Digital Modes

Getting Started

- Radio Ports & Wiring
- Sound Card Options
- Radio Setup
- Common Software
- Time Sync
- Windows Setup

Radio Ports

- Newer Radios
  - Built-in Sound Cards via USB Port
  - Rig Control via USB Port
- Most HF Radios
  - 6 Pin Mini-DIN connection (nearly identical wiring across manufacturers)
  - 13 Pin DIN connection (very different wiring across manufacturers)
  - Adapter cables available for most radios
  - Serial Ports
- Mobile Radios
  - 6 Pin Mini-DIN connection (nearly identical wiring across manufacturers)
  - Newer Yaesu models use 10 Pin Mini-DIN
  - Some have Serial Ports (usually 8 Pin Mini-DIN)
- Other (Less Ideal) Options
  - Wire directly Mic & Headphone jacks

ICOM IC-7300

Yaesu FT-710

Yaesu FTDX-10

ICOM IC-703/706

Yaesu FT-817

Yaesu FT-891

Yaesu FT-857

Kenwood TS-480

Kenwood TS-570

ICOM IC-718

ICOM IC-7200

Kenwood TS-590

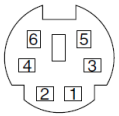
Yaesu FT-450

Kenwood TM-V71

Yaesu FTM-6000R, 200DR, 300DR, 500DR

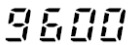
ICOM 6-Pin Mini-DIN

◇ DATA socket

DATA	PIN No.	NAME	DESCRIPTION
 Rear panel view	1	DATA IN	Input terminal for data transmit. (1200 bps: AFSK/9600 bps: G3RUH, GMSK)
	2	GND	Common ground for DATA IN, DATA OUT and AF OUT.
	3	PTT P	PTT terminal for packet operation. Connect ground to transmit data.
	4	DATA OUT	Data out terminal for 9600 bps operation only.
	5	AF OUT	Data out terminal for 1200 bps operation only.
	6	SQ	Squelch out terminal. Becomes ground level when the transceiver receives a signal which opens the squelch. • To avoid unnecessary TNC transmission, connect squelch to the TNC to inhibit transmission when receiving signals. • Keep audio output at a normal level, otherwise a "SQ" signal will not be output.

(Packet data speed)

This item is used to change the communications speed for packet operation. The data socket speed can be set to 1200 or 9600 baud.



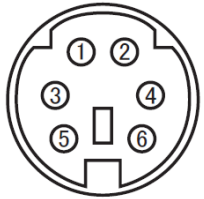
Default is 9600 baud.

Alinco 6-Pin Mini-DIN

■ Using external TNC unit

Connect mini DIN socket at the rear panel of radio to external TNC unit as shown.
Enter advanced set mode, select menu. 32 for TNC ON.
Connect pins 1,2,3 and 5 to external TNC unit and if necessary also connect pins 4 and 6.

Mini DIN socket configuration:

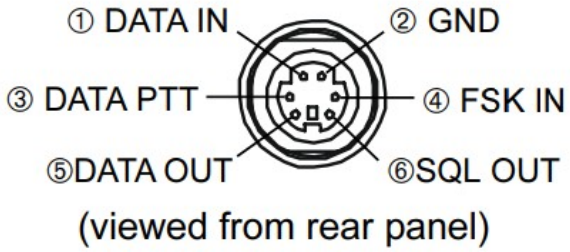
Mini DIN socket	Configurations	DEFINITION
	1.DATA IN	Packet communications DATA input (1200bps), Max 4800bps
	2.GND	Ground for DATA IN, DATA OUT and AF OUT
	3.PTT	PTT switch, connect to ground for transmitting
	4.DATA OUT	Packet communications DATA output, Data output for 9600bps received signal (500mVp-p)
	5.DATA OUT	Packet communications DATA output, Data output for 1200bps received signal (500mVp-p)
	6.SQL	Squelch output. SQL open: 0V SQL close: 5V

Yaesu 6-Pin Mini-DIN - HF vs Mobile

HF

DATA Jack

This 6-pin input/output jack provides receiver audio and squelch signals, and accepts transmit (AFSK) audio and PTT control, from an external packet TNC.

