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AVT-718 KIE Support

This document describes KIE (K-line Inverted Echo) mode of operation for the AVT-718 unit. KIE mode was first released in AVT-718 firmware version 3.6.

Introduction

KIE mode was developed to support a customer requirement. It is not known what manufacturers employ this protocol, where it is used, or what modules might use it.

This protocol may (and probably does) exist by one or more other names, depending on the manufacturer and application.

I named it "KIE" because the customer never provided a name; and it needed one.

A brief description of the protocol is in the "KIE Parameters" and "Initialization" sections of this document.

Hardware

KIE mode uses the K-line physical layer - the same K-line that the AVT-718 uses for Key Word Protocol 2000 [KWP] mode. No hardware changes or modifications to the AVT-718 board are required to use KIE mode.

Firmware

KIE mode support can be added to an existing AVT-718 unit by updating the firmware. The AVT-718 is a FLASH based device and supports field upgrades of the unit firmware.

The code file for the desired firmware version can be obtained from the factory.

The factory can also provide two host PC applications to reprogram the AVT-718 FLASH with the desired firmware. One application is a pure DOS program. The other is a 32-bit application for use under MS-Win95/98/NT.

Note: Unless otherwise indicated, numbers in this document are hex.

KIE Parameters

The following is a summary of operations for KIE mode.

- Most likely only used between two nodes, due to the byte-by-byte acknowledgment scheme employed.
- K-line physical layer. Idles at V-Batt. The K-line is pulled to ground to assert.
- UART based signaling (start bit; data bits, LSB to MSB; stop bit).
- Default baud rate is 10400 baud.
- First message byte indicates number of bytes in the message (not counting itself).
- Each byte (except last byte) is acknowledged by the receiving node transmitting the inverse of the byte just received.
- The last byte is an ASCII “ETX” character: \$03.
- The last byte is not echoed.
- Timing parameters are defined for nearly all phases of a transaction.
- A manual connection is permitted (without initialization).
- An initialization sequence prior to establishing communications is permitted.

The AVT-718 implementation of KIE mode permits the user to modify many of the operational parameters. Refer to the “Timing Parameters” section of this document.

KIE Mode Commands

A complete list of all commands and responses while in KIE mode is provided in the document: “Master Commands and Responses” AVT-718 KIE section. The document is available from our web site, Product Documentation page.

<http://www.avt-hq.com/download.htm>

Operation

KIE mode is entered by issuing the mode switch command: \$E1 \$66.

The expected response is: \$91 \$1A.

Connecting to the Network

When KIE mode is first entered, the AVT-718 is physically disconnected from the network (via a relay inside the AVT-718 unit).

There are two ways to connect to the network: Manual connection and Initialization.

Manual connected is affected by sending the manual connect command: \$61 \$04.

Initialization is invoked by sending the command: \$61 \$15.

Message from the Network

Once connected, the AVT-718 is always 'listening' to the network. All network messages are received and passed to the host.

[Coarse filtering, known as the Match table function, can be enabled with the \$3x command.]

The construction of a received message packet sent by the AVT-718 to the host is as follows.

Note: Alternate message headers are supported. Refer to the "Master Commands and Responses" document for additional information.

Time stamp disabled

0x yy rr ss tt ...

where: 0x = upper nibble "0" indicates from the network
lower nibble "x" is the count of bytes to follow
yy = received status byte (bit map, below)
rr ss tt ... = message bytes (optional)

Time stamp enabled

0x gg hh jj kk yy ID rr ss tt ...

where: 0x = upper nibble "0" indicates from the network
lower nibble "x" is the count of bytes to follow
gg hh jj kk = microsecond time stamp
yy = received status byte (bit map, below)
rr ss tt ... = message bytes (optional)

Received message examples:

05 00 04 11 22 33

05 = from the network, five bytes follow.
00 = no errors detected and message was not transmitted by this node.
04 11 22 33 = actual message bytes.
Note: the ETX byte (03) is suppressed.
It can be enabled / disabled by the 52 01 xx command.

01 40

01 = from the network, one byte follows.
40 = receive status byte indicating the received message was 'from this node'
This is the usual response expected from the AVT-718 after transmitting a message onto the network.
To forward the entire received message to the host use the 5x 06 01 command.

Receive Status Byte

	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
KIE	New byte while waiting to echo.	From this node.	Buffer time out.	0	Buffer time out waiting for echo.	Buffer forced closed.	Length error.	Last byte not ETX.

Message to the Network

Construction of a packet from the host to the AVT-718, to transmit a message onto the network, is as follows.

Note: Alternate message headers are supported. Refer to the “Master Commands and Responses” document for additional information.

0x rr ss tt ...

where:

0x = upper nibble “0” indicates to the network
lower nibble “x” is the count of bytes to follow

rr ss tt ... = message bytes

Note: the ETX byte is not required.

The AVT-718 will automatically append it.

Controlled by the 52 19 xx command.

Transmit message examples:

05 04 AA BB CC 03

05 = to the network, five bytes follow.

04 AA BB CC 03 = actual message bytes.

The ETX byte is appended by the user.

To prevent the AVT-718 from appending an ETX byte
issue the 52 19 00 command (default).

