MZC

MZC Control Specification

Rev 1. 4

Table of Contents

1.0 Overview

The MZC is able to be controlled by external devices (e.g., Touch screen, 3rd-party controller, etc.). There are 2 parts to the MZC control feature. One part is MZC system control and the other part is MZC status feedback. The control part allows some basic control of MZC zones such as volume, audio/video routing, etc. The feedback part allows the external device to synchronize with the MZC and display MZC system status. There are 2 different interfaces that can be used with a MZC. The first being the Control Port (located on the rear of an MZC) and the second being an RSA-1.0. Both interfaces follow the same command and feedback protocol but have slight differences.

GENERAL SYSTEM INFORMATION:

Every valid command will generate a reply back indicating a command was successful or a failure. Each command must be completed with a reply before another command can be sent. Most commands control the MZC independently of the programmed project within the MZC. The only exception to this rule is the Button Press Command (0x52). This action depends on what has been programmed for the given button. Feedback is provided by way of asynchronous data being transmitted to the external device. The feedback is sent out around every two seconds (when the MZC system is idle) and as a particular state has changed. See the "MZC Outgoing Messages" section for further details on the types of feedback.

INTERFACE:

Control Port:
The control port requires the use of the DTP-6 (DB9 to 4 circuit mini). The serial interface parameters are 57600 baud, 8 data bits no parity 1 stop bit, and no handshaking. The Control Port has inherent limitations which forces some requirements to be met for successful operation. The Control Port can not be available at all times. Instead, the control Port institutes a time window mechanism in which commands can only be sent within the time window. The time window is opened by sending out an open prompt (0x11). The time window stays opened until the close prompt (0x13) is sent. The time window is 20ms in duration. The external device must watch for these prompts and ensure that a command commences transmission within 20ms of receiving the open prompt (0x11).

If the command transmission has started within 20ms, the time window will be extended to ensure that the whole command will be received. There can be no long gaps or delays (inter-character delays) between the commands individual bytes. If a command has been received, the MZC will act upon it and send out a reply indicating success or failure. At this time the MZC will send out another open prompt (0x11) to give the external device chance to send another command. This will continue until no command is received within the 20ms. At which time the MZC will signal the time window closure by sending out a close prompt (0x13)

RSA-1.0 INTERFACE:

An RSA-1.0 using "MZC Control firmware" acts as an interface between the MZC system and the external device. The RSA-1.0 connects to the MZC via the expansion port. The external device connects to the RSA-1.0 via the DB9 port (null modem cable may be required depending on the external device hardware). The RSA-1.0 DB9's serial interface parameters are 57600 baud, 8 data bits no parity 1 stop bit, and no handshaking.

The RSA-1.0 buffers the incoming commands and passes them on to the MZC. The RSA-1.0's DB9 port is available at all times which eliminates the time window mechanism. There are no open or close prompts. A command can be transmitted at any time. The RSA-1.0 only accepts one command at a time. A command has to be completed (indicated by a reply) before another command can be sent. If a command has been received, the RSA-1.0 will deliver it to the MZC. The RSA-1.0 will wait for a reply back from the MZC system and then forward that reply back to the external device.

1.1 STRING EXAMPLE:

Although it depends on the programming language you are using, the example below is a representation of what the MZC will actually need to see. This command is to turn Zone 5 off; the following string must be transmitted after the command window has opened:

0x550x040xA10x02

2.0 Command Packet Structure

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length
2	0x??	Command Value
3 - N	0x??	Command Data (if any)
Last Byte	0x??	Simple Checksum

Notes:
1. Byte 0x01 (Length) is the packet character length not including the Start of Packet Byte.
2. The simple checksum is calculated such that the unsigned 8-bit sum of all characters (Start of Packet – Simple Checksum) equals 0x00.

3.0 Replay Packet Structure

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length
2	0x95	Reply
3	0x??	Originating Command Value
4	0x00 or 0x01	0x00 – NACK. Something about the command was invalid 0x01 – ACK. The command was recognized and acted upon
5 - N	0x??	Additional data (if any). Originating command specific
Last Byte	0x??	Simple Checksum

Notes:
There are a few different types of structures for the reply packet. The structure above is for most Commands. The following Commands have their own unique reply packet structure: Get Product and Version, "Source Menu List Request" and "Tuner Settings List Request." For a description of these reply packet structures, see their individual sections in this documents.

The "Originating Command Value" allows synchronizing the reply to the original command that triggered the reply.

Most commands will elicit a reply that will not have an "Additional Data" segment within the reply. The only reply that has additional data is the "Get Product and Version" command.

4.0 Commands

4.1 0xA0 - Turn Zone On

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length
2	0x??	Turn Zone On
3 - N	0x??	Zone ID (0 indexed)
Last Byte	0x??	Simple Checksum

This command turns on the specified Zone. The selected source will be the Zone's last selected source.

Example:
To turn on zone 5, the following sequence of bytes must be transmitted after the command window has opened:

Value	Meaning
0x55	Start of packet (sync byte)
0x04	Command length
0xA0	Turn Zone on command byte
0x04	Represents Zone 5 (0x00 for Zone 1, 0x01 for Zone 2, …)
0x03	8-bit simple checksum (0x55 + 0x04 + 0xA0 + 0x04 + 0x03 = 0x00)

String Example: 0x550x040xA00x040x03

Reply Example:
When 'turn on zone 5' command is sent

Value	Meaning
0x55	Start of packet (sync byte)
0x05	Command length
0x95	Response
0xA0	Originating Command value (0xA0 – Turn Zone On)
0x01	ACK
0x70	8-bit simple checksum (0x55 + 0x05 + 0x95 + 0xA0 + 0x01 + 0x70 = 0x00)

4.2 0xA1 – Turn Zone Off

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x04	Command Length
2	0xA1	Turn Zone Off
3	0x??	Zone ID (0 indexed, 0xFF to turn all Zones Off)
4	0x??	Simple Checksum

This command turns off the specified Zone. If the Zone ID is 0xFF then all Zones will be turned off.

Example:
To turn off zone 5, the following sequence of bytes must be transmitted after the command window has opened:

Value	Meaning
0x55	Start of packet (sync byte)
0x04	Command length
0xA1	Turn Zone off command byte
0x04	Represents Zone 5 (0x00 for Zone 1, 0x01 for Zone 2, …)
0x02	8-bit simple checksum (0x55 + 0x04 + 0xA1 + 0x04 + 0x02 = 0x00)

4.3 0xA2 – Party Control

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x05	Command Length
2	0xA2	Party Control
3	0x??	0x00 – Party State Off 0x01 – Party State On
4	0x??	Zone ID (0 indexed)
5	0x??	Simple Checksum

This command controls the Party state of the MZC.

Party State On – The specified zone will be set to Party Master and all other zones will turn on and match the specified zone's currently selected source and volume.

Party State Off – The MZC will exit Party Mode. Zone ID is not used.

Examples:
To make Zone 5 the Party Master and make all the other zones match the current routing of Zone 5, the following sequence of bytes must be transmitted after the command window has opened: (Assumes Zone 5 is already on)

Value	Meaning
0x55	Start of packet (sync byte)
0x05	Command length
0xA2	Party Control command
0x01	Party mode on
0x04	Represents Zone 5 (0x00 for Zone 1, 0x01 for Zone 2, …)
0xFF	8-bit simple checksum (0x55 + 0x05 + 0xA2 + 0x01 + 0x04 + 0xFF = 0x00)

To turn off Party Mode, the following sequence of bytes must be transmitted after the command window has opened:

Value	Meaning
0x55	Start of packet (sync byte)
0x05	Command length
0xA2	Party Control command
0x00	Party mode off
0x00	This is a don't care byte (Zone ID is not used for Party Off)
0x04	8-bit simple checksum (0x55 + 0x05 + 0xA2 + 0x00 + 0x00 + 0x04 = 0x00)

4.4 0xA3 – Select Source

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x05	Command Length
2	0xA3	Select Source
3	0x??	Zone ID (0 indexed)
4	0x??	Source ID (0 indexed)
5	0x??	Simple Checksum

This command will turn on the specified zone if it was in an off state. Also, the specified zone will select the specified source.

