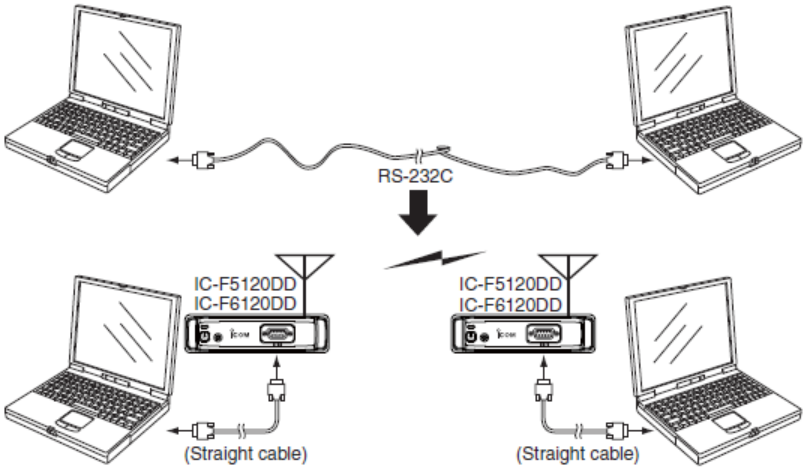
1. General Description

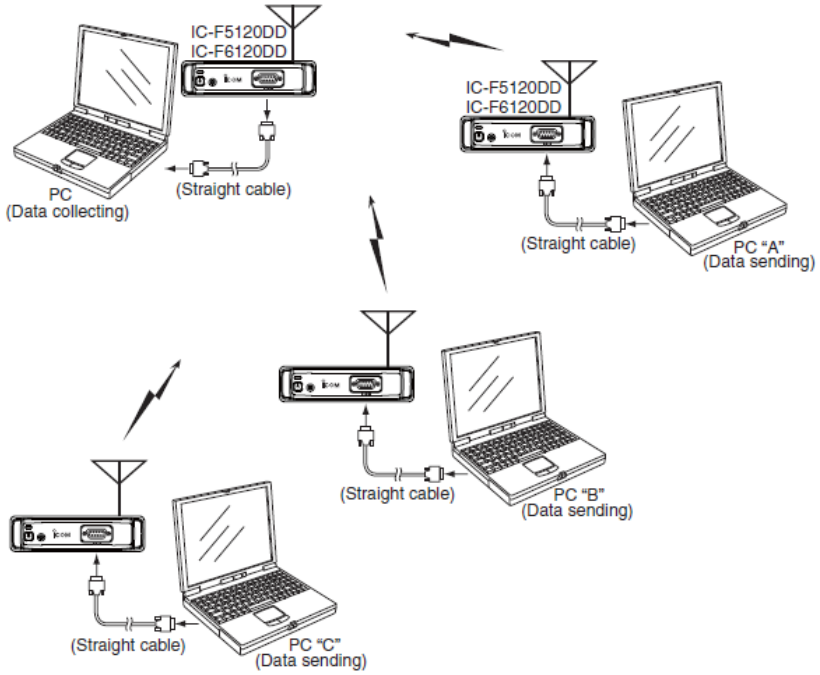
The IC-F5120DD/F6120DD is a digital format (non NXDN) transceiver designed to receive and transmit information from data software or hardware sensors. The data from the data sources is sent to the transceiver through an RS-232C cable and then sent by RF to an identical transceiver that is programmed to receive the data and deliver it to a PC software application.

The IC-F5120DD/F6120DD is a general purpose data transceiver, that transmits the input serial data in the original Control Air Interface (CAI) digital format. Because the CAI digital format is designed for only this transceiver, both the transmitting and the receiving transceivers must be Icom IC-5120DD/F6120DD series transceivers programmed to communicate with each other. That is why a highly reliable wireless link can be created.

A pair of IC-F5120DD/F6120DD allows you to replace the complex physical connection between 2 devices with a wireless connection. An extended range can be obtained.

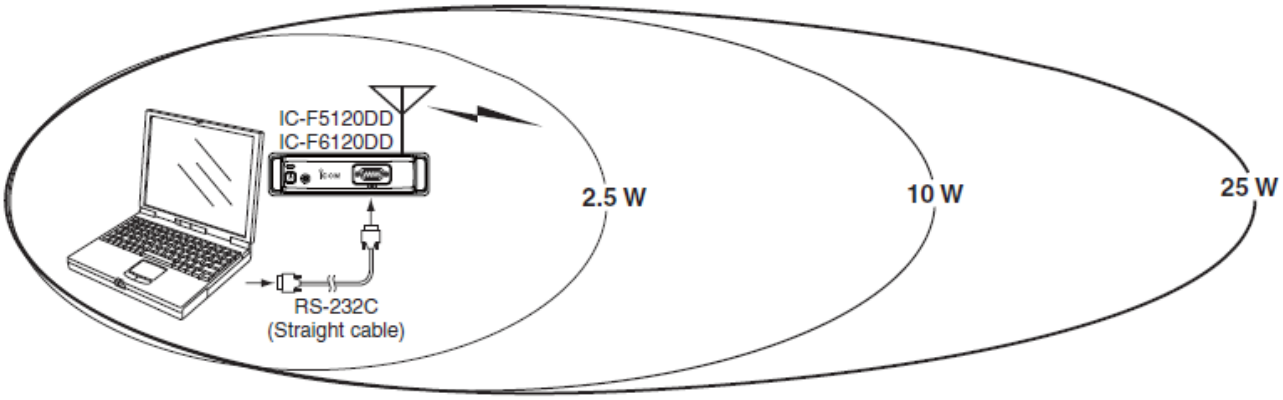


One IC-F5120DD/F6120DD can collect the data from 2 or more IC-F5120DD/F6120DDs.

