Connection Authentication

Login Packet

Upon connection establishment, the device transmits a login packet.

Format: 11-byte packet with the following structure:

- Byte 0: 0x78 (START BYTE)
- Byte 1: 0x01 (PROTOCOL INDEX for login)
- Bytes 2-9: Device IMEI encoded in BCD format (15 digits, padded to 16 digits with leading '0')
- Byte 10: 0x79 (END BYTE)

Login Response

After receiving the login packet, the server responds with a login acknowledgment.

Format: 5-byte packet with the following structure:

- Byte 0: 0x78 (START BYTE)
- Byte 1: 0x01 (PROTOCOL INDEX for login response)
- Byte 2: 0x01 (STATUS: 0x01 for success, 0x00 for failure)
- Byte 3: 0x05 (Fixed response code)
- Byte 4: 0x79 (END BYTE)

Sensor Data Packet Specification

Following successful authentication, the device transmits sensor data packets at 2-minute intervals.

Format: 25-byte packet with the following structure:

- Byte 0: 0x78 (START BYTE)
- Byte 1: 0x02 (PROTOCOL INDEX for sensor data)
- Bytes 2-7: Timestamp in BCD format (YYMMDDHHMMSS)
- Bytes 8-23: Sensor payload (16 bytes containing 8 soil parameters, 2 bytes per parameter)
- Byte 24: 0x79 (END BYTE)

The timestamp format is as follows:

- Year (last 2 digits): 1 byte in BCD (e.g., 25 for 2025 = 0x25)
- Month: 1 byte in BCD (e.g., 05 for May = 0x05)
- Day: 1 byte in BCD (e.g., 19 for 19th = 0x19)
- Hour: 1 byte in BCD (24-hour format, e.g., 14 for 2PM = 0x14)

- Minute: 1 byte in BCD (e.g., 30 for 30 minutes = 0x30)

- Second: 1 byte in BCD (e.g., 45 for 45 seconds = 0x45)

The sensor payload is structured as follows (all values in big-endian format):

Parameter	Byte Position	Format	Conversion Factor	Unit
Temperature	8-9	16-bit int	Divide by 10	°C
Humidity	10-11	16-bit int	Divide by 10	%
EC	12-13	16-bit int	None	µS/cm
pH	14-15	16-bit int	Divide by 100	pH
Nitrogen	16-17	16-bit int	None	mg/kg
Phosphorus	18-19	16-bit int	None	mg/kg
Potassium	20-21	16-bit int	None	mg/kg
Salinity	22-23	16-bit int	None	mg/L

Example Packets

Example Login Packet for IMEI "862942071230965":

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Padded to 16 digits: "0862942071230965"
Converting to BCD format: 08 62 94 20 71 23 09 65
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Complete login packet (11 bytes): 78 01 08 62 94 20 71 23 09 65 79

Example Login Response (Success):

Complete login response packet (5 bytes): 78 01 01 05 79

Example Sensor Data Packet:

Timestamp: May 19, 2025, 14:30:45

- In BCD format: 25 05 19 14 30 45

Parameter	Value (Decimal)	Hex Representation	Actual Value
Temperature	245	00 F5	24.5°C
Humidity	385	01 81	38.5%
EC	1200	04 B0	1200 µS/cm
pH	652	02 8C	6.52 pH
Nitrogen	78	00 4E	78 mg/kg
Phosphorus	35	00 23	35 mg/kg
Potassium	182	00 B6	182 mg/kg
Salinity	430	01 AE	430 mg/L

Complete sensor data packet (25 bytes): 78 02 25 05 19 14 30 45 00 F5 01 81 04 B0 02 8C 00 4E 00 23 00 B6 01 AE 79