ID-20WR-MF-FV

Read / Write Module

Datasheet

ID-Innovations
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ID Innovations

Advanced Digital Reader Technology

------Better by Design

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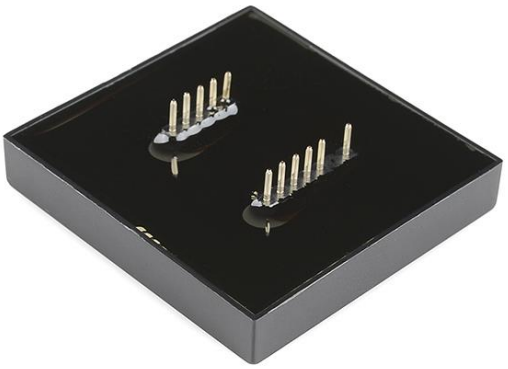
目录

1. Summary

The ID-20WR-MF-FV series contactless card Read/Write module is based on Mifare reader IC. They come with the choice of internal antenna or external antenna and are suitable and for embedded applications and general Electronic Devices. The ID-20WR-MF-FV series are user friendly and can be controlled by command from a UART (serial port). Functions are selected by a Pin jumper allowing full control of all functions.



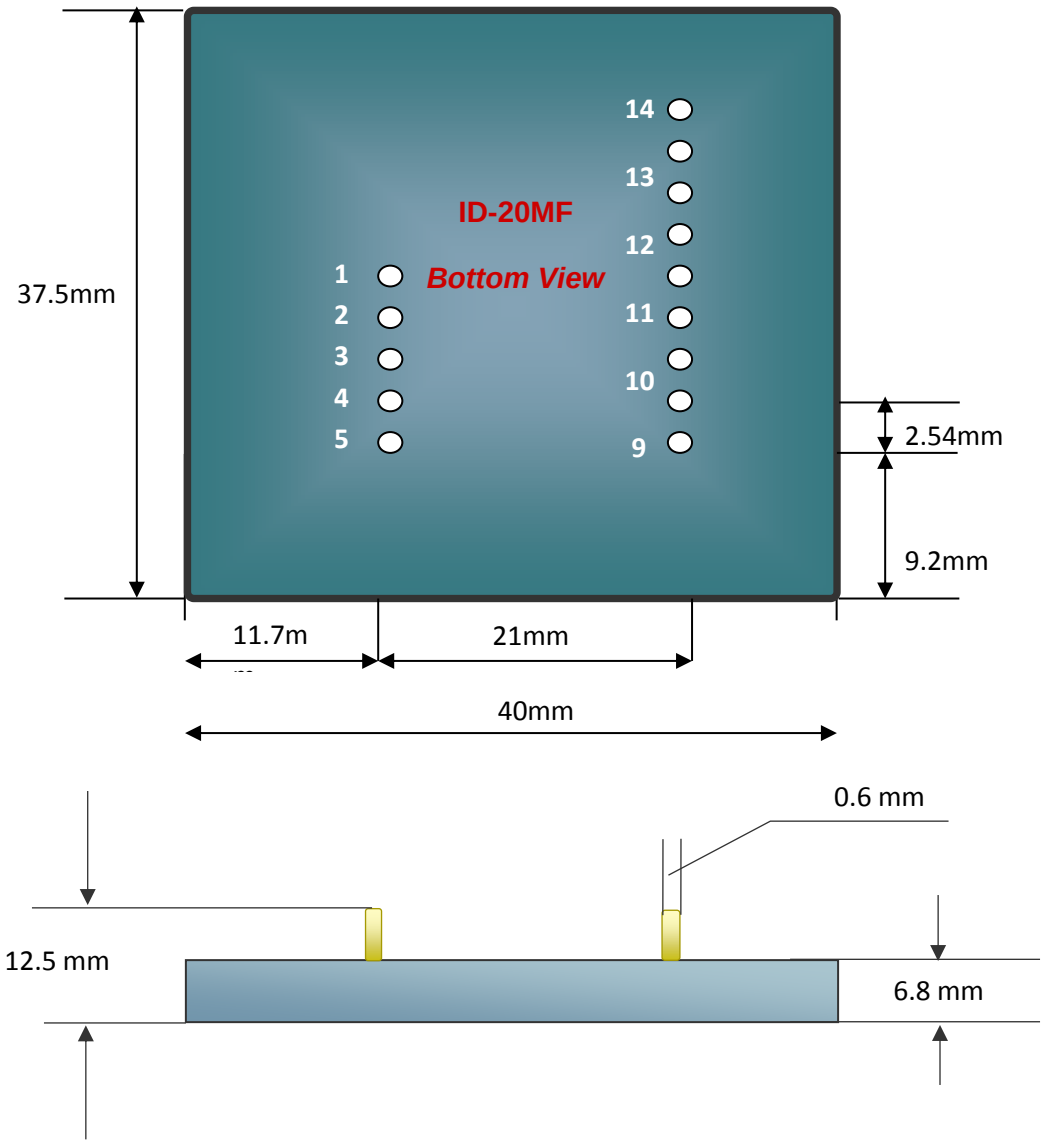
2. Characteristic

- 2 options: internal antenna or external antenna
- ISP(In System Program)function
- Small outline
- Low power consumption

3. Specification

- Support ISO/IEC14443 TypeA cards : Mifare One S50 b) Mifare One S70 c) Mifare Ultra Light
- Model：ID-20WR-MF-FV (with internal antenna) ID-20WR-MF-FV (without internal antenna)
- Frequency： 13.56 MHz
- Read/Write distance： internal antenna --30mm external antenna—up to 80mm
- Fast read/write speed.
- Communication Port： (RS232) TTL / 2400-57600BPS N,8,1
- Power： 5V DC
- Current consumption： <60 mA PK<200MA
- weight： 80g
- Operating temperature： -20℃ --- +75℃
- Storage temperature ： -40℃ --- +85℃

