



Roadmap to Control – Quick Reference Guide

Guidelines for Equipment Control Interface Development

1. Introduction

The *Roadmap to Control* is a set of recommendations for the implementation and documentation of control interfaces within the professional audiovisual and information communications industries. It was written by professional control system programmers as a project sponsored by InfoComm International® and its Independent Programmers Council. The *Roadmap* is intended to serve as a reference for interface engineers at the equipment manufacturing level. There are three primary goals of the document:

- To promote easier and more effective integration through a common control reference for manufacturers, integrators and programmers.
- To provide guidelines for defining, implementing, and documenting serial and Ethernet communication protocols.
- To help improve sales and profitability by making equipment easier to deploy, control, and maintain in the field.

2. Recommendations for Interface

- 2.01. All device communication should be able to be transmitted and received by simple ASCII communication programs, such as HyperTerminal or Telnet.
- 2.02. Retrieving a parameter should be as simple as possible to allow quick onsite confirmation of effective communications.
- 2.03. An integrated help function should be included in the interface. Simple one line descriptions of the commands should be included.
- 2.04. A query should be available for the current firmware version. Effective date and manufacturer contact information should be included.
- 2.05. If extremely verbose communications are required to run configuration software, a “limited session” should be supported. This provides a simpler interface for common control functions, reserving more detailed information for a “full session.”
- 2.06. Replies to queries should identify the device and parameter, not just the value. This allows the control system to process the reply quickly and accurately.
- 2.07. When a command cannot be executed, or the device is in a fault state, a detailed error message should be provided, rather than just a non-specific ERR message.
- 2.08. Unsolicited feedback should be provided when the status of a device changes, identifying the device, parameter and value which has changed. This reduces the need for polling, and provides efficient delivery of relevant information to the user.
- 2.09. Lag time between the transmission and execution of perceptible commands such as volume and lighting should be kept to a minimum.
- 2.10. Devices controlled by RS-232 should implement a DB-9 DCE connector, using no pins other than 2, 3, 5, 7 and 8. If other connectors or pin-outs are used, they should be printed on the device near the port. For most devices, 9600 8N1 RS-232 is appropriate. For large amounts of data throughput, 38400 8N1 RS-232 is appropriate.
- 2.11. Ethernet control is recommended if a large volume of communication traffic is expected. Devices controlled by Ethernet should implement an RJ-45 connector. Serial to Ethernet, USB, or WiFi configurations are more likely to be problematic. A default IP configuration and simple reset procedure should be provided.
- 2.12. Avoid requiring checksums unless absolutely necessary.

3. Recommendations for Documentation

- 3.01. The control interface documentation should be included in the user's manual and be easily accessible. Provide it in print or on CD-ROM in the device box and for public download on the manufacturer's website as a PDF file.
- 3.02. The opening section of any control interface technical documentation should be a brief description of the capabilities of the control interface and available commands.
- 3.03. Documentation should include contact information for the technical support department responsible for the device. This should include a generic e-mail address, telephone number, and web address (to check for an updated document before contacting tech support).
- 3.04. All numeric values should be carefully defined in scale as well as representation. A valid range should be provided for each command or query that contains numeric data.
- 3.05. A different font (e.g., Courier) should be used to clearly distinguish between the text of the document and sample strings that would be sent to or received from the device.
- 3.06. Each command, query, and reply should be fully detailed in the device's technical documentation, including examples. Even if the control protocol is based on an existing standard, such as Telnet or XML, full details should still be provided.
- 3.07. Documentation on serial connections should include details about the type and gender of connector used, the function of each connector pin, data transmission speed (baud rate), command spacing requirements (time required between commands), character spacing, character length (data bit), parity bit, stop bit. Hardware or software flow control settings should be included, even if the requirement is NONE.
- 3.08. Devices controlled by means of an Ethernet connection require the default IP address, specifications about TCP/IP or UDP/IP communication, the port number on which the connection will occur, and default user name and password if required. Instructions should also be provided for resetting the default IP address. Login, authentication or handshaking sequences required to open a session should also be detailed.
- 3.09. As an example, each byte of the formatting of one valid command should be thoroughly detailed. Describe any preamble or header, addressing scheme, command, data, check sum, and delimiter or end byte. Include information about responses from the device, such as acknowledgments or error messages.
- 3.10. A list of all available commands should be provided, including the applicable data for each command, a usage example, and expected replies.
- 3.11. All available queries should be outlined, carefully detailing the responses that can be expected from the device for each query.
- 3.12. Error replies generated by the device when replying to commands or queries should be outlined in detail, defining each potential error code or condition.
- 3.13. Each command or query should be listed with a full example of both transmitted and received data, so a dedicated "example" section at the end of the document should not be required. Manufacturers may find it advantageous to have sample programs for popular control systems available for download from their websites.