

***CIRCUIT DESIGN, INC.***

# **MB-STD-RS232**

## ***Operation Guide***

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# GENERAL DESCRIPTION & FEATURES

## Features

- CE compliance STD-402 434MHz RF module on the board
- RS232 interface with D-sub 9pins connector or Modular 6pin jack
- Fixed frequency/Auto frequency setting selectable
- Cross/Straight cable selection SW

## Applications

- Serial data transmission (RS232C communication)
- Telemeter (FA line, Sensor information)
- Wireless connection between PC and peripheral RS232 equipment

## General description

MB-STD-RS232 is designed to make it possible for the user to connect between RS232 equipments with radio. STD-402 434MHz narrow band radio module that complies with EN300220 is equipped on the board. 64 RF channels are pre-programmed in the module.

There are two frequency setting are available. In fixed (manual) setting, RF channel can be set on board switches. In auto setting, RF channel is set to vacant channel automatically.

Operation mode and communication set up (Ack, parity, data rate) can be selected by on board dip-switch. The operation mode 1 is designed for two-way communication and the operation mode 2 is designed for one-way communication (TX->RX)

1:N communication is possible by using unique module ID number that designated to each RF module.

MB-STD-RS232 is suitable for long-range telemeter and data communication application.

# SPECIFICATION

## RF parameter

Communication mode	Half-Duplex
Frequency range	433.200 to 434.775MHz
CH step	25kHz
Number of CH	64ch
CH setting	Fix/Auto (8Gr.x8ch)
Modulation data speed	9600bps.
Modulation	2FSK
Emission class	F1D
Transmission Power	10mW

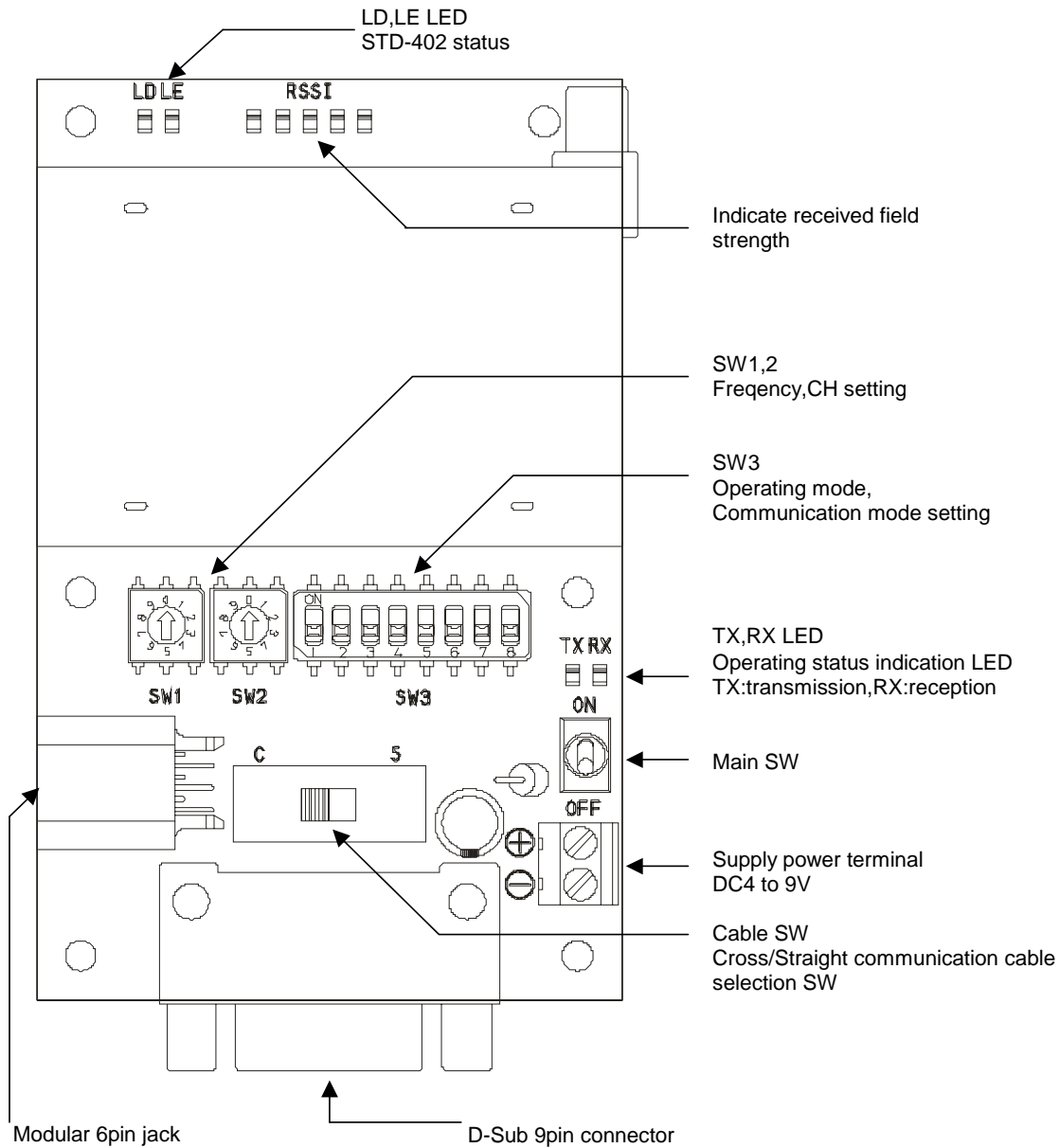
## Serial Interface

Interface	RS-232C
Data format	Asynchronous communication (UART)
Data speed of RS	1200/2400/4800/9600bps
Flow control	RS/CS hardware control
Buffer	Transmission 2kB, Reception 2kB
Interface connector	D-Sub 9P/Modular 6P

## Other

Switches	Power, Frequency, Operation Mode, Cable (Cross/Straight)
LED indication	TX, RX, RSSI, LD, LE
Dimension	85*53*15mm
SUPPLY VOLTAGE	4.0 to 9V DC

# DESCRIPTION



## Some trouble shooting

Phenomina	Cause of trouble
TX-LED blink	SW1, 2 setting error. Please check setting of SW1,2.
RX-LED blink	Low voltage. Please check supply voltage
TX and RX LED blink by turns	Internal EEPROM is something wrong. Please contact us.
Both TX and RX LED turn ON and no transmission.	There would be interference at set frequency. Please change the frequency. Noise from PC might be the cause of the problem. Please try to leave the board from PCs and check it.

# FREQUENCY CH SETTING

There are two frequency settings are available.