04 04 11 22 33

04 = to the network, four bytes follow.

04 11 22 33 - actual message bytes. ETX byte is omitted.

To enable the AVT-718 to append an ETX byte to a transmit
message, use the 52 19 01 command.

Both of these transmit examples will result in a 01 40 response from the AVT-718 to the host. This response indicates successful transmission of the message. The AVT-718 receives all messages it transmits, checks them for errors, and then issues the receive status byte response to the host.

Operational Errors

During KIE operations the AVT-718 notifies the host of any detected operational errors by issuing an error message containing two bytes of bit mapped error codes.

An error message has the form:

23 1C xx yy
23 = upper nibble “2” indicates an error message
lower nibble “3” indicates three bytes follow.
1C = indicates that this is a KIE error message.
xx yy = bit map of error conditions.

xx

- bit 7: receive mode; passive listen, no buffer found
- bit 6: transmit mode; state unknown
- bit 5: receive mode; not new byte, state unknown
- bit 4: transmit mode; waiting for echo time out
- bit 3: transmit mode; echo byte error
- bit 2: receive mode; new byte, state unknown
- bit 1: transmit mode; waiting for byte time out
- bit 0: receive mode; echo error

yy

- bit 7: transmit mode; receive byte error
- bit 6: idle mode; new byte, no buffer found
- bit 5: message length is zero
- bit 4: message header byte is zero
- bit 3: idle mode; no receive buffer available
- bit 2: transmit mode; new byte, waiting to send byte
- bit 1: no state found in main loop processing
- bit 0: K-line short to ground detected

Baud Rate

[Note: Do not confuse KIE network baud rate with the communications baud rate between the host computer and the AVT-718 unit.]

The AVT-718 default KIE mode baud rate is 10400 baud. The AVT-718 can be programmed to other K-line baud rates.

The \$53 03 xx yy command is used to set the AVT-718 K-line baud rate. Refer to the “Counter / Timer - Baud Rate Formula” section of the “Master Commands and Responses” document for details on setting the K-line baud rate.

Timing Parameters

Nearly all protocol time parameters can be changed by the user. Each of the parameters have been assigned a name and a command to query for status or change the parameter. A brief description of each time parameter is provided here.

Initialization timing parameters.

- T0: Minimum idle time. The time the bus must remain quiet or idle prior to the start of an initialization attempt. Initialization only. Default is 10,000 microseconds. Command is 5x 46.
- T_r1: Wait time, address byte to synch byte. Time interval to wait from transmitting the address byte (at 5-baud) to receive the synch byte. Initialization only. Default is 215,000 microseconds. Command is 5x 47.
- T_r2: Wait time, synch byte to keybyte #1. Time interval to wait from receiving the synch byte to receive keybyte #1. Initialization only. Default is 25,000 microseconds. Command is 5x 48.
- T_r3: Wait time, keybyte #1 to keybyte #2. Time interval to wait from receiving keybyte #1 to receive keybyte #2. Initialization only. Default is 25,000 microseconds. Command is 5x 49.
- T_r4: Wait time, keybyte #2 to inverted reply. Time interval to wait from receiving keybyte #2 to transmitting inverted keybyte #2 as a reply. Initialization only. Default is 27,000 microseconds. Command is 5x 4A.

Normal operating mode parameters.

- T_rb: Time to wait between messages. Default is 300,000 microseconds. Command is 5x 1A.
- T_rb_max: Message time out. Time to wait for message to complete before terminating it. Default is 1,100,000 microseconds. Command is 5x 1B.
- T_r6_echo: Time between receiving a byte and transmitting the inverted echo. Default is 4,000 microseconds. Command is 5x 1C.
- T_r6_xmit: Time between receiving the echo and transmitting the next byte. Default is 6,000 microseconds. Command is 5x 1D.
- T_r6_max: Time to wait for the echo before declaring it lost and terminating. Default is 55,000 microseconds. Command is 5x 1E.

Initialization sequence

When initialization is invoked (61 15 command), the following sequence of events is expected. If the sequence does not happen as expected, the AVT-718 declares a failure, aborts the attempt, disconnects from the network, and sends the disconnect message (71 01) to the host.

(Presented in chronological order, time advances going down.)

AVT-718 KIE mode (Command: 61 15)

<u>Transmitter</u>	<u>Description</u>
Retry interval	231 msec.
Bus idle	10 msec. [T0_min; 10 msec.]
AVT-718	Address byte. 5 baud; 7, odd, 1
wait	80 - 210 msec. [T_r1; 215 msec.]
ECU	Synchronization byte: \$55. 10400 baud; 8; none, 1
wait	5 - 20 msec. [T_r2; 25 msec.]
ECU	Keybyte #1. 10400 baud; 7, odd, 1
wait	1 - 20 msec. [T_r3; 25 msec.]
ECU	Keybyte #2. 10400 baud; 7, odd, 1
wait	25 - 50 msec. [T_r4; 27 msec.]
AVT-718	Keybyte #2 inverted. 10400 baud; 7, odd, 1
	Initialization complete.
	All subsequent communications: 10400 baud; 8, none, 1

Questions ??

Contact the factory by e-mail, phone, or fax.

Contact information provided on the bottom of page 1.