4. Dimensions and Pins(bottom view)



Pin Definition:

1------GND
2------external antenna TX1
3------external antenna TX2
4------external antenna RX1
5------CP
6------Future
7-----+/- (Format Select)
8-----D1(Data Pin 1)
9----D0(Data Pin 0)
10----LED(LED/BEEPER)
11----NC
12----RXD
13----TXD
14----+5V

5. Protocol Package

5.1 Command Frame Format

Name	SOP	LENG-H	LENG-L	Seq Num	Dev_ID	CMD Category	CMD	Data[0]… Data[n-1]	LRC
Values	0xAA	0x00	0x00						
No. Byte	1-byte	1-byte	1-byte	1-byte	1-byte	1-byte	1-byte	n-byte	1-byte

5.1.1 Meaning of byte in Command Frame Format

Name	Meaning
SOP	Start-of-Package byte (0xAA)
LENG-H	High byte of packet length counting from sequence number to Data[n-1]
LENG-L	Low byte of packet length counting from sequence number to Data[n-1]
Seq Number	Sequence number of Package
Dev_ID	Device ID byte : Silence bit (1Bit MSB) + Device_ID [(1)] (7 Bit)
CMD Category [(4)]	Command Category byte to specify operating standard or reader setup mode
CMD	Command byte in specified Command Category standard
Data[0] … Data[n-1]	Data bytes
LRC	Check sum of the packet which is XORing result from LENGTH to Data[n-1]

(1) The Device_ID can be between 0x00 and 0x7F. The detail of **Dev_ID** is shown in table below.

5.1.2 Dev_ID

Silence Bit [(2)] Dev_ID[7]	**ID** Dev_ID [6:0]	**Meaning**
0	0x00 [(3)]	All devices that receive command operate and respond back to host with Dev_ID of 0x00.
0	0x01 – 0x7F	The ID-matched device operates and responds back to host.
1	-	The operating device will not respond back to host

(2) The silence bit is an option for preventing data collision in reader network from simultaneous answer. User can retrieve last operating result/response from each device by using command “Get Last Response” (0x00-0x02).

(3) The ID (Dev_ID [6:0]) 0x00 can be used in broadcasting if there are multiple readers connected in a network.

(4) The commands are currently divided into 5 categories as shown in table below.

5.1.3 CMD Category

CMD Category	Meaning
0x00	Command Category for general reader function
0x01	Command Category for the reader IC (SIC9310) function
0x0A	Command Category for ISO14443A and MIFARE
0x0B	Command Category for ISO14443B
0x0D	Command Category for ISO15693

5.2 Response frame format

Name	SOP	LENG-H	LENG-L	Seq Num	Dev_ID	CMD Category	FBP CMD	Resp	Data[0]… Data[n-1]	LRC
Values	0xAA	0x00	0x00							
No.Byte	1-byte	1-byte	1-byte	1-byte	1-byte	1-byte	1-byte	1-byte	n-byte	1-byte

5.2.1 Meaning of bytes in Response Frame

Name	Meaning
SOP	Start-of-Package byte (0xAA)
LENG-H	High byte of packet length counting from sequence number to Data[n-1]
LENG-L	Low byte of packet length counting from sequence number to Data[n-1]
Seq Number	Sequence number of operated command packet
Dev_ID	Response device ID byte : 0 (1 Bit) + ID of operating Device (7 Bit)
CMD Category	Operated Command Category byte
FBP CMD	Operated command byte
Resp	Response flag of operated command
Data[0] … Data[n-1]	Response Data Bytes
LRC	Check sum of the packet which is XORing result from LENGTH to Data[n-1]

5.2.2 Response flag (Resp)

Category	Response Name	Resp	Meaning
No Error	Operation success	0x01	Operation is successful.
UART Error	Incomplete packet	0x10	Received data packet is incomplete.
	LRC error	0x11	LRC check sum verification fails.
	UART buffer full	0x12	UART receiver buffer is full.
Communication Protocol Error	Unknown command category	0x20	Device received undefined command category.
	Unknown command	0x21	Device received undefined command.
	Incorrect parameter	0x22	Device received incorrect parameter.
Board Error	Write hardware parameter error(1)	0x30	MCU fails to store hardware parameters into the ID-20MF-WR-FV EEPROM .
ISO14443A Error	HALT error	0xA0	There is a response after HALT command
	MIFARE authentication error	0xA1	MIFARE Authentication fails.
	MIFARE access error	0xA2	Perform an MIFARE authorized operation while crypto engine on reader IC is not turned on.
	MIFARE response error	0xA3	Card response error message from MIFARE operation.
ISO14443B Error	ISO14443B Error	0xB0	Card response error message
ISO15693 Error	ISO15693 Error	0xD0	Card response error message from any operation.
RF Communication Error	No Response	0xE0	There is no card or card doesn't respond.
	Framing Error	0xE1	Received frame errors.
	Collision Error	0xE2	Data collision occurs. (ISO14443A / 15693)
	Parity Error	0xE3	Parity verification fails. (ISO14443A)
	CRC Error	0xE4	Received CRC verification fails.
	Invalid Response	0xE5	Received response is invalid or not in expected format.
Reader System Error (ID-20MF-WR-FV Error)	Access E2 Error	0xF1	There is an error from accessing protected area in the EEPROM of the ID-20MF-WR-FV .
	Write E2 Error	0xF2	There is an error in programming EEPROM of ID-20MF-
	Key Error	0xF3	There is an error from loading MIFARE key.
	ID-20MF-WR-FV Execution timeout	0xF4	The ID-20MF-WR-FV don't response within defined

(1) These errors can occur in hardware developed by user to indicate there is something wrong in interface between microcontroller and the ID-20MF-WR-FV.

