Ver 1.2(2024/12/16 Hayashi)

1. GSE-COM-OBC test

We conducted a communication test between the OBC and the communication system. Commands were sent from the S-band Ground Support Equipment (GSE) to the OBC via the S-band receiver, and the test verified whether the OBC could send a response back to the GSE through the transmitter.

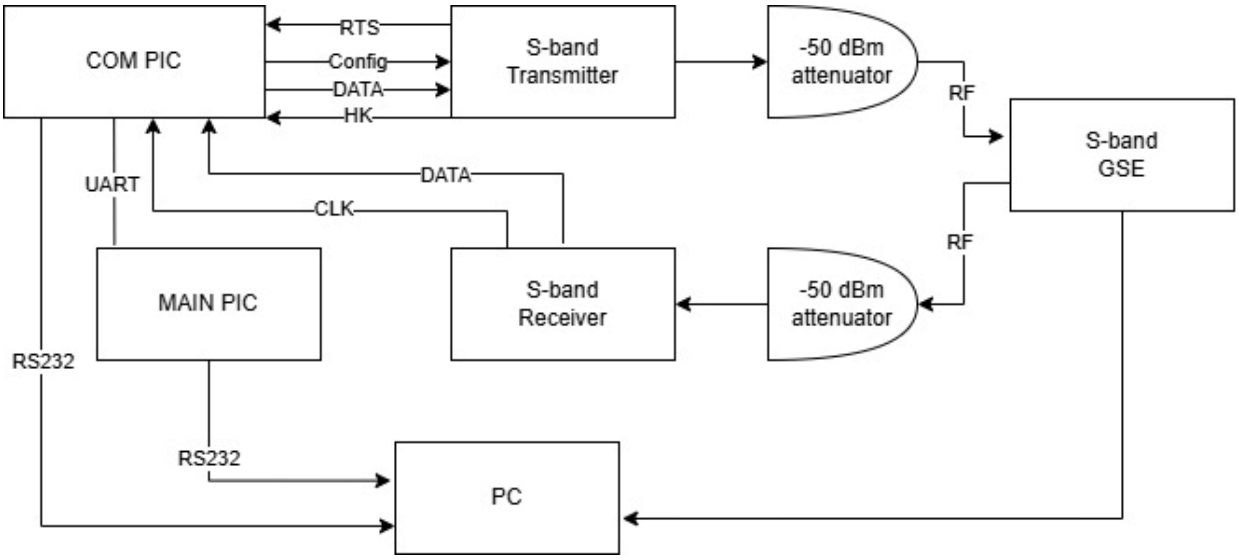

Fig 1-1 Block diagram

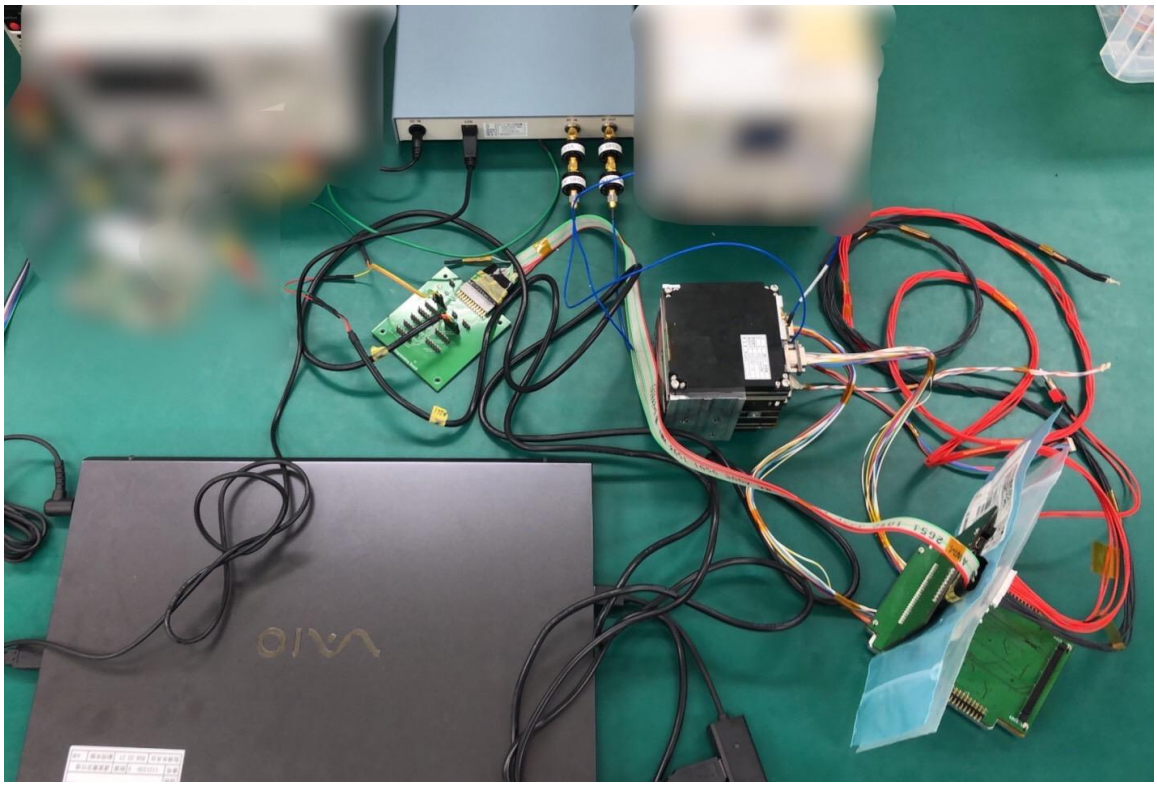

Fig 1-2 A photo capturing the entire setup

1.1. OBC-PC

We connected the ADB, OBC, and EPS boards to the backplane and programming Boards.

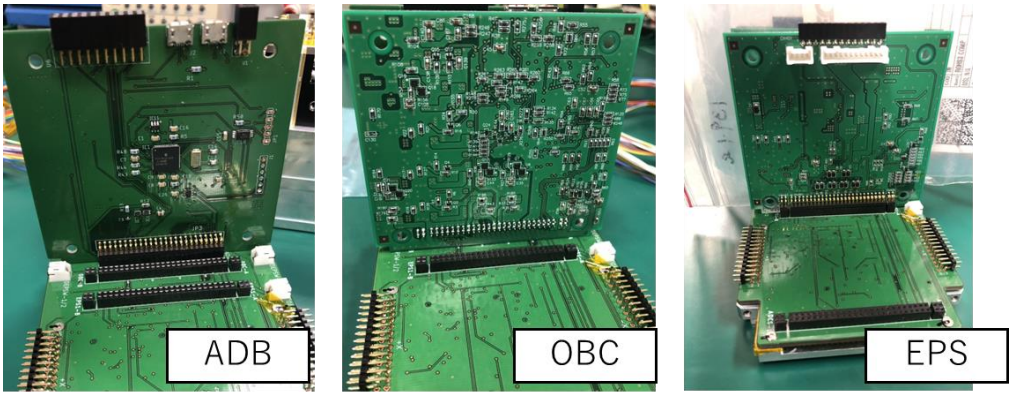

Fig 1-3 ADB, OBC, EPS and Backplane

We place a bag or similar material between the electronic boards to prevent them from coming into contact.

We connected PGC and GND among the COM ports of the PICkit Programming Port on the programming Board to the PC and monitored the COM PIC

Additionally, we connected the MAINPIC_DEBUG of the programming Board to the PC to monitor the MAIN PIC.

