

Consult Pragmatic RS-485 Control Network Protocol Documentation for detailed explanation of commands and computation of Checksum (CS)

Default destination address DA of a brand-new tuner is 0x02H [02 Hex]

Default source address SA can be any number [0xFFH is not allowed]

Start of Frame is SOF - 0x02H

LEN = Total number of bytes in the frame excluding the SOF, but including the LEN byte itself.

COMMAND = command number for the unit. See Protocol documentation for more details.

CS = Check sum calculated for the entire frame. [CS= 0x100H – (LEN+DA+SA+COMMAND+DATA)]

Following is an example to change the tuner address from default 0x02H to 0x15H

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA	CS
Set destination address to 15	02	06	02	01	80	15	62

IF TUNNER EXCEPT THIS COMMAND IT HAS TO SEND AN 'ACK' BACK

COMMAND	SOF	LEN	DA	SA	CS
ACK BACK	02	04	01	15	E5

SEND STATUS REQUEST

COMMAND	SOF	LEN	DA	SA	COMMAND	CS
STATUS REQUEST	02	05	01	15	11	D4

PC GETS AN 'ACK' AND STATUS REPLY BACK FROM THE TUNER

COMMAND	SOF	LEN	DA	SA	CS
ACK BACK	02	04	15	01	E5

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA								CS
						ID-TUNER	TV CH#	SUB CH#	MODE	ANT/CABLE	POWER	STATUS		
STATUS REPLY	02	0D	15	01	12	55	07	02	00	OO-ANT O1-CABLE	O6	O6	OO-OFF O1-ON	CALCULATE

STATUS REPLY SHOWS THAT TUNER WITH ADDRESS 15 SET TO CH 007_2 ANT(OR CABLE) MODE AND OFF (OR ON)

IF YOU SEND TO TUNER STATUS REQUEST COMMAND WITH ADDRESS OTHER THAN 15 ,TUNER DOES NOT SEND AN 'ACK' BACK

THAT MEANS THAT ANY COMMAND SENT TO TUNER WITHOUT A MATCHING ADDRESS WILL NOT GET AN 'ACK' BACK FROM THE TUNER

PC SENDS COMMAND PING

COMMAND	SOF	LEN	DA	SA	COMMAND	CS
PING	02	05	FF	02	10	EA

ALL TUNERS THAT ARE ACTIVE ON A NETWORK HAVE TO SEND AN 'ACK' BACK
IN OUR EXAMPLE (ONE TUNER WITH ADDRESS 15) THIS MESSAGE WILL BE:

COMMAND	SOF	LEN	DA	SA	CS
ACK BACK	02	04	01	15	E5

AS MANY TUNERS ARE ACTIVE PC HAS TO GET SAME NUMBERS OF ACK MESSAGES WITH DIFFERENT TUNER ADRESSES
EVERY COMMAND SENT FROM PC SHOULD HAVE A RESPONSE FROM TUNER WITH AN 'ACK' MESSAGE

BELOW ARE SAMPLES OF COMMANDS SENT TO THE TUNER WITH ADDRESS 15 AND PC ADDRESS OF 01

COMMAND	SOF	LEN	DA	SA	COMMAND	CS
VOLUME UP	02	05	15	01	20	C5
VOLUME DOWN	02	05	15	01	21	C4
MUTE(TOGGLE)	02	05	15	01	23	C2
MUTE ON	02	05	15	01	24	C1
MUTE OFF	02	05	15	01	25	C0
TUNER CHANNEL UP	02	05	15	01	41	A4
TUNER CHANNEL DOWN	02	05	15	01	42	A3

SAMPLE OF DIRRECT TUNNIG OF TUNER WITH ADDRESS 15 FROM PC ADDRESS 01 TO CHANNEL 007.02

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA						CS
SET TUNER TO CH 007.02	02	0B	15	01	43	00	00	07	2E	00	02	65

SAMPLES OF TUNER CONTROL COMMAND

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
PILLAR BOX	02	07	15	01	44	52	00	4D
FULL(WIDE)	02	07	15	01	44	52	01	4C
ZOOM1	02	07	15	01	44	52	02	4B
ZOOM2	02	07	15	01	44	52	03	4A
PANORAMA	02	07	15	01	44	52	04	49