6. Reader and Reader IC Configuration Command (0x00 / 0x01)

6.1 Reader and Reader IC Configuration Command overview (0x00 / 0x01)

Command Name	CMD Category	CMD	Description
Get_Device_ID	0x00	0x00	Get current device ID
Write_Device_ID	0x00	0x01	Write or change device ID
Get_Last_Response	0x00	0x02	Get last response that the reader device answers to host
Test_Communication	0x00	0x03	Test communication by echoing back to host
Get_Firmware_Version	0x00	0x04	Get current firmware version
Reset_ASIC	0x01	0x20	Reset the reader IC ID-20MF-WR-FV
Read_Single_ID-20MF-WR-	0x01	0x21	Read single register from the ID-20MF-WR-FV
Write_Single_ID-20MF-WR-	0x01	0x22	Write single register to the ID-20MF-WR-FV
Read_Multiple_ID-20MF-WR-FV_Register	0x01	0x23	Read Multiple Registers from the ID-20MF-WR-FV
Write_Multiple_ID-20MF-WR-FV_Register	0x01	0x24	Write Multiple Registers to the ID-20MF-WR-FV
Read_E2_ID-20MF-WR-FV [(1)]	0x01	0x25	Read EEPROM of the ID-20MF-WR-FV
Write_E2_ID-20MF-WR-FV [(1), (2)]	0x01	0x26	Write EEPROM of the ID-20MF-WR-FV
Load_E2_Config [(1)]	0x01	0x27	Load configuration in the EEPROM to initial the ID-20MF-WR-FV
Calculate_CRC	0x01	0x28	Calculate CRC based on current configuration
Turn_RF_Field_On	0x01	0x30	Start 13.56-MHz carrier emission
Turn_RF_Field_Off	0x01	0x31	Stop 13.56-MHz carrier emission
Get_Driver_Config [(3)]	0x00	0x40	Get current driver configuration information from ID-20MF-WR-FV
Write_Driver_Config	0x00	0x41	Write current driver configuration
Set_Timeout_for_Card_Response[(4)]	0x01	0x42	Define timeout period for the reader IC in case of no response from card.

(1) The ID-20MF-WR-FV contains 256-byte EEPROM. The accessibility of the EEPROM is categorized into 3 sections as listed below.

Bytes Address	Access Type	Content	Executable Command
0x00 … 0x0F	Read Only (Write-Protected)	Manufacturer information Manufacturer configuration	Read E2 ID-20MF-WR-FV (0x01-0x25)
0x10 … 0x6F	Read/ Write	User Data Register Initialization data	Read E2 ID-20MF-WR-FV (0x01-0x25) Write E2 ID-20MF-WR-FV (0x01-0x26) Load E2 Config
0x70 … 0xFF	Write Only (Read-Protected)	Keys for Authentication	Write E2 ID-20MF-WR-FV (0x01-0x26)

(2) Addresses between 0x60 to 0x6F in the EEPROM of ID-20MF-WR-FV are used by CET-102 Firmware. Writing to these addresses is inhibited.

(3) The driver configuration is information used by CET-102 Firmware to set up driver characteristic to serve specific RF topologies in ID-20MF-WR-FV.This information is stored in EEPROM of ID-20MF-WR-FV . To make the reader properly operable and achieve the highest performance, the driver configuration must be specifically set to match to RF topology of hardware. The RF topology can be one of these configurations namely

1. Differential driver with internal envelop detector,
2. Differential driver with external envelop detector,
3. Single-ended driver with external envelop detector,
4. 50-ohm output Class-E driver with external envelop detector.

(4) The "Set Timeout for card response" command should be performed after executing the following commands

1. A_Config_Reader_43A (0x0A – 0x00)
2. B_Config_Reader_43B (0x0B – 0x00)
3. D_Config_Reader_15693 (0x0D – 0x00).

Else, these commands will supersede the setting timeout value by default value.

6.2 Reader Configuration Command (0x00 / 0x01)

Command Name	CMD Category	CMD	Payload (Data[0]… Data[n-1])	
Get_Device_ID	0x00	0x00	-	
Write_Device_ID	0x00	0x01	Device_ID	
Get_Last_Response	0x00	0x02	-	
Test_Communication	0x00	0x03	Data_Echo(0) + … + Data_Echo(N-1)	
Get_Firmware_Version	0x00	0x04	-	
Reset_ASIC	0x01	0x20	-	
Read_Single_ID-20MF-WR-	0x01	0x21	Reg_Address	
Write_Single_ID-20MF-WR-	0x01	0x22	Reg_Address + Data_Wr	
Read_Multiple_ID-20MF-WR-	0x01	0x23	Reg_Address (0) + Reg_Address (1) + … + Reg_Address (N-1)	
Write_Multiple_ID-20MF-WR-FV_Register	0x01	0x24	Reg_Address (0) + Data_Wr(0) + Reg_Address (1) + Data_Wr(1) + … + Reg_Address (N-1) + Data_Wr(N-1)	
Read_E2_ID-20MF-WR-FV	0x01	0x25	E2_Start_Address + LenData_Read_E2	
Write_E2_ID-20MF-WR-FV	0x01	0x26	E2_Start_Address + Data_Wr_E2(0) + … + Data_Wr_E2(N-1)	
Load_E2_Config	0x01	0x27	E2_Start_Address	
Calculate_CRC	0x01	0x28	Data(0) + … + Data(N-1)	
Turn_RF_Field_On	0x01	0x30	-	
Turn_RF_Field_Off	0x01	0x31	-	
Get_Driver_Config	0x00	0x40	-	
Write_Driver_Config	0x00	0x41	Driver_Configuration_Type	
			0x00	DRIVER_CONFIG_X_CC Differential close coupling network with internal envelope
			0x01	DRIVER_CONFIG_X_CCXENV Differential close coupling network with external envelope
			0x02	DRIVER_CONFIG_X_S50OUT Single-ended driver with external envelope
			0x03	DRIVER_CONFIG_X_E50OUT 50-ohm output from class-E driver with external envelope
Set_Timeout_for_Card_Response	0x01	0x42	Timeout Code	
			0x00	Previous setting
			0x01	1 ms
			0x02	2 ms
			0x03	4 ms
			0x04	8 ms
			0x05	16 ms
			0x06	32 ms

