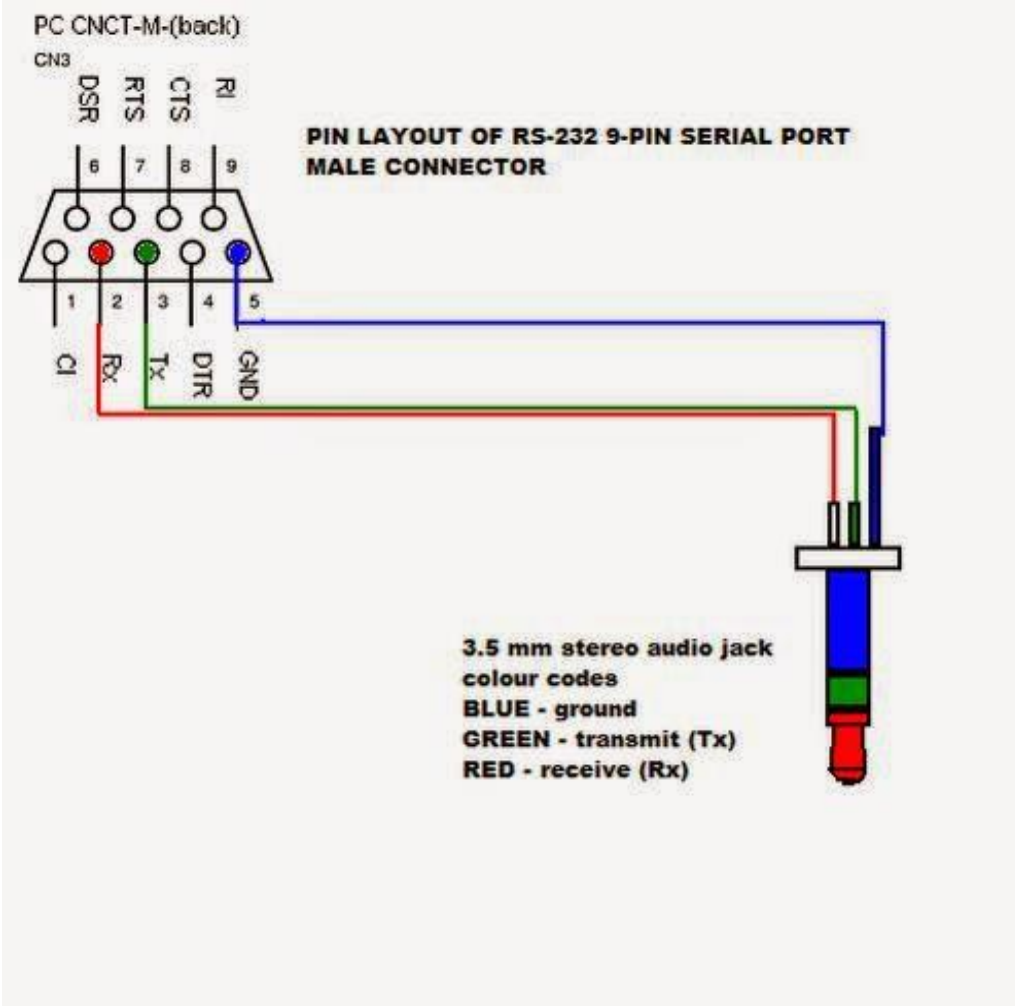


Connector and RS232 format

3.5mm Pin Jack

Tip - RxD (Output), Ring - TxD (Input), Sleeve Ground

DCE, 9600 bps, 8 bit, no parity, 1 stop, 1 Stop



<https://www.amazon.com/SF-Cable-Female-Serial-Cable-6/dp/B004T9BBJC>

Packet: Flag, Type, Command, Data (1 - 16 bytes), Checksum

		msb								lsb
FLAG:	0x7E	0	1	1	1	1	1	1	0	
TYPE:		1	0	S	0	n	n	n	n	nnnn: Data size = (nnnn + 1)
S: 1=Status (ACK/NAK), 0=Data/Command										
COMMAND :		1	RD	c	c	c	c	c	c	RD: 1 = Read command, 0 = Write command
Data (0):		:	:	:	:	:	:	:	:	
Data (n):										
CHECKSUM:	((Type + Command + Data) Modulo 256) BEFORE FLAG/DLE suppression									

Protocol rules

Transmit (BelCanto to other equipment)

- If a Data, Checksum byte == Flag (0x7E) or DLE (0x10) send DLE character (do not include in checksum calculation) add byte to checksum, exclusive OR byte with 0x40 and send byte.