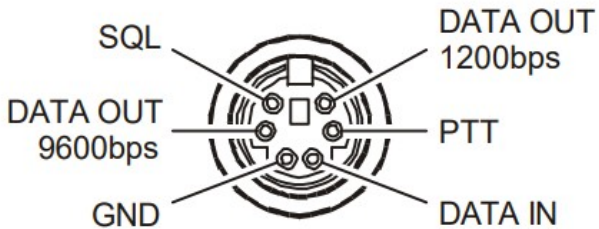


(viewed from rear panel)

Mobile

③ **DATA** Jack

This 6-pin, mini-DIN jack accepts AFSK input from a Terminal Node Controller (TNC); it also provides fixed-level Receiver Audio Output, Push-To-Talk (PTT), Squelch Status, and ground lines.



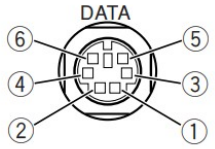
DATA

Kenwood 6-Pin Mini-DIN - HF vs Mobile

HF

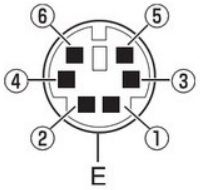
DATA connector pin assignment (6-pin mini DIN)

Pin No.	Pin Name	Function
1	ANI	Audio input from MCP/ TNC
2	ANG	Audio signal ground
3	DTS	Ground this terminal to transmit. When it is grounded, the microphone input turns OFF.
4	NC	No connection
5	ANO	Audio output for MCP/ TNC
6	SQC	Squelch status • Squelch open: Low impedance • Squelch close: High impedance
Metal cover	GND	Ground



DATA connector
(Front view)

Data terminal pins:



No.	Name	I/O	Function
①	PKD	Input	Audio signal for packet transmission
②	DE	—	PKD terminal ground
③	PKS	Input	'L' is transmitted and the microphone is muted
④	PR9	Output	9600 (bps) repeat signal
⑤	PR1	Output	1200 (bps) repeat signal
⑥	SQC	Output	Squelch control signal; Closed: 'L', Open: 'H' (The default settings can be changed in Menu 520)
	E	—	Common ground

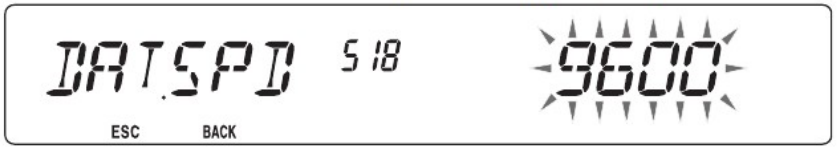
DATA TERMINAL SPEED

Select 1200 or 9600 bps for the data transfer rate, depending on your TNC.

1200 bps: Transmit data input (PKD) sensitivity is 40 mV_{p-p}, input impedance is 10 kΩ.

9600 bps: Transmit data input (PKD) sensitivity is 2 V_{p-p}, input impedance is 10 kΩ.

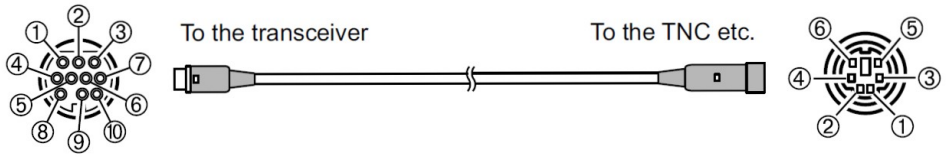
1 Enter Menu mode and access Menu 518 (DAT.SPD) {page 20}.



2 Set the data speed to 1200 or 9600 bps.

Newer Yaesu 10-Pin Mini-DIN to 6-Pin Adapters

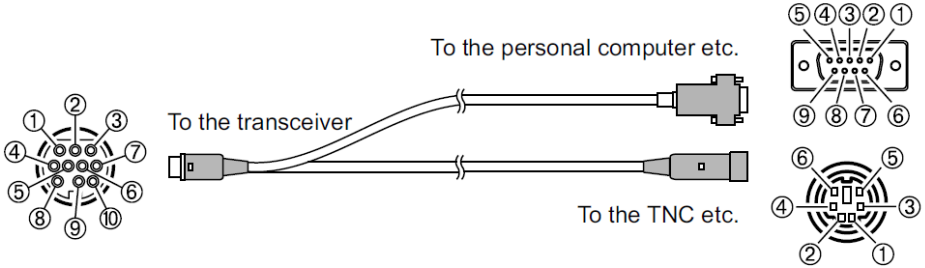
● **Data cable “CT-164” (MDIN 10 pin ⟷ MDIN 6 pin)**



