ADVANCED VEHICLE TECHNOLOGIES, Inc.

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K-Line Initialization Information

There are two sections to this document.

#1:

Detailed information about the different initialization modes as implemented in various AVT interface units.

- AVT-512
- AVT-418
- AVT-716
- AVT-718

Only the AVT-716 supports “ISO” mode of operation. Those parameters are not documented here.

#2:

Summarize the different initialization and communication modes as called out in various specifications.

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Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 512, 418, 716, and 718.

CARB Initialization (Command: 61 11)

Transmitter	**Description**
Retry interval	300 msec.
Bus idle	more than 300 msec. W5_min
AVT interface	Address byte 5 baud; 1 start; 8 data; no parity; 1 stop
	bus idle 400 msec. W1_max
ECU	Synchronization byte = $55 10400 baud; 1 start; 8 data; no parity; 1 stop
	all communications at 10.4 kbaud
	bus idle 20 msec. W2_max
ECU	Keybyte #1 10400 baud; 1 start; 8 data; no parity; 1 stop
	bus idle 20 msec. W3_max
ECU	Keybyte #2 10400 baud; 1 start; 8 data; no parity; 1 stop
	bus idle 25 msec. W4_min
AVT interface	Keybyte #2 inverted 10400 baud; 1 start; 8 data; no parity; 1 stop
	bus idle 50 msec. W4_max
ECU	Address inverted 10400 baud; 1 start; 8 data; no parity; 1 stop
	Initialization complete.

Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 512, 418, 716, and 718.

5 Baud Initialization (Command: 61 12)

Transmitter	**Description**
Retry interval	300 msec.
Bus idle	more than 300 msec. W5_min
AVT interface	Address byte 5 baud; 1 start; 8 data; no parity; 1 stop
	bus idle 400 msec. W1_max
ECU	Synchronization byte: $55 at xxx baud rate. Baud rate range: 1200 to 10400 baud. 1 start; 8 data; no parity; 1 stop
	all communications at xxx baud rate.
	bus idle 20 msec. W2_max
ECU	Keybyte #1 xxx baud; 1 start; 8 data; no parity; 1 stop
	bus idle 20 msec. W3_max
ECU	Keybyte #2 xxx baud; 1 start; 8 data; no parity; 1 stop
	bus idle 25 msec. W4_min
AVT interface	Keybyte #2 inverted xxx baud; 1 start; 8 data; no parity; 1 stop
	bus idle 50 msec. W4_max
ECU	Address inverted xxx baud; 1 start; 8 data; no parity; 1 stop
	Initialization complete.

Keyword Protocol 2000 Initialization

Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 512, 418, 716, and 718.

Fast Initialization (Command: 6x 13)

Transmitter	**Description**
Bus idle	First transmit after power on: more than 300 msec. After a Stop Communicate: more than 55 msec. After a time-out: 0 msec.
AVT interface	Wake-up pattern: K&L lines low for 25 +/- 1 msec. K&L lines high for 25 +/- 1 msec.
	all communications 10400 baud; 1 start; 8 data; no parity; 1 stop
AVT interface	Start Communications Service request. *(This is a message.)*
	bus idle: 25 to 50 msec.
ECU	Start Communications Service response. *(This is a message.)*
	Initialization complete.

Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 512, 418, 716, and 718.

Special Mode #1 (Command: 61 14)

Transmitter	**Description**
Retry interval	300 msec.
Bus idle	more than 10 msec. T0_min
AVT interface	Address byte 5 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 400 msec. T1_max
ECU	Synchronization byte = $55 9600 baud; 1 start; 8 data; no parity; 1 stop
	all communications at 9600 baud.
	bus idle 200 msec. T2_max
ECU	Keybyte #1 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 200 msec. T3_max
ECU	Keybyte #2 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 1 msec. T4_min
AVT interface	Keybyte #2 inverted 9600 baud; 1 start; 7 data; odd parity; 1 stop
	Initialization complete.
	All subsequent communications at 9600 baud; 1 start; 8 data; no parity; 1 stop

Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 512, 418, and 718.

