\$	% (*)	&	'	()	*	+	,	-
.	/	:	;	<	=	>	? (*)	@	\
[]	\	^	-					

4 Bit Character Set (Standard Tracks Two and Three, ABA and MINTS)

0	1	2	3	4	5	6	7	8	9
:	;(*)	<	=	>	? (*)				

(*) The following codes are reserved, as noted, and cannot be written to the card when using the standard (IATA, ABA, and MINTS) format. This is not a limitation in the product. This is in accordance with the ANSI specification.

	STX	ETX
Track 1	% (25h)	? (3Fh)
Track 2	; (3Bh)	? (3Fh)
Track 3	; (3Bh)	? (3Fh)

3. POWER ON

Note: If the user has changed the EE-ROM settings, the power on state will reflect the EE-ROM settings. The following information reflects the behavior of the unit

3.1. Unit Power On Message

When the Unit power is turned on, the Unit transmits the following messages to the HOST, via the RS-232C, with no handshaking.

```
<0D><0A>
<Unit Model Number><Unit Firmware Version>
<20><20><0D><0A><0A>
Copyright (c) 1995, NEURON CORPORATION
<0D><0A><0D><0A>
```

3.2. Card Ejection

If a card is inside of a Motorized Unit when the power is turned on, it will be ejected from the front of the Unit.

3.3. Unit Default Settings

Power On and Operational Default Settings may be modified via the EE-ROM. Please refer to the EE-ROM Default Listing Table for full details.

The Factory Default Settings for the primary characteristics of the Unit are as follows:

3.3. 1. Communication Parameters

9600 Baud
 7 Bit Data length
 Even Parity
 1 Stop bit
 3s Time Out for inter-character-gap
 No Handshaking

3.3.2. Track Density and Specification

Track-1:	8.27bit/mm (210 bpi)	IATA
Track-2:	2.95bit/mm (75 bpi)	ABA
Track-3:	8.27bit/mm (210 bpi)	MINTS

3.3.3 Miscellaneous Default Parameters

Card insert position after power on	Front
Card eject position at power on	Front
Shutter Yes / No	Yes
Shutter open/close time	3 s

3.3.4 Packet Block format

<STX ><Character String Data><ETX><BCC>

4. COMMANDS and MESSAGES

4.1 Command and Message Format

The following shows the format for commands and messages sent from the HOST or from the UNIT.

< Identifier > < Parameters >

Note: If the HOST sends illegally formatted messages or commands, the Unit will return a NAK.

4.2. Command and Message List

4.2. 1. Command List

Command Name	Identifier	Parameter
Card Data Read	CR	C or B or I or none, Read track designation
Card Data Write	CW	C or I or none, Track-1, Track-2, Track-3 Data
Card Processing Mode Set	CH	F or R or S or M or none
Card Holding Time Set	CI	R or S, Time-data (nn)
Card Capture	CE	F or R or none
Card Read/Write Prohibit	CP	none
Status Check	AP	none
Reset Command	RS	none
Open Shutter Command	ST	nn (Shutter Open Time in seconds)
Front Pass Through	CMF	Pass Through Mode: front intake read eject
Rear Pass Through	CMR	Pass Through Mode: rear intake front eject
Cancel Pass Through	CM	Cancels Pass Through (Read and Write Command also cancel the Pass Through mode)
IC Card Connect	IC	S or R
Hi-Coercivity Change	HC	L or M or H
<CH series exclusive command list>		
Card Data Read	CRC	Normal direction read
Card Data Read	CRG	Reverse direction read
Card Data Write	CWC	Normal direction write
Card Data Write	CWG	Reverse direction write

4.2.2. Message List

Message Name	Identifier	Parameter
Read Data	DR	Track-1, Track-2, Track-3 Data
Write Operation Result	DW	6 digit result information
Unit Operating Status	DA	5 digit status information
Unit Trouble Status	DH	2 digit error information
EE-ROM Read Date	DE	Hi Address Lo Address Hi Data, Lo Data

Note : Digits of message are different to each unit model.

4.3 Commands

Commands are sent from the HOST to the Unit via RS-232 according to the communication protocol listed in section 2.4.

4.3.1 Card Data Read Command

Identifier: CR (43h 52h)		Message: DR, DH
Parameter Syntax: < C or B or I or none> < a > < b > < c >		
Parameter	Description	
C (43h)	Card data is converted to ASCII characters according to ISO specification	
B (42h)	Binary Read Command	
I (49h)	IC Card Connect after read (Note: only valid for units with IC Card Contacts)	
<a>,,<c>	Specifies the individual tracks. <a> is track 1, is track 2, <c> is track 3	
1 (3lh)	Enable read for <a>, , or <c>	
0 (3Oh)	Disable read for <a>, , or <c>	
Example	[C][R][C][31][31][30] read tracks one and two, do not read track three	

Operation:

- 1) If there is no track designation, the Unit reads all three tracks.
- 2) If illegal characters are used on the card, the Unit processes an error.
- 3) If a card is inserted in the Unit before it sends an ACK to the HOST, the card read operation is canceled and the Unit sends the Trouble Status Message (DH) to the HOST.
- 4) If a new command is received before inserting the card, the current command is canceled and the new command becomes effective.
- 5) If ENQ is received during the card read operation, the Unit sends a NAK to the HOST, and then sends the message for this command.
- 6) If a message other than ENQ is received during card read operation, the Unit sends CAN to the HOST, and then sends the message for this command.
- 7) After the Unit receives the read command, a card can be inserted into the unit. When the card reaches the first sensor, the motor activates and the card is automatically taken into the Unit. The card is then read. Upon successful completion of the read operation, the Unit sends the Read Data Message (RD) to the HOST. Then the card is ejected.
- 8) If illegal syntax is found in the read data on the card, the Unit tries to read the card two more times. If the Unit fails to read valid data, the Unit cancels the read command and starts error processing. If an error is detected, the card is ejected from the Unit, and the Unit sends the Trouble Status Message (DH) to the HOST.

4.3.2 Card Data Write Command

Identifier: CW (43h 57h)		Message: DW, DH
Parameter Syntax: <C or I or none> <Character string-1 > <US> <Character string-2 > <US> <Character string-3 >		
Parameter	Description (Read verification is not performed with this command)	
C (43h)	Card data is converted to ASCII characters according to ISO specification.	
I (49h)	IC Card Connect after write (Note: only valid for units with IC Card Contacts)	
US (1Fh)	Separator: used as a delimiter to separate information between tracks	
Character string-1	Data to be written to track-1	
Character string-2	Data to be written to track-2	
Character string-3	Data to be written to track-3	

Operation:

- 1) Data is only encoded on the specified tracks.
- 2) If illegal characters are used in the parameter string, the Unit starts error processing.
- 3) If there is not a separator (1Fh) code in the parameter string, the Unit starts error processing.
- 4) If a card is inserted in the Unit before it sends an ACK to the HOST, the card read operation is canceled and the Unit sends the Trouble Status Message (DH) to the HOST.
- 5) If a new command is received before inserting the card, the current command is canceled and the new command becomes effective.
- 6) If ENQ is received during card encoding operation, the Unit sends a NAK to the HOST at the end of processing, and then sends the message for this command.
- 7) If message other than ENQ is received during card read operation, the Unit sends a CAN to the HOST at the end of processing, and then sends the message for this command.
- 8) After receiving the encode command, the card can be inserted into the Unit. When the card reaches the first sensor, the motor activates and card is automatically take into the Unit. Then the encoding processor starts encoding the card data, and the read-verify processor verifies the card data. Once the data is verified, the Unit sends the Write Operation Result Message (DW) to the HOST via RS-232C line. Then the card is ejected from the Unit.
- 9) When an illegal syntax is found in the verified data, the Unit retries the write-read-verify sequence three times. If the operation cannot be completed successfully, the Unit cancels the write command and starts error processing. When the error is detected, the card is ejected and the Unit sends the Trouble Status Message (DH) to the HOST via RS-232C line.

4.3.3 Card Processing Mode Set Command

Identifier: CH (43h 48h)		Message: none
Parameter Syntax: < R or F or none or S or MR or MF or M >		
Parameter	Description	
R (52h)	Eject card from the rear of the Unit	
F (46h)	Eject card from the front of the Unit	
none	Eject card from the front of the Unit	
S (53h)	Hold card inside the Unit	
MR (4Dh 52h)	Hold card at the rear of the Unit	
MF (4D, 46h)	Hold card at the front of the Unit	
M (4Dh)	Hold card at the front of the Unit	

Operation:

- 1) If illegal characters are used in the parameter, the Unit sends a NAK to the HOST.
- 2) If correct characters are used in parameter, the Unit sends an ACK to the HOST.

- 3) After receiving the MODE SET command, the Unit is set in the specified mode for ejecting or holding the card.
- 4) When the Unit power is turned on, card processing mode is set to F (eject a card from the Unit front) automatically.

4.3.4 Card Holding Time Set Command

Identifier: CI (43h 49h)		Message: none
Parameter Syntax: < R or S > < nnn or none >		
Parameter	Description	
R (52h)	After nnn seconds, the Unit draws the card inside and ejects it completely from the rear of the Unit	
S (53h)	After nnn seconds, the Unit draws the card inside and holds the card at the front of the Unit	
nnn	Holding time in seconds (001 - 255 decimal)	
none	none is equal to 0 Seconds, and card will not be drawn into the Unit	

Operation:

- 1) When the Card Processing Mode is set to MR (Hold a card at the rear of the Unit) or MF (Hold a card at the front of the Unit) or M (Hold a card at the front of the Unit), this command is activated.
- 2) If illegal characters are used in parameter, the Unit will send a NAK to the HOST.
- 3) If holding time (nnn) is set to greater than 255 the Unit will send a NAK to the HOST.
- 4) If the correct characters and syntax are used in parameter, the Unit will return an ACK to the HOST.