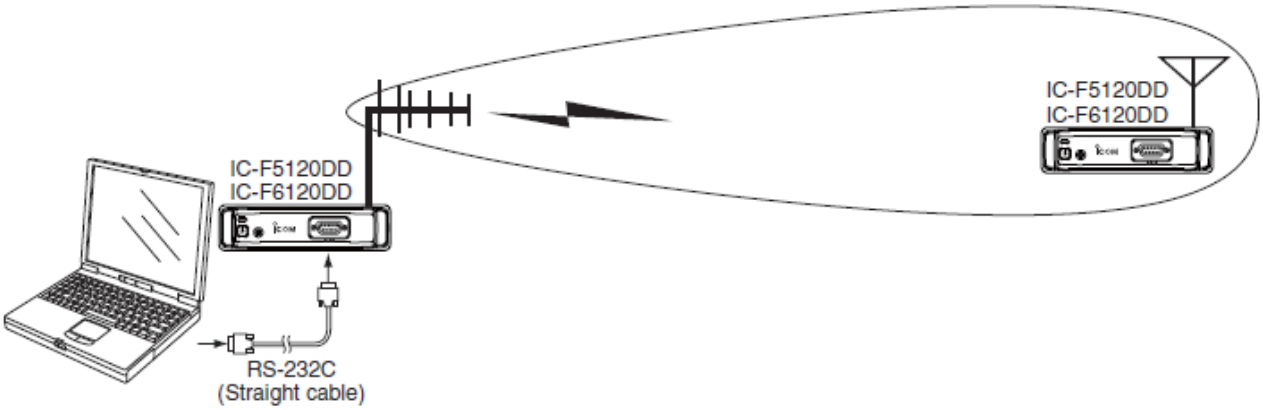


Note: In this example, all transceivers are set to “All Call” or same group ID.

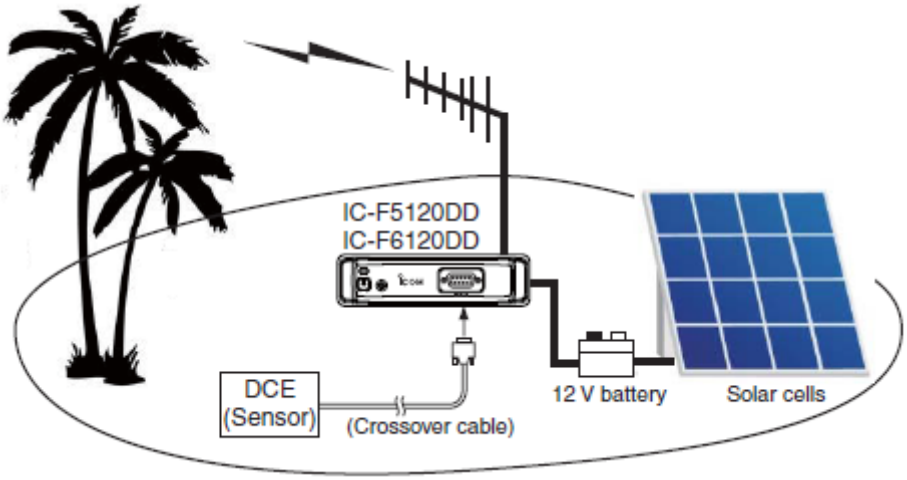
A reliable RF link can be created with a maximum transmit power of 25 W.



The range can be extended using a Yagi antenna.



In an isolated remote place, you can use the solar panels and high capacity of batteries as the power supply.



*The IC-F5120DD/F6120DD series has no voice communication capability.

*The sensors and/or software used in the data collecting are non-Icom products, and are usually designed for a relatively specific application.

2. Features.

- Supports Data Rates of 9600 bps at 12.5 kHz channel spacing, and 4800 bps at 6.25 kHz channel spacing.
- Supports Data Encryption
- Transmit power options of 2.5 (USA version)/5.5 W (Europe version), 10 and 25 Watts.
- Can be powered by a 12 V battery or power source

3. Application

General

- Wire elimination
- Remote monitoring
- Remote sensing
- Remote control
- Text message exchange
- Periodic data transfer
- Long-range RFID

Telemetry applications:

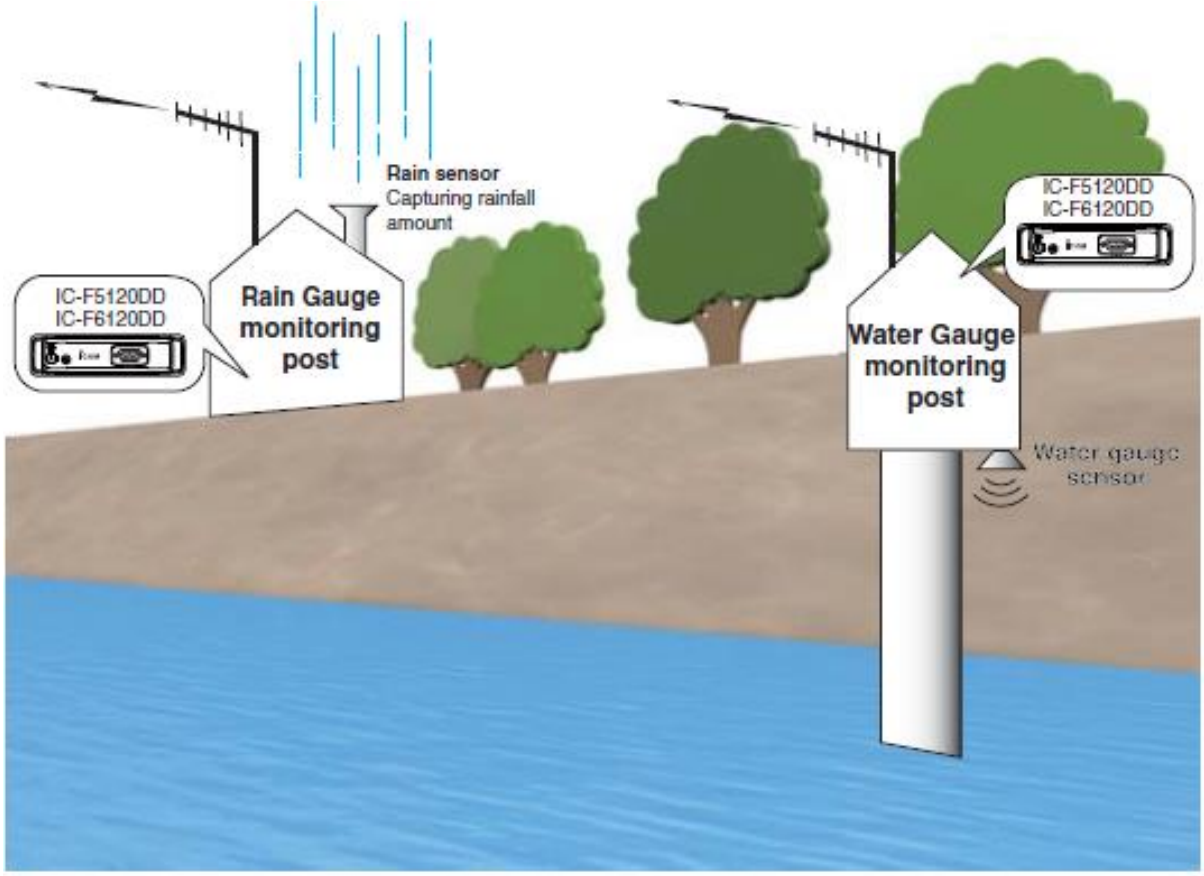
- Temperature
- Humidity
- Position report
- Status report
- Rain gauge
- Water gauge
- Others

Telecontrol applications:

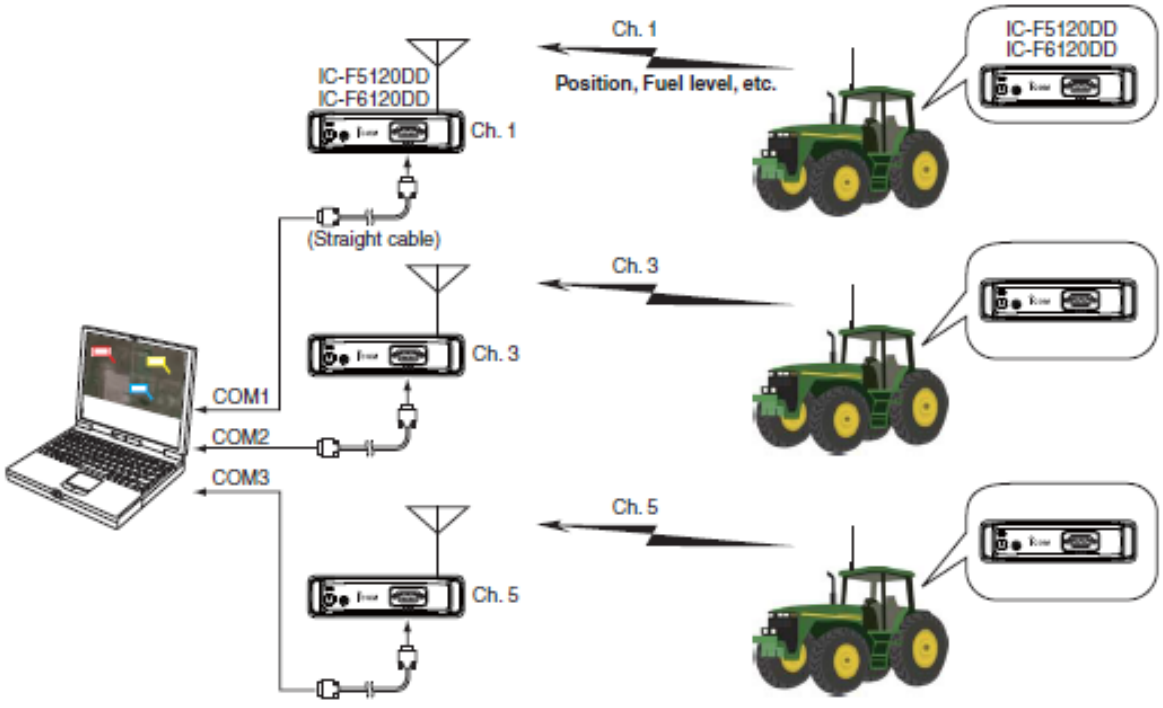
- Call Systems
- Temporally Traffic signs
- Gate openers
- Unmanned vehicles
- Industrial automation

Field to be used:

Agriculture, Weather, Scientifi c, Industrial, Construction, Disaster prevention, Security, Defence, and so on.