Receive (other equipment to BelCanto)

- If FLAG (0x7E) character is received Reset checksum to 0x00. Set Data payload size to next byte (TYPE) and (0x0F + 1)
- If DLE (0x10) character is received discard it (do not include in checksum) exclusive OR next byte with 40H before placing in receive buffer and add to checksum.
- If valid packet is received parse and process packet.
 - If (COMMAND and 0x1F) is valid command for device.
 - If RD bit of COMMAND byte = 1 return requested data
 - Else execute request and return ACK packet
 - Else If (COMMAND and 0x1F) is invalid command for device. Return NAK packet

Push (Bel Canto to other equipment)

- After the first received packet with a correct checksum Current values for Mute, Input, and Volume will be sent. Any changes to Mute, Input, or Volume will automatically send a packet with the new value.

ACK Packet

FLAG: 0x7E
 TYPE: 0xA0
 COMMAND : Received COMMAND
 ACK: 0x06
 CHECKSUM: (0xA6 + COMMAND) modulo 256

NAK Packet

FLAG: 0x7E
 TYPE: 0xA0
 COMMAND : Received COMMAND

NAK: 0x15
 CHECKSUM: (0xB5 + COMMAND) modulo 256
READ response Packet
 FLAG: 0x7E
 TYPE: 0x80 + Data payload size - 1 (n)
 COMMAND : Received COMMAND
 Data (0):
 :
 :
 :
 :
 Data (n):
 CHECKSUM: (TYPE + COMMAND + DATA(0)...DATA(n)) modulo 256

Commands

COMMAND	Description	Write	Read	ACI
0x02	Display	ON/OFF	ON/OFF	x
0x03	Mute	ON/OFF/SOFT	ON/OFF/SOFT	x
0x05	Input	0 to 7	currently selected/MODE	x
0x07	Volume	0 to 200	0 - 200 (168 = 0dB)	x
0x09	Balance	-12 to +12	-12 - +12 (0 = centered)	x

Display (0x02) : READ/WRITE the DISPLAY state of the selected device

WRITE Commands

Data0	Value	Description
OFF	0xE0	Turn the units Display OFF Decimal : 126 128 130 224 226 Hex : 7E 80 82 E0 E2 7E 80 82 E0 E2
ON	0xE1	Turn the units Display ON Decimal : 126 128 130 225 227 Hex : 7E 80 82 E1 E3 7E 80 82 E1 E3

READ Command

Data0	Value	Description
NULL	0x00	Query units Display state Decimal : 126 128 194 0 66 Hex : 7E 80 C2 00 42 7E 80 C2 00 42

Response

Data0	Value	Description
OFF	0xE0	Units Display is OFF Decimal : 126 128 194 224 34 Hex : 7E 80 C2 E0 22
ON	0xE1	Units Display is ON Decimal : 126 128 194 225 35 Hex : 7E 80 C2 E1 23

Mute (0x03) : READ/WRITE the MUTE state of the current device

WRITE Commands

Data0	Value	Description
OFF	0xE0	Enable the outputs. Decimal : 126 128 131 224 227 Hex : 7E 80 83 E0 E3 7E 80 83 E0 E3
ON	0xE1	Hard MUTE (no output) the outputs Decimal : 126 128 131 225 228 Hex : 7E 80 83 E1 E4 7E 80 83 E1 E4
SOFT	0xE2	SOFT MUTE the outputs. Decimal : 126 128 131 226 229 Hex : 7E 80 83 E2 E5 7E 80 83 E2 E5

READ Command

Data0	Value	Description
NULL	0x00	Query units MUTE state Decimal : 126 128 195 0 67 Hex : 7E 80 C3 00 43 7E 80 C3 00 43

Response

Data0	Value	Description
OFF	0xE0	Units outputs are active (MUTE is OFF) Decimal : 126 128 195 224 35 Hex : 7E 80 C3 E0 23
ON	0xE1	Units outputs are disabled (MUTE is ON) Decimal : 126 128 195 225 36 Hex : 7E 80 C3 E1 24 7E 80 C3 E1 24
SOFT	0xE2	Units is in SOFT MUTE Decimal : 126 128 195 226 37 Hex : 7E 80 C3 E2 25 7E 80 C3 E2 25

Input (0x05) : READ/WRITE the selected Input state of the current device

WRITE Command

Data0	Value	Description
Input 1 ETH	0x00	Select input 1 Decimal : 126 128 133 0 5 Hex : 7E 80 85 00 05 7E 80 85 00 05
Input 2 USB	0x01	Select input 2 Decimal : 126 128 133 1 6 Hex : 7E 80 85 01 06 7E 80 85 01 06
Input 3 AES	0x02	Select input 3 Decimal : 126 128 133 2 7

Input 4 SP1	0x03	Hex : 7E 80 85 02 07 Select input 4 Decimal : 126 128 133 3 8 Hex : 7E 80 85 03 08	7E 80 85 02 07 7E 80 85 03 08
Input 5 TOS	0x04	Hex : 7E 80 85 04 09 Select input 5 Decimal : 126 128 133 4 9 Hex : 7E 80 85 05 0A	7E 80 85 04 09 7E 80 85 05 0A
Input 6 LIN1	0x05	Hex : 7E 80 85 06 0B Select input 6 Decimal : 126 128 133 5 10 Hex : 7E 80 85 07 0C	7E 80 85 06 0B 7E 80 85 07 0C
Input 7 LIN2	0x06	Hex : 7E 80 85 08 0D Select input 7 Decimal : 126 128 133 6 11 Hex : 7E 80 85 09 0E	7E 80 85 08 0D 7E 80 85 09 0E
Input 8 PHONO	0x07	Hex : 7E 80 85 0A 0F Select input 8 Decimal : 126 128 133 7 12 Hex : 7E 80 85 0B 10	7E 80 85 0A 0F 7E 80 85 0B 10

