CAN BUS COMMUNICATIONS

CoolMax SRX · CAN Protocol

Bus Topology, Pinout, Identifier Format, Command and Broadcast Frames

Spec · SRX-CAN-PROTO



SRX-FAMILY SLAVE · CAN 2.0B INTEGRATION

DOCUMENT	REVISION	EFFECTIVE
SRX-CAN-PROTO	2.2.3	11 / 2026
FIRMWARE	**AUDIENCE**	**FORMAT**
2.0.1 and later	Integrators	A4 · 12 pages

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> **Rev 2.2.3 gives the first firmware release for every message, command and flag, back to 2.0.1.** Working from an earlier revision, re-check remote frames (§2), master IDs and ID assignment (§3), the Active Flags and Inhibit Reason (§5.1), Shutdown recovery (§6.3), Power Target clamping (§6.4) and the battery BMS frames (§7).

CHAPTER 01

Network Topology & Pinout

Scope. This document is for integrating a master controller with the CoolMax SRX and compatible SRX-family slaves over CAN: topology, pinout, identifier format, and every broadcast and command frame the slave emits or accepts.

Firmware. Applies to CoolMax SRX and SRX-R firmware 2.0.1 and later. The **Min FW** column (or tag) gives the first release with each item. Releases 2.6.9 and 2.8.4 were for the SRX-R only, so an item they introduced reads *2.8.4 (SRX-R) / 2.9.4 (SRX)*, shortened to *2.8.4 R / 2.9.4* in narrow tables. **Releases 2.6.6 to 2.8.4 have been withdrawn; update units on them to 2.17.9.**

The CAN bus is structured as a linear network, with short stubs branching from 'T' connectors on the main bus backbone to each device. The CAN bus data lines must be terminated at each end of the main bus with **120 Ω** resistors between the CAN-H and CAN-L signals.

SRX CAN Pin-Out

Pin-out is shown on an 8-position modular (RJ-style) connector with pins numbered 1–8 from left to right. The SRX presents two paralleled CAN sockets so units can be daisy-chained; both carry the same four signals.

PIN	CAN CONNECTOR
3	+5 V
4	CAN High (CAN-H, non-inverting)
5	CAN Low (CAN-L, inverting)
6	GND

Pins 1, 2, 7 and 8 are unused. RS485 (Modbus) has its own pair of sockets, labelled MODBUS, with a different pin-out: pin 6 is RS485-B there, not GND. Do not plug a CAN cable into a MODBUS socket.

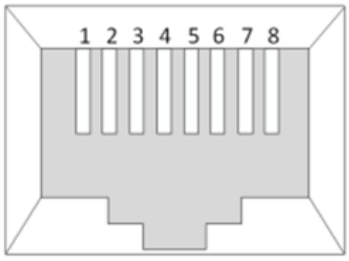


FIGURE 1 · RJ-STYLE CONNECTOR PIN NUMBERING

> **Isolation:** pins 3 and 6 bring the SRX's internal +5 V rail and signal ground out on the connector. If the bus crosses an isolation barrier, do not carry pins 3 and 6 through it.

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CHAPTER 02

Hardware & Software Overview

Hardware

The CAN hardware interface used is compatible with the **CAN 2.0B** standard. Three bit rates are selectable:

DEFAULT	2.8.4 R / 2.9.4	2.8.4 R / 2.9.4
500 kbps	**250 kbps**	**125 kbps**

500 kbps is available on every release from 2.0.1. 250 and 125 kbps need 2.8.4 (SRX-R) / 2.9.4 (SRX); earlier releases run at 500 kbps only.

Software

The CAN protocol uses **data frames** for all communication. The SRX transmits **standard (11-bit) data frames only** and ignores every extended-identifier frame on the bus. **Do not send remote frames.** All measurement data is transmitted using 32-bit integers with the most significant byte (MSB) sent first.

> **CAN DATA FRAME**
> The protocol uses the standard CAN 2.0B data frame layout: 11-bit identifier (see §3), DLC, and up to 8 bytes of payload. The SRX populates each payload as one or two 32-bit integers, or as individually addressed bytes, as detailed per-message in §4–§6.