Special Mode #2 (Command: 6x 15)

Transmitter	**Description**
Bus idle	First transmit after power on: more than 300 msec. After a Stop Communicate: more than 55 msec. After a time-out: 0 msec.
AVT interface	Wake-up pattern: K&L lines low for T1 time [55 47 command]. [55 47 00 00 88 B8 = 35 milliseconds] K&L lines high for remainder of Wake-up period. Wake-up period (low plus high time) is T2 time [55 48 command]. [55 48 00 00 C3 50 = 50 milliseconds] A 35 msec. low time and a 50 msec. period means the lines are low for 35 msec., then high for 15 msec., and then the start communications message is transmitted.
	all communications baud rate is set by the 53 03 command 1 start; 8 data; no parity; 1 stop [53 03 00 0C = 9600 baud]
AVT interface	Start Communications Service request. *(This is a message.)*
	bus idle: 25 to 50 msec.
ECU	Start Communications Service response. *(This is a message.)*
	Initialization complete.

Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 418 and 718.

Special Mode #3 (Command: 62 16 xx)

Transmitter	**Description**
Retry interval	300 msec.
Bus idle	more than 2 000 usec. T0_min
AVT interface	Address byte 5 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 2 000 000 usec. T1_max
ECU	Synchronization byte = $55 9600 baud; 1 start; 8 data; no parity; 1 stop
	all communications at 9600 baud.
	bus idle 1 200 000 usec. T2_max
ECU	Keybyte #1 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 1 200 000 usec. T3_max
ECU	Keybyte #2 9600 baud; 1 start; 7 data; odd parity; 1 stop
	Initialization complete.
	All subsequent communications at 9600 baud; 1 start; 8 data; no parity; 1 stop
AVT interface to Host	73 03 <keybyte 1> <keybyte 2>
AVT interface	Immediately enter pass through mode. Pass through mode timeout is “xx” in command. “xx” is measured in 62.5 msec increments.
AVT interface	If AVT interface exits pass through mode, it issues the responses: 62 0C 00 [exit pass through mode] 71 03 [connected to the network]

Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 418 and 718.

Special Mode #4 (Command: 61 17)

Transmitter	**Description**
Retry interval	300 msec. (W5_min) (Note: supposed to be "T0" > 2 sec.)
AVT interface	Address byte 5 baud; 1 start; 8 data; no parity; 1 stop
	bus idle 2 ms. < T1 < 1 sec.
	The AVT interface assumes all communications from this point on are at the rate programmed previously using the 53 03 xx yy command.
ECU	Synchronization byte = $55 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 2 ms. < T2 < 40 msec.
ECU	byte "K1" 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 2 ms. < T2 < 40 msec.
ECU	byte "K2" 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 2 ms. < T2 < 40 msec.
ECU	byte "C1" 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 2 ms. < T2 < 40 msec.
ECU	byte "C2" 9600 baud; 1 start; 7 data; odd parity; 1 stop
	bus idle 2 ms. < T2 < 40 msec.
ECU	byte "CS" (checksum) 9600 baud; 1 start; 7 data; odd parity; 1 stop
	(continued on next page)

	wait “T2” (W3_max); “55 65” command
AVT interface	byte “K2” inverted 9600 baud; 1 start; 7 data; odd parity; 1 stop
	(continued on next page)
	The AVT interface sends the received message to the host. The format is: 06 FF K1 K2 C1 C2 CS
	Initialization complete.

KIE mode Initialization

Presented in chronological order, time advances going down.
Communications parameters shown are that of the AVT - 512, 418, and 718.