			0x07	64 ms
			0x08	128 ms
			0x09	256 ms
			0x0A	512 ms
			0x0B	1 s

6.3 Reader-Configuration-Command Response (0x00 / 0x01)

Command Name	CMD Category	FBP CMD	Resp	Payload (Data[0]… Data[n-1])
Get_Device_ID	0x00	0x00	0x01	Device_ID
Write_Device_ID	0x00	0x01	0x01	-
			Other	-
Get_Last_Response	0x00	0x02	0x01	CMD_Mode + CMD + Resp + Data_Resp(0) + ... + Data_Resp(N-1)
Test_Communication	0x00	0x03	0x01	Data_Echo(0) + … + Data_Echo(N-1)
			Other	-
Get_Firmware_Version	0x00	0x04	0x01	Version(0) + … + Version(3)
Reset_ASIC	0x01	0x20	0x01	-
Read_Single_ID-20MF-WR-FV_Register	0x01	0x21	0x01	Data_Rd
			Other	-
Write_Single_ID-20MF-WR-FV_Register	0x01	0x22	0x01	-
			Other	-
Read_Multiple_ID-20MF-WR-FV_Register	0x01	0x23	0x01	Data_Rd(0) + Data_Rd(1) + … + Data_Rd(N-1)
			Other	-
Write_Multiple_ID-20MF-WR-FV_Register	0x01	0x24	0x01	-
			Other	-
Read_E2_ID-20MF-WR-FV	0x01	0x25	0x01	Data_E2(0) + Data_E2(1) + … + Data_E2(N-1)
			Other	-
Write_E2_ID-20MF-WR-FV	0x01	0x26	0x01	-
			Other	-
Load_E2_Config	0x01	0x27	0x01	-
			Other	-
Calculate_CRC	0x01	0x28	0x01	CRC_Result_High_Byte + CRC_Result_Low_Byte
			Other	-
Turn_RF_Field_Off	0x01	0x30	0x01	-
Turn_RF_Field_Off	0x01	0x31	0x01	-
Get_Driver_Config	0x00	0x40	0x01	Driver configuration Type (1 byte) 0x00: DRIVER_CONFIG_X_CC Differential close coupling network with internal envelope 0x01: DRIVER_CONFIG_X_CCXENV Differential close coupling network with external envelope 0x02: DRIVER_CONFIG_X_S50OUT Single-ended driver with external envelope 0x03: DRIVER_CONFIG_X_E50OUT 50-ohm output from class-E driver with external envelope
			0x01	-

Write_Driver_Config	0x00	0x41	Other	-
Set_Timeout_for_Card_Response	0x01	0x42	0x01	-
			Other	-

7. ISO15693 Command (0x0D)

7.1 ISO15693-Command overview (0x0D)

The commands in this section are provided as described in mandatory and optional command in ISO15693-3.

Command Name	Command Category	Command	Description
D_Config_Reader_15693	0x0D	0x00	Configure register in the ID-20MF-WR-FV to serve ISO15693
D_Config_Speed_Reader	0x0D	0x01	Configure CODEC speed in the ID-20MF-WR-FV for ISO15693
D_Get_Speed_Reader	0x0D	0x02	Get current CODEC speed from the ID-20MF-WR-FV
Get_Firmware_Version	0x00	0x04	Get current firmware version
Inventory 1 slot	0x0D	0x10	Perform Inventory 1-slot command
Inventory 16 slot (1)	0x0D	0x11	Perform Inventory 16-slot command
Stay Quiet	0x0D	0x12	Perform Stay-Quiet command
Read Single Blocks	0x0D	0x13	Read data Block
Write Single Blocks	0x0D	0x14	Write data Block
Lock Block	0x0D	0x15	Lock data block
Read Multiple Blocks	0x0D	0x16	Read multiple Block
Write Multiple Blocks	0x0D	0x17	Write multiple Blocks
Select	0x0D	0x18	Perform select command
Reset to Ready	0x0D	0x19	Perform Reset-to-Ready command
Write AFI	0x0D	0x1A	Write AFI value
Lock AFI	0x0D	0x1B	Lock AFI value
Write DSFID	0x0D	0x1C	Write DSFID value
Lock DSFID	0x0D	0x1D	Lock DSFID value
Get System Information	0x0D	0x1E	Get system information
Get Multiple Block Security status	0x0D	0x1F	Get multiple block security status
D_Transparent_With_CRC	0x0D	0xC0	Transmit ISO15693 arbitrary data with CRC appending at the end of the transmission packet
D_Transparent_WithOut_CRC	0x0D	0xC1	Transmit ISO15693 arbitrary data without CRC appending at the end of the transmission packet
Send_1_Pulse	0x0D	0xC2	Send 1 pulse to indicate next slot in anti-collision process

(1) For the inventory 16 slot, the reader transmits pulses to indicate end of each slot automatically and reports all response present in each slot both successful and failed responses. There is no need to transmit “Send_1_Pulse” manually.