CHAPTER 03

Identifier, Addressing & Data Field

Identifier

The identifier field has been split into two sections for the CoolMax SRX. **Bits 10–5** contain the **device identifier** and **bits 4–0** contain the **message identifier** associated with that device.

ROLE	DEVICE ID RANGE	MIN FW
MASTER ID	0 to 8	2.0.2 (see §3 below)
RESERVED	9	2.19.5
OPERATIONAL SLAVE ID	10 to 60	2.0.1
UNASSIGNED SLAVE ID (START-UP)	62	2.0.1 (nothing is sent on it)

CAN device IDs (6 bits)

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> **USE MASTER IDS 0 TO 8**
> **Give a master a device ID from 0 to 8.** Firmware 2.0.2 to 2.17.9 accepts commands from IDs 0 to 9; from 2.19.5 ID 9 is reserved and a master on ID 9 has its commands ignored. **2.0.1 accepts commands from any identifier**, so a battery's Pylontech-style frames can be taken as commands: update 2.0.1 units before they share a bus with a battery.

From 2.0.2, a slave only acts on a command whose device identifier is in the master range. Units also exchange coordination frames with each other; a master does not need to act on them.

Device ID Assignment

Units ship configured to CAN ID 10. Where several units share a bus, each one self-assigns a free identifier in the range 10 to 60 (2.0.1). From 2.4.2 a unit reuses its stored identifier across restarts; 2.0.x self-assigns on every start. From 2.19.6 self-assignment skips 24 and 56, whose frames would alias battery identifiers. **A unit that has not yet settled on an identifier transmits nothing.**

A rack powering up together takes a few seconds to settle. **Do not treat identifiers as stable addresses across a re-index; key on the serial number in §4.1 instead.**

Data Field

The data field in all frames is fixed at **8 bytes** (64 bits), with the following exceptions:

- **Enable** (§6.1) and **Reset** (§6.2) carry no data (DLC 0).
- **Shutdown** (§6.3) accepts DLC 0 or 8 bytes.

The data field is sent and received in **MSB-first** order. Two messages are exceptions and are packed **little-endian**; both are called out where they are defined: **Hardware Information** (§4.5) and **Remote Temperature** (§6.6).

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CHAPTER 04

Broadcast Messages — Telemetry

Data frames containing telemetry values are periodically broadcast onto the bus by the CoolMax SRX slave. Unless noted, the message ID is the slave's base address plus the offset shown.

MESSAGE	ID OFFSET	PERIOD	MIN FW
Identification Information (§4.1)	Slave base + 0	2 s (3 s on 2.0.x)	2.0.1
PV Voltage / Current (§4.2)	Slave base + 1	1 s	2.0.1
Output Voltage / Current (§4.3)	Slave base + 2	1 s	2.0.1
Output Power / Device Temperature (§4.4)	Slave base + 4	1 s	2.0.1
Active Flags (§5.1)	Slave base + 5	1 s	2.0.1 (byte 3: 2.19.5)
General ACK (§5.3)	Slave base + 6	on demand	2.8.4 (SRX-R) / 2.9.4 (SRX)
Hardware Information (§4.5)	Slave base + 10	2 s	2.0.1
Firmware Version (§4.6)	Slave base + 11	2 s	2.0.1
GF Status (§5.4)	**Master** base + 12	500 ms, during a GF test only	2.0.2
Charge State (§5.2)	Slave base + 14	30 s	2.8.4 (SRX-R) / 2.9.4 (SRX)

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Broadcast Messages — Telemetry

§4.1 Identification information

Slave Base + 0 | Min FW 2.0.1 | DLC 8

VARIABLE	BITS	TYPE	DESCRIPTION
Serial Number	63…32	Uint32	Device serial number, allocated at manufacture.
Device Status	31…0	Uint32	See enum below.