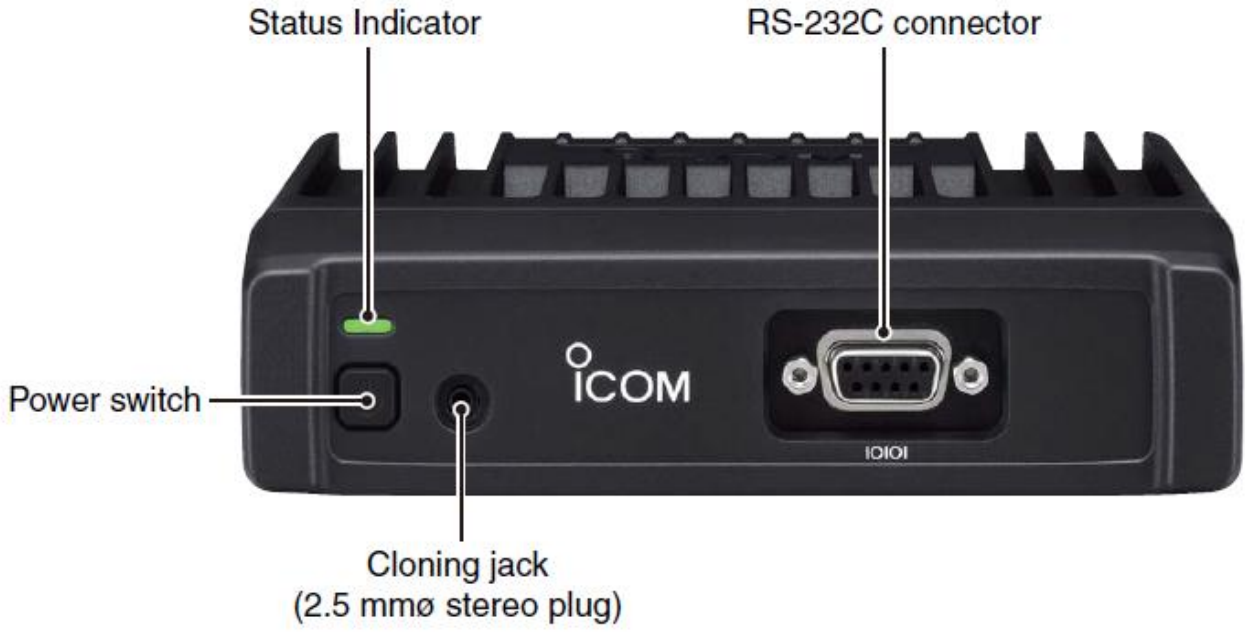
<For disaster prevention>



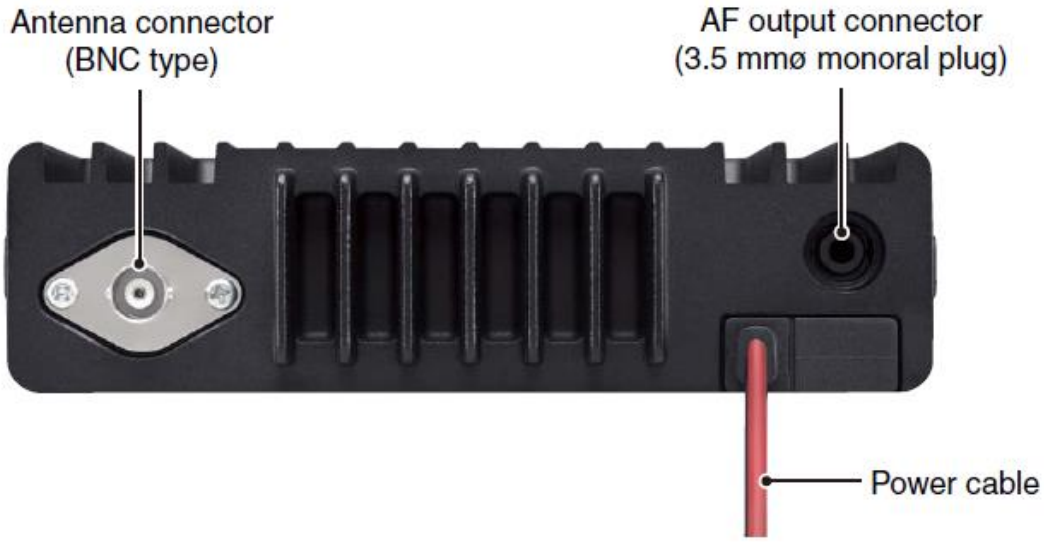
<During harvest>

4. Panel Description

- **Front view**



- **Rear view**



Status indicator

The Status Indicator indicates various transceiver statuses.

Color	Status	Description
Green	Lit	Power ON and standing by
	Blinking	Receiving data
Red	Lit	Transmitting data
Orange	Blinking	A problem occurred. The cause may differ, depending on the blinking pattern. See the diagram below for details about the blinking patterns and causes.

