TECHNICAL PROTOCOL

RS-485 Communication Protocol

RF Power Amplifier Modules

This document defines the interface and data exchange format between a host system and an RF power amplifier module. It covers framing, PA enable control, command responses and module status telemetry.

Document number	Version	Revision date	Status
PRD-COM-RS485-PA-en-US	**1.3**	**2026-11-11**	**Released**

Implementation boundary
This revision of the protocol does not define node addressing, checksum or CRC, host timeout and retry behavior, RS-485 termination or biasing, or transceiver turnaround timing. Confirm these items, product-specific limits and project requirements in approved product or project documentation before implementation.

1. Interface overview

This protocol uses an RS-485 half-duplex serial interface for communication between the host and the power amplifier module.

Parameter	Value
Physical interface	RS-485 half-duplex serial communication
Baud rate	115200 bps
Data format	8 data bits, no parity
Protocol notation	Hexadecimal (HEX)
Default byte order	Big-endian; high byte first unless otherwise specified by the customer

2. Data conventions

UINT is an unsigned 32-bit integer, USHORT is an unsigned 16-bit integer and UCHAR is an unsigned 8-bit integer. Bit 0 and byte 0 represent the least significant bit and least significant byte. Reserved fields are retained for future expansion and default to zero.

3. Communication rules

The host issues control or parameter-query commands. Communication follows a master-slave response model: the host sends one command, the power amplifier module processes it and returns the corresponding response, completing one communication cycle.

3.1 Data frame format

Field	Identifier	Length	Definition
Frame head	Head	2 bytes	Fixed value 0x7E7E
Command type	Type	1 byte	Instruction type, denoted by T
Data length	BufLen	2 bytes	Length of the data area in bytes
Data area	Buf	n bytes	Command or response data
Frame end	Stop	2 bytes	Fixed value 0x0A0D

4. PA enable control (T = 0x01)

The host uses this command to switch the PA off or on. After PA protection is triggered, the command can be used to restart the amplifier after the applicable recovery conditions are satisfied.

Byte	Content	Definition
1-2	Frame head	0x7E7E
3	Command type	0x01
4-5	Data length	0x0001 (one data byte)
6	PA enable control	0x00: PA off; 0x01: PA on
7-8	Frame end	0x0A0D

Enable command examples

Host request - turn PA on

```
7E 7E 01 00 01 01 0A 0D
```

Module response - control successful

```
7E 7E 01 00 01 FF 0A 0D
```

Module response - control failed

```
7E 7E 01 00 01 01 0A 0D
```

5. Control command response

The response command type echoes the received control command type. The response data byte reports whether the requested action succeeded.

Byte	Content	Definition
1-2	Frame head	0x7E7E
3	Command type	Echo of the received control command type
4-5	Data length	0x0001 (one data byte)
6	Control response	0xFF: successful; 0x01: failed; other values reserved
7-8	Frame end	0x0A0D

6. Status query (T = 0xFF)

The status query has no data field. The host sends the following fixed frame:

```
7E 7E FF 00 00 0A 0D
```

7. Parameter query response (T = 0xFF)

The module returns 16 data bytes containing measured values and protection states. Multi-byte values use the default big-endian ordering defined by this protocol.

Byte	Content	Encoding / definition
1-2	Frame head	0x7E7E
3	Command type	0xFF
4-5	Data length	0x0010 (16 data bytes)
6	PA on/off status	0x00: off; 0x01: on
7-8	Input voltage	Unsigned 16-bit; 0.1 V per count; 285 = 28.5 V
9-10	Input current	Unsigned 16-bit; 0.1 A per count; 125 = 12.5 A
11-12	Module temperature	Signed 16-bit; 0.1 °C per count; 285 = 28.5 °C
13-14	Forward output power	Unsigned 16-bit; 0.1 dBm per count; 425 = 42.5 dBm
15-16	Reflected output power	Unsigned 16-bit; 0.1 dBm per count; 425 = 42.5 dBm
17	Input voltage status	0x00: normal; 0x01: over-voltage; 0x02: under-voltage
18	Input current status	0x00: normal; 0x01: over-current protection
19	Module temperature status	0x00: normal; 0x01: over-temperature protection
20	Output power status	0x00: normal; 0x01: output over-power protection

Byte	Content	Encoding / definition
21	VSWR protection status	0x00: normal; 0x01: VSWR protection
22-23	Frame end	0x0A0D

8. Default protection thresholds

Protection	Protocol default	Implementation note
Under-voltage	24 V	Confirm against the applicable product or project release
Over-voltage	32 V	Confirm against the applicable product or project release
Over-current	10 A or 20 A	Product-dependent value; confirmation is required
Over-temperature	105 °C	Recovery is 65 °C below the over-temperature threshold
Output over-power	52 dBm	Confirm against the applicable product or project release

9. Integration verification

Before putting the system into service, verify byte order, command-response timing, bus direction control, physical-layer termination and biasing, error handling, every product-dependent threshold and the recovery sequence under the actual module and system test conditions.