Device Status enum values:

VALUE	NAME	DESCRIPTION	MIN FW
0	Slave Un-Assigned	No operational ID yet.	2.0.1
1	Starting	Startup / initialisation in progress.	2.19.5
2	Output Enabled	Converter output is actively enabled.	2.0.1
3	Restricted	Thermal derating or other power limitation active.	2.19.5
4	Output Disabled	Converter output has been explicitly disabled.	2.0.1
5	Standby	Ready but not outputting.	2.19.5
6	Fault Detected	A fault has shut the converter down.	2.0.1
7	Minimum Power Idle	Demand below the minimum the unit can deliver. Benign: a full battery or low irradiance.	2.19.5
8	Output Unreachable	The unit could not settle at a usable operating point. Check load and configuration.	2.19.5

> Decode any unrecognised value as “ready, not outputting”: new codes may be added.

§4.2 PV voltage / current measurement

Slave Base + 1 | Min FW 2.0.1 | DLC 8

VARIABLE	BITS	TYPE	DESCRIPTION
PV Current	63…32	Int32	PV Current (mA)
PV Voltage	31…0	Int32	PV Voltage (mV)

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Broadcast Messages — Telemetry (Cont.)

§4.3 Output voltage / current measurement

Slave Base + 2 | Min FW 2.0.1 | DLC 8

VARIABLE	BITS	TYPE	DESCRIPTION
Output Current	63…32	Int32	Output Current (mA)
Output Voltage	31…0	Int32	Output Voltage (mV)

§4.4 Output power / device temperature measurement

Slave Base + 4 | Min FW 2.0.1 | DLC 8

VARIABLE	BITS	TYPE	DESCRIPTION
Device Temperature	63…32	Int32	Heatsink temperature, millidegrees Celsius
Output Power	31…0	Int32	Output Power (W)

Output power is derived from the output voltage and current in §4.3 and reads 0 whenever either of them is at or below zero. It is **output** power, not input power.

§4.5 Hardware information

Slave Base + 10 | Min FW 2.0.1 | DLC 8

This frame is little-endian. Unlike every other broadcast, its three fields are sent least significant byte first.

BYTES	FIELD	TYPE	DESCRIPTION
0–1	Hardware Revision	Uint16 LE	Control board hardware revision.
2–5	Manufacture Date/Time	Uint32 LE	Manufacture date and time stamp.
6–7	Check Value	Uint16 LE	Check value. Ignore.

> **Corrected in Rev 2.2.0:** earlier revisions described this frame as `[HW Rev][Batch][Manufacturer][Device Type]`, four Int16 values MSB-first. **Batch ID, Manufacturer ID and Device Type are not available over CAN**; read them over Modbus RTU or through AERL Link.

§4.6 Firmware version

Slave Base + 11 | Min FW 2.0.1 | DLC 8

BYTES	FIELD	TYPE	DESCRIPTION
0–3	Reserved	—	Ignore these bytes.
4	Major	Uint8	Firmware major version.
5	Minor	Uint8	Firmware minor version.
6	Patch	Uint8	Firmware patch version.
7	Reserved	Uint8	Reserved, 0.

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CHAPTER 05

Broadcast Messages — Status

§5.1 Active flags — faults

Slave Base + 5 | Min FW 2.0.1 | DLC 8

BYTES	FIELD	TYPE	DESCRIPTION
0–2	Reserved	—	Ignore (not zero-filled on 2.17.9 and earlier).
3	Inhibit Reason	Uint8	§5.1.1. From 2.19.5; ignore it before.
4–7	Fault Flags	Uint32	Bit field, MSB-first. Bit 0 is the LSB of byte 7.