7.2 ISO15693-Command (0x0D)

Command Name	Command Category	Command	Payload (Data[0]… Data[n-1])
D_Config_Reader_15693	0x0D	0x00	-
D_Config_Speed_Reader			Speed TX/RX (Speed TX) Hi-Nibble / (Speed RX) Lo-Nibble 0000b XXXX 1 out of 256 (1.65 kbits/s) 0001b XXXX 1 out of 4 (26.48 kbits/s) XXXX 0000b 1 Sub Low rate (6.62 kbits/s) XXXX 0001b 1 Sub High rate(26.48 kbits/s) XXXX 0010b 1 Sub Ultra high rate (52.96 kbits/s) XXXX 0011b 2 Sub Low rate(6.67 kbits/s) XXXX 0100b 2 Sub High rate(26.69 kbits/s)
D_Get_Speed_Reader	0x0D	0x02	-
Inventory 1 slot	0x0D	0x10	Inventory_Mode(1) + [AFI] (5) + MaskLen + MaskUIDValue0 + ... + MaskUIDValue7
Inventory 16 slot	0x0D	0x11	Inventory_Mode(1) + [AFI] (5) + MaskLen + MaskUIDValue0 + ... + MaskUIDValue7
Stay Quiet	0x0D	0x12	Non Inventory Mode(2) + UID(0) + ... + UID(7)
Read Single Blocks	0x0D	0x13	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + BlockAddr
Write Single Blocks	0x0D	0x14	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + BlockAddr + Data(0) + Data(1) + .. + Data(Block Len-1)
Lock Block	0x0D	0x15	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + BlockAddr
Read Multiple Blocks	0x0D	0x16	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + BlockAddr + Num_of_Block
Write Multiple Blocks	0x0D	0x17	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + Block_Size + BlockAddr + Num_of_Block + Data(0) + Data(1) + .. + Data(Block Len-1)
Select	0x0D	0x18	Non Inventory Mode(2) + UID(0) + ... + UID(7) +
Reset to Ready	0x0D	0x19	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) +
Write AFI	0x0D	0x1A	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + AFI Value
Lock AFI	0x0D	0x1B	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) +
Write DSFID	0x0D	0x1C	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + DSFID Value
Lock DSFID	0x0D	0x1D	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) +
Get System Information	0x0D	0x1E	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) +
Get Multiple Block Security status	0x0D	0x1F	Non Inventory Mode(2) + [UID(0) + ... + UID(7)] (4) + BlockAddr + Num_of_Block
D_Transparent_With_CRC	0x0D	0xC0	Timeout(3) + TXData(0)+ .. + TXData(N-1)
D_Transparent_WithOut_CRC	0x0D	0xC1	Timeout(3) + TXData(0)+ .. + TXData(N-1)
Send_1_Pulse	0x0D	0xC2	-

(1) The Inventory Mode byte is defined as shown in table below.

Bit	7	6	5	4	3	2	1	0
Name	RFU Flag	Option Flag	Protocol Extension Flag	-	AFI mode			
					0001b	Check AFI		
					0000b	Not Check AFI		

If AFI mode = 0001b, AFI byte must be supplied in input command packet. Depending on special mode required by each card, RFU Flag, Option Flag and Protocol Extension can be set to compose a flag following ISO15693.

(2) The Non Inventory Mode is defined as shown in table below.

Bit	7	6	5	4	3	2	1	0
Name	RFU Flag	Option Flag	Protocol Extension Flag	-	Operation mode			
					0010b	Select Mode		
					0001b	Address Mode		

					0000b	Non Address Mode

(3) The timeout code is defined in the command “Set Timeout for Card response” (0x00 + 0x42)

(4) For these command, UID is optional. If operation mode is Address Mode, UID must be supplied in payload. (5)

Depending on setup flag in Inventory_Mode and Non_Inventory_Mode, Value in bracket [ ] is an optional.

7.3 ISO15693-Command Response (0x0D)

Command Name	Command Category	Command	Resp	Payload (Data[0]… Data[n-1])	
D_Config_Reader_15693	0x0D	0x00	0x01 Resp_Err	- -	
D_Config_Speed_Reader	0x0D	0x01	0x01 Resp_Err	- -	
D_Get_Speed_Reader	0x0D	0x02	0x01 Resp_Err	Speed TX/RX(1) -	
Inventory 1 slot	0x0D	0x10	0x01 Resp_Err	DSFID + UID(0) + … + UID(7) (2) -	
Inventory 16 slot (3)	0x0D	0x11	0x01	Slot_Num + Slot_Resp + Slot_Len + [DSFID + UID] / [Remaining data in ID-20MF-WR-FV FIFO]+... Slot_Num + Slot_Resp + Slot_Len + [DSFID + UID] / [Remaining data in ID-20MF-WR-FV FIFO]+...	
				Slot_Num	Number of slot that there is tag response
				Slot_Resp	Response of packet as defined in table 1.2.2 in each slot If Slot_Resp = 0x01, “DSFID + UID” is reported, else remaining data in ID-20MF-WR-FV FIFO is reported.
				Slot_Len	Length of data in each sub slot
			Resp_Err	-	
Stay Quiet	0x0D	0x12	0x01	-	
			Resp_Err	-	
Read Single Blocks	0x0D	0x13	0x01	Block Security(4) + Data(0) + ... + Data(N)	
			Resp_Err	-	
Write Single Blocks	0x0D	0x14	0xD0 0x01 Resp_Err 0xD0	Error Code (5) - - Error Code(5)	
Lock Block	0x0D	0x15	0x01 Resp_Err 0xD0	- - Error Code(5)	
Read Multiple Blocks	0x0D	0x16	0x01	Block Security(4) + Data[0](0) + ... + Data[0](N) + Block Security(4) + Data*1+(0) + ... + Data*1+(N) + …	
			Resp_Err 0xD0	- Error Code(5)	
Write Multiple Blocks	0x0D	0x17	0x01 Resp_Err 0xD0	- - Error Code(5)	
Select	0x0D	0x18	0x01 Resp_Err 0xD0	- - Error Code(5)	
			0x01	-	