READ Command

Data0	Value	Description
NULL	0x00	Query the units FRONT input selection. Decimal : 126 128 197 0 69 Hex : 7E 80 C5 00 45

Response

Data0	Value	Description
Input 1 ETH	0x00	Input 1 is selected. Decimal : 126 128 197 0 69 Hex : 7E 80 C5 00 45
Input 2 USB	0x01	Input 2 is selected. Decimal : 126 128 197 1 70 Hex : 7E 80 C5 01 46
Input 3 AES	0x02	Input 3 is selected. Decimal : 126 128 197 2 71 Hex : 7E 80 C5 02 47
Input 4 SP1	0x03	Input 4 is selected. Decimal : 126 128 197 3 72 Hex : 7E 80 C5 03 48
Input 5 TOS	0x04	Input 5 is selected. Decimal : 126 128 197 4 73 Hex : 7E 80 C5 04 49
Input 6 LIN1	0x05	Input 6 is selected. Decimal : 126 128 197 5 74 Hex : 7E 80 C5 05 4A
Input 7 LIN2	0x06	Input 7 is selected. Decimal : 126 128 197 6 75 Hex : 7E 80 C5 06 4B
Input 8 PHONO	0x07	Input 8 is selected. Decimal : 126 128 197 7 76 Hex : 7E 80 C5 07 4C

Volume (0x07) : READ/WRITE the VOLUME state of the currently selected input of the device

WRITE Commands

Data0	Value	Description
Level	n = 0-200	Set the Volume to n/2 Decimal : 126 128 135 n 7+ n Hex : 7E 80 87 hh 07+hh
Level	0xC8	Set the Volume to 100.0 Decimal : 126 128 135 200 207 Hex : 7E 80 87 C8 CF
Level	0x09	Set the Volume to 4.5 (Note the checksum=0x10, see above) Decimal : 126 128 135 9 16 Hex : 7E 80 87 09 10 50

READ Command

Data0	Value	Description
NULL	0x00	Query units volume setting Decimal : 126 128 199 0 71 Hex : 7E 80 C7 00 47

Response

Data0	Value	Description
Level	n	Units volume is n/2 Decimal : 126 128 199 n 71 + n Hex : 7E 80 C7 hh 47 + hh
Level	0x55	Volume is 42.5 (x2=85=0x55) Decimal : 126 128 199 85 156 Hex : 7E 80 C7 55 9C
Level	0xc8	Volume is 100 (x2=200=0xc8) Decimal : 126 128 199 200 15 Hex : 7E 80 C7 C8 0F
Level	0x37	Volume is 27.5 (Note the checksum=0x7E/126, see above) Decimal : 126 128 199 55 16 Hex : 7E 80 C7 37 10 3E

Balance (0x09) : READ/WRITE the BALANCE setting of the device.

WRITE Commands - number = Left Channel is Higher, + number = Right Channel is Higher

Data0	Value	Description
Level	n = -12 to +12	Set the BALANCE to (-12 to +12) Decimal : 126 128 137 n 9 + n

Hex : 7E 80 89 hh 09+hh
 Level 0xFC Set the outputs BALANCE to -4
 Decimal : 126 128 137 252 5
 Hex : 7E 80 89 FC 05 7E 80 89 FC 05
 Level 0x07 Set the outputs BALANCE to +7 (Note the checksum=0x10, see above)
 Decimal : 126 128 137 7 16 80
 Hex : 7E 80 89 07 10 50 7E 80 89 07 10 50

READ Command

Data0	Value	Description
NULL	0x00	Query units BALANCE setting Decimal : 126 128 201 0 73 Hex : 7E 80 C9 00 49 7E 80 C9 00 49

Response

Data0	Value	Description
Level	n	Units BALANCE is n Decimal : 126 128 201 n 73 + n Hex : 7E 80 C9 hh 49 + hh
Level	0x07	Units BALANCE is +7 Decimal : 126 128 201 7 80 Hex : 7E 80 C9 07 50 7E 80 C9 07 50

Version (0x33) :

READ: Firmware Version/Model strings

Data	Name	Description
MODEL	0xEC	Return max 16 Byte ASCII Model string Decimal : 126 128 243 236 95 Hex : 7E 80 F3 EC 5F 7E 80 F3 EC 5F
VERSION	0xED	Return max 16 Byte ASCII Version string Decimal : 126 128 243 237 96 Hex : 7E 80 F3 ED 60 7E 80 F3 ED 60