① PKD (packet data input)
② GND
③ PSK(PTT)
④ RX 9600 (9600 bps packet data output)
⑤ RX 1200 (1200 bps packet data output)
⑥ PK SQL (squelch control)
⑦ -
⑧ -
⑨ -
⑩ -

① PKD (packet data input)
② GND
③ PSK(PTT)
④ RX 9600 (9600 bps packet data output)
⑤ RX 1200 (1200 bps packet data output)
⑥ PK SQL (squelch control)

● **Data cable “CT-163” (MDIN 10 pin ⟷ MDIN 6 pin & Dsub 9 pin)**



① PKD (packet data input)
② GND
③ PSK(PTT)
④ RX 9600 (9600 bps packet data output)
⑤ RX 1200 (1200 bps packet data output)
⑥ PK SQL (squelch control)
⑦ TXD (serial data output [transceiver → PC])
⑧ RXD (serial data input [transceiver ← PC])
⑨ CTS (data communication control)
⑩ RTS (data communication control)

Dsub 9 pin
① -
② TXD (serial data output [transceiver → PC])
③ RXD (serial data input [transceiver ← PC])
④ -
⑤ GND
⑥ -
⑦ CTS (data communication control)
⑧ RTS (data communication control)
⑨ -

MDIN 6 pin
① PKD (packet data input)
② GND
③ PSK(PTT)
④ RX 9600 (9600 bps packet data output)
⑤ RX 1200 (1200 bps packet data output)
⑥ PK SQL (squelch control)

ICOM 13-Pin DIN

◇ ACC socket

ACC	PIN No.	NAME	DESCRIPTION	SPECIFICATIONS
 Rear panel view	1	8 V	Regulated 8 V output.	Output voltage : 8 V ±0.3 V Output current : Less than 10 mA
	2	GND	Connects to ground.	———
	3	HSEND	Input/output pin. (HF/50 MHz only) Goes to ground when transmitting. When grounded, transmits.	Ground level : –0.5 V to 0.8 V Output current : Less than 20 mA Input current (Tx) : Less than 200 mA
	4	BDT	Data line for the optional AT-180.	———
	5	BAND	Band voltage output. (Varies with amateur band)	Output voltage : 0 to 8.0 V
	6	ALC	ALC voltage input.	Control voltage : –4 V to 0 V Input impedance : More than 10 kΩ
	7	NC	———	———
	8	13.8 V	13.8 V output when power is ON.	Output current : Max. 1 A
	9	TKEY	Key line for the optional AT-180.	———
	10	FSKK	Controls RTTY keying	"High" level : More than 2.4 V "Low" level : Less than 0.6 V Output current : Less than 2 mA
	11	MOD	Modulator input. Connects to a modulator.	Input impedance : 10 kΩ Input level : Approx. 100 mV rms
	12	AF	AF detector output. Fixed, regardless of [AF] position in default settings.	Output impedance : 4.7 kΩ Output level : 100–300 mV rms
	13	SQLS	Squelch output. Goes to ground when squelch opens.	SQL open : Less than 0.3 V/5 mA SQL closed : More than 6.0 V/100 µA

① brown ⑧ gray
② red ⑨ white
③ orange ⑩ black
④ yellow ⑪ pink
⑤ green ⑫ light blue
⑥ blue
⑦ purple ⑬ light green

Color refers to the cable strands of the supplied cable.