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
AUDIO MUTE ON	02	07	15	01	44	57	00	48
AUDIO MUTE OFF	02	07	15	01	44	57	01	47

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
SET VOLUME LEVEL	02	07	15	01	44	56	00-FE	CALCULATE

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
SET SLEEP TIME MIN.	02	07	15	01	44	47	00-FE	CALCULATE

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
V-CHIP ON	02	07	15	01	44	4C	00	53
V-CHIP OFF	02	07	15	01	44	4C	01	52

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
DIGITAL AUDIO OUTPUP AC3	02	07	15	01	44	4F	00	50
DIGITAL AUDIO OUTPUP PCM	02	07	15	01	44	4F	01	4F

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
RF AIR MODE	02	07	15	01	44	7E	00	21
RF CABLE MODE	02	07	15	01	44	7E	01	20
RF MODE STATUS READ	02	07	15	01	44	7E	FF	22

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
CLOSED CAPTION MODE OFF	02	07	15	01	44	4D	00	52
CLOSED CAPTION MODE	02	07	15	01	44	4D	11 TO 68 HEX	CALCULATE

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
NAVRAM COPY FROM SYSTEM	02	07	15	01	44	3C	00-FF	CALCULATE
NAVRAM PASTE TO SYSTEM	02	07	15	01	44	3E	00-FF	CALCULATE

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
COPY AIR CH MAP FROM SYSTEM	02	07	15	01	44	3A	00-FF	CALCULATE
PASTE AIR CH MAP TO SYSTEM	02	07	15	01	44	3B	00-FF	CALCULATE

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
COPY CABLE CH MAP FROM SYSTEM	02	07	15	01	44	2E	00-FF	CALCULATE
PASTE CABLE CH MAP TO SYSTEM	02	07	15	01	44	2C	00-FF	CALCULATE

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
NAVRAM PAGE NUMBER	02	07	15	01	44	4E	00-FF	CALCULATE
AIR CHANNEL MAP PAGE#	02	07	15	01	44	44	00-FF	CALCULATE
CABLE CHANNEL MAP PAGE#	02	07	15	01	44	45	00-FF	CALCULATE

SAMPLE OF DIRRECT TUNNIG OF TUNER WITH ADDRESS 15 FROM PC ADDRESS 01 TO CHANNEL 007.02

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA							CS
DIRRECT CHANNEL TUNING	02	0C	15	01	44	42	00	00	07	2E	00	02	21

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
COPY CABLE CH MAP FROM SYSTEM	02	07	15	01	44	2E	00-FF	CALCULATE
PASTE CABLE CH MAP TO SYSTEM	02	07	15	01	44	2C	00-FF	CALCULATE

REMOTE CONTROL KEY COMMAND

COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
RC_CH_UP	02	06	15	01	45	13		8C
RC_CH_DN	02	06	15	01	45	14		8B

THE FOLLOWING COMMANDS ARE ONLY FOR FACTORY TRAINED TECHNICIANS:

SYSTEM COMMANDS

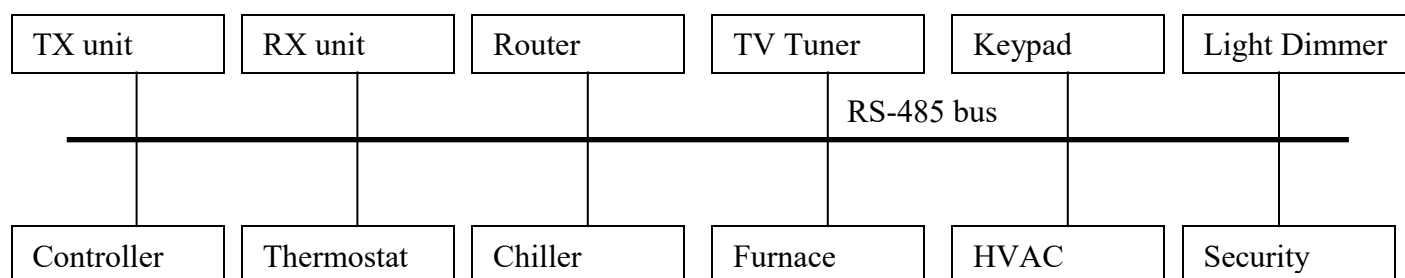
COMMAND	SOF	LEN	DA	SA	COMMAND	DATA		CS
SYSTEM RESTART	02	07	15	01	44	46	00	59
SYSTEM PARAMETERS RESET+RESTART	02	07	15	01	44	46	01	58
INSTALL PARAMETERS RESET/RESTART	02	07	15	01	44	46	02	57
ALL PARAMETERS RESET	02	07	15	01	44	46	03	56
SERVICE MODE ENTERING (AGING)	02	07	15	01	44	46	0A	4F
SERVICE MODE ENTERING (SELF TEST)	02	07	15	01	44	46	0B	4E
SERVICE EXIT	02	07	15	01	44	46	14	45
PRE-DEFINED CHANNEL MAP ADD	02	07	15	01	44	46	15	44