\* Fix setting (manual)

Frequency is set by switches (SW1 & SW2) on the board manually. RSSI-LED indication helps to set vacant channel.

\* Auto setting

MB-STD-RS232 search radio carrier to find vacant channel before starting radio communication and set to vacant channel automatically.

Pre-programmed 64 frequency channels are divided to 8 groups. The group can be selected by SW2.

## Fixed mode: Frequency table

SW1	SW2	Frequency	SW1	SW2	Frequency
0	0	433.200	3	2	434.000
	1	433.225		3	434.025
	2	433.250		4	434.050
	3	433.275		5	434.075
	4	433.300		6	434.100
	5	433.325		7	434.125
	6	433.350		8	434.150
	7	433.375		9	434.175
	8	433.400		0	434.200
	9	433.425		1	434.225
1	0	433.450	4	2	434.250
	1	433.475		3	434.275
	2	433.500		4	434.300
	3	433.525		5	434.325
	4	433.550		6	434.350
	5	433.575		7	434.375
	6	433.600		8	434.400
	7	433.625		9	434.425
	8	433.650		0	434.450
	9	433.675		1	434.475
2	0	433.700	5	2	434.500
	1	433.725		3	434.525
	2	433.750		4	434.550
	3	433.775		5	434.575
	4	433.800		6	434.600
	5	433.825		7	434.625
	6	433.850		8	434.650
	7	433.875		9	434.675
	8	433.900		0	434.700
	9	433.925		1	434.725
3	0	433.950	6	2	434.750
	1	433.975		3	434.775

**Auto mode: Frequency group table**

SW1	SW2	Frequency	
7	0	Group 0	433.200 - 434.600 (200kHz step 8ch)
	1	Group 1	433.225 - 434.625 (200kHz step 8ch)
	2	Group 2	433.250 - 434.650 (200kHz step 8ch)
	3	Group 3	433.275 - 434.675 (200kHz step 8ch)
	4	Group 4	433.300 - 434.700 (200kHz step 8ch)
	5	Group 5	433.325 - 434.725 (200kHz step 8ch)
	6	Group 6	434.350 - 434.750 (200kHz step 8ch)
	7	Group 7	434.375 - 434.775 (200kHz step 8ch)

Auto mode can be used at operation mode 2\* (one way communication) only.

\*see “Operation Mode Setting SW” page

**Initial setting: (master / slave)**

SW1	SW2	Function
9	0	STD-402 initial setting / Set to Slave
9	1	STD-402 initial setting /Set to Master
9	9	Setting mode (Lf, Ack, Character strings, etc.) and TEST

# OPERATION MODE SETTING SW

No	Description	SW 3 setting								
		ON				OFF				
1	Operation Mode	Transmitter				Receiver				
2		Mode 2 (One way communication)				Mode 1 (Two way communication)				
3	(Reserve)	Setting Prohibited				Off				
4	(Reserve)	Setting Prohibited				Off				
5	U A	ACK response	Yes				No			
6		Parity	Yes (Even)				No			
7	R T	Communication Speed (bps)	ON	9600	OFF	4800	ON	2400	OFF	1200
8			ON		ON		OFF		OFF	

TX/RX setting is not necessary in Operation Mode 1.

Following setting cannot be changed.

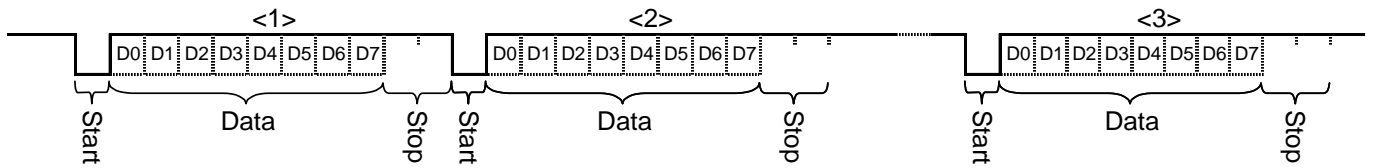
Data length	8 bit
Stop bit	TX: 2bit / RX: 1bit or more

### Remark: Stop bit at UART communication:

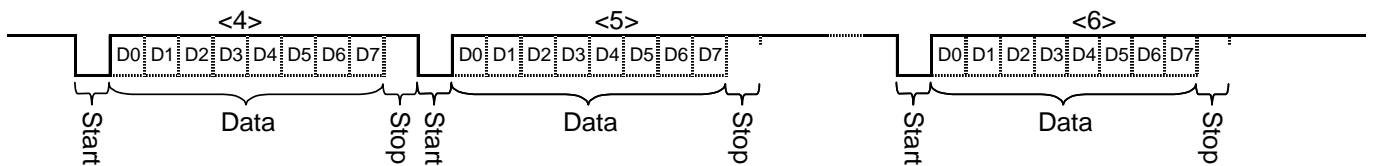
Normally, Stop bit is selected one of 1/1.5/2 bit when COM port of PC equipment is set-up. When continuous data are outputted, data comes after stop bit as shown in below <1> and <2>, however there is a case as shown in below <2> and <3> that there is more time space than specified stop bit length because of asynchronous communication. Therefore it shall be OK if stop bit is “1” or more.

The MB-STD-RS232 receives the data from PC correctly if stop bit is 1 bit or more. Stop bit of data from the MB-STD-RS232 to PC is fixed to 2 bit therefore communication with PC can be made regardless of stop bit (1,1.5 or 2 bit).

Communication [Bit=8 ,Stop=2 ,Party=None]



Communication [Bit=8 ,Stop=1 ,Party=None]





# JUMPER SETTING

There are 6 jumper settings on the board. Following figure shows default setting. Changing J4 and J5 can change LED-working condition to reduce the consumption current.