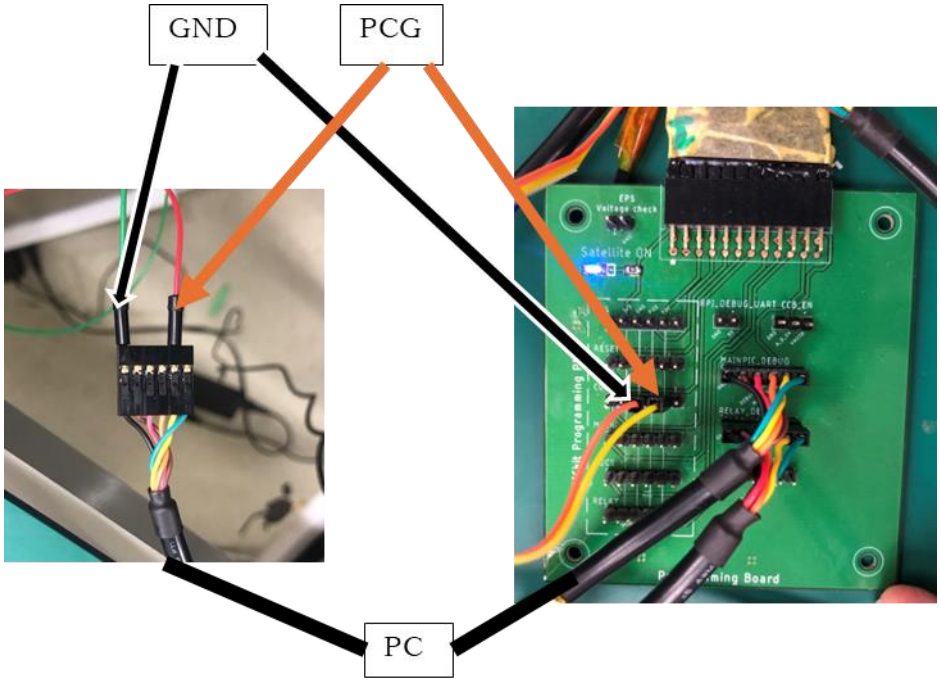

Fig 1-4 Programming Board-PC

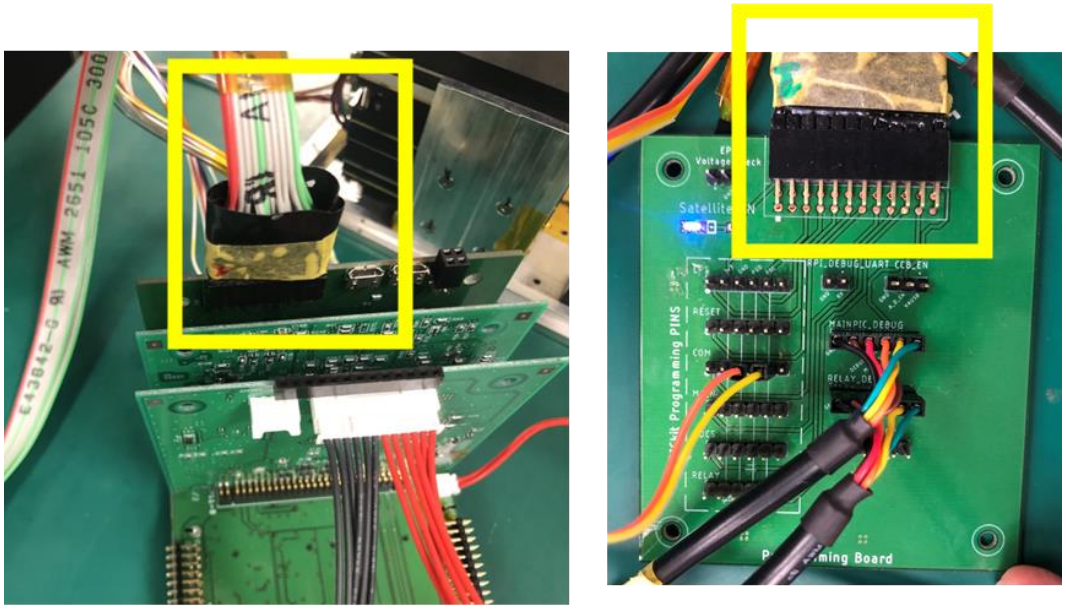

Fig 1-5 Programming Board - Backplane

We confirmed that the programming Board and BPB are connected by performing a continuity check on the GND.