4.3.5 Card Capture Command

Identifier: CE (43 45)		Message: DH
Parameter Syntax: < R or F or none or MR or MF >		
Parameter	Description (specifies the Card Capture Direction)	
R (52h)	Rear direction	
F (46h)	Front direction	
none	Front direction	
MR (4Dh 52h)	Hold card at the rear of the Unit	
MF (4Dh 46h)	Hold card at the front of the Unit	

Operation:

- 1) If illegal characters are used in parameter, the Unit will send a NAK to the HOST.
- 2) If correct characters are used in parameter, the Unit will send an ACK to the HOST.
- 3) If a card is in the Unit, the Unit will eject the card from the specified direction. The Unit will not transmit a message after ejecting the card.
- 4) If a card is not in the Unit, the Unit sends the Trouble Status Message (DH) to HOST.
- 5) When an error occurs in the eject operation, the Unit sends the Trouble Status Message (DH) to the HOST.
- 6) the HOST.

4.3.6 Card Read/Write Prohibit Command

Identifier: CP (43h 50h)	Message: none
Parameter Syntax: none	

Operation:

- 1) If illegal characters are used in parameter, the Unit sends a NAK to the HOST.
- 2) If the correct characters are used in parameter, the Unit sends an ACK to the HOST.
- 3) After receiving this command, a card cannot be inserted into the Unit until a Card Read, Card Write, or Reset command has been sent to the unit.

4.3.7 Unit Status Check Command

Identifier: AP (41h 50h)	Message: DA
Parameter Syntax: none	

Operation:

After receiving this command, the Unit will send the Operating Status Message DA

4.3.8 Unit Reset Command

Identifier: RS (52h 53h)	Message: DH
Parameter Syntax: < 0 <30h>, 1 <31h>, or none	
Parameter	Description (specifies the Card Capture Direction)
none	Initialize Unit to Power On settings
0 (30h)	Standard settings, without shutter
1 (31h)	Standard settings, with shutter

Operation:

After receiving this command, the Unit performs the Power On initialization routine. All parameters will be reset to the initial Power On state. Any changes made to the EE-ROM will become effective at this time. Upon completion of the power on initialization routine, the Unit will send the Power On Message to the host, as specified in section 3.1.

4.3.9 Front Pass Through Command

Identifier: CMF (43h 4Dh 46h)	Message: none
Parameter Syntax: none	

Operation:

This command enters the Unit into the Front Pass Through Mode. When a card is inserted into the front of the unit, it will be ejected through the rear of the unit without being read.

4.3.10 Rear Pass Through Command

Identifier: CMR (43h 4Dh 52h)	Message: none
Parameter Syntax: none	

Operation:

This command enters the Unit into the Rear Pass Through Mode. When a card is inserted into the rear of the unit, it will be ejected through the front of the unit without being read.

4.3.11 Cancel Pass Through Command

Identifier: CM (43h 4Dh)	Message: none
Parameter Syntax: none	

Operation:

This command cancels the Pass Through Mode.

Note: Issuing a Read Command or a Write Command will also cancel the Pass Through Mode.

4.3.12 IC Card Contact Command

Note: This command is only valid for units with IC Card Contacts

Identifier: IC (49h 43h)	Message: DH0x (IC Module status)
Parameter Syntax: <S or R>	
Parameter	Description
R (52h)	Clear IC control contacts and return card
S (53h)	Send card to IC control contacts

4.4 Messages

The messages are sent to HOST via RS-232C, according to the communications protocol as listed in section 2.4.

4.4.1 Read Data Messages

Identifier: DR (44h 52h)		Message: none
Parameter Syntax: < 0 or N > < Track-1 Read Data or Error Information > <US> < 0 or N > < Track-2 Read Data or Error Information > <US> < 0 or N > < Track-3 Read Data or Error Information >		
Return Code	Description	
0 (4Fh)	Read data is correct (OK)	
N (4Eh)	Read data is incorrect (NG)	
US (1Fh)	Separator	
Error Code	Description	
1 (31h)	Unable to find the STX digit on the magnetic card stripe	
2 (32h)	Unable to find the ETX digit on the magnetic card stripe	
3 (33h)	LRC (Longitudinal Redundancy Check) data on magnetic stripe is invalid	
4 (34h)	VRC (Vertical Redundancy Check) data on magnetic card is invalid	
5 (35h)	Reserved for Future Use	
6 (36h)	Data format on magnetic card is invalid	
7 (37h)	Reserved for Future Use	

Description

- 1) If invalid information is found on a track, the Unit sends N and the error information. Otherwise, the Unit sends the Card Data.

4.4.2 Write Operation Result Messages

Identifier: DW (44h 57h)		Message: As per parameter Syntax
Parameter Syntax: < a > < b > < c > < d > < e > < f > < a > < b > Message for Track-1 < c > < d > Message for Track-2 < e > < f > Message for Track-3		
Return Code	Description	
< a > < c > < e >	These digits are the result message for Write-Read-Verify operation, O or N	
0 (4F)	Write-Read-Verify is correct (OK)	
N (4E)	Write-Read-Verify is incorrect (NG)	
Error Code	Description	
< b > < d > < f >	These digits are the error type message for the card	
0 (30h)	No error found in the magnetic card data (OK)	
1 (31h)	Unable to find STX digit on the magnetic card stripe	
2 (32h)	Unable to find ETX digit on the magnetic card stripe	
3 (33h)	LRC (Longitudinal Redundancy Check) data on the magnetic card stripe is incorrect	
4 (34h)	VRC (Vertical Redundancy Check) data on the magnetic card stripe is incorrect	
5 (35h)	Reserved for Future Use	
6 (36h)	Data format on magnetic strip is incorrect	
7 (37h)	Information on the subject track does not correspond with the encoded data	