Example:
To select Source 1 in the Zone 5 the following sequence of bytes must be transmitted after the command window has opened

Value	Meaning
0x55	Start of packet (sync byte)
0x05	Command length
0xA2	Select Source
0x01	Zone ID (0 indexed)
0x04	Source ID (0 indexed)
0xFF	8-bit simple checksum (0x55 + 0x05 + 0xA3 + 0x + 0x + 0x = 0x00)

4.5 0xA4 – Tone Level

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x06	Command Length
2	0xA4	Tone Level
3	0x??	Zone ID (0 indexed)
4	0x??	0x00 – Bass 0x01 – Treble
5	0x??	Level (SIGNED) -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6
6	0x??	Simple Checksum

This command will set the specified zone's tone level. Note that the Level is a signed value, e.g., 0xFF for -1, 0xFE for -2… 0xFA for -6.

Example:
To select Bass -1 setting in zone 5, the following sequence of bytes must be transmitted after the command window has opened

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x06	Command Length
2	0xA4	Tone Level
3	0x04	Zone ID (0 indexed)
4	0x00	0x00 – Bass 0x01 – Treble
5	0xFF	Level (SIGNED) -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6
6	0xFE	Simple Checksum

4.6 0x41 – Get Product & Version

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x03	Command Length
2	0x41	Get Product & Version
3	0x??	Simple Checksum

This command queries the MZC for its product and version information.

Reply Format:
The reply back from the MZC will be of the following format:

Value	Meaning
0x55	Start of packet (sync byte)
0x??	Command length
0x95	Response
0x41	Originating Command value (0x41 – Get Product & Version)
0x01	ACK
0x??	Product Code 0x0C-MZC-64 0x0C-MZC-66 0x0C-MZC-88
0x??	Firmware Version High Byte (For Internal Use)
0x??	Firmware Version Low Byte (For Internal Use)
0x??	Product Version (NULL terminated ASCII string)
0x??	8-bit simple checksum

Example of the Reply:

Value	Meaning
0x55	Start of packet (sync byte)
0x16	Command length
0x95	Response
0x41	Originating Command value (0x41 – Get Product & Version)
0x01	0x01 = ACK
0x05	0x05 = MZC-66
0x02	Firmware Version High Byte (For Internal Use)
0x20	Firmware Version Low Byte (For Internal Use)
0x56 0x65 0x72 0x73 0x69 0x6F 0x6E 0x20 0x32 0x2E 0x31 0x2E 0x39 0x00	"Version 2.1.9"
0x98	8-bit simple checksum

4.7 0x49 – Video Routing

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x08	Command Length
2	0x49	Video Route
3	0x00	Reserved
4	0x00	Reserved
5	0x00	Reserved
6	0x??	Input 0x00 – 0x07 respective Source Input 0xFE – Page Input 0xFF – Clears Routing
7	0x??	Zone ID (0 indexed)
8	0x??	Simple Checksum

This command allows overriding of the automatic video routing performed by the select source type commands.

Example:
To route video from Source 1 into Zone 5, the following sequence of bytes must be transmitted after the command window has opened.

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x08	Command Length
2	0x49	Video Route
3	0x00	Reserved
4	0x00	Reserved
5	0x00	Reserved
6	0x00	Input 0x00 = Source Input One
7	0x04	Zone ID (0 indexed)
8	0x56	Simple Checksum

4.8 0x4C – Output Set

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x07	Command Length
2	0x4C	Output Set
3	0x00	Reserved
4	0x??	Unite Address
5	0x??	Specific Output 0x00 – Contact Closure #1 0x01 – Contact Closure #2 (MZC-88 only)
6	0x??	Output For Contact Closures: 0x00 – Not Energized 0x01 – Energized 0x02 – Toggle
7	0x??	Zone ID (0 indexed)

This command controls the state of the specified contact closure (relay).

Example:
To energize contact closure #1 on a single MZC-66 system, the following sequence of bytes must be transmitted after the command window has opened.

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x07	Command Length
2	0x4C	Output
3	0x00	Reserved
4	0x00	Unit Address
5	0x00	0x00 – Contact Closure #1
6	0x01	0x01 – Energized
7	0x57	Simple Checksum

4.9 0x52 – Button Press

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x07	Command Length
2	0x52	Button Press
3	0x??	Zone ID (0 indexed)
4	0x??	Address ID (0 indexed)
5	0x??	Source ID (0 indexed)
6	0x??	Key ID (0 indexed)
7	0x??	Simple Checksum

This command enables an external controller to emulate a MZC keypad button press.

Example:
To simulate a keypad on a MZC-66 stand alone unit in Zone 5, Source 1, button #1 the following sequence of bytes must be transmitted after the command window has opened.

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x07	Command Length
2	0x52	Button Press
3	0x04	Zone ID (0 indexed)
4	0x00	Address ID (0 indexed)
5	0x00	Source ID (0 indexed)
6	0x00	Key ID (0 indexed)
7	0x4E	Simple Checksum

4.10 0x56 – Audio Routing

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x08	Command Length
2	0x56	Audio Route
3	0x00	Reserved
4	0x00	Reserved
5	0x00	Reserved
6	0x??	Input 0x00 – 0x07 respective Source Input 0xFE – Page Input 0xFF – Clears Routing
7	0x??	Zone ID (0 indexed)
8	0x??	Simple Checksum

This command allows overriding of the automatic audio routing performed by the select source type commands.

4.11 0x57 – Audio Level

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x08	Command Length
2	0x57	Audio Route
3	0x00	Reserved
4	0x00	Reserved
5	0x00	Action 0x00 – Volume Down 0x01 -- Volume Up 0x02 – Mute Toggle 0x03 – Mute Off 0x04 – Mute On 0x05 – Volume Level (data = absolute level)
6	0x??	Data - Depends on action
7	0x??	Zone ID (0 indexed)
8	0x??	Simple Checksum

This command allows setting of the specified Zone's preamp state.
Valid Volume Levels: 0-44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80

4.12 0x58 – Audio Tone

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x07	Command Length
2	0x58	Audio Route
3	0x00	Reserved
4	0x00	Reserved
5	0x00	Action 0x00 – Bass Down 0x01 -- Treble Down 0x02 – Bass Up 0x03 – Treble Up 0x04 – Bass Flat 0x05 – Treble Flat
6	0x??	Zone ID (0 indexed)
7	0x??	Simple Checksum

This command allows adjustment of the specified Zone's preamp.

4.13 0x62 – Tuner Preset Control

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x08	Command Length
2	0x56	Tuner Preset Control
3	0x00	Tuner ID
4	0x00	Zone ID
5	0x00	Preset # (0-9)
6	0x??	Simple Checksum

This command is for the MZC88 only. It allows preset selection of the internal tuners.

4.14 0x63 – Tuner Control

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x05	Command Length
2	0x63	Tuner Control
3	0x??	Tuner ID
4	0x??	Command 0x03 – AM/FM Toggle 0x04 – Next Preset 0x05 – Prev Preset 0x06 – Seek Up 0x07 – Seek Down 0x0A – Mono/Stereo 0x0B – Tune Up 0x0C – Tune Down
5	0x??	Simple Checksum

This command is for the MZC88 only. It allows control of the internal tuners.

4.15 0x68 – Zone Initialization Request

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x04	Command Length
2	0x68	Zone Initialization Request
3	0x??	Zone ID
4	0x??	Simple Checksum

When an External Device powers up it will not know what a particular Zones Initialization Data is set to. An External Device will want to send this command to each individual Zone in order to get each Zones Initialization Data from the MZC.

Reply Format:
The reply back from the MZC will be of the following format

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length
2	0x95	Response
3	0x68	Originating Command Value (0x68 Zone Initialization Request)
4	0x01	ACK
5	0x??	Zone ID
6	0x??	Number of Sources in the Zone
7 - {N-1}	0x??	Zone Name if any (ASCII String, NULL Terminated)
N	0x??	Simple Checksum

An External Device can use the Zone ID as an offset into an Internal Zone List Data Structure that can be used to store the Number of Sources in the Zone and the Zone Name.