1.2. Power supply

We connected the EPS to a stabilized power supply and attached the switch, to the backplane. The stabilized power supply was set to operate at low voltage with 7.2V and 1.5A.

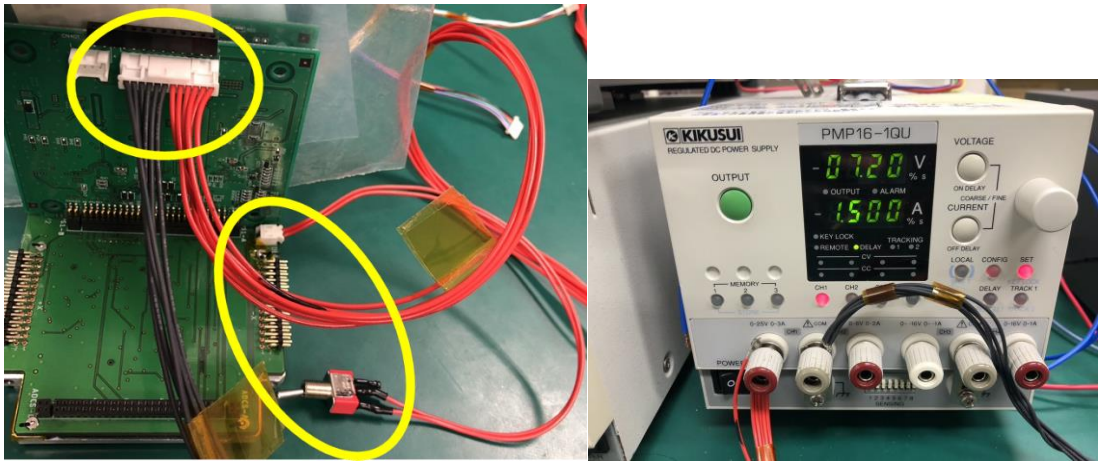

Fig 1-6 EPS Board - Power supply

1.3. GSE, S band Transmitter and Receiver

We connected the backplane to the S-band transmitter (TX) and the S-band receiver (RX) using D-sub cables. For the RX, we used a D-sub cable with pin 11 disconnected.