4.4.3 Terminal Operating Status Messages

Identifier: DA (44h 41h)	
Parameter Syntax: <a><c><d><e> <a> Unit Status Card Holding Status <c> Shutter Status <d> Reserved for Future Use <e> Unit Power Status	
Return Code	Description
< a >	This digit is the Status Message for the Unit Operation
0 (30h)	Unit is prohibited (CP has been sent)
1 (31h)	Unit is waiting to perform the Card Read Operation
2 (32h)	Unit has received a Card Write Command (CW) and is waiting to write a card
3 (33h)	This is an IC Card Unit
< b >	This digit is Status Message for the Card Holding Status
0 (30h)	Unit is not holding a card
1 (31h)	Unit is holding a card internally
2 (32h)	Unit is holding a card in the front position
< c >	This digit is Status Message for shutter operation
0 (30h)	No Shutter
1 (31h)	Shutter Closed
2 (32h)	Shutter Open
< d >	Reserved for Future Use
0 (30h)	Reserved for Future Use
1 (31h)	Reserved for Future Use
< e >	Power Status
0 (30h)	12V and/or 5V Level is good
1 (31h)	12V and/or 5V Level is below the requirement

4.4.4 Terminal Trouble Status Messages

Identifier: DH (44h 48h)	
Parameter Syntax: < a > < b > < a > Upper digit is fixed at ASCII 0 (30h) < b > Lower digit identifies the Trouble Status, as listed below	
Return Code	Description
< a >	Upper digit is selection at ASCII "0" (30h) or ASCII "1"
< b >	Trouble Status
0 0 (30h, 30h)	Reserved for Future Use
0 1 (30h, 31h)	Unit is holding a card internally
0 2 (30h, 32h)	A mismatched state for the shutter open/close and acknowledge has occurred
0 3 (30h, 33h)	No transfer action on the card has been detected after having activated motor
0 4 (30h, 34h)	After having detected a card with the magnetic sensor on the shutter; the card has not reached the first sensor position of the Unit within 5 seconds (time out error)
0 5 (30h, 35h)	Reserved for future use
0 6 (30h, 36h)	IC Card position O.K. (IC Card Units Only)
0 7 (30h, 37h)	IC Card position Not O.K. (IC Card Units Only)
1 0 (31h, 30h)	Empty in the hopper
1 1 (31h, 31h)	No transfer action in the hopper
1 2 (31h, 32h)	System Reserved
1 3 (31h, 33h)	Abnormal sensor in the hopper

4.5 Hi Coercivity Selection

Identifier: HC(48h 43h)		Message: none
Parameter Syntax: L,M or H		
Parameter	Description	
L (4Ch)	Set Low Coercivity mode 1 24k A/m (300 Oe)	
M (4Dh)	Set Low Coercivity mode 2 52k A/m (650 Oe)	
H (48h)	Set High Coercivity 200k-320k Am (2,500 ~ 4000 Oe)	

Return Status Message

Identifier: DA (44h 41h)	
Parameter Syntax: <a> <c> <d> <e> <f> <a> Unit Status Card holding status <c> Shutter Status <d> Reserved <e> Power Status <f> Coercivity setting Status <g> Hopper setting Status	
Return Code	
<a>	Unit status
0 (30h)	Unit is prohibited (CP command sent)
1 (31h)	Unit waiting to perform Card read operation
2 (23h)	Write Command received (CW) Unit waiting for card to write
	Card holding status
0 (30h)	Unit not holding card
1 (31h)	Unit is hold card internally
2 (32h)	Unit is holding card at front
<c>	Shutter status
0 (30h)	No shutter
1 (31h)	Shutter closed
2 (32h)	Shutter open
<d>	Reserved
0,1(30h 31h)	Reserved
<e>	Power status
0 (30h)	12v, 5v voltage level OK
1 (31h)	12v, 5v voltage level below requirement
<f>	Coercivity Setting of unit
0 (30h)	Coercivity set High 200-320k A/m (2500-4000 Oe)
1 (31h)	Coercivity set Low Mode-2 52k A/m (650 Oe)
2 (23h)	Coercivity set Low Mode-1 24k A/m (300 Oe)
<g>	Card of Hopper unit
0 (30h)	Hopper unit not holding card
1 (31h)	Empty of Hopper unit

5. Operating Condition Parameters

The Unit has an internal EE-ROM for changing the operating condition parameters. When changes are made, they do not become effective until the HOST transmits a Reset Command (RS) to the Unit, or until the Unit power is turned off and on.

5.1 EE-ROM Commands and Messages

Parameter changes are made through the RS-232 interface.

5.1.1 EE-ROM Commands

Cmd	Description	Para.
EO	EE-ROM Access Enable Command	6.2.1
EC	EE-ROM Access Disable Command	6.2.2
ER	EE-ROM Data Read Command	6.2.3
EE	EE-ROM Write Start Command	6.2.4
EW	EE-ROM Data Write Command	6.2.5
ED	EE-ROM Write End Command	6.2.6

5.1.2 EE-ROM Messages

Message Name	Identifier	Parameter
EE-ROM Data Read Response	DE	Hi Address, Lo Address, Hi Data, Lo Data

5.2 Command List

Commands are sent from the Host to the Unit via RS-232C according to the communication protocol listed in section 2.4.