4.16 0x71 – Source Initialization Request

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x06	Command Length
2	0x71	Source Initialization Request
3	0x??	Zone ID
4	0x??	Device Type 0x02 – External Device
5	0x??	Source Index (0 Indexed)
6	0x??	Simple Checksum

After the External Device gets the Zone Initialization Reply for a particular Zone it will have the Source Count that exists for that particular Zone. The External Device can now send a Source Initialization Request for every Source that exists in that particular Zone.

The Device Type parameter should always be set to 0x02 to indicate an External Device.

The Source Index parameter is just an indexed value and does not equate to the Source ID.

Reply Format:
The reply back from the MZC will be of the following format:

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length
2	0x95	Response
3	0x68	Originating Command Value (0x71 Source Initialization Request)
4	0x01	ACK
5	0x??	Zone ID
6	0x??	Device Type 0x02 – External Device
7	0x??	Source Index (0 indexed)
8	0x??	Source ID
9		Source Key ID
10	0x??	Source Type 0x00 – Standard Source 0x01 – iPod (MODE Base) 0x02 – MODE Jukebox (RSA) 0x03 – Internal MZC Tuner 0x04 – STT-2.0 (RSA) 0x05 – XRT12 (RSA) 0x06 – FIREBALL (RSA) 0x07 – MS250 (RSA) 0x08 – T-4555 (RSA) 0x09 – TUN-3.7 (RSA)
11	0x??	Source Expansion Address
12 - {N-1}	0x??	Source Name if any (ASCII String, NULL Terminated)
N		Simple Checksum

The Device Type must match the External Device in order for the External Device to process this Reply.

An External Device can use the Source Index as an offset into an Internal Source List Data Structure that can be used to store the Source ID, Source Key ID, Source Type, Source Expansion Address, and Source Name.

The Source Key ID is the Key ID value that will be passed to the MZC when the source is selected by the user from the External Device by way of the Button Press Command instead of the Source Select Command.

The Source Type will allow the External Device to figure how a particular source is handled and displayed. Different types of sources are handled uniquely.

The Source Expansion Address allows the External Device to direct messages towards the source for direct messages. This is only used when applicable.

The Source Name is what the External Device should display within its Source Selection Menu for the particular source. The Source Name is programmed in EZ TOOLS.

4.17 0x69 – Zone Status Request

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x04	Command Length
2	0x69	Zone Status Request
3	0x??	Zone ID
4	0x??	Simple Checksum

The MZC when idle will send out a periodic Zone Status Message for every Zone. In order to get an immediate Zone Status Message from the MZC, the External Device can send out a Zone Status Request command.

The Zone ID parameter will equal the Zone for which the External Device is requesting information for.

Reply Format:
The reply back from the MZC will be of the following format:

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x0D	Command Length
2	0x95	Response
3	0x69	Originating Command Value (0x69 Zone Status Request)
4	0x01	ACK
5	0x??	Zone ID (0 indexed)
6	0x??	Reserved
7	0x??	Flags b0=0/1 – Unmuted/Muted b1=0/1 – Zone Off/Zone On b2=0/1 – Normal Mode/Party Mode b3=0/1 – Not Party Master/Party Master b4-b7 – reserved
8	0x??	Zone's Selected Source ID
9	0x??	Zone's Volume Level (%, 0 -100)
10	0x??	Zone's Bass Level (signed and in dB)
11	0x??	Zone's Treble Level (signed and in dB)
12	0x??	Zone's Volume Level (actual value)
13	0x??	Simple Checksum

The information in this Reply allows the External Device to know the exact status of any Zone at any particular time.

4.18 0x73 – Source Menu List Request

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x05	Command Length
2	0x73	Source Menu List Request
3	0x??	Zone ID
4	0x??	Source ID
5	0x??	Simple Checksum

The Source Initialization includes a parameter that describes the Source Type. If the Source Type is defined as 0x00 (Standard Source) there may be a Source Menu List of Function items programmed for that Source. In order to get the Source Menu List, an External Device must send a Source Menu List Request command to the MZC. When an External Device has selected a Source that has Function items programmed for it, the External Device should proceed to display the Menu List of Function Items for that Source.

Reply Format:
The reply back from the MZC will be of the following format:

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x95	Response
3	0x73	Originating Command Value (0x73 Source Menu List Request)
4	0x01	ACK
5	0x??	Command Length (High Byte)
6	0x??	Zone ID
7	0x??	Source ID
8	0x??	Source Menu List of Function Items Count (# of Function Items that follow)
9 - {N-1}	0x??	Source Menu List of Function Items (Each Function Item consists of 3 parts) Key ID (Byte) Reserved (Byte) Function Item Label (ASCII String, NULL Terminated
N	0x??	Simple Checksum

The Source Menu List of Function Items Count defines the number of Function Items in the Source Menu List of Function Items.

The Source Menu List of Function Items provides the Function Item Label's that are necessary for the External Device to display the Function Item Label's within the External Device's Source Menu List of Function Items.

The Source Menu List of Function Items also gives the Function Items Key ID that is to be used in the Button Press Command that allows a user to select the particular Function Item from the Source Menu List of Function Items. The length of each Function Item Varies by the length of its Function Item Label.

4.19 0x75 – Tuner Setting List Request

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x05	Command Length
2	0x75	Tuner Setting List Request
3	0x??	Zone ID
4	0x??	Tuner ID
5	0x??	Simple Checksum

The Source Initialization Reply includes a parameter that describes the Source Type. If the Source Type is defined as 0x03 (Internal MZC88 Tuner) there will be a Tuner Setting List, an External Device must send a Tuner Settings List Request command to the MZC. When an External Devices has selected an MZC88 Internal Tuner Source, the External Device should proceed to display the Tuner Settings List of Presets for that Tuner Source.

The Zone ID parameter will equal the Zone for which the External Device is requesting information for.

The Tuner ID parameter will equal the Tuner for which the External Device is requesting information for.

Reply Format:
The reply back from the MZC will be of the following format:

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x95	Response
3	0x75	Originating Command Value (0x75 Tuner Setting List Request)
4	0x01	ACK
5	0x??	Command Length (High Byte)
6	0x??	Zone ID
7	0x??	Tuner ID
8	0x??	Flags b0 – Set to indicate that an External Display should go to a Menu Screen and show Menu Information b1 – Set to indicate that an External Display should go to a Now Playing Screen and show Media Information b2 – Set to indicate that when the Tuned Frequency is a FM frequency, the FM frequency should be displayed in the European Format
9	0x??	Tuned Frequency LSB
10	0x??	Tuned Frequency MSB
11	0x??	Menu List of Tuner Presets Count (# of Tuner Presets that follow)
12 - {N1-1}	0x??	Menu List of Tuner Preset Frequencies (Each Frequency consists of 2 parts) Tuner Preset Frequency LSB Tuner Preset Frequency MSB
N1 - {N2-1}	0x??	Menu List of Tuner Preset Labels (Each Label consists of 1 part) Tuner Preset Label (ASCII String, NULL Terminated)
N2	0x??	Simple Checksum

For a detailed explanation of how to decode the Tuned Frequency and Tuner Preset Frequency Bytes, please refer to section 6.2 (Tuner State Message).