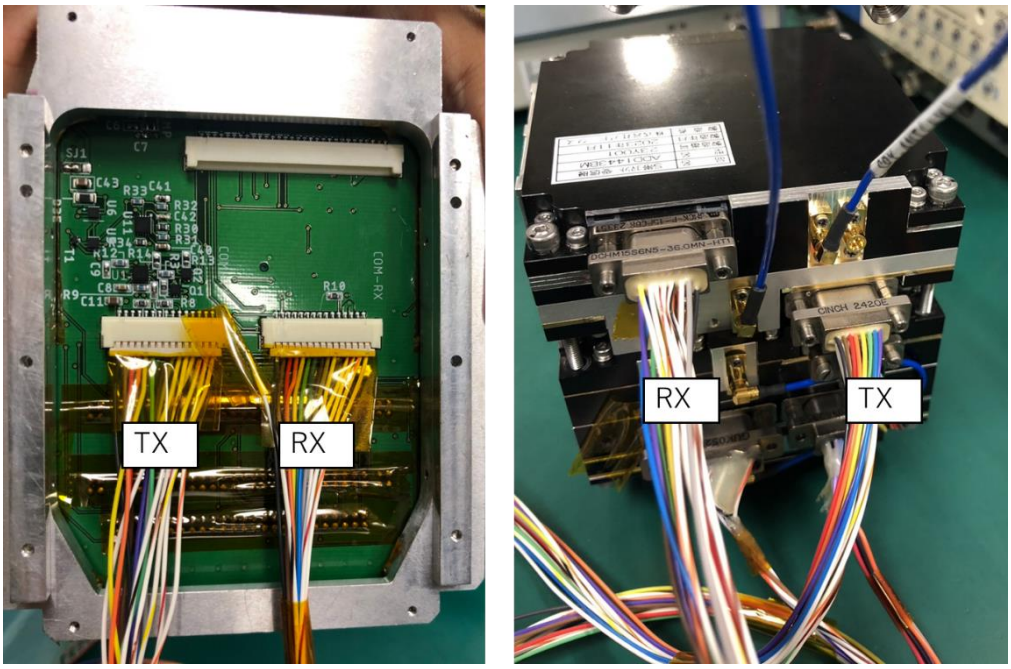

Fig 1-7 Backplane – Transmitter and Receiver

We connected the S-Band Ground Support Equipment (GSE) to the transmitter and receiver. The transmitter (upper TX) was connected to the RF IN of the GSE, and the receiver (lower RX) was connected to the RF OUT. 50 dBm attenuators were used to protect the GSE from damage. To prevent communication noise, a torque wrench was used to tighten the bolts.