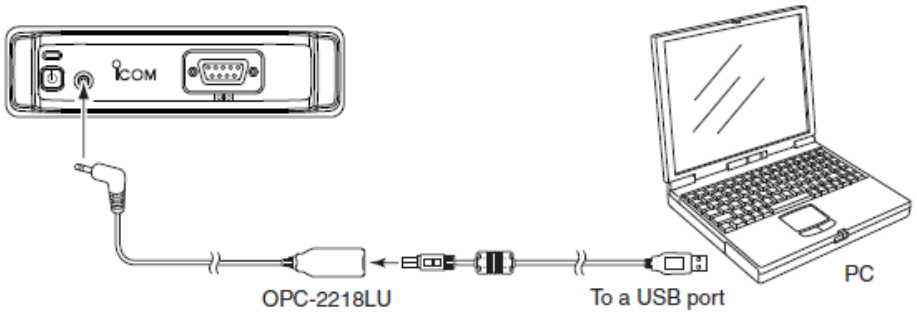
Power switch

- Hold down for 1 second to turn ON the transceiver in the Normal mode.
- Hold down for 5 seconds to turn ON the transceiver in the Cloning mode.

Cloning Jack

The cloning jack is connected to the serial port of the FRONT CPU, through a logic level converter. Connecting the optional OPC-2218LU allows you to clone or configure the transceiver using a PC.

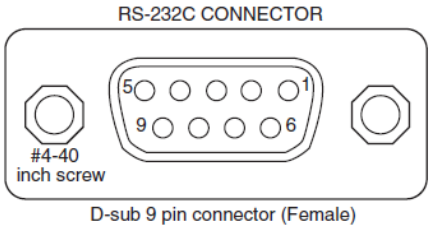
- **Connection**



RS-232C connector (Female)

Supports RS-232C serial communication. An RS-232C cable is used to connect to an external serial communication device (DCE: Data Circuit-terminating Equipment).

- **Pin assignment**



Pin No.	Line Name	I/O
1	(No connection)	–
2	RxD	OUT
3	TxD	IN
4	DTR	IN
5	GND	–
6	(No connection)	–
7	RTS	IN
8	CTS	OUT
9	(No connection)	–

Antenna Connector

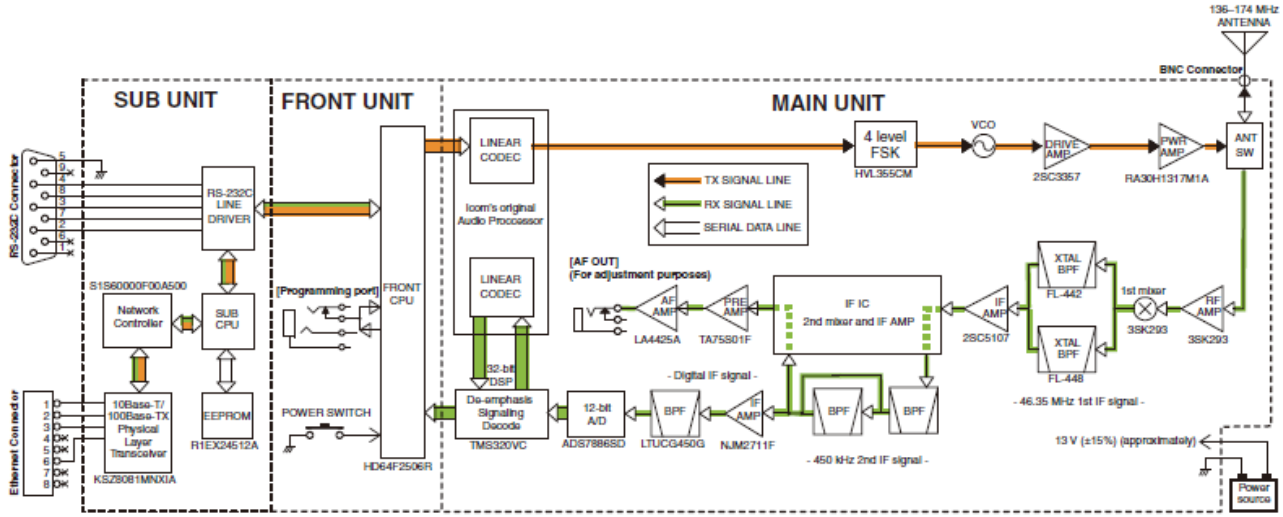
Connect the antenna coaxial cable of a VHF antenna (For the IC-5120DD) or UHF antenna (For the IC-F6120DD) using a BNC type connector. Ask your dealer for advice on the selecting a suitable of antenna.

AF output jack

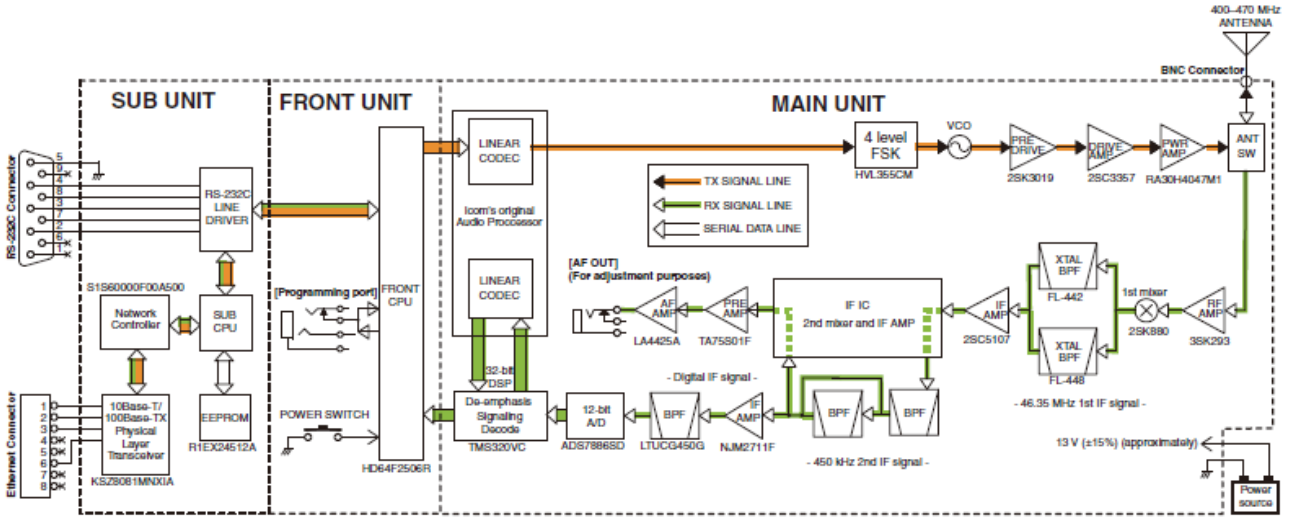
Raw demodulated audio signals are output from this connector.
You can measure and check the receive sensitivity using an SSG and SINAD meter without a BER counter.