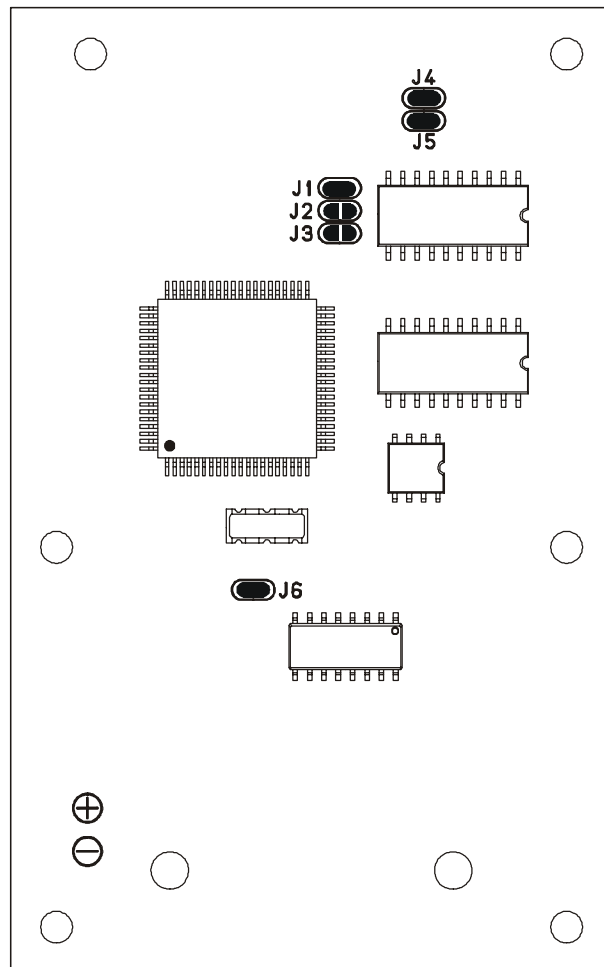
Item	Module set up			LED operation		/RESET
	J1	J2	J3	J4	J5	J6
Module (STD-402 433MHz)	Short	Open	Open			
TX, RX, RSSI, LED ON				Short		
LD, LE LED ON					Short	
/Reset						Short

J1, J2, J3: Module set up STD-402 434MHz setting must be as above

J4: LED operation of TX, RX, RSSI LED      Use: Short,    Non use (off): Open

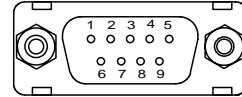
J5: LED operation of LD, LE                      Use: Short,    Non use=(off): Open

J6: CPU reset signal: This must be short



# COMMUNICATION INTERFACE

The board equip D-SUB 9pin and Modular 6pin as communication interface.



## Pin description

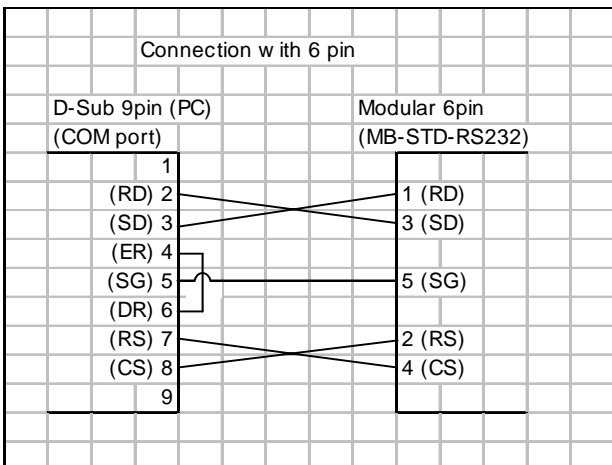
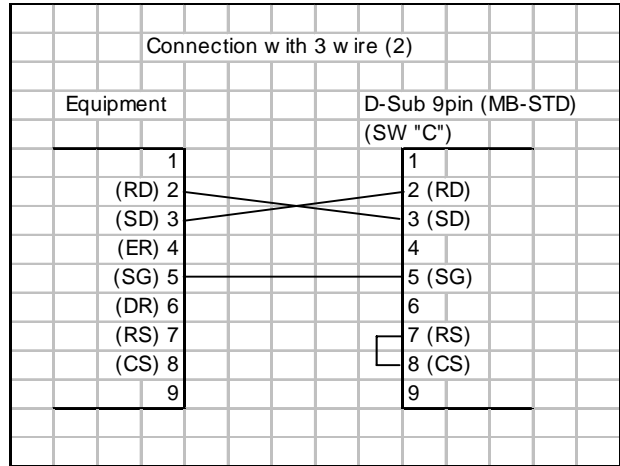
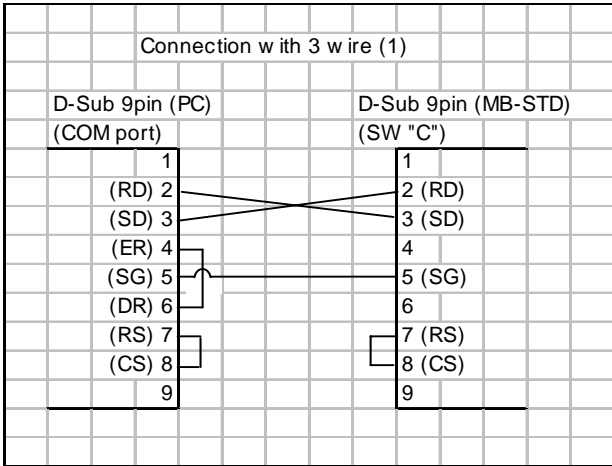
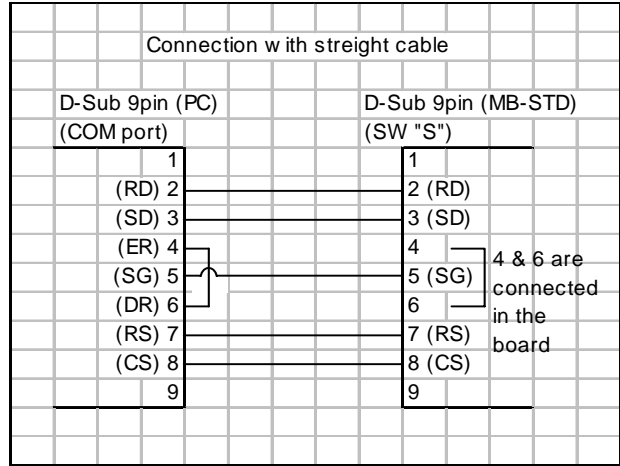
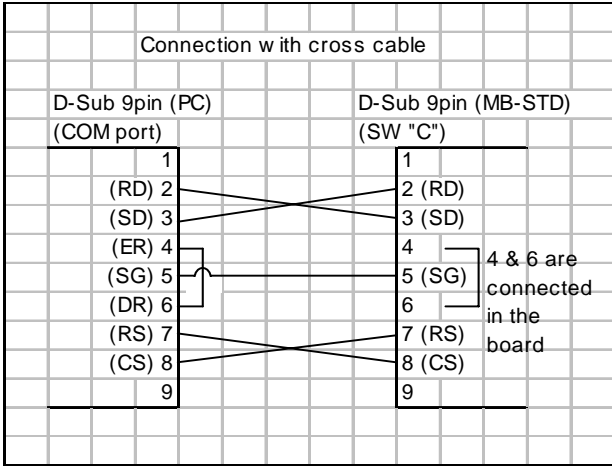
Signal	I/O	Modular 6P	D-Sub 9P (*)		Remark
			SW="C"	SW="S"	
RD (RX)	I	1	2	3	Input terminal /from PC
RS (RTS)	O	2	7	8	Hi when the equipment become data reception possible. Lo when internal buffer is full.
SD (TX)	O	3	3	2	Data output terminal /from PC
CS (CTS)	I	4	8	7	Hi when SD terminal send data Lo when SD terminal do nt send data
GND (SG)		5	5		GND
DC (+)		6	-		Supply power (DC4 to 9V) is possible from Modular 6pin.