RS-485 Control Network Protocol

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The following control network protocol is developed for all products designed, developed and manufactured by/and for Pragmatic Communications Systems, Inc.

Architecture:



Features:

- * Simple CAT-5 cable for interconnect between nodes. (May need a RJ45 to DB9 adaptor)
- * Each node has a unique address
- * Any node can talk to any other node
- * Allows for keypad, PC or network control of the entire system

Functions:

CATS Transmitter / Receiver:

- Status request
- Volume up/down/mute
- Local source select

CATS Router:

- Status Request
- Connection command

Keypad: Consult Product Manual.

System controller: User defined.

TV Tuner:

- Status request
- Mode selection
- Channel selection
- Control commands

Light Dimmer: Consult Product Manual.

Security: Consult Product Manual

HVAC: Consult Product Manual

Furnace: Consult Product Manual

Chiller: Consult Product Manual

Thermostat: Consult Product Manual

RS-485 Protocol

The purpose of the protocol is to implement a reliable method to transport messages from one device on the network to another device on the network. The low-level protocol is responsible for generating the packet structure, and handling all aspects of line control, error detection, and retries.

Packet format:

| **SOF** | **Len** | **DA** | **SA** | **Data** | **CS** |

SOF = Start_Of_Frame = 02 (hex)

Len = Length of packet

DA = Destination Address (TV (terminal))= 1 byte, 01 to FC (hex)

SA = Source (Sending) Address (Server (host)) = 1 byte, 01 to FC (hex)

Data = message (0 to 64 bytes)

CS = Checksum of all fields except SOF

This is how you calculate CS= 100 hex – (Len + DA + SA + DATA) (all bytes in Hex)

Each packet must begin with a Start_Of_Frame byte. The SOF byte must be a 02. The receiver ignores any packet that does not begin with a 02.

The first byte in the packet after the SOF byte is the Length field. This is the length of the length byte, the two address bytes, the data bytes, and the checksum. Since the data field may be omitted, the length could have a minimum value of 4, if the application level supports that. For example, the application could define a packet with no data to be an "Acknowledgement" of a previously sent packet. The Length field does NOT include the SOF byte; it is the number of bytes in the packet that come after the SOF byte.

Each device on the network must have a unique address. The address may be between 01 and FC (hex). The address 00 is not used, in order to better protect against packet errors. The address FF is reserved for use as a "broadcast" address, to send a message to all devices at once. The installer/designer must have a detailed and comprehensive strategy to assign unique addresses to each device, so that the system will function properly.

The first byte after the Length field must be the Destination Address (DA). The receiver ignores any packet that does not match its own unique device address.

The next byte after the DA is the Source Address (SA). The SA identifies the sender of the message, and therefore defines where the reply needs to be sent back to.

The message to be sent is contained in the data field. The data field may be omitted, as described above, if the application level supports it. The data field is the only field that may be omitted; all of the other fields are required. The maximum length of the data field depends on the application and the limitations of each device on the network. The contents of the data field are defined below under the command structure.