When bit 2 is set within the Flags byte, FM frequencies need to be translated to ASCII using European European frequencies. In the U.S., the FM frequencies jump by 200KHz. So the valid FM sub-MHz values need to be displayed as ".1", ".3", ".5",".7", and ".9". In Europe, the frequencies jump by 50KHz. So the valid FM sub-MHz values need to be displayed as ".00", ".05", ".10", ".15", ".20", etc…

4.20 0x90 – Metadata Device Control

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x09	Command Length
2	0x90	Metadata Device Control
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	Reserved
5	0x??	State Stamp (Must be the State Stamp received from a previous Menu Information Message or Media Information Message)
6	0x??	Reserved
7	0x??	Metadata Device Command 0x00-0xFF (See Metadata Device Commands)
8	0x??	Command Data (Only used with select Metadata Device Commands)
9	0x??	Simple Checksum

This Command is only used when a Metadata Device is connected in the System. The Source Initialization Message includes a parameter that describes the Source Type. If the Source Type is defined to be a Metadata Device Type (0x01, 0x02, 0x04, 0x05, 0x06 for now) the source's metadata and control are handled by an MZC Expansion Metadata Device. This Metadata Device is responsible for maintaining a dynamic menu structure. This menu structure is basically transmitted to the MZC Control RSA so that an External Device can display it. When the External Device navigates the menu it does so by sending commands, e.g. Menu Up, Menu Select, ..., Commands to a Metadata Device which causes the Metadata Device to act upon the command and

update its menu structure. The updated menu structure then gets retransmitted to the MZC Control RSA so that an External Device also uses the Metadata Device Command to send Commands directly to the actual Source Device that is connected to the MZC Expansion Metadata Device.

The Metadata Device Address informs the MZC to what Metadata Device to deliver the Command to. This information is gotten from the Source Initialization Message.

The State Stamp parameter is gotten from the latest Menu or Media Information Message that was received by the External Device that has same Metadata Device Address that we are sending this Command to. This helps synchronization problems that may arise if the External Device for some reason failed to receive/process the latest Menu or Media information Message. If that would be the case, the External Device could be displaying old information and the user might have navigated on that wrong information which could lead to the user being confused. In the Metadata Device, if a Metadata Device Command is received that has an out-of-sync State State Stamp, the command will not be acted upon. Instead the Metadata Device will send out the latest Menu Information Message to try and update the out-of-syn External Device.

The Metadata Device Commands for each of the different Source Types is explained under the Metadata Device Commands section.

The Data parameter is applicable with only select Metadata Device Commands. When the Command is Menu Up or Menu Down, Command Data holds the count of the jump up or down. When the Command is Set Audio, the Data holds the audio input that should be selected. These are just a few examples.

4.21 Metadata Device Addresses

Metadata Device	Address
iPod Base	30h-3Fh
JukeBox RSA	4xh (Out1:x=0,4,8,C Out2:x=1,5,9,D Out3:x=2,6,A,E Out4:x=3,7,B,F)
STT 2.0 RSA	5xh (Tuner1:x=0,2,4,6,8,A,C,E Tuner2:x=1,3,5,7,9,B,D,F)
XRT 12 RSA	60h-6Fh
FireBall RSA	70h-7Fh
MS250 RSA	8xh (80h-87h) (Out1:x=0,4, Out2:x=1,5, Out3:x=2,6 Out4:x=3,7)
T-455 RSA	
TUN-3.7 RSA	A0h – A7h

4.22 Metadata Device Addresses

4.22.1 iPod Base

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x02	Play/Pause Toggle
0x05	Stop
0x06	Next Track
0x07	Previous Track
0x08	Fast Forward
0x09	Rewind
0x0A	Stop Fast Forward/Rewind
0x0B	Next Chapter
0x0C	Previous Chapter
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Increments the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x14	Shuffle Off
0x16	Step Thru Shuffle Modes (Shuffle Tracks, Shuffle Albums, Shuffle Off)
0x1A	Step Thru Repeat Modes (Repeat one Track, Repeat all Tracks, Repeat Off)
0x50	Set Shuffle Mode to Shuffle Tracks and Repeat Mode to Repeat all Tracks, then Play Next Track
0x80	Select Audio Source (Command Data: 0=None, 1=iPod, 2=Mode Base , 3=Mode Adapter

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x0D, 0x0E, 0x0F, 0x10, 0x50.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x02, 0x05, 0x06, 0x07, 0x08, 0x09, 0x0A, 0x0B, 0x0C.

No Message will be sent as a Reply to the following Action Values:
0x14, 0x16, 0x1A, 0x80.

4.22.2 JukeBox

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x02	Play/Pause Toggle
0x03	Play
0x04	Pause
0x05	Stop
0x06	Next Track
0x07	Previous Track
0x08	Fast Forward
0x09	Rewind
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Increments the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x13	Shuffle On
0x14	Shuffle Off
0x15	Shuffle Toggle
0x18	Repeat All
0x19	Repeat Off

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x0D, 0x0E, 0x0F, 0x10.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x02, 0x03, 0x04, 0x05, 0x06, 0x07, 0x08, 0x09, 0x13, 0x14, 0x15, 0x18, 0x19.

4.22.3 STT 2.0

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x06	Next Preset
0x07	Previous Preset
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Increments the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x20	Power On
0x21	Power Off
0x22	AM
0x23	FM
0x24	AM/FM Toggle
0x25	Mono
0x26	Stereo
0x27	Mono/Stereo Toggle
0x28	Seek Up
0x29	Seek Down
0x2A	Tune Up
0x2B	Tune Down
0x2C	Select Preset (Command Data: 0-29 Presets)

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x06, 0x07, 0x0D, 0x0E, 0x0F, 0x10, 0x20, 0x21, 0x22, 0x23, 0x24, 0x25, 0x26, 0x27.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x22, 0x23, 0x24, 0x28, 0x29, 0x2A, 0x2B, 0x2C.

4.22.4 XRT12

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x06	Next Preset
0x07	Previous Preset
0x0B	Next Channel
0x0C	Previous Channel
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Increments the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x2C	Select Preset (Command Data: 0-19 Presets)
0x2D	Jump (Jumps to last preset or channel selected)
0x2E	Mute (Mutes the audio out from the XRT12)
0x2F	Unmute (Unmutes the audio out from the XRT12)
0x30	Next (If b0 Bit is set in the Preset State Byte of Media Information Message: Next Preset A) (If b1 Bit is set in the Preset State Byte of Media Information Message: Next Preset B) (If b0 Bit is set in the Channel State Byte of Media Information Message: Next Channel)
0x31	Previous (If b0 Bit is set in the Preset State Byte of Media Information Message: Previous Preset A) (If b1 Bit is set in the Preset State Byte of Media Information Message: Previous Preset B) (If b0 Bit is set in the Channel State Byte of Media Information Message: Previous Channel)

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x0D, 0x0E, 0x0F, 0x10.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x06, 0x07, 0x0B, 0x0C, 0x10, 0x2C, 0x2D, 0x2E, 0x2F, 0x30, 0x31.

4.22.5 FireBall

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x02	Play/Pause Toggle
0x03	Play
0x05	Stop
0x06	Next Track
0x07	Previous Track
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Increments the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x1B	Play Mode: Normal
0x1C	Play Mode: Repeat Track
0x1D	Play Mode: Repeat Title
0x1E	Play Mode: Repeat Group
0x1F	Play Mode: Random Title
0x20	Play Mode: Random Group

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x0D, 0x0E, 0x0F, 0x10.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x02, 0x03, 0x05, 0x06, 0x7, 0x1B, 0x1C, 0x1D, 0x1E, 0x1F, 0x20.

4.22.6 MS250

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x02	Play/Pause Toggle
0x03	Play
0x05	Stop
0x06	Next Track
0x07	Previous Track
0x08	Fast Forward
0x09	Rewind
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Increments the Hilited Menu Line by the amount given in the Command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x13	Shuffle On
0x14	Shuffle Off
0x18	Repeat On
0x19	Repeat Off

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x0D, 0x0E, 0x0F, 0x10.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x02, 0x03, 0x05, 0x06, 0x07, 0x08, 0x09, 0x13, 0x14, 0x18, 0x19.