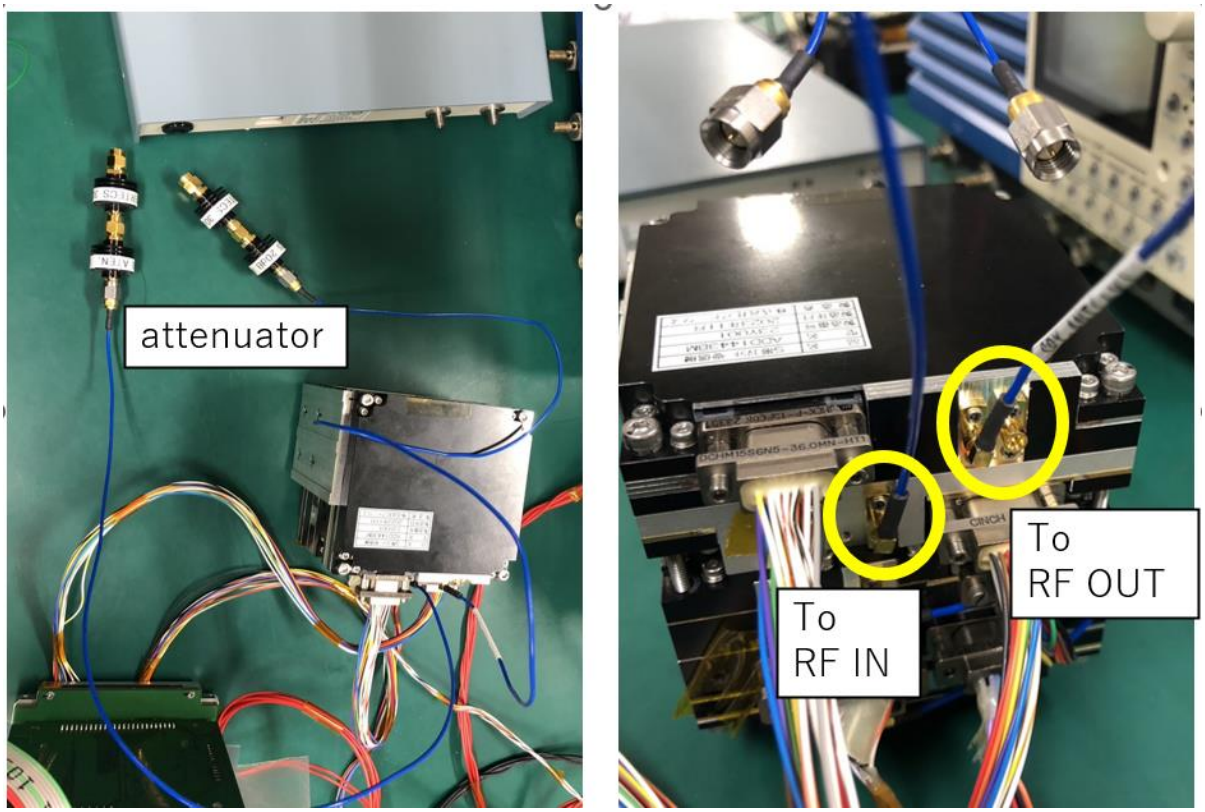

Fig 1-8 Attenuator connected to the transmitter and receiver

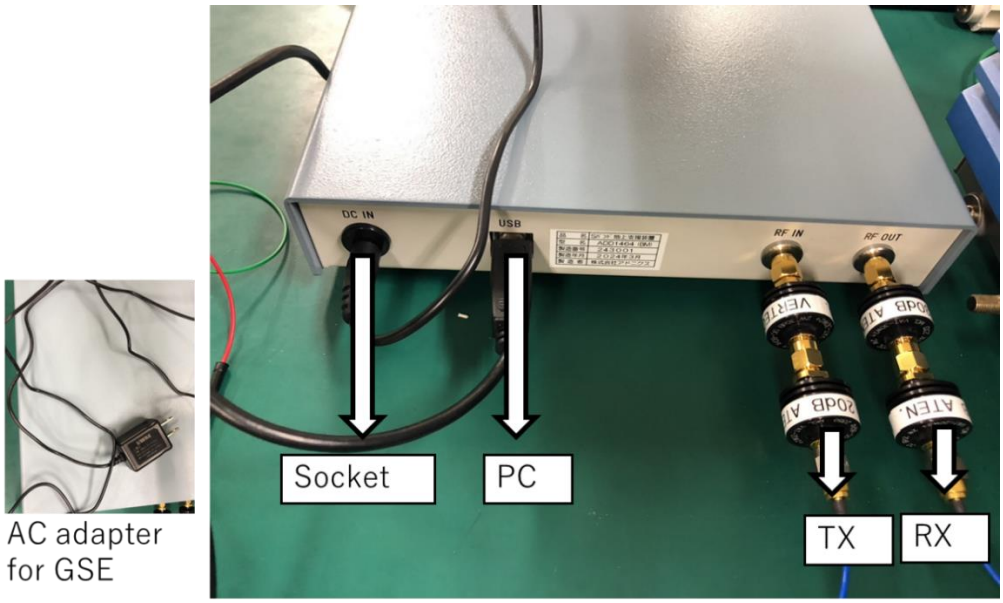

Fig 1-9 Interface of the GSE

1.4. Software

We used Kyuterm to monitor the COM PIC, MAIN PIC, and GSE. The serial ports and baud rates used are as follows:

Target	Serial port number	Baud rate
Com pic	COM4	57600 bps
Main pic	COM3	57600 bps
GSE	COM port number corresponding to Serial B *1	115200 bps

*1 Please check the USB Serial Port Properties from Device Manager. In the "Location" field, you will see "on USB Serial Converter A-D." Use the COM port number corresponding to A-D.

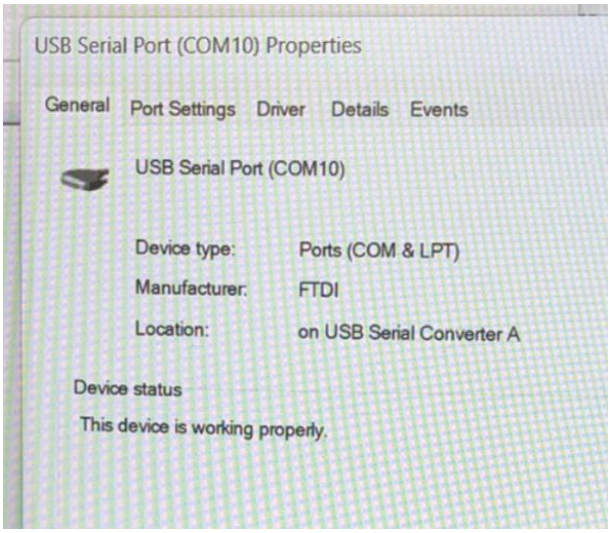

Fig 1-10 e.x. USB Serial Port Properties (At the time of shooting, Serial A was set to COM10.)

Only the GSE was monitored with HEX display enabled.

First, I turned on the power for the GSE. To operate the GSE, we used S Band GSE CONTROL Ver. 1.0. The software settings are as shown in the following picture.

Fig 1-11 Screen of S Band GSE CONTROL Ver. 1.0

To configure the S-Band GSE Control, begin by setting the "Now time" option to OFF. Then, navigate to the "SERIAL PORT" settings and select the COM number corresponding to Port A for the "PORT No." After this, open the Serial Port. Verify that the serial number is 243001 (Initial file number) and press the "SET" button to confirm the configuration.