Kenwood 13-Pin DIN

ACC2 CONNECTOR

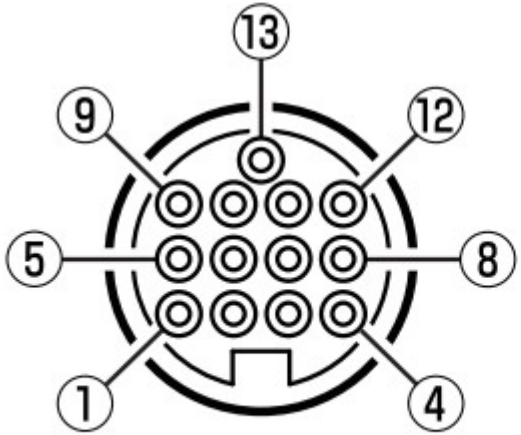
ACC 2

Pin No.	Pin Name	Function	I/O
1	NC	No connection	—
2	RTTY	RTTY key input	I
3	ANO	Audio output from the transceiver • Connect to the audio input of the TNC, MCP, or PC (or PC interface connection). • Audio output level is independent from the **AF** control setting. • Audio output level can be changed by adjusting the value in Menu No. 74. Set the value to a moderate audio output level. The default value of 4 is approximately 0.5 V_{p-p}, which is a standard modulating signal. The settings of 0 ~ 9 vary from approximately 0 V_{p-p} to 1.2 V_{p-p}. • Impedance: Approx. 10 kΩ.	O
4	GND	Ground	—
5	PSQ	Transceiver squelch control • Connect to the squelch input of the TNC, MCP, or PC connection interface. • Squelch open: Low impedance • Squelch closed: High impedance	O
6	NC	No connection	—
7	NC	No connection	—
8	GND	Ground	—
9	PKS	PTT input for data communication • Connect to the PTT output of the TNC, MCP, or PC connection interface. • Microphone audio input mutes when transmitting.	I
10	NC	No connection	—
11	ANI	Audio input for data communication • Connect to the audio output of the TNC, MCP, or PC (or PC interface connection). • Audio input level is independent from the microphone gain (set with the **[MIC]** key). • Audio input level can be changed by adjusting the value in Menu No. 73. The default value of 4 is approximately 10 mVrms, which is a standard modulating signal. The settings of 0 ~ 9 vary from approximately no modulation to approximately 1 mVrms. • Impedance: Approx. 10 kΩ.	I
12	GND	Ground	—
13	SS	PTT input (same as the front panel MIC connector) • During transmission, the audio input of ACC2 connector terminal 11 (ANI) and the USB terminal are muted.	I

Yaesu 13-Pin DIN (uncommon)

⑪ ACC

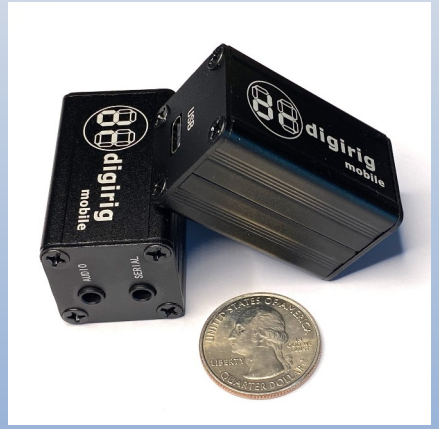
This 13-pin jack may be connected to an external device.



① Power ON
② GND
③ DATA1
④ DATA2
⑤ CLOCK
⑥ CS
⑦ 3.3V
⑧ 13.8V
⑨ Reserve
⑩ Reserve
⑪ CNT RX
⑫ CNT TX
⑬ Reserve

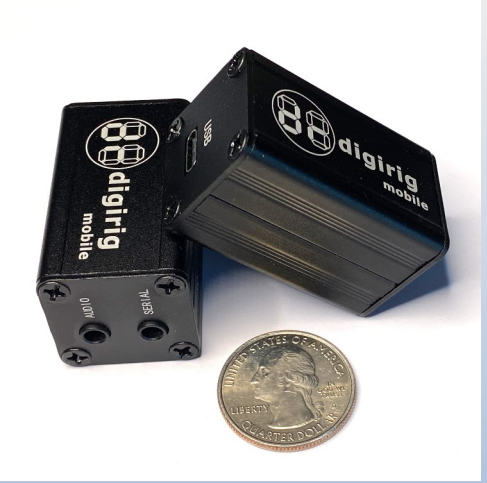
Sound Cards – Radio to Computer Interface