4.22.7 T-4555

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x06	Next Preset
0x07	Previous Preset
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Decrements the Hilited Menu Line by the amount given in the command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x22	AM
0x23	FM
0x28	Seek Up
0x29	Seek Down
0x2C	Select Preset (Command Data: 0-39 Presets)
0x30	Next (If b0 Bit is set in the Preset State Byte of Media Information Message: Next Preset) (If b0 Bit is set in the Channel State Byte of Media Information Message: Next Satellite Channel) (If b1 Bit is set in the Channel State Byte of Media Information Message: Next Seek Up AM/FM Channel)
0x31	Previous (If b0 Bit is set in the Preset State Byte of Media Information Message: Previous Preset) (If b0 Bit is set in the Channel State Byte of Media Information Message: Previous Satellite Channel) (If b1 Bit is set in the Channel State Byte of Media Information Message: Previous Seek Up AM/FM Channel)
0x32	SATELLITE

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x0D, 0x0E, 0x0F, 0x10.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x02, 0x03, 0x05, 0x06, 0x07, 0x08, 0x09, 0x13, 0x14, 0x18, 0x19.

4.22.8 TUN-3.7

Value	Action
0x00	Menu Information Request
0x01	Media Information Request
0x06	Next Preset
0x07	Previous Preset
0x0D	Menu Up (Decrements the Hilited Menu Line by the amount given in the command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0E	Menu Down (Decrements the Hilited Menu Line by the amount given in the command Data Byte) (Command Data: 0-250 Menu Lines, 255=5% of all Menu Lines, 254=50 Menu Lines)
0x0F	Menu Select (Selects the Hilited Menu Line indicated in the Menu Information Message)
0x10	Menu Back (Decrements the Current Menu Level indicated in the Menu Information Message)
0x22	AM
0x23	FM
0x28	Seek Up
0x29	Seek Down
0x2C	Select Preset (Command Data: 0-39 Presets)
0x30	Next (If b0 Bit is set in the Preset State Byte of Media Information Message: Next Preset) (If b0 Bit is set in the Channel State Byte of Media Information Message: Next Satellite Channel) (If b1 Bit is set in the Channel State Byte of Media Information Message: Next Seek Up AM/FM Channel)
0x31	Previous (If b0 Bit is set in the Preset State Byte of Media Information Message: Previous Preset) (If b0 Bit is set in the Channel State Byte of Media Information Message: Previous Satellite Channel) (If b1 Bit is set in the Channel State Byte of Media Information Message: Previous Seek Up AM/FM Channel)
0x32	SATELLITE

A Menu Information Message will be sent as a Reply to the following Action Values:
0x00, 0x0D, 0x0E, 0x0F, 0x10.

A Media Information Message will be sent as a Reply to the following Action Values:
0x01, 0x06, 0x07, 0x22, 0x23, 0x28, 0x29, 0x2C, 0x30, 0x31, 0x32.

5.0 MZC Outgoing Messages

5.1 0x20 - Zone Status Message

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x0B	Command Length
2	0x20	Zone Status Message
3	0x??	Zone ID (0 indexed)
4	0x??	Reserved
5	0x??	Flags b0=0/1 – Unmuted/Muted b1=0/1 – Zone Off/Zone On b2=0/1 – Normal Mode/Party Mode b3=0/1 – Not Party Master/Party Master b4-b7 – reserved
6	0x??	Zone's Selected Source ID
7	0x??	Zone's Volume Level (%, 0 -100)
8	0x??	Zone's Bass Level (signed and in dB)
9	0x??	Zone's Treble Level (signed and in dB)
10	0x??	Zone's Volume Level (actual value)
11	0x??	Simple Checksum

The MZC system utilizes a 'Zone Status Message' to update the external device as to the current state of the MZC's zones. These unsolicited packets are sent out the Control Port at a ~2 second interval (Note: unless the MZC is busy doing an operation at which time the interval will be extended until the operation has concluded). In addition to this interval, a packet will be sent when a zone state has changed. This allows the external device to be kept in the loop as to the state of the zones.

5.2 0x29 - Tuner State Message

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length
2	0x29	Tuner State Message
3	0x??	Tuner ID
4	0x??	Flags b2=0/1 – US/Europe
5 & 6	0x????	Tuned Frequency (LSB first) MSB - MHz for FM, 100KHz for AM LSB FM – represents 10KHz values so 0x01 = 10KHz, 0x32 = 500KHz AM – value is in 1KHz (have to show 2 digits, so 0x00 would show "00" USA FM value range 0x5732 – 0x6B5A (87.5 MHz – 107.9 MHz) 200KHz jumps Euro FM value range 0x5732 – 0x6C00 (87.50 MHz – 108.00 MHz) 50KHz jumps USA AM value range 0x0514 – 0x110A (520 KHz – 1710 KHz) 10KHz jumps Euro AM value range 0x0516 – 0x1014 (522 KHz – 1620 KHz) 9KHz jumps
7 - {N - 1}	0x??	Station name (ASCII, NULL term.)
N	0x??	Simple Checksum

The Tuner ID allows distinction between Tuner 1 and Tuner 2 (IDs of 0 & 1 respectively)

B2 of Flags indicates the Tuners region. If clear it means it is set to US. If set it means it is set to Europe. The real difference is how FM is displayed. Europe needs 2 digits displayed after the decimal point.

The Tuned Frequency parameter is a 16-bit value that is used to determine both AM and FM frequencies.

The Station Name can be used to display the station's call letters. If none exists, it will be a NULL.

This unsolicited message will be sent out Control Port at a ~2 second interval (Note: unless the MZC is busy doing an operation at which time the interval will be extended until the operation has been concluded). In addition to this interval, a packet will be sent when the MZC detects that the tuner's selection has changed.

5.3 0x23 - MZC Busy Message

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x03	Command Length
2	0x23	MZC Busy Message
3	0x??	Simple Checksum

This message is an unsolicited message. When the MZC is in a Busy State, it will send this message to alert the External Device that it should display a Busy indication to the user.

5.4 0x24 - MZC UnBusy Message

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x03	Command Length
2	0x24	MZC UnBusy Message
3	0x??	Simple Checksum

This Message is an unsolicited message. When the MZC is finished being in a Busy State, it will send this message to alert the External Device that it should no longer display a Busy indication to the user.

5.5 0x27 - Source Information Message

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length
2	0x27	Source Information Message
3	0x??	Source Index (0 Indexed)
4 - {N- 1}	0x??	Source Name and Source Variable (ASCII String, NULL Terminated)
N	0x??	Simple Checksum

This unsolicited message will be sent out the Control Port at a ~2 second interval (Note: unless the MZC is busy doing an operation at which time the interval will be extended until the operation has been concluded). The Source Name and Source Variable will vary depending on the Source Type indicated in a Reply from a previous Source Initialization Request that has the same Source Index as this Source Information Message. The following describes what will be in the Source Name and Source Variable ASCII String for each of the different Source Types:

Source Type	Source Name and Source Variable (ASCII String, NULL Terminated)
0x00 Standard Source	N/A. A Source Information Message will not be sent.
0x01 iPod (MODE Base)	The Source Name programmed in EZ TOOLS followed by one of the following: The internal iPod Name (Programmed in iTunes) "NOT DOCKED" (If the iPod is not docked in its Base)
0x02 MODE Jukebox (RSA)	N/A. A Source Information Message will not be sent
0x03 Internal MZC Tuner	The Source Name programmed in EZ TOOLS followed by: The current Station's Frequency
0x04 STT-2.0 (RSA)	N/A. A Source Information Message will not be sent
0x05 XRT12 (RSA)	The Source Name programmed in EZ TOOLS followed by one of the following: The current Station's Name and Number "OFF" (If the XRT12 is not connected or is powered off)
0x06 FIREBALL (RSA)	The Source Name programmed in EZ TOOLS followed by one of the following: "FIREBALL" "FIREBALL OFF" (If the FIREBALL is not connected or is powered off)
0x07 MS250 (RSA)	The Source Name programmed in EZ TOOLS followed by one of the following: "MS250" "MS250 OFF" (If the MS250 is not connected or is powered off)
0x08 T-4555 (RSA)	The Source Name programmed in EZ TOOLS followed by one of the following: "T-4555" "T-4555 OFF" (If the T-4555 is not connected or is powered off)
0x09 TUN 3.7 (RSA)	The Source Name programmed in EZ TOOLS followed by one of the following: "T-4555" "T-4555 OFF" (If the TUN 3.7 is not connected or is powered off)

5.6 0x94 - Menu Information Message

The Source Initialization Message includes a parameter that describes the Source Type. If the Source Type is defined to be a Metadata Device Type (0x01, 0x02, 0x04, 0x05, 0x06 for now) the source's metadata and control are handled by an MZC Expansion Metadata Device. This Metadata Device is responsible for maintaining a dynamic menu structure. This menu structure is basically transmitted to the MZC Control RSA so that an External Device can display it. When the External Device navigates the menu it does so by sending commands, e.g. Menu Up, Menu Select, ..., Commands to a Metadata Device which causes the Metadata Device to act upon the command and update its menu structure. The updated menu structure then gets retransmitted to the MZC Control RSA so that an External Device may be updated to the most current menu structure. The Menu Information Message is what provides the External Device with the most current menu structure.