\* D-Sub 9P signal shall be changed by selection of cross/streight cable

# COMMUNICATION CABLE

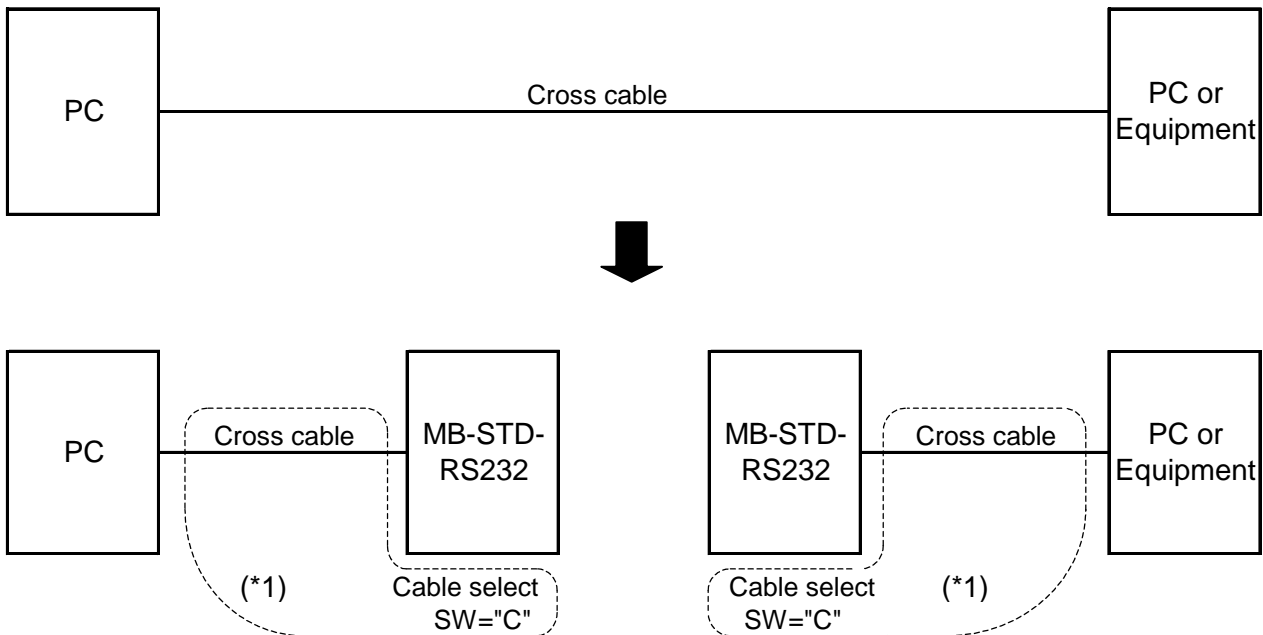
Cross cable which mainly connect between PCs and streight cable which connect PCs and perpherial RS 232 equipment are avaiable as RS232 standard cable.

Please set “Cable SW”(cross/streight) according to the cable.



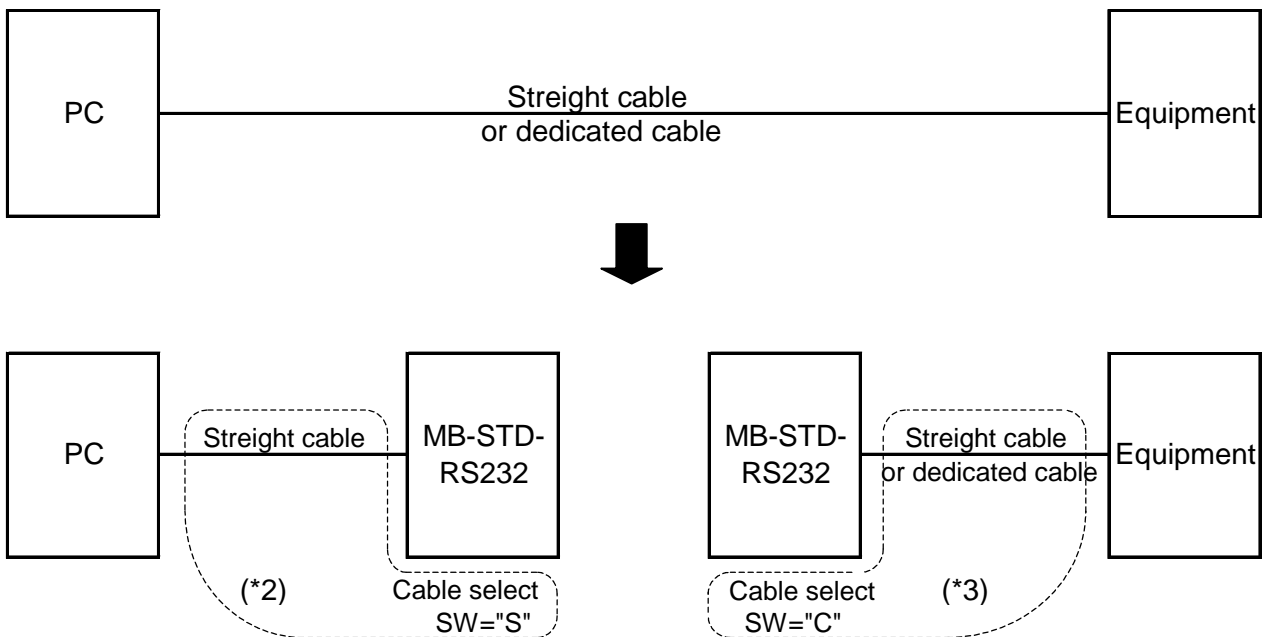
# CONNECTION EXAMPLE

PC to PC or RS232 equipments etc./ Connect with cross cable



\*1 If cable is streight cable please set the Cable select SW to “S”.

PC to RS232 equipment / Connect with streight cable or dedicated cable.



\*2 If cable is cross cable, please set the Cable select SW to “C”

**\*3 In this case, the interface of equipment is cross connection with PC or the dedicated cable is crossed cable, therefore the Cable select SW should be set to “C”.**

# OPERATION MODE

MB-STD-RS232 has two operation modes as below.