5. Circuit

- **Functional block diagrams (IC-F5120DD: VHF version)**



- **Functional block diagrams (IC-F6120DD: UHF version)**



Data Control

The RS-232C connector is connected to the FRONT CPU through the RS-232C line driver on the SUB UNIT. The FRONT CPU transfers the input data to the DSP in the MAIN UNIT.
The received data from the DSP is output through the RS-232C connector.

Packet Transmission

The TX data is applied to the CPU in the FRONT UNIT, through the data bus line. The data is applied to the DSP which adds the error check sum frame to the input data. The DSP also encrypts the packet, according to a preset.
The DSP also adds the communication control header frame and sync control frame to the packet.

Modulation Circuit

The TX packet from the DSP is converted into the baseband signal, applied to the linear CODEC module in the AF CUSTOM IC, and then converted into an analog signal. The converted analog signal level is adjusted by the volume control, and then applied to both the VCO and PLL reference frequency oscillator for the 4 level FSK modulation.

RS-232C Line Driver

The line driver converts the RS-232C logic level to the 3.3 V CMOS level.

Data Port Controller

The RS-232C data line is connected to the SUB CPU. The SUB CPU switches the data line according to the preset. The SUB CPU and FRONT CPU are connected to the serial communication line.
The received data is transferred to the FRONT CPU, and then output through the RS-232C connector.

Ethernet Communication Controller (Depending on the version)

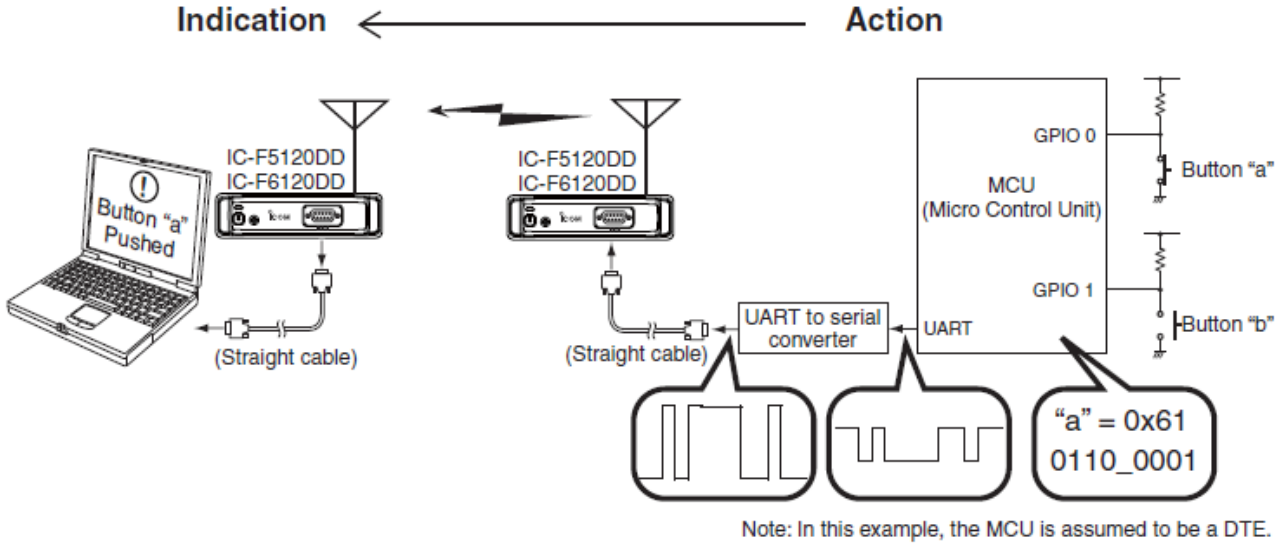
The TCP/IP network control IC supports 10 Base-T and 100 Base-TX. The physical layer interface PHY chip supports MII.
The Ethernet interface is connected to the Ethernet connector through the pulse transfer and common mode noise choke coil.

6. Application development tips

You can develop hardware applications where the data sending period or timing can be specified with a simple Micro Control Unit (MCU), that has General Purpose Input/Output (GPIO) ports.
If you use a DCE (Data Circuit-terminating Equipment), you can control it by an MCU with a switching relay. The IC-F5120DD/F6120DD's potential is up to your hardware and software design.

Receives the button input detection data:

When a button is pushed (Action), the PC screen displays which button is pushed (Indication).



Note: In this example, the MCU is assumed to be a DTE.