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x27	Menu Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6		Action Flags b0 - Set to indicate that the message is only valid up to the Hilited Menu Line Byte. b1 - Set to indicate that an External Display should go to a Now Playing Screen and show Media Information. b2 - Set to indicate that the Metadata Device is not connected.
7		Current Menu Level
8		Hilited Menu Line
9		Play State of the Metadata Device b0 - Stopped b1 - Playing b2 - Paused
10 - 13		Total Valid Menu Lines within Current Menu Level 4 bytes - Least Significant Byte First, Most Significant Byte Last
14 - 17		Reserved
18 - 41		Current 6 Menu Line's Index Number's (Menu Line 1 first, Menu Line 6 Last) Each of the Menu Line Index Numbers consists of 4 Byte's each Least Significant Byte First, Most Significant Byte Last
42 - {N1 - 1}		Current Menu's Caption Label (ASCII String, NULL Terminated)
N1 - {N2 - 1}		Current Menu Line 1 Index Label (ASCII String, NULL Terminated)
N2 - {N3 - 1}		Current Menu Line 2 Index Label (ASCII String, NULL Terminated)
N3 - {N4 - 1}		Current Menu Line 3 Index Label (ASCII String, NULL Terminated)
N4 - {N5 - 1}		Current Menu Line 4 Index Label (ASCII String, NULL Terminated)
N5 - {N6 - 1}		Current Menu Line 5 Index Label (ASCII String, NULL Terminated)
N6 - {N7 - 1}		Current Menu Line 6 Index Label (ASCII String, NULL Terminated)
N7		Simple Checksum

5.7 0x93 - Media Information Messages

The Source Initialization Message includes a parameter that describes the Source Type. If the Source Type is defined to be a Metadata Device Type (0x01, 0x02, 0x04, 0x05, 0x06 for now) the source's metadata and control are handled by an MZC Expansion Metadata Device. This Metadata Device is responsible for supplying the External Device with the source's Media Information. This Media Information is basically transmitted to the MZC Control RSA so that an External Device can display it or make decisions based upon its contents. The Media Information Message will be sent as a reply to certain Metadata Device Commands. It will also be sent as an unsolicited message at a 2 second interval (Note: unless the MZC is busy doing an operation at which time the interval will be extended until the operation has concluded). The Media Information Message is what provides the External Device with the most current up-to-date Media Information.

5.7.1 iPod

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6		Reserved
7	0x??	Play State 00 - Stopped 01 - Playing 02 - Paused
8	0x??	Repeat State 00 - Repeat Off 01 - Repeat One 02 - Repeat All
9	0x??	Shuffle State 00 - Shuffle Off 01 - Shuffle Songs 02 - Shuffle Albums
10 - 13	0x??	Play Queue Count 4 bytes - Least Significant Byte First, Most Significant Byte Last
14 - 17	0x??	Playing Item's Index (Within the Play Queue Count) 4 bytes - Least Significant Byte First, Most Significant Byte Last
18 - 21	0x??	Playing Item's Total Play Time 4 bytes - Least Significant Byte First, Most Significant Byte Last
22 - 25	0x??	Playing Item's Play Position (Within the Total Play Time) 4 bytes - Least Significant Byte First, Most Significant Byte Last
26 - {N1 - 1}	0x??	Playing Items Title (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Playing Items Artist (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Playing Items Album (ASCII String, NULL Terminated)
N3	0x??	Simple Checksum

5.7.2 Jukebox

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6		Reserved
7	0x??	Play State 00 - Stopped 01 - Playing 02 - Paused

5.7.2 Jukebox (cont.)

Byte Number	Value	Meaning
8	0x??	Repeat State 00 - Repeat Off 01 - Repeat All
9	0x??	Shuffle State 00 - Shuffle Off 01 - Shuffle On
10 - 13	0x??	Play Queue Count 4 bytes - Least Significant Byte First, Most Significant Byte Last
14 - 17	0x??	Playing Item's Index (Within the Play Queue Count) 4 bytes - Least Significant Byte First, Most Significant Byte Last
18 - 21	0x??	Playing Item's Total Play Time 4 bytes - Least Significant Byte First, Most Significant Byte Last
22 - 25	0x??	Playing Item's Play Position (Within the Total Play Time) 4 bytes - Least Significant Byte First, Most Significant Byte Last
26 - {N1 - 1}	0x??	Playing Items Title (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Playing Items Artist (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Playing Items Album (ASCII String, NULL Terminated)
N3	0x??	Simple Checksum

5.7.3 STT 2.0

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6		Reserved
7	0x??	Reserved
8	0x??	Reserved
9	0x??	Reserved
10 - 13	0x??	Reserved
14 - 17	0x??	Reserved
18 - 21	0x??	Reserved
22 - 25	0x??	Reserved
26 - {N1 - 1}	0x??	Radio Band and Station Frequency (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Reserved (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Reserved (ASCII String, NULL Terminated)
N3	0x??	Simple Checksum

5.7.4 XRT12

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6	0x??	Reserved
7	0x??	Reserved

5.7.4 XRT12 (cont.)

Byte Number	Value	Meaning
8	0x??	Preset State b0 – Set to indicate that a Preset A is currently selected b1 – Set to indicate that a Preset B is currently selected
9	0x??	Channel State b0 – Set to indicate that a Channel is currently selected.
10 - 13	0x??	Reserved
14 - 17	0x??	Reserved
18 - 21	0x??	Reserved
22 - 25	0x??	Reserved
26 - {N1 - 1}	0x??	Station Category (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Station Name and Number (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Artist (ASCII String, NULL Terminated)
N3 - {N4 - 1}	0x??	Title (ASCII String, NULL Terminated)
N4	0x??	Simple Checksum

5.7.5 Fireball

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6		Reserved
7	0x??	Play State 00 - Stopped 01 - Playing 02 - Paused
8	0x??	Repeat State 00 - Repeat Off (Normal) 01 - Repeat Track 02 - Repeat Title 04 - Repeat Group
9	0x??	Random State 00 - Random Off (Normal) 10 - Random Title 20 - Random Group
10	0x??	Play Icon Indicator b0 - Do not show Play Icon b1 - Show Play Icon
11 - 14	0x??	Play Queue Count 4 bytes - Least Significant Byte First, Most Significant Byte Last
15 - 18	0x??	Playing Item's Index (Within the Play Queue Count) 4 bytes - Least Significant Byte First, Most Significant Byte Last
19 - 22	0x??	Playing Item's Total Play Time 4 bytes - Least Significant Byte First, Most Significant Byte Last
23 - 26	0x??	Playing Item's Play Position (Within the Total Play Time) 4 bytes - Least Significant Byte First, Most Significant Byte Last
27 - {N - 1}	0x??	Playing Items Album/Movie/Station (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Playing Items Title (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Playing Items Artist (ASCII String, NULL Terminated)
N3 - {N4 - 1}	0x??	Media Information Caption (ASCII Sting, NULL Terminated)
N4	0x??	Simple Checksum