Reset to Ready	0x0D	0x19	Resp_Err	-
			0xD0	Error Code[5]
			0x01	-
Write AFI	0x0D	0x1A	Resp_Err	-
			0xD0	Error Code[5]
			0x01	-
Lock AFI	0x0D	0x1B	Resp_Err	-
			0xD0	Error Code[5]
			0x01	-
Write DSFID	0x0D	0x1C	Resp_Err	-
			0xD0	Error Code[5]
			0x01	-
Lock DSFID	0x0D	0x1D	Resp_Err	-
			0xD0	Error Code[5]
Get System Information	0x0D	0x1E	0x01	Info Flag [6] + UID(0) + … + UID(7) + DSFID + AFI + VICC memory size [7](2 byte) + IC_ref [8]
			Resp_Err	-
			0xD0	Error Code[5]
			0x01	BSS(0) + … + BSS(N)[9]
Get Multiple Block Security status	0x0D	0x1F	Resp_Err	-
			0xD0	Error Code[5]
D_Transparent_With_CRC	0x0D	0xC0	0x01	RespData(0) + … + RespData(N-1)
			Resp_Err	-
D_Transparent_WithOut_CRC	0x0D	0xC1	0x01	RespData(0) + … + RespData(N-1)
			Resp_Err	-
Send_1_Pulse	0x0D	0xC2	0x01	RespData(0) + … + RespData(N-1)
			Resp_Err	-

(1) Speed TX/RX is as shown in input parameter of "D_Config_Speed_Reader".

(2) The UID in response packet starts from least significant byte to most significant byte, which reflects to what transmit from tag in chronological order.

(3) For Inventory 16 slot, successful and failed response presenting in each slot both are reports.
Examples 1, RX > "AA 00 1D 7D 00 0D 11 01 00 01 09 00 20 E1 22 0C 00 01 04 E0 09 01 09 00 69 96 23 0C 00 01 04 E0 4B".
This response can be decomposed as shown in table below. There are 2 cards response completely in slot 0 and slot 9.

Header	Length-H Length-L	SEQ NUM	DEV ID	CMD MODE & CMD	Resp	Slot_Num	Slot_Resp	Slot_Len	[DSFID + UID] / [Remaining data in SIC9310 FIFO]		LRC
AA	00 1D	7D	00	0D 11	01						
						00	01	09	00	20 E1 22 0C 00 01 04 E0	
						09	01	09	00	69 96 23 0C 00 01 04 E0	
											4B

Examples 2, RX> "AA 00 29 54 00 0D 11 01 00 01 09 00 20 E1 22 0C 00 01 04 E0 01 01 09 00 D1 DD 22 0C 00 01 04 E0 04 01 09 00 74 96 23 0C 00 01 04 E0 88". This response can be decomposed as shown in table below. There are three cards response in three different slots in this example.

Header	Length-H Length-L	SEQ NUM	DEV ID	CMD MODE & CMD	Resp	Slot_Num	Slot_Resp	Slot_Len	[DSFID + UID] / [Remaining data in SIC9310 FIFO]		LRC
AA	00 29	54	00	0D 11	01						
						00	01	09	00	20 E1 22 0C 00 01 04 E0	
						01	01	09	00	D1 DD 22 0C 00 01 04 E0	
						04	01	09	00	74 96 23 0C 00 01 04 E0	
											88

Examples 3, RX> "AA 00 20 56 00 0D 11 01 00 01 09 00 20 E1 22 0C 00 01 04 E0 04 E2 0C 00 00 04 00 00 00 00 00 00 00 00 00 87".

This response can be decomposed as shown in table below.

Header	Length-H Length-L	SEQ NUM	DEV ID	CMD MODE & CMD	Resp	Slot_Num	Slot_Resp	Slot_Len	[DSFID + UID] / [Remaining data in SIC9310 FIFO]		LRC
AA	00 20	56	00	0D 11	01						
						00	01	09	00	20 E1 22 0C 00 01 04 E0	
						04	E2	0C	00 00 04 00 00 00 00 00 00 00 00 00		
											87

For the example 3, there are a successful response in one slot and collision in another slot. In the slot collision occurs, collision response is “00 00 04 00 00 00 00 00 00 00 00 00” consisting of Response flag (1 bytes), DSFID (1 bytes), UID (8 bytes) and CRC (2 byte) respectively. Note that data after collision is masked to zero. User can further discriminate collided tags by reissuing Inventory 16-slot command with mark value equal to the number of slot that collision occurred and mark length of “0x04”. In this case, mark value is “0x04”.

(4) Block security presents, if option flag in input command packet is set. (5)
Resp of “0xD0” is reported, if Bit Error flag in ISO15693 response is set.
(6) Info Flag is one byte information following ISO15693. The bit detail is shown in table below.

Bit	7	6	5	4	3	2	1	0
Name	0	0	0	0	IC reference	VICC memory size	AFI	DFSID

(7) VICC memory size is two byte information following ISO15693. The bit detail is shown in table below.

Byte	12th byte in pay load								13th byte in pay load							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Name	Number of blocks								0	0	0	Block size in bytes				

Block size is expressed in number of bytes on 5 bits, allowing to specify up to 32 bytes i.e. 256 bits. It is one less than the actual number of bytes. E.g. a value of '1F' indicates 32 bytes, a value of '00' indicates 1 byte.