The calculation of the checksum includes all bytes of the packet except the leading SOF byte. The DA, SA, Length, and all data bytes are included in the checksum. The checksum is calculated by first taking the 8-bit-modulo sum of all of the included bytes in the packet, then taking the twos-complement of the sum. The checksum byte is then sent as the last byte of the packet. At the receiver, all included bytes of the packet, including the checksum, are added together using 8-bit-modulo addition. The result should be zero for a valid packet. The examples illustrate how the checksum is calculated and appended after the data field. If the checksum is not zero, then the packet is not valid, and the receiver should ignore the packet.

Examples

Send a hex "AA" from station 1 to station 7:

02 05 07 01 AA 49

Send the string "HELLO" from station 1C to station 4:

02 09 04 1C 48 45 4C 4C 4F 63

Send an "ACK" back (zero length data field):

02 04 1C 04 DC

Note: The first two examples, although valid for the protocol, are actually not realistic for this application, because they do not include a valid command within the message, as required by this application. These examples are intended to explain and illustrate the format of valid packets for the protocol, and not the content of the message within the packet.

Line contention

RS-485 is a half-duplex system. This means that only one device on the network is allowed to send at any one time. Prior to sending a message, the potential sender must examine the line to see if it is busy or not. If the line is busy, then the sender needs to wait until the line is free before beginning the transmission.

Retries

One of the purposes of this protocol is to implement a reliable method of communications between the various devices. Therefore, each message needs to have either an acknowledgement or a reply message from the destination device, to confirm to the sender that the message was received properly.

If the sender fails to get a reply back from the destination device, then the sender should assume that the packet was not received properly, and the sender should re-send the packet. If there is still no reply after 3 tries, the sender should quit and declare a network communications failure.

Autonomous Response (AR)

Any device on the bus that executes an IR command is required to broadcast an autonomous response on the bus upon execution of the IR command. For example, if a CATS receiver is issued a volume up or down command, it is required to broadcast an AR upon execution of the IR command. If a router is requested to change source selection from a room via IR command, the router is required to broadcast an AR on the bus. The packet for this AR broadcast message is as follows:

| **SOF** | **Len** | **DA** | **SA** | **Data** | **CS** |

SOF = Start Of Frame = 02 (hex)

Len = Length of packet

DA = Destination Address = 1 byte, FD (hex) NOTE: Always fixed for AR broadcast

SA = Source (Sending) Address = 1 byte, 01 to FC (hex)

Data = message (0 to 255 bytes) NOTE: This consists of Status reply command for the device

CS = Checksum of all fields except SOF

Multi-master operation on the bus

Multi-master operation on the bus is based on Collision Avoidance / Multiple Access method. Normally all devices on the bus are in the listen mode. When the devices see a SOF on the bus, they set an internal Busy flag and go to a pre-determined wait state derived from the device address.

Formula to calculate the delay for the wait state:

$35 \text{ ms} + (255 - \text{Device Address in decimal}) * 1 \text{ ms}$

Refer to the timing diagram in figure 1.

T0 – T1 = bus is available to any device to send data.

T1 = Rx1 takes control of the bus.

T1 – T2 = delay to make RTS stable. < 15 ms.