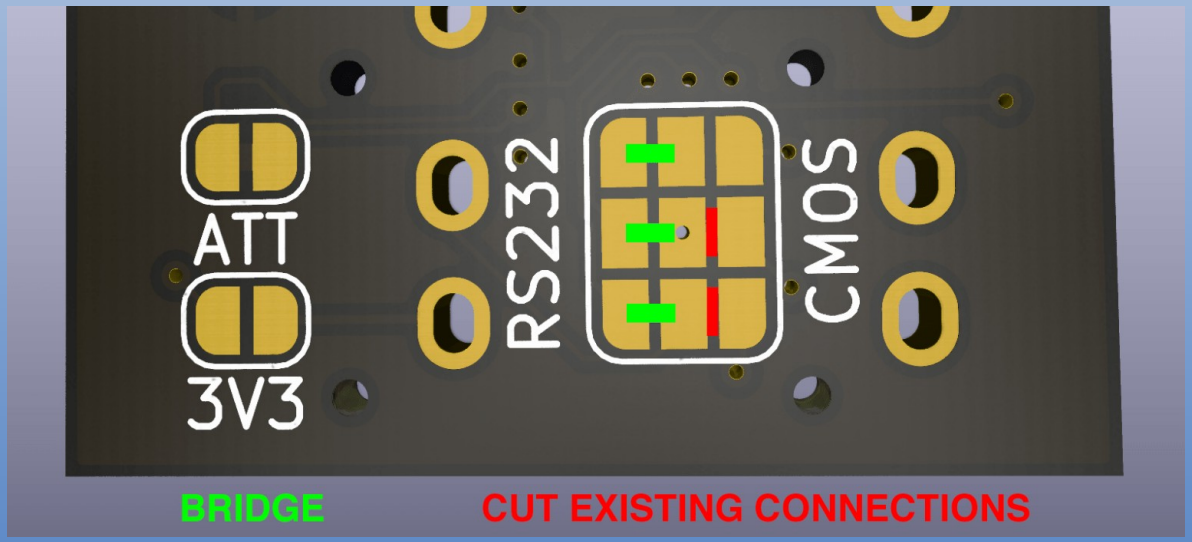
- Newer Radios
  - Built-in Sound Cards
- External Add-Ons
  - DigiRig ($50+)
  - SignaLink USB ($150)
  - RigBlaster ($70-$200+)
- DIY Sound Card Interfaces
  - Cheap (under $20)
  - uGreen USB Sound Card (Low Noise Floor, No Birdies)
  - DIY Interface Cables
  - May Require Signal Attenuation (Hardware or Software)
  - Use Rig Control or VOX to Key Radio

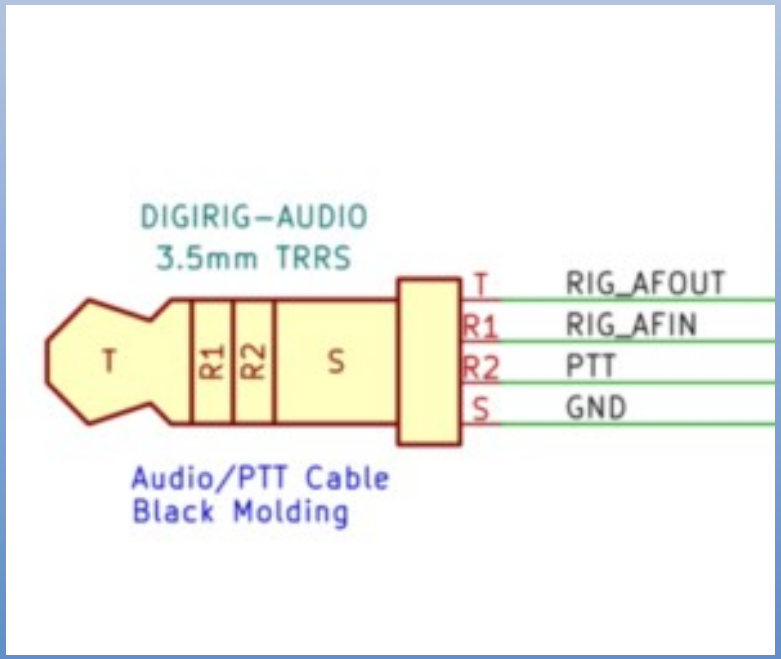


Sound Cards – DigiRig

- Inexpensive ($50 + Cables)
- Very Small in Size
- USB Sound Card Built-in
- Digital Modes with One Cable
- Serial Port Built-In (supports RS-232, CI-V, TTL, etc.)
- Digital Modes & Rig Control with Two Cables
- USB-C Connection