MCU Software Code

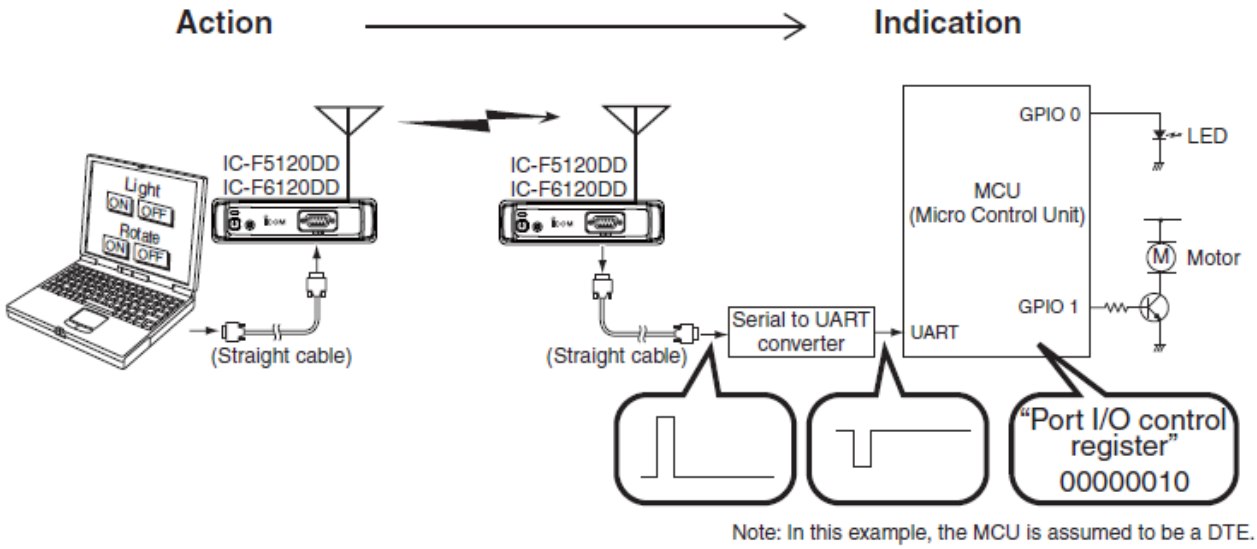
Use 2 GPIO ports as the input.
When one of them is connected to the ground (button is pushed), a 1byte bit stream is output from the UART port, that represents the button that was pushed.
The button on the GPIO 0 port is named "a," so the character "a" is sent from the UART port.

Hardware

A UART-Serial converter IC is used to convert the logic level to the RS-232 level.

Remotely controls the circuit:

The user can remotely control the LED and motor.



Note: In this example, the MCU is assumed to be a DTE.

MCU Software Code

Use 2 GPIO ports as the input.

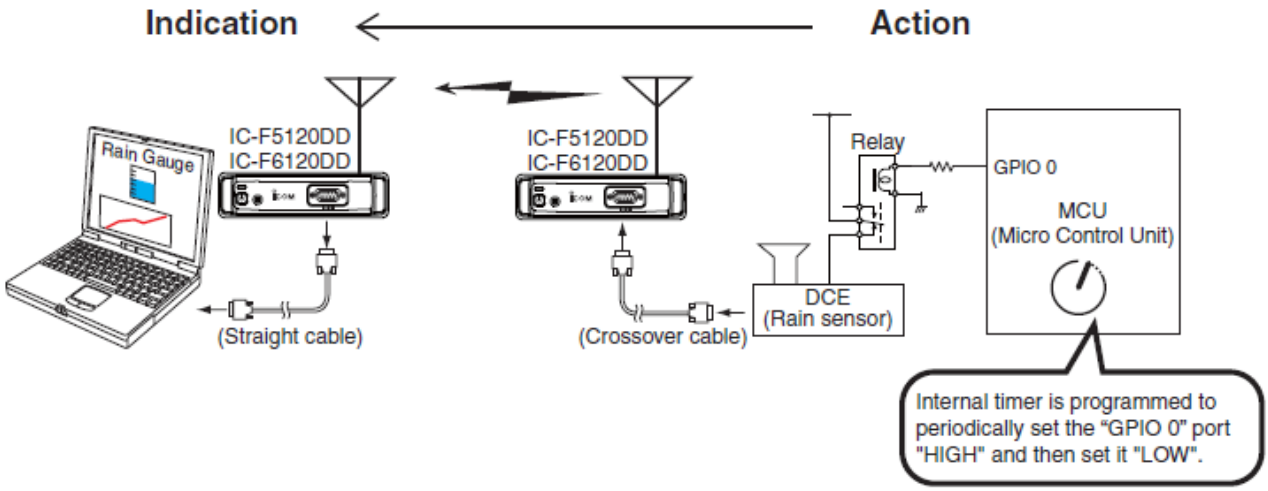
When the data (1 byte), that identifies/represents the port to control, is received, the specified port is turned "High" to light the LED or rotate the motor.

Hardware

A UART-Serial converter IC is used to convert the logic level to UART level.

Periodically receive data from the remotely located DCE (sensor):

The sensor is controlled by the MCU to send data every minute.



MCU Software Code

Use 1 GPIO ports as the input.

Code the internal timer interval to 1 minute.