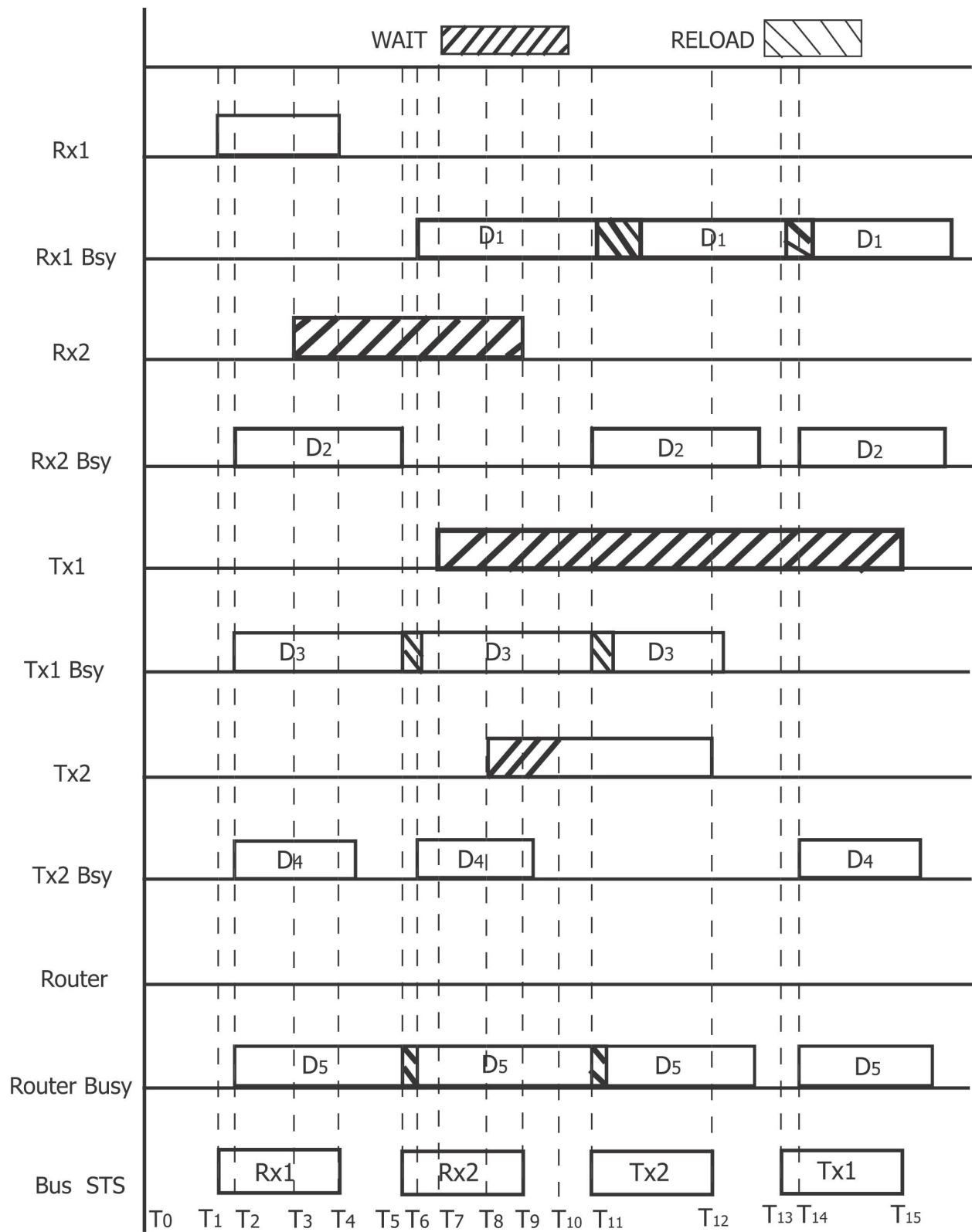
T2 = Rx1 commences data transmission and all other devices on the bus enter variable wait state.

T3 = Rx2 ready for data transmission but waits for busy condition to clear

T4 = bus released by Rx1.

T5 = Rx2 clears busy flag and is ready for transmission
T5 – T6 = delay to make RTS stable. < 15 ms.
T6 = Rx2 commences data transmission and all other devices on the bus enter variable wait state.
T7 = Tx1 ready for data transmission but waits for busy condition to clear
T8 = Tx2 also ready for data transmission but waits for busy condition to clear
T9 = bus released by Rx2.
T10 = Tx2 clears busy condition and is ready for transmission
T10 – T11 = delay to make RTS stable. < 15 ms
T11 = Tx2 commences data transmission and other devices on the bus enter variable wait state
T12 = bus released by Tx2
T13 = Tx1 clears busy condition and is ready for transmission
T13 – T14 = delay to make RTS stable. < 15 ms
T14 = Tx1 commences data transmission and other devices on the bus enter variable wait state
T15 = bus released by Tx1.

Note: There is a small possibility of collision during the delay times for making RTS stable.