BIT	FLAG	DESCRIPTION	MIN FW
0	**Hardware Fault (Generic)**	Generic hardware fault; battery BMS alarm (§7)	2.0.1
1	**No Config Data**	No configuration data set	2.0.1
2	**Config Data Out of Range**	Configuration out of range; BMS limit (§7) from 2.19.5	2.0.1
3	**Battery Sense Lost**	Battery Sense no longer responding	2.0.1
4	**CAN Master Lost**	CAN master lost (Note 1)	2.0.1
5	**Internal Over Temp**	Internal temperature fault	2.0.1
6	**Vin Low Fault**	Input voltage too low	2.0.1
7	**Vout Low Fault**	Output voltage too low	2.0.1
8	**Vout High Fault**	Output voltage too high	2.0.1
9	**Vin High Fault**	Input voltage too high	2.0.1
10	**High PV Current**	PV input current too high	2.0.1
11	**Over Temp Fault**	Device temperature exceeds maximum	2.0.1
12	**Low Battery Temp**	Low battery temperature	2.0.1
13	**Earth Fault Positive**	Earth fault on positive conductor	2.0.1
14	**Earth Fault Negative**	Earth fault on negative conductor	2.0.1
15	**Active Cooling Fault**	Fan fault	2.0.1

BIT	FLAG	DESCRIPTION	MIN FW
16	**Output Over-current**	Output over-current; on bit 24 from 2.19.5	2.0.1
17	**Iin High Fault**	Input current too high	2.0.1
18	**Cross Check Fault**	Cross-check failed	2.0.1
19	**Temp Sensor Timeout**	Temperature sensor unresponsive	2.0.1
20	**Earth Fault**	Low isolation resistance (see below)	2.0.1
21	**No Output Fault**	No output detected	2.0.1
22	**Low Bat Temp Cut-off**	Low battery temperature cut-off active	2.0.1
23	**High Bat Temp Cut-off**	High battery temperature cut-off active	2.0.1
24	**Current Flow Disrupted**	Charging interrupted (see below)	2.0.1
25	**Pre-charge Failure**	Pre-charge failure	2.0.1
26	**PV Pre-charge Failure**	PV input pre-charge failure	2.8.4 R / 2.9.4
27	**PWM Regulation Failure**	Current flowing while PWM is disabled	2.19.5
28	**PWM Corruption**	PWM state corruption detected	2.19.5
29	**Stack Overflow**	Internal stack overflow detected	2.19.5
30	**Clock Failure**	Clock failure (CSS/drift) detected	2.19.5
31	**Brownout**	Brown-out detected	2.19.5

2.8.4 R / 2.9.4 is 2.8.4 on the SRX-R and 2.9.4 on the SRX. **Bit 16:** output over-current before 2.19.5; from 2.19.5 it reports on bit 24 instead. **Bit 20:** clears itself after about 30 min from 2.6.6; held until the unit resets from 2.19.6. On 2.17.9 and earlier the flags are a latched snapshot, updated when a fault is raised or cleared. Some bits cover more than one underlying condition. Use AERL Link or the unit's event log to identify the specific cause, or contact AERL.

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§5.1.1 Inhibit reason (byte 3)

Min FW 2.19.5

Undefined before 2.19.5: ignore it. From 2.19.5 byte 3 names why a healthy unit is deliberately delivering no output, so it can be told apart from an idle unit.

VALUE	NAME	CLEARS ON	MIN FW
0	None	—	2.19.5
1	Shutdown Latch	Latched off by a fault elsewhere on the bus. Reset or power cycle.	2.19.5
2	Input Protection Lockout	Reset or power cycle.	2.19.5
3	Version Gate	Every unit on the bus on 2.19.6 or later. A unit holds off while it hears older firmware: update the whole bus.	2.19.6
4	BMS Envelope	Charge target back inside the battery's limits (§7).	2.19.5
5	Isolation Lockout	Reset or power cycle.	2.19.5

§5.2 Charge state

Slave Base + 14 | Min FW 2.8.4 R / 2.9.4 | DLC 8

BYTES	FIELD	TYPE	DESCRIPTION
0–5	Reserved	—	Reserved, zero-filled.
6	Reserved	Uint8	Advisory status flags. Do not parse.
7	Charge State	Uint8	0 = Bulk · 1 = Absorb · 2 = Equalise · 3 = Float

> **Do not read bytes 4–7 as a single Int32.** Byte 6 is zero before 2.19.5 and carries flag bits from 2.19.5, so a 32-bit read of that field returns, for example, `0x0303` instead of 3. **Read byte 7 alone.**

§5.3 General ACK broadcast

Slave Base + 6 | Min FW 2.8.4 R / 2.9.4 | DLC 8

VARIABLE	BITS	TYPE
Acknowledged	63…56	Uint8
Reserved	55…0	—

1 = Acknowledged, 0 = Not Acknowledged (data byte 0); reserved bits zero-filled. Sent only in reply to *Change State* (§6.5).