Number of blocks is on 8 bits, allowing to specify up to 256 blocks. It is one less than the actual number of blocks. E.g. a value of 'FF' indicates 256 blocks, a value of '00' indicates 1 block.

(8) IC_ref is an 8-bits IC reference and its meaning is defined by IC manufacturer.
(9) BSS is block security status.

7.4 SIC custom command overview (0x0D) (for the CET6600 only)

Command Name	Command Category	Command	Description
Set EAS(1)	0x0D	0x30	Enable EAS mode (If EAS mode is not locked)
Reset EAS	0x0D	0x31	Disable EAS mode (If EAS mode is not locked)
Lock EAS(2)	0x0D	0x32	Lock current status of EAS mode
EAS Alarm	0x0D	0x33	Invoke the CET6600 to transmit EAS code (Tag must be preset in EAS mode)
Kill (3)	0x0D	0x34	Destroy a specific-UID tag
Load Password (Login)	0x0D	0x35	Login to enable accessing card content
Write Password	0x0D	0x36	Write password 0, password 1 or kill code
Lock Password(2)	0x0D	0x37	Lock current password or kill code
Set Password Mode(4)	0x0D	0x38	Setup password mode or kill enable
Lock Password Mode(2),(4)	0x0D	0x39	Lock current status of the password mode
Get Password Mode(4)	0x0D	0x3A	Get current status of the password mode
Set OTP (5)	0x0D	0x3C	Set OTP mode
Get OTP (5)	0x0D	0x3D	Get current status of the OTP mode

Write XUID [6]	0x0D	0x3E	Write XUID to a specific-UID tag
Read XUID [6]	0x0D	0x3F	Write XUID from a specific-UID tag

(1) EAS (Electronic Article Surveillance) is a configurable mode in the CET6600. If EAS mode is set, "EAS Alarm" command can invoke tag to transmit EAS code.

(2) Lock EAS command will lock related configuration permanently. Such configuration will be frozen forever.

(3) Kill command will permanently disable tag function. The tag has been killed will not answer to any request from reader.

(4) Password mode defined password to be used and accessibility for read and write content of the CET6600

(5) OTP is one time programmable feature. If an OTP bit is set, the associated data section can not modified forever. Note that if the OTP is set to one, it can not reset to zero.

(6) XUID is a 6-byte extended Unique ID and an one-time writable information. If XUID has been once written, XUID can not be modified later.

7.5.CET custom command (0x0D)

Command Name	Command Category	Command	Payload (Data[0]… Data[n-1])
Set EAS	0x0D	0x30	Non Inventory Mode(1) + [UID(0) + … + UID(7)] (11)
Reset EAS	0x0D	0x31	Non Inventory Mode(1) + [UID(0) + … + UID(7)] (11)
Lock EAS	0x0D	0x32	Non Inventory Mode(1) + [UID(0) + … + UID(7)] (11)
EAS Alarm	0x0D	0x33	Non Inventory Mode(1) + [UID(0) + … + UID(7)] (11)
Kill	0x0D	0x34	Non Inventory Mode(1) + UID(0) + … + UID(7) (12) + Kill Code(0) + … + Kill Code(3) (2)
Load Password (Login)	0x0D	0x35	Non Inventory Mode(1) + UID(0) + … + UID(7) (12) + PWD Mode(3), (4) + RNG(5) + PWD (6) Non Inventory Mode(1) + UID(0) + … + UID(7) (12) + PWD ID(7) + PWD(0) + … + PWD(3)
Write Password	0x0D	0x36	PWD_ID: 0x01 PWD0; 0x02 PWD1; 0x03 Kill Code
Lock Password	0x0D	0x37	Non Inventory Mode(1) + UID(0) + … + UID(7) (12) + PWD ID(7)
Set Password Mode	0x0D	0x38	Non Inventory Mode(1) + UID(0) + … + UID(7) (12) + PWD Mode(3), (4), (8)
Lock Password Mode	0x0D	0x39	Non Inventory Mode(1) + UID(0) + … + UID(7) (12)
Get Password Mode	0x0D	0x3A	Non Inventory Mode(1) + UID(0) + … + UID(7) (12)
Set OTP	0x0D	0x3C	Non Inventory Mode(1) + UID(0) + … + UID(7) (12) + OTP Mode(9)
Get OTP	0x0D	0x3D	Non Inventory Mode(1) + UID(0) + … + UID(7) (12)
Write XUID	0x0D	0x3E	Non Inventory Mode(1) + UID(0) + … + UID(7) (12) + XUID(0) + … + XUID(5)
Read XUID	0x0D	0x3F	Non Inventory Mode(1) + UID(0) + … + UID(7) (12)

(1) Non Inventory Mode is as described in standard command of ISO15693 (0x0D + 0x1X). If operation mode is address mode, UID must be supplied in the input command packet.

(2) A matched Kill code, written by "Write Password" command, is required for successfulness of kill operation.

(3) The password mode PWD Mode, shown in table below, is configuration defining password to be used and accessibility for read and writes content of the CET6600

Password mode (PWD Mode)								
Bit	7	6	5	4	3	2	1	0
Name	0	0	Kill Enable	M	PA (Password Allocation)		SM (Security Mode)	

Kill Enable : Set up Kill-Enable bit	
0b	Reset Kill-Enable bit in the CET6600 to protect tag from KILL command
1b	Set Kill-Enable bit in the CET6600 to enable Kill command to operate.