Operation Mode 1: Two-way (Semi-duplex) communication

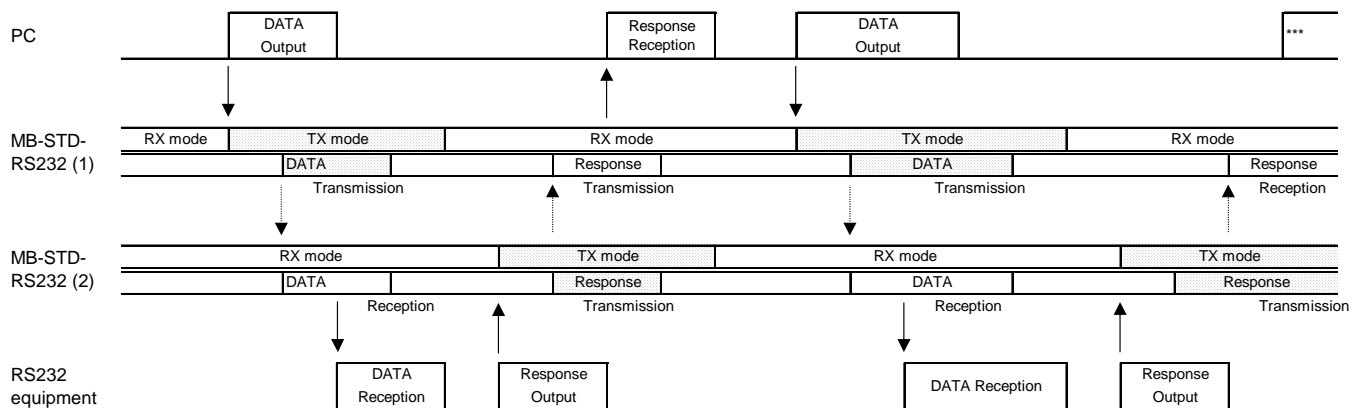
Operation Mode 2: One-way communication

## Operation Mode 1: Two-way (Semi-duplex) communication

This mode is useful for an application of two-way communication with Ack/Nck response between PC and RS232 equipment, and an application that returns the data from RS232 equipment to PC according to the command from PC. MB-STD-RS232 is in RX at wait time (stand by). When the unit receives radio data from the other unit, the unit will start outputting the data to RS232 port. When MB-STD-RS232 get the data from PC through RS232C connector, the data is stored in internal buffer and then will be sent after the MB-STD-RS232 check that the carrier frequency to be set is not used on air. The unit returns to RX when all data in buffer is gone.

1:N communication is possible by implementing the group setting. In this case, the application software have to be programmed to consider that identification number of RS232 equipment have to be included in transmission command, and only the equipment which has requested ID number returns the data when its command is received.

In this operation mode, Only Fix CH setting can be used.



## Operation Mode 2: One-way communication

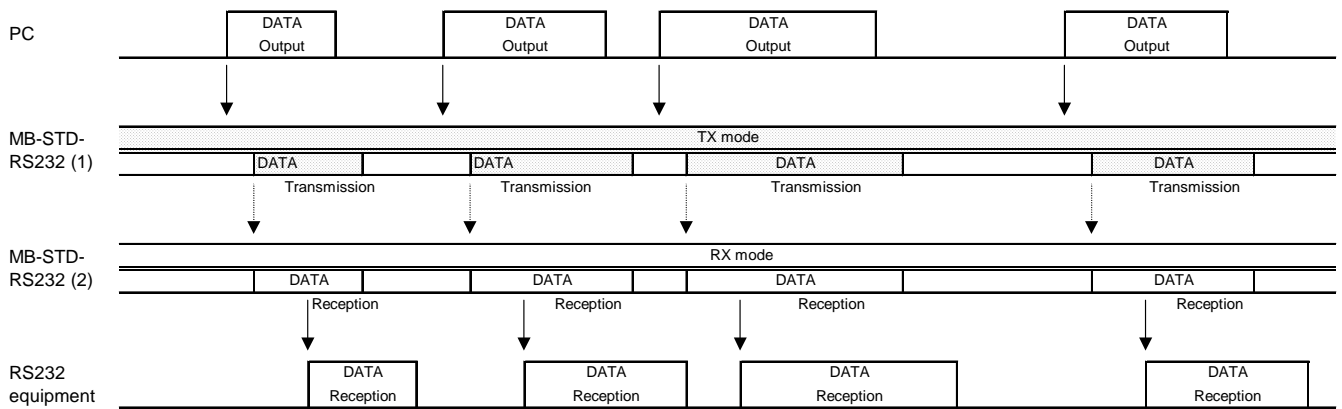
This mode is useful for an application of one-way communication from PC to measurement equipment.

TX(transmitter)/RX(receiver) setting can be done with dip switch on the MB-STD-RS232. TX unit transmit the signal at selected channel regardless that data is in buffer or not. RX unit outputs the data to RS232 port when radio signal is received. (RX unit does not transmit even data is inputted to RS232 port).

1:N communication is possible by implementing the group setting. 1 x TX unit to N x RX units communication is possible.

In this operation mode, Either Fix channel setting or Auto channel setting is used.

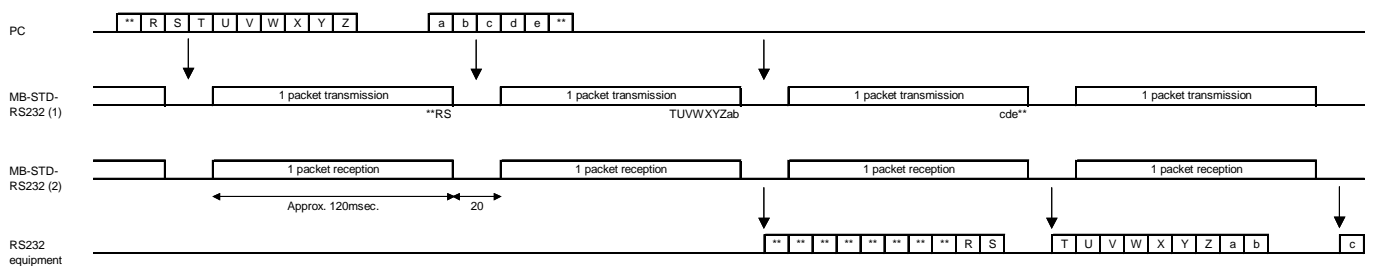
In Auto setting, TX unit perform automatic RF channel search and transmit the data in the vacant RF channel. RX unit perform channel scan to detect transmission signal and set to the RF channel.