5.2.1. EE-ROM Access Enable Command

Identifier: EO (45h 4Fh)	Message: none
Parameter Syntax: < a > < b > < c > < d > < e > < f > < a > - < f > : 6 digit password, characters limited to the range of 20h ~ 7Ah The default password is NEURON (4Eh 45h 55h 52h 4Fh 4Eh)	

Operation

- 1) If the password is correct, the Unit sends an ACK to the HOST after receiving EOT.
- 2) If the password is not correct, this command is ignored and the Unit sends a NAK to the HOST.

5.2.2. EE-ROM Access Disable Command

Identifier: EC (45h 43h)	Message: none
Parameter Syntax: none	

Operation

- 1) At the completion of EE-ROM access, the HOST must send this command to the Unit.
- 2) The Unit will send an ACK to the HOST after receiving this command.

5.2.3. EE-ROM Data Read Command

Identifier: ER (45h 52h)	Message: DE
Parameter Syntax: < nn >	
nn : EE-ROM Address (see section 6.2. Parameter Address List)	

Operation

- 1) Before using this command, the host must send the EE-ROM Access Enable (EO)
- 2) If the HOST sends the Data Read Command before EE-ROM Access Enable Command (EO), the Unit will send a NAK to the HOST.
- 3) After receiving the command, the Unit sends the data from the EE-ROM that is located at the specified address.

5.2.4. EE-ROM Write Start Command

Identifier: EE (45h 45h)	Message: none
Parameter Syntax: none	

Operation

- 1) The Unit sends an ACK to the HOST after receiving this command.
- 2) If the HOST sends this command before EE-ROM Access Enable Command (EO), the Unit will send a NAK to the HOST.
- 3) After receiving the command, you will be able to change the Unit's EE-ROM data.

5.2.5. EE-ROM Data Write Command

Identifier: EW (45 57)	Message: none
Parameter Syntax: < aa >< dd> aa: EE-ROM Address (see section 6.2. Parameter Address List) dd: Write data	

Operation

- 1) Before using this command, you must send the EE-ROM Access Enable (EO) and EE-ROM Write Start (EE) commands.
- 2) If these commands are used before you send the EE-ROM Access Enable Command (EO) and the Write Start Command (EE), the Unit will send a NAK to the HOST.
- 3) After receiving the command, the Unit writes the specified data into the EE-ROM at the address defined with the parameter.

5.2.6 EE-ROM Write End Command

Identifier: ED (45h 44h)	Message: none
Parameter Syntax: none	

Operation

- 1) The Unit will send an ACK to the HOST after receiving this command.
- 2) If the HOST sends the command before EE-ROM Access Enable Command (EO) or Write Start Command (EE), the Unit will send a NAK to the HOST.
- 3) After sending this command, the EE-ROM cannot be changed.

5.3 EE-ROM Parameter Address Map

Address			Value	Description
CH1	CH2	CH3		
00	10	20	00 ~ 07	Enable/Disable read/write operation and encode format
			00	Operation is disabled
			01	NTT format
			02	IATA format
			03	ABA format (in the case of track-2, the read/write density is 2.95bits/mm (75bpi))
			04	MINTS (THRIFT) format
			05	IBM format
			06	NEC format
			07	AAMVA Format
01	11	21	00 ~ FF	Data length
			00	The read/write data length is variable within the format selected at parameter address 00/10/20
			01 ~ FF	This value describes overall length of read/write data.
04	14	24	00 ~ 32	Set parity and bit length on magnetic card strip. The upper 4 bits define the character length, and the lower 4 bits select the parity
			0x	4 bit Characters
			1x	5 bit Characters
			2x	6 bit Characters
			3x	7 bit Characters
			x0	No parity
			x1	Even parity
			x2	Odd parity
05	15	25	00 ~ FF	Setting of the offset position for STX on magnetic stripe
			00	Standard position
			01 ~ FF	The offset position is n times 1 bit length from standard location
06	16	26	00 ~ FF	Declaration of STX character (0 for default)
07	17	27	00 ~ FF	Declaration of ETX character (0 for default)
08	18	28	00 ~ 03	Select the LRC calculation limit (0 for default)
			00	Data
			01	STX through one character before ETX
			02	From one bit past STX through ETX
			03	STX through ETX
09	19	29	00 ~FF	Setting of the transmission start location on magnetic card data
0A	1A	2A	00~FF	Setting of the transmission end location on magnetic card data