> **Not acknowledged:** Enable, Reset, Shutdown and Power Target. Confirm those from the telemetry.

§5.4 GF status broadcast

Master Base + 12 | DLC 8 | Min FW 2.0.2

VARIABLE	BITS	TYPE
Reserved	63…0	—

Broadcast every 500 ms while a ground-fault test is in progress, to signal that a GF test is active.

> **Note:** sent with the **Master** base address, not the slave's own. Subscribe on the master ID range. The frame carries no source identity.

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CHAPTER 06

Command Messages

Commands are sent by the master, at the master's base address plus the offset shown. From 2.0.2 a slave acts only on commands from the master range (use 0 to 8; §3).

COMMAND	ID OFFSET	DLC	ACK	MIN FW
Enable (§6.1)	+22	0	no	2.0.1
Reset (§6.2)	+23	0	no	2.4.2
Shutdown (§6.3)	+24	0 or 8	no	2.0.1
Power Target (§6.4)	+25	8	no	2.0.1 (clamping: see §6.4)
Change State (§6.5)	+30	8	yes	2.8.4 (SRX-R) / 2.9.4 (SRX)
Remote Temperature (§6.6)	+31	8	no	2.0.1
GF Status Hold (§6.7)	+12	8	no	2.0.2

§6.1 Enable

ID **Master Base + 22** | DLC **0** | Min FW **2.0.1**

Enables the output. **A valid Power Target (§6.4) must have been received first:** Enable is ignored by a unit that has never had a target, or whose target has timed out (Note 1). Send the target, then the enable.

§6.2 Reset

ID **Master Base + 23** | DLC **0** | Min FW **2.4.2**

Restarts the module, staggered by serial number so units on a shared bus do not reboot together; allow a few seconds. **On 2.0.1 to 2.0.3, Reset does not work as described: update those units first.**

§6.3 Shutdown

Master Base + 24 | DLC 0 or 8 | Min FW 2.0.1

Disables the output of the charger. **Send DLC 0, or 8 bytes with byte 0 = `0x00` .** This is a **recoverable stop**: the unit disables its output and stays off until it receives **Enable** (§6.1). A Power Target alone does not restart it. A unit reporting Inhibit Reason 1 (§5.1.1; 2.19.5) has been latched off by a fault elsewhere on the bus: reset or power-cycle it.

§6.4 Power target

Master Base + 25 | DLC 8 | Min FW 2.0.1

VARIABLE	BITS	TYPE	DESCRIPTION
Voltage	63…32	Uint32	Output Voltage Target (mV), e.g. 57600
Current	31…0	Uint32	Maximum Output Current (mA), e.g. 70000

Not acknowledged. At most one target is accepted every 250 ms (100 ms before 2.4.2); targets sent faster than that are discarded.

> **From 2.8.4 (SRX-R) / 2.9.4 (SRX), targets are clamped:** current to the configured limit; voltage only above the configured absorb (or equalise) voltage + 5 V; a low non-zero target is raised to the minimum. If the unit regulates below the commanded value, check its configured set points before treating it as a fault. **Earlier releases reject an out-of-range target** (event −1302) and disable the output.

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§6.5 Change state

Master Base + 30 · DLC 8 · Min FW 2.8.4 R / 2.9.4

VARIABLE	BITS	TYPE
State	63…56	Uint8
Reserved	55…0	—

State (data byte 0): 0 = Bulk · 1 = Absorb · 2 = Equalise · 3 = Float. Acknowledged with §5.3. A request for *Equalise* is **rejected with a NACK** when equalisation is disabled in the unit's charge configuration; any value above 3 is also NACKed.