## Restriction on data communication

The MB-STD-RS232 equips STD-402 transceiver module and performs packet communication using CPU interface mode (data length 63bit) of the transceiver.

Serial data or command stream from PC or other equipment connected to the MB-STD-RS232 is pcketed and sent to a receiver. When these data are outputted from the unit, the time space appear as shown in below. The time space (delay) is 300msec or more when operation mode 2 (one-way communication) is used.



\* Figure shows timing chart of STD-402 mode (2)

# ACK AUTO RESPONSE FUNCTION

Depending on RS232 equipment, but some equipment stop or become error and repeat transmitting same data if Ack/Nck command is not returned as response signal within several 10 msec.

This is not problem in wired communication because PC can return Ack/Nck command immediately after receiving data from RS232 equipment. Wireless communications with the MB-STD-RS232 have a few sec. time-lag for the response.

This function is given to avoid error caused by such situation. It is realized to return Ack (or specific response string) response return.

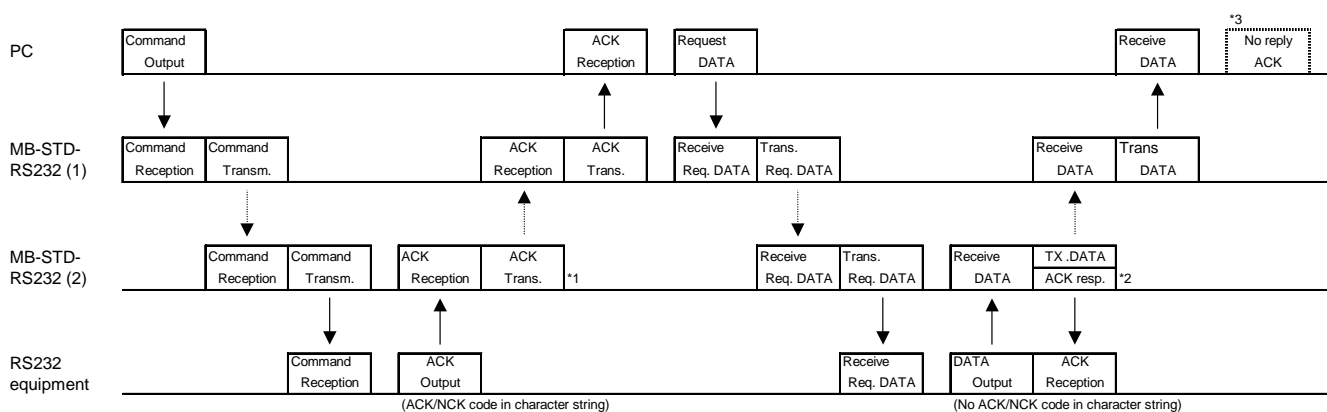
- 1) MB-STD-RS232 operates as that the data from RS232 equipment is suppose to carry delimiter symbol (Etx,Lf etc.) at end.
- 2) When Ack/Nck character is contained in output from RS232 equipment, MB-STD-RS232 judges that the Ack/Nck character is the response from PC and when it is not contained the output is recognized as data stream (i.e. measurement data) for request data command from PC. The MB-STD-RS232 sends Ack response only if this data stream (without Ack/Nck) is recognized.  
(If there is data in TX buffer, the Ack will be sent after that.)
- 3) Delimiter, Ack/Nck and character string to recognize these operation can be changed by user.

Example: Delimiter “Lf” (0AH)

Response detect code 1 “Ack” (06H)

2 “Nck” (15H)

Auto response character string “Ack Cr Lf” (06 0D 0AH) Max. 16 characters.



\*1 This is for reply to command from PC. The MB-STD-RS232 does not need to reply with ACK to RS232 equipment

\*2 There is no ACK/NCK code in character string. The MB-STD-RS232 reply ACK to RS232 using ACK auto response function

\*3 The MB-STD-RS232 (2) has returned ACK to RS232 equipment. Therefore PC does not need to reply ACK to RS232 equipment.

# GROUP SETTING

The MB-STD-RS232 has stored unique module identification number in the radio module. When one unit is set up for master and other unit(s) is for slave, slave modem unit operate with same ID as master unit.

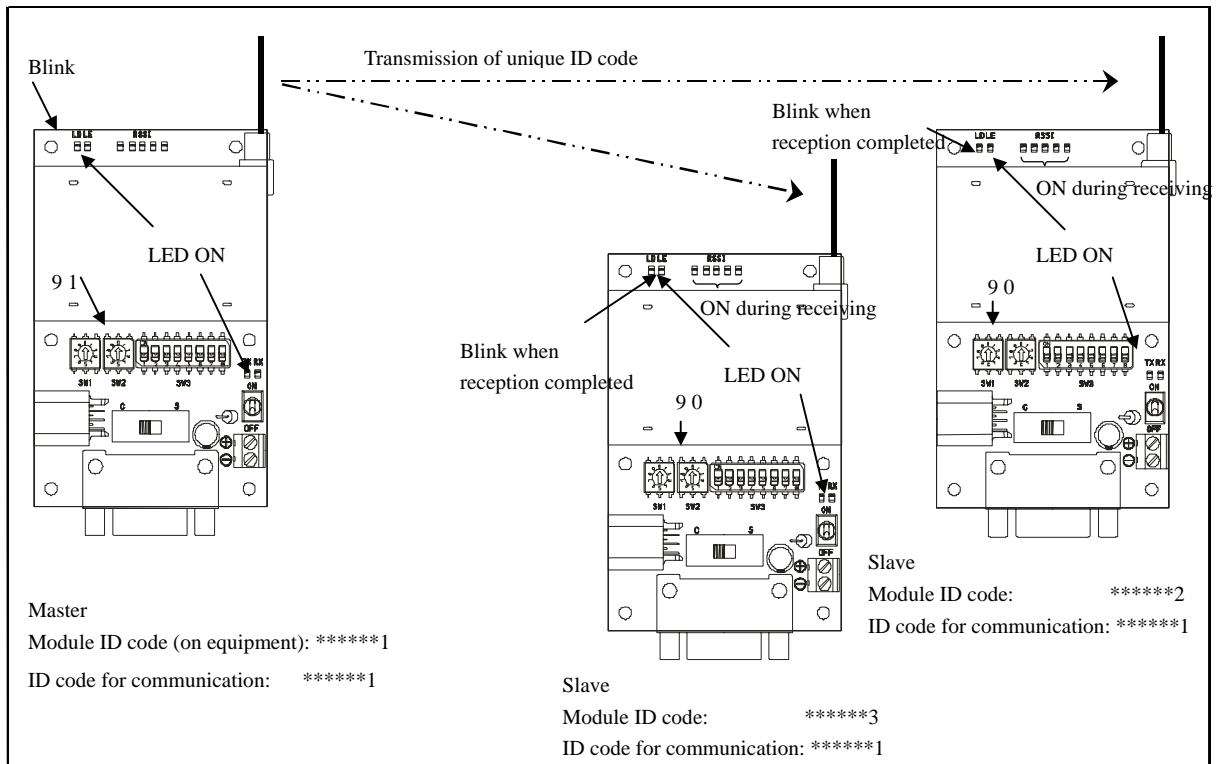
If this setting (group setting) have not finished, radio communication between the MB-STD-RS232 is not possible even with same frequency.