Address	Value	Description
40	00 ~ 06	Select of baud rate for RS-232
	00	1200 bit/s
	01	2400 bit/s
	02	4800 bit/s
	03	9600 bit/s
	04	19200 bit/s
41	00 ~ 01	RS-232 data length
	00	7 bits
	01	8 bits
42	00 ~ 01	RS-232 stop bit length
	00	1 bit
	01	2 bits
43	00 ~ 02	RS-232 parity
	00	No parity
	01	Even Parity
	02	Odd Parity
44	00 ~ 01	Enable/disable RS-232 handshaking
	00	Disable
	01	Enable
46	00 ~ FF	Setting of Transmission Retry
	00	Transmission Retry is Two Times
	01 ~ FF	Number of Retries are as defined
47	00 ~ 02	Select header type for communication block
	00	None
	01	STX
	02	User defined
48	20 ~ 7A	Declaration of the user's header character
49	00 ~ 01	Separator type for communication block
	00	1Fh Placed after Track 1 & Track 2
	01	User defined (See address 4A)
	10	1Fh Placed according to # of tracks
4A	20 ~ 7A	Declaration of the user's separator character
4B	00 ~ 06	Select End Code for communication block
	00	None
	01	CR (0Dh)
	02	LF (0Ah)
	03	CR LF (0Dh 0Ah)
	04	ETX (03h)
	05	EOT
	06	User defined
4C	20 ~ 7A	Declaration of the user's end code character
4D	00 ~ 02	Select desired BCC
	00	No BCC
	01	1 digit BCC
	02	2 digit BCC
50	00 ~ FF	Shutter open time in Seconds

Address	Value	Description
51	00 ~ 01	Select as to whether unit has shutter
	00	Unit does not have shutter
	01	Unit has shutter
52	00 ~ FF	Communications Time Out (1 = 100 ms)
	32	Default Communications Time Out Setting
5A	00	Read Disabled
	01	Insert Units: reads card on the way out; Swipe Units: reads Left to Right
	02	Insert Unit: reads card on the way in, Swipe Units: Both directions
	03	Reads in both directions
5F	00	High Coercivity
	01	Low Coercivity Mode-2 52k A/m (650 Oe)
	02	Low Coercivity Mode-1 24k A/m (300 Oe)
	03	Reserved
60	00 ~ 01	Write operation enable/disable
	00	Read only
	01	Read/Write
61	00 ~ 01	Power On Ready State selection for the Prohibit feature
	00	Card operation is prohibited
	01	Card operation is not prohibited
62	00 ~ 03	Select of the card holding operation for the Unit
	00	Card is captured from the front
	01	Card is captured from the rear
	02	The Unit holds the card inside
	03	The Unit holds the card in the front of the unit, and then pulls the card inside after the time defined at address 63h
	04	The unit holds the card at the rear, and then pulls the card inside after the time defined at address 63h
63	00 - FF	Declaration of the time for the card holding at front position in seconds
64	00 ~ 01	Card insertion point
	00	Card to be inserted from the front
	01	Card to be inserted from the rear
66	00 ~ FF	Setting of retry times for Read-Write-Verify operation
	00	The unit will re-try twice
	01 ~ FF	The unit will re-try the specified number of times
68	0 ~ 2	Setting of the IC Card Unit Enable/Disable
	0	Disable
	1	Enable 1
	2	Enable 2 (MSA-140 is connector type)
70	20 ~ 7A	1st. digit character for password
71	20 ~ 7A	2nd. digit character for password
72	20 ~ 7A	3rd. digit character for password
73	20 ~ 7A	4th. digit character for password
74	20 ~ 7A	5th. digit character for password
75	20 ~ 7A	6th. digit character for password

APPENDIX I EE-ROM DEFAULT VALUES**MTM-490 and MTM-491 & MTM-494 EE-ROM Default Values**

ADDR	VALUE	ADDR	VALUE	ADDR	VALUE	ADDR	VALUE
00	02h	20	04h	40	03h	60	01h
01	00h	21	00h	41	00h	61	01h
02	02h	22	02h	42	00h	62	03h
03	00h	23	00h	43	01h	63	00h
04	00h	24	00h	44	00h	64	00h
05	00h	25	00h	45	00h	65	Reserved
06	00h	26	00h	46	03h	66	03h
07	00h	27	00h	47	01h	67	Reserved
08	00h	28	00h	48	00h	68	Reserved
09	00h	29	00h	49	00h	69	Reserved
0A	4Ch	2A	68h	4A	2Ah	6A	Reserved
0B	Reserved	2B	Reserved	4B	04h	6B	Reserved
0C	Reserved	2C	Reserved	4C	00h	6C	Reserved
0D	Reserved	2D	Reserved	4D	01h	6D	Reserved
0E	Reserved	2E	Reserved	4E	Reserved	6E	Reserved
0F	Reserved	2F	Reserved	4F	Reserved	6F	Reserved
10	03h	30	00h	50	05h	70	4Eh
11	00h	31	00h	51	00h	71	45h
12	02h	32	00h	52	Reserved	72	55h
13	00h	33	00h	53	Reserved	73	52h
14	00h	34	00h	54	Reserved	74	4Fh
15	00h	35	00h	55	Reserved	75	4Eh
16	00h	36	00h	56	Reserved	76	Reserved
17	00h	37	00h	57	Reserved	77	Reserved
18	00h	38	00h	58	Reserved	78	Reserved
19	00h	39	00h	59	Reserved	79	Reserved
1A	25h	3A	Reserved	5A	Reserved	7A	Reserved
1B	Reserved	3B	Reserved	5B	Reserved	7B	Reserved
1C	Reserved	3C	Reserved	5C	Reserved	7C	Reserved
1D	Reserved	3D	Reserved	5D	Reserved	7D	Reserved
1E	Reserved	3E	Reserved	5E	Reserved	7E	Reserved
1F	Reserved	3F	Reserved	5F	Reserved	7F	Reserved

Note: Addresses marked “Reserved” are reserved for system use and/or future use. These values should not be modified by the user.