Command functions

00 to 0F = reserved
10 = "Ping" (communications check)
11 = Status request
12 = Status reply
13 to 1D = reserved
1E = Identify (request)
1F = Identify (reply)
20 = Volume Up
21 = Volume Down
22 = Volume Set
23 = Mute (toggle)
24 = Mute On
25 = Mute Off
26 = Bass increment
27 = Bass decrement
28 = Bass Set
29 = Treble increment
2A = Treble decrement
2B = Treble Set
2C = Balance increment
2D = Balance decrement
2E = Balance Set
2F = Display message on LCD
30 = Source increment
31 = Source decrement
32 = Source Select
33 = Remote Source increment
34 = Remote Source decrement
35 = Remote Source Select
36 = Router Connection command
37 = Request Source Input Label
38 = Source Input Label (reply)
39 to 3F = reserved
40 = Tuner Mode Toggle (TV/CATV to FM mode)
41 = Tuner Channel Up
42 = Tuner Channel Down
43 = Tuner Channel Number Direct Tuning
44 = Tuner Control Command
45 = Digital Tuner Channel Number Direct Tuning
50 to 7F = Reserved for Keypad
80 = Program device address
81 = Program Input Source label
82 to 8F = Reserved for programming / configuration / setup
90 to FE = available for future use
FF = NAK

Command Descriptions

Preliminary! All command functions and formats are subject to change without notice.

Note:

Command codes 10 to 1F are for any device,

Command codes 20 to 32 are for the Receiver and Transmitter,

Command codes 33 to 35 are extra commands for the Transmitter only

Command codes 36 to 38 are for the Router only and additional command codes are for the individual type of device as defined.

00 to 0F = reserved; do not use

10 = "Ping" (communications check)

All devices **MUST** implement the Ping command.

The "Ping" command is available to check if a device is "online" and responding. The addressed device should respond with an "ACK".

11 = Status request

This command requests the status of the device. The device should respond with command code 12.

12 = Status reply

This command code should only be used to reply to command code 11. The format of the status reply is different for each type of device. The first byte of the reply data is a code to indicate the type of the device:

- R = Receiver
- T = Transmitter
- C = Controller
- M = Matrix (router)
- K = Keypad
- U = Tuner
- V = Volume control

The status reply for the Receiver and Transmitter has the following format:

Format = [ID][Source][Remote][Volume][Mute][Bass][Treble][Balance]

where,

ID = R or T as defined above.

Source = Local Source select:

0 = From transmitter (Receiver only)

1 = Main

2 = Aux

Remote = Remote Source select: (Transmitter only)

1 = Main

2 = Aux

Volume = Volume setting:

1B = Minimum

3C = Line Out (0 dB)

3F = Maximum

Mute = 0 = Mute OFF (normal),

1 = Mute ON

Bass, Treble, Balance = current settings

The status reply for the router (Matrix) has the following format:

Format = [ID][Select table]

where,

ID = M for Matrix

Select table = list of connections for each output. For example, if the reply list is:

57286314

this shows that output (or zone) #1 is being driven by input source #5, output #2 is being driven by input source #7, etc.

Low level example: Here is a sample exchange between the controller (01) and a Receiver (02) with the status reply:

Req. = 02 05 02 01 11 E7

Reply = 02 0D 01 02 12 52 00 00 2B 00 06 06 00 55

The status reply for the Tuner has the following format:

**Format = [ID][TV Chan #][Sub channel#][TV/FM Mode]
[Ant/Cable Select][06][06][Power status]**

where,

ID = U for Tuner

TV Chan # = TV channel number

Sub channel# = Sub channel number

TV/FM Mode = Selected mode of the tuner

Ant/Cable Select = Selected mode of the TV

TV/CATV=0, FM=1

Ant = 0, Cable = 1

Power status

Tuner Off=00

Tuner On=01

The status reply for the DIGITAL TUNER has the following format:

Format = [ID][TV Chan #][Sub channel#][MUTE Mode][Ant/Cable Select][VOLUME LEVEL][RESOLUTION][Firmware revision] [Power status]

where,

ID = U for Tuner

TV Chan # = TV channel number

Sub channel# = Sub channel number

MUTE Mode = MUTE mode of the tuner MUTE OFF=1, MUTE ON=0

Ant/Cable Select = Selected mode of the TV Ant = 0, Cable = 1

VOLUME LEVEL from 00 to FEH

RESOLUTION 480i = 00

480p = 01

720p = 02

1080i = 03

Firmware revision = Firmware revision number

Power status Tuner Off=00

Tuner On=01

13 to 1D = reserved

1E = Identify (request) (not implemented yet)

1F = Identify (reply) (not implemented yet)

20 = Volume Up

Reply = ACK

This command increments the volume setting by one, up to the maximum value.