## Setting procedure

1. Select unit to be master and set SW1 to “9” and SW2 to “1”. Select unit(s) to be slave and set SW1 to “9” and SW2 to “0”. Power on the units.
2. When power of the master unit is turned on, TX, RX and LE LED turn ON and LD LED blinks. Radio transmission start and continue for about 10sec.
3. When power of slave unit(s) is turned on, TX,RX LED turn ON and RSSI turn on when signal from master is received. LD blink when group setting is completed.

After slave unit receives unique module identification code stored in master units, radio communication can be performed with this code.

Note: This setting is to set identification code for radio communication. Original unique module identification code of slave unit itself remains unchanged. When the unit that was used for slave is set to master and perform communication, identification number is different from former communication. Therefore interference does not occur.





# ACK AUTO RESPONSE SETTING

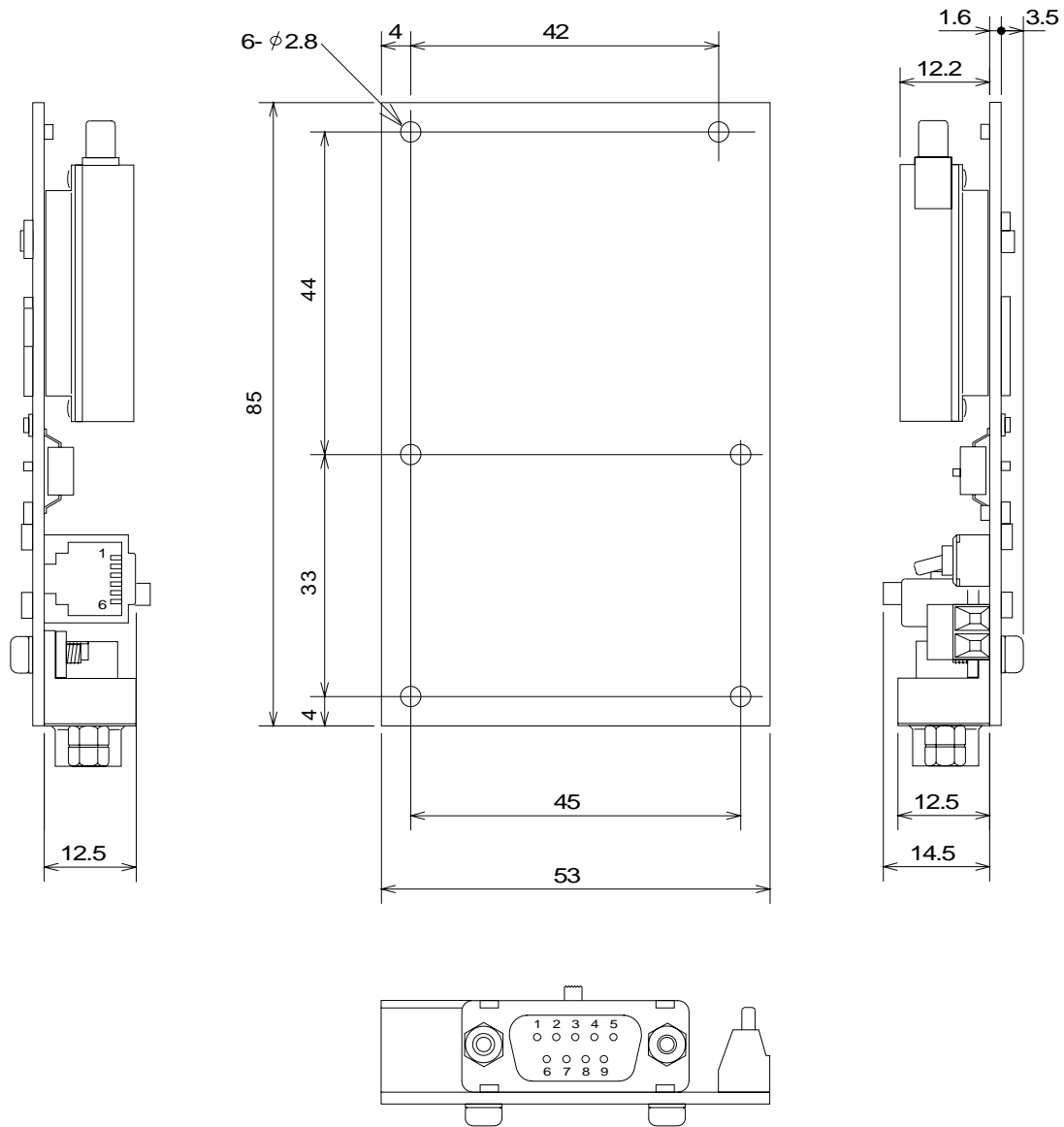
Delimiter, Ack/Nck code and auto response character string (max. 16 characters) for recognition of Ack auto response can be changed from RS232 port using software like Windows Hyper Terminal.