SCR-932N EE-ROM Default Values

ADD	VALUE	ADD	VALUE	ADD	VALUE	ADD	VALUE
00	02h	20	00h	40	03h	60	00h
01	00h	21	00h	41	00h	61	00h
02	00h	22	00h	42	00h	62	03h
03	00h	23	00h	43	01h	63	00h
04	22h	24	00h	44	01h	64	00h
05	00h	25	00h	45	00h	65	Reserved
06	05h	26	00h	46	00h	66	00h
07	1Fh	27	00h	47	01h	67	Reserved
08	03h	28	00h	48	00h	68	Reserved
09	00h	29	00h	49	00h	69	Reserved
0A	Reserved	2A	Reserved	4A	2Ah	6A	Reserved
0B	Reserved	2B	Reserved	4B	04h	6B	Reserved
0C	Reserved	2C	Reserved	4C	00h	6C	Reserved
0D	Reserved	2D	Reserved	4D	01h	6D	Reserved
0E	Reserved	2E	Reserved	4E	Reserved	6E	Reserved
0F	Reserved	2F	Reserved	4F	Reserved	6F	Reserved
10	03h	30	00h	50	00h	70	4Eh
11	00h	31	00h	51	00h	71	45h
12	00h	32	00h	52	Reserved	72	55h
13	00h	33	00h	53	Reserved	73	52h
14	02h	34	00h	54	Reserved	74	4Fh
15	00h	35	00h	55	Reserved	75	4Eh
16	0Bh	36	00h	56	Reserved	76	Reserved
17	0Fh	37	00h	57	Reserved	77	Reserved
18	03h	38	00h	58	Reserved	78	Reserved
19	00h	39	00h	59	Reserved	79	Reserved
1A	Reserved	3A	Reserved	5A	Reserved	7A	Reserved
1B	Reserved	3B	Reserved	5B	Reserved	7B	Reserved
1C	Reserved	3C	Reserved	5C	Reserved	7C	Reserved
1D	Reserved	3D	Reserved	5D	Reserved	7D	Reserved
1E	Reserved	3E	Reserved	5E	Reserved	7E	Reserved
1F	Reserved	3F	Reserved	5F	Reserved	7F	Reserved

Note: Addresses marked “Reserved” are reserved for system use and/or future use. These values should not be modified by the user.

SCR-590N EE-ROM Default Values

ADD	VALUE	ADD	VALUE	ADD	VALUE	ADD	VALUE
00	02h	20	04h	40	03h	60	00h
01	00h	21	00h	41	00h	61	01h
02	00h	22	02h	42	00h	62	00h
03	00h	23	00h	43	01h	63	00h
04	00h	24	00h	44	01h	64	00h
05	00h	25	00h	45	00h	65	Reserved
06	00h	26	00h	46	00h	66	00h
07	00h	27	00h	47	01h	67	Reserved
08	00h	28	00h	48	00h	68	Reserved
09	00h	29	00h	49	00h	69	Reserved
0A	Reserved	2A	Reserved	4A	2Ah	6A	Reserved
0B	Reserved	2B	Reserved	4B	04h	6B	Reserved
0C	Reserved	2C	Reserved	4C	00h	6C	Reserved
0D	Reserved	2D	Reserved	4D	01h	6D	Reserved
0E	Reserved	2E	Reserved	4E	Reserved	6E	Reserved
0F	Reserved	2F	Reserved	4F	Reserved	6F	Reserved
10	03h	30	00h	50	00h	70	4Eh
11	00h	31	00h	51	00h	71	45h
12	02h	32	00h	52	Reserved	72	55h
13	00h	33	00h	53	Reserved	73	52h
14	00h	34	00h	54	Reserved	74	4Fh
15	00h	35	00h	55	Reserved	75	4Eh
16	00h	36	00h	56	Reserved	76	Reserved
17	00h	37	00h	57	Reserved	77	Reserved
18	00h	38	00h	58	Reserved	78	Reserved
19	00h	39	00h	59	Reserved	79	Reserved
1A	Reserved	3A	Reserved	5A	Reserved	7A	Reserved
1B	Reserved	3B	Reserved	5B	Reserved	7B	Reserved
1C	Reserved	3C	Reserved	5C	Reserved	7C	Reserved
1D	Reserved	3D	Reserved	5D	Reserved	7D	Reserved
1E	Reserved	3E	Reserved	5E	Reserved	7E	Reserved
1F	Reserved	3F	Reserved	5F	Reserved	7F	Reserved

Note: Addresses marked “Reserved” are reserved for system use and/or future use. These values should not be modified by the user.