5.7.6 MS250

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6	0x00	Reserved
7	0x??	Play State 00 - Stopped 01 - Playing 02 - Paused
8	0x??	Repeat State 00 - Repeat Off (Normal) 01 - Repeat On
9	0x??	Shuffle State 00 - Shuffle Off (Normal) 10 - Shuffle On
10	0x??	Play Icon Indicator b0 - Do not show Play Icon b1 - Show Play Icon
11 - 14	0x??	Play Queue Count 4 bytes - Least Significant Byte First, Most Significant Byte Last
15 - 18	0x??	Playing Item's Index (Within the Play Queue Count) 4 bytes - Least Significant Byte First, Most Significant Byte Last
19 - 22	0x??	Playing Item's Total Play Time 4 bytes - Least Significant Byte First, Most Significant Byte Last
23 - 26	0x??	Playing Item's Play Position (Within the Total Play Time) 4 bytes - Least Significant Byte First, Most Significant Byte Last
27 - {N - 1}	0x??	Playing Items Title/Station (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Playing Items Album/Country (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Playing Items Artist/Language (ASCII String, NULL Terminated)
N3 - {N4 - 1}	0x??	Media Information Caption (ASCII String, NULL Terminated)
N4	0x??	Simple Checksum

5.7.6 T-4555

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6	0x00	Reserved
7	0x??	Reserved
8	0x??	Preset State b0 – Set to indicate that a Preset is currently selected
9	0x??	Channel State b0 – Set to indicate that a Satellite Channel is currently selected. b1 – Set to indicate that a AM/FM Channel is currently selected
10 - 13	0x??	Reserved
14 - 17	0x??	Reserved
18 - 21	0x??	Reserved
22 - 25	0x??	Reserved
26 - {N1 - 1}	0x??	Station Category (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Station Name and Number (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Artist (ASCII String, NULL Terminated)
N3 - {N4 - 1}	0x??	Title (ASCII String, NULL Terminated)
N4	0x??	Simple Checksum

5.7.8 TUN-3.7

Byte Number	Value	Meaning
0	0x55	Start of Packet (Sync Byte)
1	0x??	Command Length (Low Byte)
2	0x93	Media Information Message
3	0x??	Metadata Device Address (See Metadata Device Addresses)
4	0x??	State Stamp (To be used when sending a Metadata Device Command)
5	0x??	Command Length (High Byte)
6	0x??	Reserved
7	0x??	Reserved
8	0x??	Preset State b0 – Set to indicate that a Preset is currently selected
9	0x??	Channel State b0 – Set to indicate that a Satellite Channel is currently selected. b1 – Set to indicate that a AM/FM Channel is currently selected
10 - 13	0x??	Reserved
14 - 17	0x??	Reserved
18 - 21	0x??	Reserved
22 - 25	0x??	Reserved
26 - {N1 - 1}	0x??	Station Category (ASCII String, NULL Terminated)
N1 - {N2 - 1}	0x??	Station Name and Number (ASCII String, NULL Terminated)
N2 - {N3 - 1}	0x??	Artist (ASCII String, NULL Terminated)
N3 - {N4 - 1}	0x??	Title (ASCII String, NULL Terminated)
N4	0x??	Simple Checksum

6.0 Reference Charts and Definitions

6.1 Unit ID Value

Value	MZC Type
0x00	Master
0x01	Slave 1
0x02	Slave 2
0x03	Slave 3
0x04	Slave 4

6.2 Source ID Value

Value	Source
0x00	Source 1
0x01	Source 2
0x02	Source 3
0x03	Source 4
0x04	Source 5
0x05	Source 6
0x06	Source 7
0x07	Source 8

6.3 Address ID (Keypad)

Value	Keypad Setting
0x00	0
0x01	1
0x02	2
0x03	3
0x04	4
0x05	5
0x06	6
0x07	7
0x08	8
0x09	9
0x0A	A
0x0B	B
0x0C	C
0x0D	D
0x0E	E
0x0F	F

6.4 Key ID (Keypad)

See Keypad Charts Fig 1-4

Value	Button #
0x00	1
0x01	2
0x02	3
0x03	4
0x04	5
0x05	6
0x06	7
0x07	8
0x08	9
0x09	10
0x0A	11
0x0B	12
0x0C	13
0x0D	14
0x0E	15
0x0F	16
0x10	17
0x11	18
0x12	19
0x13	20
0x14	21
0x15	22
0x16	23
0x17	24
0x18	25
0x19	26
0x1A	27
0x1B	28
0x1C	29
0x1D	30
0x1E	31
0x1F	32
0x20	33
0x21	34
0x22	35
0x23	36
0x24	37
0x25	38
0x26	39
0x27	40
0x28	41
0x29	42
0x2A	43
0x2B	44
0x2C	45
0x48	73

6.4 Key ID (Keypad)

See Keypad Charts Fig 1-4

Value	Button #
0x49	74
0x4A	75
0x4B	76
0x4C	77
0x4D	78
0x4E	79
0x4F	80
0x50	81
0x51	82

6.5 Zone ID Value

Value	Zone
0x00	Zone 1
0x01	Zone 2
0x02	Zone 3
0x03	Zone 4
0x04	Zone 5
0x05	Zone 6
0x06	Zone 7
0x07	Zone 8
0x08	Zone 9
0x09	Zone 10
0x0A	Zone 11
0x0B	Zone 12
0x0C	Zone 13
0x0D	Zone 14
0x0E	Zone 15
0x0F	Zone 16
0x10	Zone 17
0x11	Zone 18
0x12	Zone 19
0x13	Zone 20
0x14	Zone 21
0x15	Zone 22
0x16	Zone 23
0x17	Zone 24
0x18	Zone 25
0x19	Zone 26
0x1A	Zone 27
0x1B	Zone 28
0x1C	Zone 29
0x1D	Zone 30
0x1E	Zone 31
0x1F	Zone 32

6.6 How to calculate the Check Sum

Definition:
A check sum is a form of redundancy check, a simple way to protect the integrity of data by detecting errors in data that are sent through space (telecommunications) or time (storage). It works by adding up the basic components of a message, typically the asserted bits, and storing the resulting value. Anyone can later perform the same operation on the data, compare the result to the authentic checksum and (assuming that the sums match) conclude that the message was probably not corrupted.

An example of a simple check sum formula:

Calculations in Hex:
The easiest way to calculate the check sum is to add up all the bytes in hex then subtract the sum from 0X100.

Example:
x55 + x07 + x52 + x04 + x00 + x00 + x00 = B2
x100 – B2 = 0x4E
Check Sum for these bytes is 0x4E

Calculations in Decimal:
Another way to calculate the check sum is to convert to decimal first then repeat the process just like calculating for hex

Example:
Using the same numbers as before I will converted hex values into decimal then add do the math accordingly. Formula to calculate from hex to decimal is as follows:

The first number (5) of the value gets multiplied by 16, and then the sum (80) gets added to the second number (5) answer will be 85 in decimal.

Math:

Working from left to right:
x55 = 5 multiplied by 16 = 80
80 + 5 = 85
Answer is 85 in decimal
Do this for each of the hex values.

x55 = 85; x07 = 07; x52 = 82; x04 =04; x00 = 0; x00 = 0; x00 = 0

Then add all the decimal values up:
85 + 07 + 82 + 04 + 0 + 0 +0 = 178

If the sum is greater then 256 we subtract 256 from that number until the number is below 256; then subtract one more time from 256. Then the sum of that number is converted back into hex.

Since then sum of the numbers in this example is below 256, we only subtract one time from 256.
(Sum) 178 – 256 = 78

Once we have out number (788) in decimal; we then convert it to Hex.
78 = 0X4E

Since just about every calculator out there does these type of calculations we use in this document, it's not often you have to think about really how it's done. If a calculators is not obtainable, see section 8.0 decimal to hex conversion chart.