§6.6 Remote temperature

Master Base + 31 · DLC 8 · Min FW 2.0.1

VARIABLE	BITS	TYPE
Battery Temperature	63…32	Int32 LE
Reserved	31…0	—

Battery temperature in **millidegrees Celsius** (°C × 1000), packed in data bytes 0–3 **little-endian**. Bytes 4–7 are ignored entirely. Values outside −10 to 100 °C are ignored. Used for temperature-compensated charging. Not acknowledged.

§6.7 GF status hold

Master Base + 12 · DLC 8 · Min FW 2.0.2

Sent by a device about to perform a ground fault test, so units sharing the array hold their startup until the test finishes. Payload ignored. Same message identifier as the GF Status broadcast (§5.4): the SRX treats the frame as a command when it arrives from a master identifier and as telemetry otherwise. Not acknowledged.

§6.8 Reserved message identifiers

All other message identifiers are reserved. **Do not transmit them on a bus carrying SRX units**, and ignore any frame seen on them.

CHAPTER 07

Battery BMS Frames Consumed by the SRX

Where an SRX shares a CAN bus with a battery that publishes the Pylontech-style frame set, it listens to the frames below. No configuration is required.

ID	USE	MIN FW
0x359	Alarm flags. A high voltage, high temperature, high charge current, BMS internal or cell imbalance alarm stops charging. Logged as event −1305.	2.4.2
0x351	Charge voltage limit and charge current limit, both in 0.1 unit steps, little-endian. Used as a ceiling to cross-check the SRX's own charge target.	2.19.5

On firmware 2.17.9 and earlier the SRX charges to its own configuration and ignores 0x351 and 0x356. From 2.19.5, if the SRX's charge target stays outside the limits published on 0x351, the unit stops and raises fault flag bit 2 with Inhibit Reason 4 (§5.1.1), and resumes when the target is back inside the published envelope.

> **Releases 2.0.1 to 2.6.7 transmit frames on 0x305 and 0x307 every 2 s** (vendor identification), which can conflict with a battery that uses those identifiers. 2.6.9 (SRX-R), 2.9.4 (SRX) and later do not transmit them.

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Implementation Notes

NOTE 1 · KEEP-ALIVE

Under a CAN master, the CoolMax slave must receive a Power Target command at least every **32 seconds** (the timeout is about 32–34 s). If it does not, it reverts to its own stored charge configuration and disables its output (2.0.1). This is the CAN Master Lost condition (bit 4). The next valid Power Target clears the condition and re-enables the output, provided no other fault is active. Send a target every 1 to 5 seconds in normal operation.

NOTE 2 · AUTO-START

The CoolMax slave will automatically begin charging after receiving a valid voltage target from the master device, provided no fault flags are set. An explicit Enable (§6.1) is only needed after a Shutdown.

NOTE 3 · BUS LOADING

Keep the SRX on a bus segment with minimal unrelated traffic. Heavy third-party traffic costs the SRX processing time.

Revision History

REVISION	DATE	CHANGE
Earlier revisions: see previous editions.		
2.1.0	09/09/26	Corrected bit rates, master ID range (0–8, 9 reserved), Hardware Information, Firmware Version and Charge State layouts and the keep-alive interval. Added device status 7 and 8, the inhibit reason byte, Power Target clamping, the GF Status hold command, the reserved identifier list, the battery BMS frames and ID self-assignment.
2.2.0	10/09/26	Reorganised for integrators.
2.2.1	08/11/26	Updated for firmware 2.19.6: inhibit reason 3, flag notes, reserved identifiers, IDs 24 and 56; MODBUS sockets have their own pin-out; contents page corrected.
2.2.2	09/11/26	Minimum firmware marked on items that need firmware later than 2.17.9; device status 7 and 8 need later firmware.
2.2.3	16/11/26	Minimum firmware for every message, command and flag, from 2.0.1; corrections for firmware 2.17.9 and earlier; internal identifiers removed.

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