21 = Volume Down

Reply = ACK

This command decrements the volume setting by one, down to the minimum value.

22 = Volume Set

Data = value for volume setting (1B to 3F) [Value range is 00 to FE for the Digital Tuner board]

Reply = ACK

This command sets the volume level to the value given in the command. The value must be in the range 1B (minimum) to 3F (maximum), where 3C = line out (0 dB) point.

23 = Mute (toggle)

Reply = ACK

The purpose of this command is to emulate the Mute button from the IR remote, and toggle the mute state.

24 = Mute On

Reply = ACK

This command sets the mute ON (no audio).

25 = Mute Off

Reply = ACK

This command sets the mute OFF (normal).

26 = Bass increment

Reply = ACK

This command increments the bass setting, up to the maximum.

27 = Bass decrement

Reply = ACK

This command decrements the bass setting, down to the minimum.

28 = Bass Set

Data = value for bass setting (02 to 0B)

Reply = ACK

This command sets the bass setting to the specified value. The value must be in the range between 02 (-12 dB) to 0B (+15 dB), where 06 = 0 dB (default).

29 = Treble increment

Reply = ACK

This command increments the treble setting, up to the maximum.

2A = Treble decrement

Reply = ACK

This command decrements the treble setting, down to the minimum.

2B = Treble Set

Data = value for treble setting (02 to 0A)

Reply = ACK

This command sets the treble setting to the specified value. The value must be in the range between 02 (-12 dB) to 0A (+12 dB), where 06 = 0 dB (default).

2C = Balance increment

Reply = ACK

This command increments the balance setting, (more to the right,) up to the maximum.

2D = Balance decrement

Reply = ACK

This command decrements the balance setting, (more to the left,) down to the minimum.

2E = Balance Set

Data = value for balance setting (DC to 24, two's complement)

Reply = ACK

This command sets the balance setting to the specified value. The value must be in the range DC (=−36 decimal, for max left) to 24 (+36 decimal, for max right), where 00 is equal balance.

2F = Display message on LCD

Data = message for display

Reply = ACK

Note: the message for display must be exactly 16 characters.

30 = Source increment

Reply = ACK

This command increments the source selection to the next input.

31 = Source decrement

Reply = ACK

This command decrements the source selection to the previous input.

32 = Source Select

Data = value for source select (0 to 2)

Reply = ACK

This command sets the source selection to the specified value.
For the receiver, there are three choices available:

- 0 = (from router)
- 1 = Local input: Main
- 2 = Local input: Aux

For the transmitter, there are two choices available:

- 1 = Local input: Main
- 2 = Local input: Aux

This command chooses which source input is sent to the local A/V output of the receiver or transmitter unit. For example, normally a receiver is going to be set to "from router" so that the A/V program comes from the selected input (source) from the router. However, suppose that a receiver also has a local VCR connected to the local "Main" input. Then selecting source "1" (Main) will allow the receiver to send the output from the VCR to the TV.

33 = Remote Source increment (transmitter only)

Reply = ACK

This command increments the source selection to the next input.

34 = Remote Source decrement (transmitter only)

Reply = ACK

This command decrements the source selection to the previous input.

35 = Remote Source Select (transmitter only)

Data = value for source select (1 to 2)

Reply = ACK

This command sets the remote source selection to the specified value. For the transmitter, there are two choices available:

1 = Local input: Main

2 = Local input: Aux

This command chooses which of the two source inputs is sent through the encoder and out the CAT5 interface to the remote receiver.

Note: In most applications, this command would not be used, because all the source selections are handled by the router. However, for special applications which do not include a router, and have no more than two source inputs, the transmitter handles the source input selection and sends one of the two inputs to the receiver. The remote source select is completely independent from the local source select.

36 = Router Connection command

Data = [Output #][Input #]

Reply = ACK

This command controls the crosspoint matrix router. The first parameter is the output, or zone, number. The second parameter is the input, or source, number. The connection command directs the router to connect the specified input to the specified output, and thus switch the router, and thus allow the receiver to be connected to the desired input source.