Once the serial port is configured, adjust the control settings. In the "UP-LINK CONTROL" section, set the "SUB CARR RATE" to 4k. Similarly, in the "DOWN-LINK CONTROL" section, set the "BIT RATE" to 64k.

When ready to start transmission from the GSE, turn the TX (transmit) switch ON and set the MOD (modulation) switch OFF. Next, set the uplink control frequency to 2050 MHz and sweep it in 1 kHz increments within a range of ±20 kHz. And then, return the frequency to 2050 MHz and turn the MOD switch ON.

After finishing the transmission, ensure both the TX and MOD switches in the UP-LINK CONTROL section are turned OFF. Failing to do so will result in the signal being transmitted unintentionally.

1.5. Result

We used the DTArchiver to record the received data. We selected the COM port number corresponding to port D for the USB Serial Port in DTA Archiver. The baud rate in DTArchiver's COM port: parameter settings (COM ポート:パラメータ設定，ボーレート) was set to 2000000 and pressedsetting(設定). After pressing Start Recording (記録開始) in DTArchiver, we performed the uplink and downlink, then pressed Stop Recording (記録終了) to save the data. After recording, we pressed open (開く) to review the data.

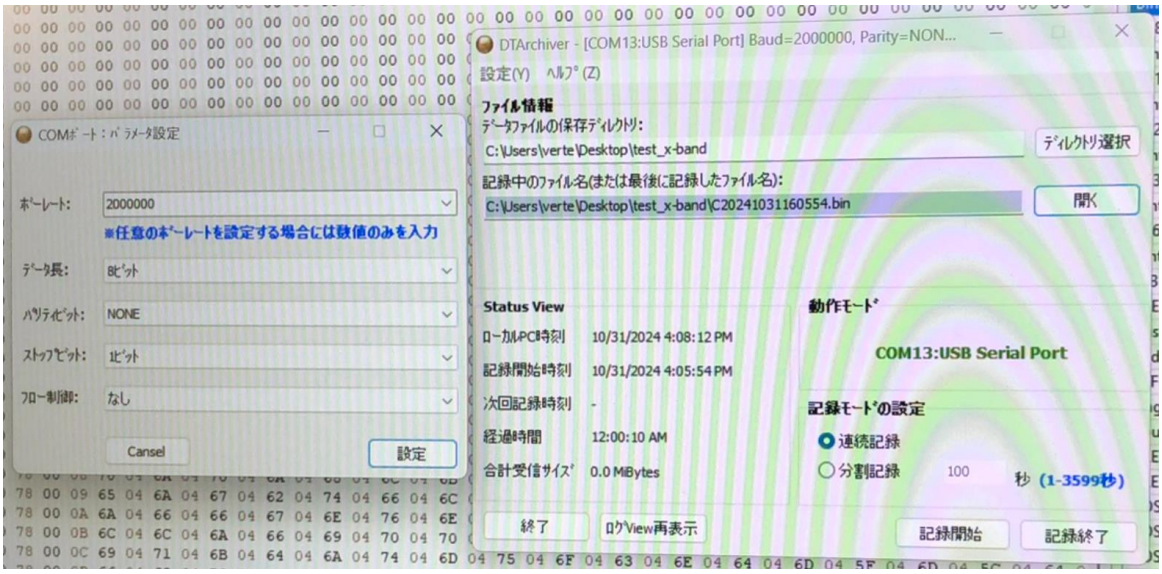

Fig 1-12 DTArchiver

The command generation was done using the command_generator. First, we sent the F5-B1 unregulator command from the GSE to activate the transmitter. Next, we sent the 00 memory address command. Monitoring the MAIN PIC and COM PIC confirmed that the OBC received the command. We also verified that the GSE received the response command sent from the OBC.

2. Cleanup

The work is finished, please CLOSE the Serial Port opened in each software and exit the programs. After that, turn off the power of the stabilized power supply and the S-band GSE.