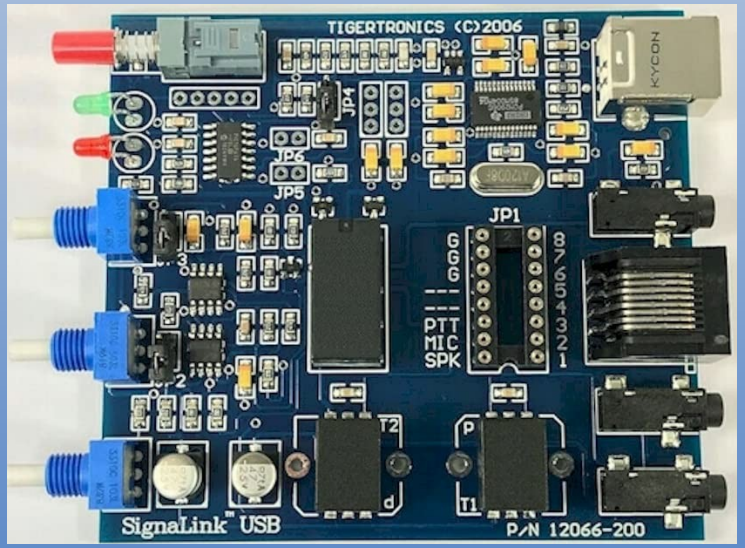






Sound Cards – SignaLink USB

- More Expensive ($150 w-cables)
- Physically Larger
- USB Sound Card Built-in
- Digital Modes with One Cable
- Audio Levels Adjustable on Front
- No Serial Port Built-In
- Rig Control Requires Separate Connection to Radio
- USB-B Connection



Radio Setup

- May Need to Set Radio to Specific Mode
  - Data-SSB instead of regular SSB, etc.
  - Radio needs to know drive audio source
- May Need to Change Menu Setting
  - Enable Data Port
  - Set Correct Data Port Mode
- AGC Settings – Slow or Off
- Don’t Splatter!
  - No ALC Activation = No Overdriving
  - Set transmit power higher than desired output and reduce audio for desired power level. Impossible to overdrive.
- Rig Control
  - Auto Band Switching
  - Auto Frequency Changes
  - Transmit Keying

Common Software

- **WSJT-X**
  - FT8, FT4, WSPR, & All Other JT Modes
- **JS8 Call**
  - Uses FT8 protocol, but allows for longer form QSOs
- **FLDIGI**
  - RTTY, PSK, MFSK, Olivia, THOR, & Virtually Every Other Non-JT Mode
  - NBEMS Integration
- **Winlink**
  - Send and receive e-mail from anywhere
  - Becoming the standard for ARES, etc.

Time Sync

- Required for FT8, WSPR, & All Other JT Modes
- NTP (Network Time Protocol) – Needs Internet
  - Dimension 4
  - BktTimeSync
- GPS – No Internet
  - USB GPS Receiver (<$20)
  - BktTimeSync

Windows Setup

- Sound Settings Menu Shortcut & Autostart
  - Quick Access to Sound Card Levels
  - Load Windows Sound Control Panel On Startup for Easy Access
- Sound Settings
  - Never Set Radio Sound Card As Default (Prevents Transmitting Windows Sounds and Other Audio Over the Air)
  - Turn Off Audio Enhancements & AGC
  - Adjust Levels as Necessary for Mic & Speakers (Sometimes Very Low Levels Are Required)
  - May Need to Change Audio Format (Bitrate - 16 Bit vs 24 Bit and/or Sample Rate – 44.1KHz vs 48KHz)

Windows Setup

- Serial COM Ports
  - Rig Control & GPS
  - Windows Device Manager
    - Verify COM Port Number
    - They Can Change If You Use Multiple Devices and/or Plug Into Different USB Port
  - FTDI Based Serial Adapters Preferred (Higher Quality Chipset, Better Drivers)