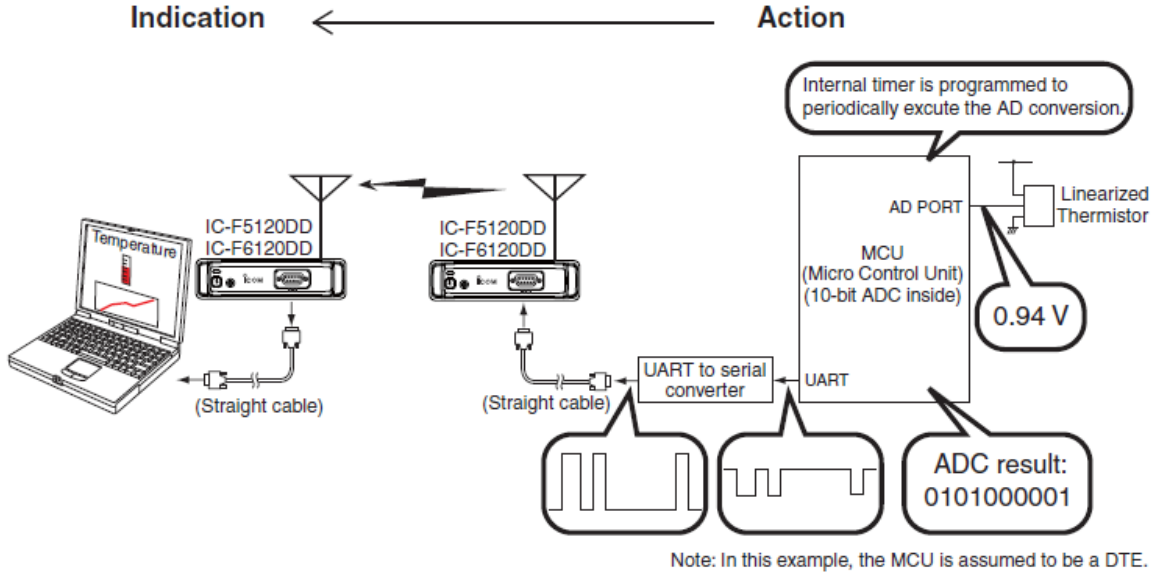
Every 1 minute, GPIO port 0 becomes "High" to turn ON the switching relay. Then the DCE (sensor) is activated and sends the sensor's data.

Hardware

A switching relay, that is used to supply power to the DCE.

Periodically receive temperature data:

Temperature data is sent every 1 minute, and it is displayed on the PC screen



Note: In this example, the MCU is assumed to be a DTE.

MCU Software Code

Use one A/D port (10-bit ADC).

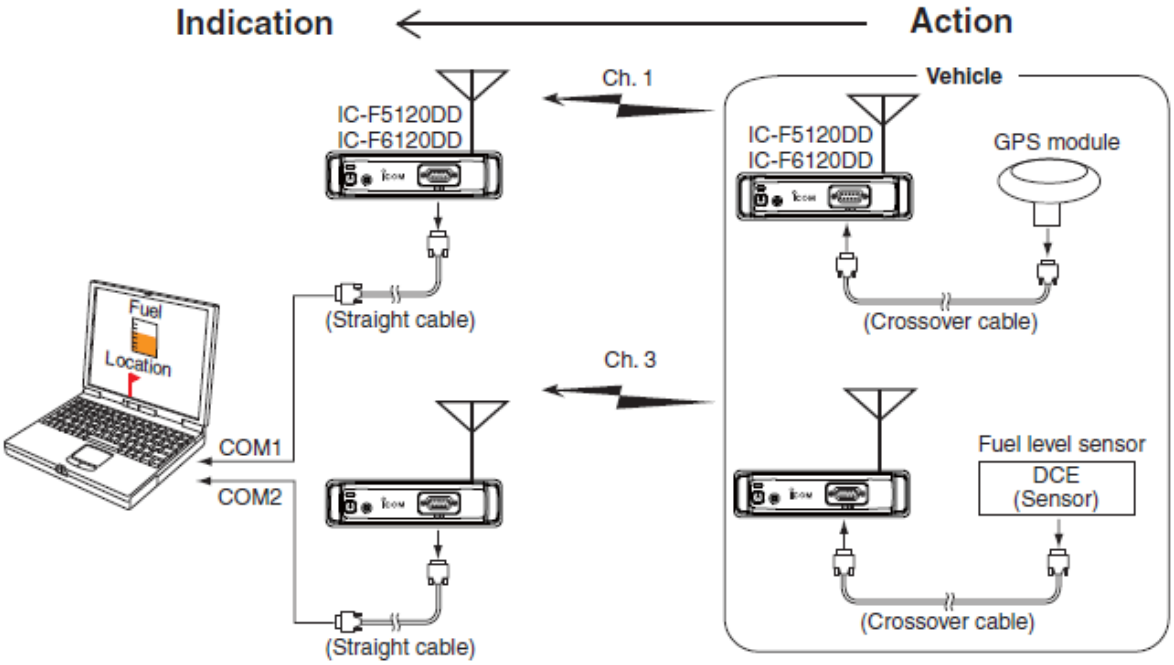
The internal timer is programmed to periodically reads the AD port, and stores the ADC result in a register. The MCU outputs a 2 bytes bit stream from the UART port that represents the sensing voltage.

Hardware

A linearized temperature sensor.

Frequently receives the positions and remaining fuel data from the vehicle:

Use one IC-F5120DD/F6120DD for report the position, and another for monitoring the fuel level.



Hardware

A GPS module is used to obtain the NMEA position data. A fuel level sensor is used to monitor the remaining fuel level.