## Procedure

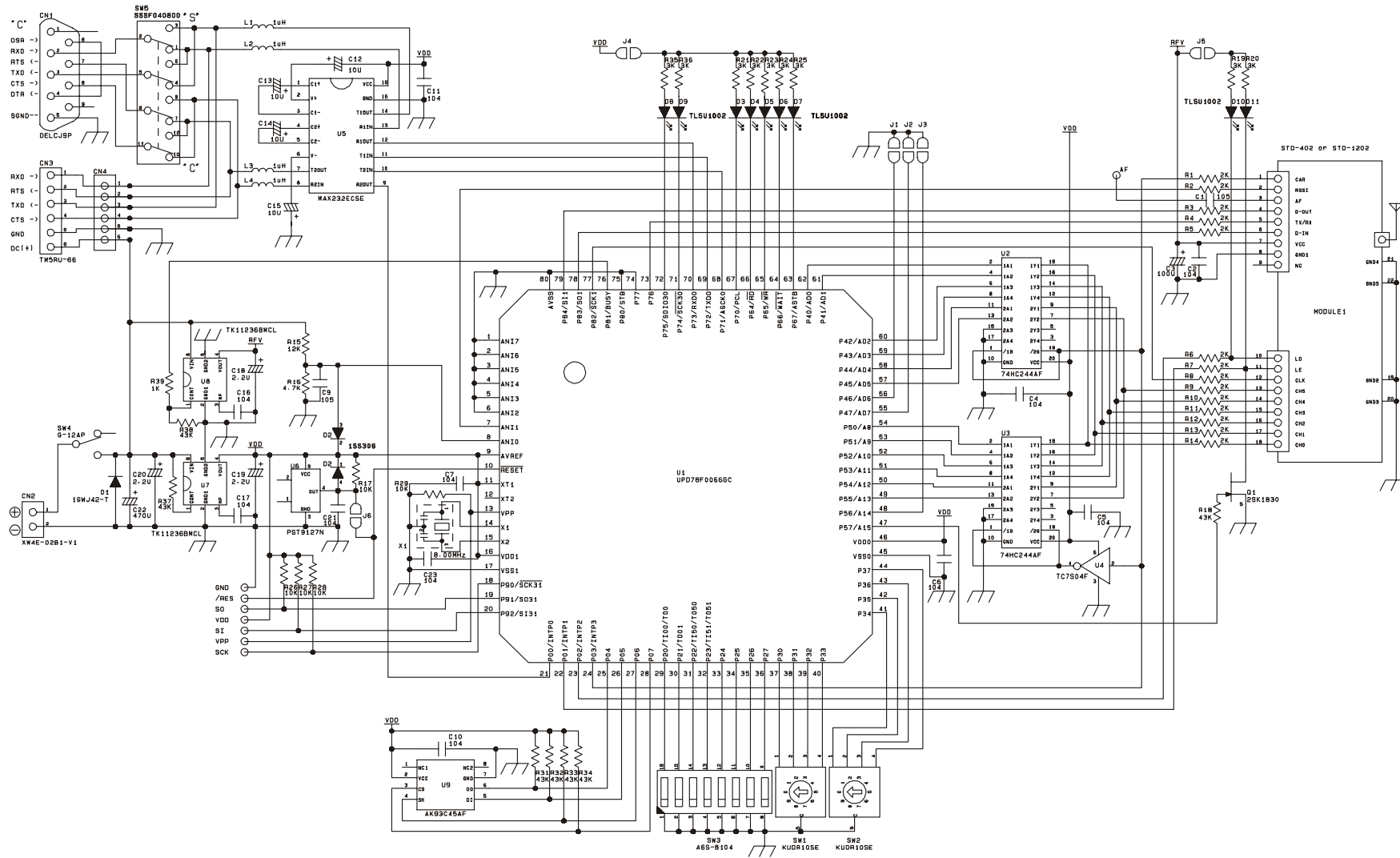
1. Connect MB-STD-RS232 and PC with RS232 cable. Set SW1 and SW2 on the MB-STD-RS232 to “9”, “9”, then power ON
2. Start up the Hyper Terminal and set communication condition as below.  
4800bps, Bit = 7, Parity = Odd, Stop Bit = 1, Flow control = Hard ware
3. At first, type “/A CrLf” and return. Check if the MB-STD-RS232 modem return the product name and program ver.
4. Sets up with reference to the following table.

Command	Transmission format	Correct Response data (example)	Description
“/A”	“/A CrLf”	“/A MB-STD-RS232, 001.000 CrLf”	Product name, Program Ver.
“/I”	“/I 06, 0D, 0A CrLf”	“OK CrLf”	Set and check of ACK response character string (HEX) Max. 12 character (prohibit to include ASCII code “00”)
	“/I CrLf”	“/I 06, 0D, 0A CrLf”	
“/K”	“/K 06 CrLf”	“OK CrLf”	Set and check of ACK response detect code 1 (HEX). Example: 06H=Ack
	“/K CrLf”	“/K 06 CrLf”	
“/L”	“/L 15 CrLf”	“/L OK CrLf”	Set and check of ACK response detect code 2 (HEX). Example: 15H = Nck
	“/L CrLf”	“/L 15 CrLf”	
“/M”	“/M 0A CrLf”	“OK CrLf”	Set and check of delimiter (HEX) Example: 0AH = Lf
	“/M CrLf”	“/M 0A CrLf”	

# DIMENSION



# CIRCUIT DIAGRAM





## Important notice

### Caution

- As the radio module communicates with electronic radio waves, there are cases where transmission will be temporarily cut off in accordance with the surrounding environment and method of usage. The manufacturer is exempt from all responsibility relating to damage to personnel or other equipment and other secondary damage.
- Do not use the equipment within the vicinity of devices that may malfunction as a result of electronic radio waves from the radio module.
- The manufacturer is exempt from all responsibility relating to secondary damage for the operation, performance and reliability of equipment connected to the radio module.
- Communication performance will be affected by the surrounding environment, so communication tests should be carried out before actual use.
- Ensure that the power supply for the radio module is within the specified rating. Short circuits and reverse connections may result in overheating and damage and must be avoided at all costs.
- Ensure that the power supply has been switched off before attempting any wiring work.
- The case is connected to the GND terminal of internal circuit, so do not contact the '+' side of the power supply terminal to the case.
- When batteries are used as the power source, avoid short circuits, recharging, dismantling, and pressure. Failure to observe this may result in the outbreak of fire, overheating and damage to the equipment. Remove the batteries when the equipment is not to be used for a long period of time. Failure to observe this may result in battery leaks damaging the equipment.
- Do not use this equipment in vehicles with the windows closed, in locations where it is subject to direct sunlight, or in locations with extremely high humidity.
- The radio module is neither waterproof nor splash proof. Ensure that it is not splashed with soot or water. Do not use the equipment which water or other foreign objects enter the case.
- Do not drop the radio module or otherwise subject it to strong shocks.
- Do not subject the equipment to condensation (including moving it from cold locations to locations with a dramatic increase in temperature.)
- Do not use the equipment in locations where it is likely to be affected by acid, alkalis, organic agents or corrosive gas.
- Do not bend or break the antenna. Metallic objects placed in the vicinity of the antenna will have a great effect on communication performance. As far as possible, ensure that the equipment is placed well away from metallic objects.
- The GND for the radio module will also affect communication performance. If possible, ensure that the case GND and the circuit GND are connected to a large GND pattern.

### Warning

- Do not take a part or modify the equipment.
- Do not remove the product label (the label adhering to the upper surface of the module.) The use of modules from which the label has been removed is prohibited.