37 = Request Source Input Label

Data = [Input #]

Reply = 38

The router has storage so that each source input may have a label such as "DSS", "DVD", etc. This command requests the source label for the specified input from the router.

38 = Source Input Label (reply)

Data = [Label value]

The message is used to reply from the above source label request command. The router responds with the stored label value.

39 to 3F = reserved

40 to 4F = Reserved for Tuner commands (mode and channel select)

40 = Toggle mode between TV/CATV and FM

This command toggles between the TV/CATV mode and FM mode

Reply = ACK

41 = Channel Up

This command increments the channel up by one TV/CATV channel or 1 FM channel

Reply = ACK

42 = Channel Down

This command decrements the channel down by one TV/CATV channel or 1 FM channel

Reply = ACK

43 = Tune to channel (Analog/NTSC/CATV Tuner only)

Data = [channel #] 6 bytes: first three bytes represent one integer for channel, decimal point, last two bytes represent one integer for sub-channel (Example: Data = 009.05 is channel 9, sub-channel 5) (major channel, .minor or sub-channel)

TV = 001.xx – 125.xx
FM = 0877 - 1079

Reply = ACK

44 = Tuner Control Command

Data = [command] [value]

<u>Command</u>	<u>Value</u>	<u>; comments</u>
52	0 = pillar box 1 = full (wide) 2 = zoom1 3 = zoom2 4 = panorama	; 'R' = 52
57	0 = audio mute on 1 = audio mute off	; 'W' = 57
56	00-FEH	; 'V' = 56, volume level
45	RC key code	; 'E' = 45, IR control key code
47	00-FEH	; 'G' = 47, Sleep timer in minutes
4C	0 = off 1 = on	; 'L' = 4C, v-chip on / off
4D	0 = Closed caption off Lower nibble: Caption Mode (CC1: 1~ TEXT4: 8) High nibble: Caption Service (Service1: 1 ~ Service6: 6)	; 'M' = 4D, Closed Caption
4F	0 = Dolby Digital 1 = PCM	; 'O' = 4F, Digital Audio output
46	0 = system restart 1 = system parameter reset + restart 2 = system/install parameter reset + restart 3 = all parameter reset + restart 10 = service mode entering (aging) 11 = service mode entering (self test) 20 = service exit (normal / aging, etc.) 21 = pre-defined channel map add	; 'F' = 46, System Commands

<	01 – FFh page number	NAVRAM copy from system
>	01 – FFh page number	NAVRAM paste to system
:	01 – FFh	Copy Air channel map from system
;	01 – FFh	Paste Air channel map to system
.	01 – FFh	Copy Cable channel map from system
,	01 – FFh	Paste Cable channel map to system
N	01xFFh	NAVRAM page number
D	01xFFh	Air channel map page #
E	01xFFh	Cable channel map page #
”	0x00 ` 0xFE 0xFF for status read	Direct Tuning using major-minor # NOT FOR DIGITAL TUNER
~	0 = Air 1 = Cable 0xFF for status read	Changing RF mode
I	0 = IR disabled 1 = IR enable	Enable/disable IR
K	0 = keys disabled 1 = keys enabled	Enable/disable key operation

45 = Digital Tuner Tune to channel

Data = [channel #] 6 bytes: first three bytes represent one integer for channel, decimal point, last two bytes represent one integer for sub-channel (Example: Data = 009.05 is channel 9, sub-channel 5) (major channel.minor or sub-channel)

TV = 001.xx – 125.xx

50 to 7F = Reserved for Keypad

80 to 8F = Reserved for programming / configuration / setup

80 = Set Device address

Data = number between 01h and FCh. [Numbers 00h, FDh, FEh and FFh not allowed.]

81= Program Source Input label

Data = [Label #][Text]

Label # is between 1 to 8. This corresponds to the 1-8 inputs on the router. Text must be 16 characters long. No more, no less. This is the desired label for the router input.

90 to FE = available for future use

FF = NAK

This reply is used instead of an ACK if the command code is not valid, or if any required parameters are omitted.