7.0 Decimal to Hex Conversion Chart

Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex
0	0x00	51	0x33	102	0x66	153	0x99
1	0x01	52	0x34	103	0x67	154	0x9A
2	0x02	53	0x35	104	0x68	155	0x9B
3	0x03	54	0x36	105	0x69	156	0x9C
4	0x04	55	0x37	106	0x6A	157	0x9D
5	0x05	56	0x38	107	0x6B	158	0x9E
6	0x06	57	0x39	108	0x6C	159	0x9F
7	0x07	58	0x3A	109	0x6D	160	0xA0
8	0x08	59	0x3B	110	0x6E	161	0xA1
9	0x09	60	0x3C	111	0x6F	162	0xA2
10	0x0A	61	0x3D	112	0x70	163	0xA3
11	0x0B	62	0x3E	113	0x71	164	0xA4
12	0x0C	63	0x3F	114	0x72	165	0xA5
13	0x0D	64	0x40	115	0x73	166	0xA6
14	0x0E	65	0x41	116	0x74	167	0xA7
15	0x0F	66	0x42	117	0x75	168	0xA8
16	0x10	67	0x43	118	0x76	169	0xA9
17	0x11	68	0x44	119	0x77	170	0xAA
18	0x12	69	0x45	120	0x78	171	0xAB
19	0x13	70	0x46	121	0x79	172	0xAC
20	0x14	71	0x47	122	0x7A	173	0xAD
21	0x15	72	0x48	123	0x7B	174	0xAE
22	0x16	73	0x49	124	0x7C	175	0xAF
23	0x17	74	0x4A	125	0x7D	176	0xB0
24	0x18	75	0x4B	126	0x7E	177	0xB1
25	0x19	76	0x4C	127	0x7F	178	0xB2
26	0x1A	77	0x4D	128	0x80	179	0xB3
27	0x1B	78	0x4E	129	0x81	180	0xB4
28	0x1C	79	0x4F	130	0x82	181	0xB5
29	0x1D	80	0x50	131	0x83	182	0xB6
30	0x1E	81	0x51	132	0x84	183	0xB7
31	0x1F	82	0x52	133	0x85	184	0xB8
32	0x20	83	0x53	134	0x86	185	0xB9
33	0x21	84	0x54	135	0x87	186	0xBA
34	0x22	85	0x55	136	0x88	187	0xBB
35	0x23	86	0x56	137	0x89	188	0xBC
36	0x24	87	0x57	138	0x8A	189	0xBD
37	0x25	88	0x58	139	0x8B	190	0xBE
38	0x26	89	0x59	140	0x8C	191	0xBF
39	0x27	90	0x5A	141	0x8D	192	0xC0
40	0x28	91	0x5B	142	0x8E	193	0xC1
41	0x29	92	0x5C	143	0x8F	194	0xC2
42	0x2A	93	0x5D	144	0x90	195	0xC3
43	0x2B	94	0x5E	145	0x91	196	0xC4
44	0x2C	95	0x5F	146	0x92	197	0xC5
45	0x2D	96	0x60	147	0x93	198	0xC6
46	0x2E	97	0x61	148	0x94	199	0xC7
47	0x2F	98	0x62	149	0x95	200	0xC8
48	0x30	99	0x63	150	0x96	201	0xC9
49	0x31	100	0x64	151	0x97	202	0xCA
50	0x32	101	0x65	152	0x98	203	0xCB

7.0 Decimal to Hex Conversion Chart (cont.)

Decimal	Hex	Decimal	Hex	Decimal	Hex	Decimal	Hex
204	0xCC	217	0xD9	230	0xE6	243	0xF3
205	0xCD	218	0xDA	231	0xE7	244	0xF4
206	0xCE	219	0xDB	232	0xE8	245	0xF5
207	0xCF	220	0xDC	233	0xE9	246	0xF6
208	0xD0	221	0xDD	234	0xEA	247	0xF7
209	0xD1	222	0xDE	235	0xEB	248	0xF8
210	0xD2	223	0xDF	236	0xEC	249	0xF9
211	0xD3	224	0xE0	237	0xED	250	0xFA
212	0xD4	225	0xE1	238	0xEE	251	0xFB
213	0xD5	226	0xE2	239	0xEF	252	0xFC
214	0xD6	227	0xE3	240	0xF0	253	0xFD
215	0xD7	228	0xE4	241	0xF1	254	0xFE
216	0xD8	229	0xE5	242	0xF2	255	0xFF

8.0 Keypad Numbering Layouts

Fig 1 (MKP-1.1/1.0)

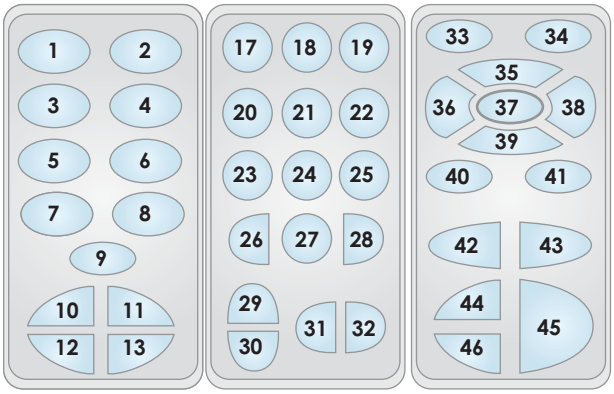


Fig 2 (MKP-2.1)

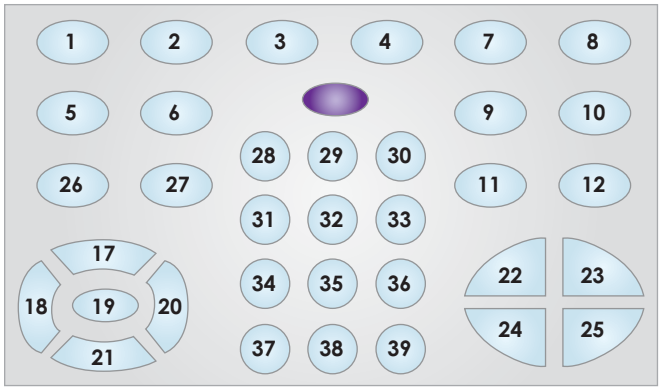


Fig 3 (MKP-1.1)

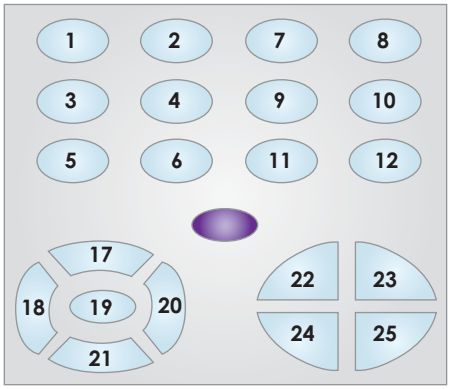
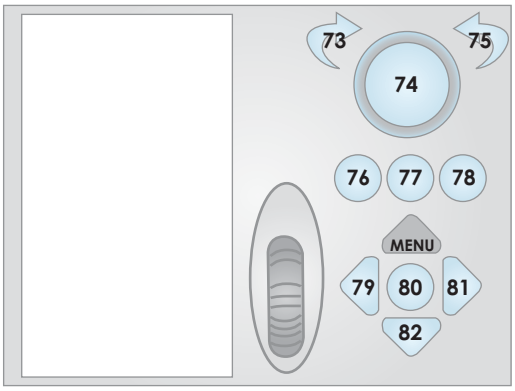


Fig 4 (MODE 3.1)



9.0 Revision History

Release Version 1.1
Release Version 1.2 - Added support for the Arcam MS250, Onkyo T-4555 and TUN-3.7
Release Version 1.3 - 4.11 0x57 Audio Level - pertaining to Volume Up/Down action
Release Version 1.4 - 5.1 0x20 - Zone Status Message - Add missing section 03/21/08

Authors:

Todd Stanchfield
Rick Geller
Edward Mangler

SpeakerCraft®

940 Columbia Ave., Riverside CA 92507 USA • Phone (800) 448 0976 Fax (951) 787 8747 International +1 951 787 0543 • www.speakercraft.com