M : Specify password in tag used to compare with transmitted password during loading password	
0b	Use Password 0
1b	Use Password 1

PA (Password Allocation) : Define passwords to be used in protection	
00b	Use Password 0 for read protection and Password 1 for write protection. If tag was set in this mode, input PWD shall match Password 0 during loading password with M value of 0 to read content. To write data to tag, input PWD shall match Password 1 during loading password with M value of 1.
01b	Use Password 0 for protection. If tag was set in this mode, input PWD shall match Password 0 during loading password with M value of 0 to read/write content.
10b	Use Password 1 for protection. If tag was set in this mode, input PWD shall match Password 1 during loading password with M value of 1 to read/write content.
11b	Use Both Password 0 and Password 1 (64 Bits) for protection. If tag was set in this mode, input 8-bytes PWD matched Password 0 and Password 1 must be used for loading password with any value of M to read/write content.
SM (Security Mode(1:0)) : Define protection function of the password	
00b	No protection

01b	Read Protection Only
10b	Write Protection Only
11b	Read and Write Protection

Summarized protection function controlled by PA (Password Allocation) and SM (Security Mode(1:0))				
PA (Password Allocation)		**SM (Security Mode(1:0))**		**Protection Function**
00b	Use Password 0 for read protection and Password 1 for write protection	00b	No protection	No protection
		01b	Read Protection Only	Read Protection by Password 0, M = 0
		10b	Write Protection Only	Write Protection by Password 1, M = 1
		11b	Read and Write Protection	Read Protection by Password 0, M = 0 and Write Protection by Password 1, M = 1
01b	Use Password 0 for all protection	00b	No protection	No protection
		01b	Read Protection Only	Read Protection by Password 0
		10b	Write Protection Only	Write Protection by Password 0
		11b	Read and Write Protection	Read & Write Protection by Password 0
10b	Use Password 1 for all protection	00b	No protection	No protection
		01b	Read Protection Only	Read Protection by Password 1
		10b	Write Protection Only	Write Protection by Password 1
		11b	Read and Write Protection	Read & Write Protection by Password 1
11b	Use Both Password 0 and Password 1 (64 Bits) for all protection	00b	No protection	No protection
		01b	Read Protection Only	Read Protection by Password 0 + Password 1
		10b	Write Protection Only	Write Protection by Password 0 + Password 1
		11b	Read and Write Protection	Read & Write Protection by Password 0 + Password 1

(4) The Password Mode during loading password must match with preset password mode in tag.

(5) The RNG (Random Number) can be either 4 byte or 8 byte depending on preset password mode. RNG is used in encrypting password during login. Practically, RNG should be altered every time to prevent playback attack.

(6) The PWD is input password. If PA = "11b", 8-byte RNG, 4-byte PWD0 and 4-byte PWD1 must be supplied in input packet respectively.

(7) The PWD ID specifies target password address or Kill code to be written or locked.

(8) Value of M is negligible in "Set Password Mode" command. Password mode and Kill Enable are set simultaneously. (9)

The OTP Mode is a configuration byte defined write-protection area.

OTP Mode								
Bit	7	6	5	4	3	2	1	0
Name	0	0	0	0	0	L	OTP MODE(1:0)	

L : Lock Control to Lock current status of OTP MODE	
0b	Not Lock OTP
1b	Lock OTP. If Lock OTP bit was set to one, it can not reset back to zero and OTP MODE value can not be altered later.

OTP MODE(1:0) (10)	
00b	Not Lock
01b	Lock Page 0 (Address 0 - 15)
10b	Lock Page 1 (Address 16 - 31)

(10) If either bit of OTP Mode is set to one, it can not reset back to zero. Consequently, the associated data page will be locked forever.

(11) For these commands, UID is optional. If operation mode is Address Mode, UID must be supplied in payload. (12)

For these commands, UID is require.

7.6 CET customcommand response (0x0D)

Command Name	Command Category	Command	FBP	Payload (Data[0]… Data[n-1])
Set EAS	0x0D	0x30	0x01	-
			Resp_Err	-
			0xD0	Error Code
Reset EAS	0x0D	0x31	0x01	-
			Resp_Err	-
			0xD0	Error Code
Lock EAS	0x0D	0x32	0x01	-
			Resp_Err	-
			0xD0	Error Code
EAS Alarm	0x0D	0x33	0x01	EAS VALUE(0) + EAS VALUE(1) +...+ EAS VALUE(31) (1)
			Resp_Err	-
			0xD0	Error Code
Kill	0x0D	0x34	0x01	-
			Resp_Err	-
			0xD0	Error Code
Set Password	0x0D	0x35	0x01	-
			Resp_Err	-
			0xD0	Error Code
Write Password	0x0D	0x36	0x01	-
			Resp_Err	-
			0xD0	Error Code
Lock Password	0x0D	0x37	0x01	-
			Resp_Err	-
			0xD0	Error Code
Set Password Mode	0x0D	0x38	0x01	-
			Resp_Err	-
			0xD0	Error Code
Lock Password Mode	0x0D	0x39	0x01	-
			Resp_Err	-
			0xD0	Error Code
Get Password Mode	0x0D	0x3A	0x01	PWD Mode
			Resp_Err	-
			0xD0	Error Code
Set OTP	0x0D	0x3C	0x01	-
			Resp_Err	-
			0xD0	Error Code
Get OTP	0x0D	0x3D	0x01	OTP Mode
			Resp_Err	-
			0xD0	Error Code
Write OTP UID	0x0D	0x3E	0x01	-
			Resp_Err	-
			0xD0	Error Code
Read OTP UID	0x0D	0x3F	0x01	DSFID + UID(0) + ... + UID(7) +OTP UID(0) + ... + OTP UID(5)
			Resp_Err	-
			0xD0	Error Code

(1) For the CET6600,the EAS value is "2FB36270D5A7907FE8B18038D281497682DA9A866FAF8BB0F19CD112A57237EF" .