MSA-590 EE-ROM Default Values

ADDR	VALUE	ADDR	VALUE	ADD	VALUE	ADD	VALUE
00	02h	20	04h	40	03h	60	01h
01	00h	21	00h	41	00h	61	01h
02	02h	22	02h	42	00h	62	03h
03	00h	23	00h	43	01h	63	00h
04	00h	24	00h	44	00h	64	00h
05	00h	25	00h	45	00h	65	Reserved
06	00h	26	00h	46	03h	66	03h
07	00h	27	00h	47	01h	67	Reserved
08	00h	28	00h	48	00h	68	01h
09	00h	29	00h	49	00h	69	Reserved
0A	4Ch	2A	68h	4A	2Ah	6A	Reserved
0B	Reserved	2B	Reserved	4B	04h	6B	Reserved
0C	Reserved	2C	Reserved	4C	00h	6C	Reserved
0D	Reserved	2D	Reserved	4D	01h	6D	Reserved
0E	Reserved	2E	Reserved	4E	Reserved	6E	Reserved
0F	Reserved	2F	Reserved	4F	Reserved	6F	Reserved
10	03h	30	00h	50	05h	70	4Eh
11	00h	31	00h	51	00h	71	45h
12	02h	32	00h	52	Reserved	72	55h
13	00h	33	00h	53	Reserved	73	52h
14	00h	34	00h	54	Reserved	74	4Fh
15	00h	35	00h	55	Reserved	75	4Eh
16	00h	36	00h	56	Reserved	76	Reserved
17	00h	37	00h	57	Reserved	77	Reserved
18	00h	38	00h	58	Reserved	78	Reserved
19	00h	39	00h	59	Reserved	79	Reserved
1A	25h	3A	Reserved	5A	Reserved	7A	Reserved
1B	Reserved	3B	Reserved	5B	Reserved	7B	Reserved
1C	Reserved	3C	Reserved	5C	Reserved	7C	Reserved
1D	Reserved	3D	Reserved	5D	Reserved	7D	Reserved
1E	Reserved	3E	Reserved	5E	Reserved	7E	Reserved
1F	Reserved	3F	Reserved	5F	Reserved	7F	Reserved

Note: Addresses marked “Reserved” are reserved for system use and/or future use. These values should not be modified by the user.

CH-491 & MTM-494 & CT-894 EE-ROM Default Values

ADDR	VALUE	ADDR	VALUE	ADDR	VALUE	ADDR	VALUE
00	02h	20	04h	40	03h	60	01h
01	00h	21	00h	41	00h	61	00h
02	02h	22	02h	42	00h	62	00h
03	00h	23	00h	43	01h	63	00h
04	00h	24	00h	44	00h	64	01h
05	00h	25	00h	45	00h	65	Reserved
06	00h	26	00h	46	03h	66	03h
07	00h	27	00h	47	01h	67	Reserved
08	00h	28	00h	48	00h	68	Reserved
09	00h	29	00h	49	00h	69	Reserved
0A	4Ch	2A	68h	4A	2Ah	6A	Reserved
0B	Reserved	2B	Reserved	4B	04h	6B	Reserved
0C	Reserved	2C	Reserved	4C	00h	6C	Reserved
0D	Reserved	2D	Reserved	4D	01h	6D	Reserved
0E	Reserved	2E	Reserved	4E	Reserved	6E	Reserved
0F	Reserved	2F	Reserved	4F	Reserved	6F	Reserved
10	03h	30	00h	50	05h	70	4Eh
11	00h	31	00h	51	00h	71	45h
12	02h	32	00h	52	Reserved	72	55h
13	00h	33	00h	53	Reserved	73	52h
14	00h	34	00h	54	Reserved	74	4Fh
15	00h	35	00h	55	Reserved	75	4Eh
16	00h	36	00h	56	Reserved	76	Reserved
17	00h	37	00h	57	Reserved	77	Reserved
18	00h	38	00h	58	Reserved	78	Reserved
19	00h	39	00h	59	Reserved	79	Reserved
1A	25h	3A	Reserved	5A	Reserved	7A	Reserved
1B	Reserved	3B	Reserved	5B	Reserved	7B	Reserved
1C	Reserved	3C	Reserved	5C	Reserved	7C	Reserved
1D	Reserved	3D	Reserved	5D	Reserved	7D	Reserved
1E	Reserved	3E	Reserved	5E	Reserved	7E	Reserved
1F	Reserved	3F	Reserved	5F	Reserved	7F	Reserved

Note: Addresses marked “Reserved” are reserved for system use and/or future use. These values should not be modified by the user.

APPENDIX II -- MSA Connectors

(1) Power Supply A: IL-S-4P-S2L2-EF (JAE Japan Aviation Electronics Industry, Ltd.)

Pin No.	Signal	Description
1	Gnd	Ground
2	Gnd	Ground
3	Vcc	12V DC
4	Vcc	12V DC

(2) RS-232 Communications Interface (IL-S-7P-S2L2-EF)

Pin No.	Signal	I/O	Description
1	Tx	O	Transmit Data
2	Rx	I	Receive Data
3	RTS	O	Request to Send
4	CTS	I	Clear to Send
5	DTR	O	Data Terminal Ready
6	Signal Ground	--	Signal Ground
7	Frame Ground	--	Frame (shield) Ground

(3) IC Card Interface (Connector : IL-Y-8P-S16T2-EF (JAE))

Pin No.	Signal	Description
1	C8	REU
2	C7	I/O
3	C6	VPP
4	C5	GND
5	C1	VCC
6	C2	RST
7	C3	CLK
8	C4	RFU