KIE mode (Command: 61 15)

Transmitter	**Description**
Retry interval	231 msec.
Bus idle	10 msec. [T0_min; 10 msec.]
AVT interface	Address byte. 5 baud; 1 start; 7 data; odd parity; 1 stop
	80 - 210 msec. [T_r1; 215 msec.]
ECU	Synchronization byte: $55. 10400 baud; 1 start; 8 data; no parity; 1 stop
	5 - 20 msec. [T_r2; 25 msec.]
ECU	Keybyte #1. 10400 baud; 1 start; 7 data; odd parity; 1 stop
	1 - 20 msec. [T_r3; 25 msec.]
ECU	Keybyte #2. 10400 baud; 1 start; 7 data; odd parity; 1 stop
	25 - 50 msec. [T_r4; 27 msec.]
AVT interface	Keybyte #2 inverted. 10400 baud; 1 start; 7 data; odd parity; 1 stop
	Initialization complete.
	All subsequent communications at 10400 baud; 1 start; 8 data; no parity; 1 stop

Summary of Unit Operations

All times are in milliseconds

Description / Event	KWP 61 11	KWP 61 12	KWP 61 14	KIE 61 15
Retry interval (min)	300	300	231	231
Time Bus idle before 'tester' transmits address	300 *W5_min*	300 *W5_min*	> 10 *T0_min*	> 10 *T0_min*
Tester transmits address	5 baud 1 start, 8 data, no parity, 1 stop	5 baud 1 start, 8 data, no parity, 1 stop	5 baud 1 start, 7 data, odd parity, 1 stop	5 baud 1 start, 7 data, odd parity, 1 stop
Time	400 *W1_max*	400 *W1_max*	80 - 210 *T_r1*	80 - 210 *T_r1*
ECU transmits synch byte	10400 baud 1 start, 8 data, no parity, 1 stop	variable baud 1 start, 8 data, no parity, 1 stop	9600 baud 1 start, 8 data, no parity, 1 stop	10400 baud 1 start, 8 data, no parity, 1 stop
Time	20 *W2_max*	20 *W2_max*	5 - 20 *T_r2*	5 - 20 *T_r2*
ECU transmits Keyword #1	10400 baud 1 start, 8 data, no parity, 1 stop	xxx baud 1 start, 8 data, no parity, 1 stop	9600 baud 1 start, 7 data, odd parity, 1 stop	10400 baud 1 start, 7 data, odd parity, 1 stop
Time	20 *W3_max*	20 *W3_max*	1 - 20 *T_r3*	1 - 20 *T_r3*
ECU transmits Keyword #2	10400 baud 1 start, 8 data, no parity, 1 stop	xxx baud 1 start, 8 data, no parity, 1 stop	9600 baud 1 start, 7 data, odd parity, 1 stop	10400 baud 1 start, 7 data, odd parity, 1 stop
Time	25 *W4_min*	25 *W4_min*	25 - 50 *T_r4*	25 - 50 *T_r4*
Tester transmits inverted Keyword #2	10400 baud 1 start, 8 data, no parity, 1 stop	xxx baud 1 start, 8 data, no parity, 1 stop	9600 baud 1 start, 7 data, odd parity, 1 stop	10400 baud 1 start, 7 data, odd parity, 1 stop
Time	50 W4_max	50 W4_max		
ECU transmits inverted address	10400 baud 1 start, 8 data, no parity, 1 stop	xxx baud 1 start, 8 data, no parity, 1 stop		
All subsequent communications	10400 baud 1 start, 8 data, no parity, 1 stop	xxx baud 1 start, 8 data, no parity, 1 stop	9600 baud 1 start, 7 data, odd parity, 1 stop	10400 baud 1 start, 7 data, odd parity, 1 stop

Summary of Unit Operations

All times are in milliseconds

Description / Event	KWP mode	KIE mode
Time from end of inverted Keyword #2 and start of ECU Identification	1 - 200 *T6*	25 - 50
Time between bytes within a message	1 - 40 *T7*	0.5 - 50 typical: 10
Time between messages	1 - 2000 *T9*	1 - 1100

Summary of Select Specifications

All times are in milliseconds

Description / Event	ISO 9141	ISO 9141-2	KWP CARB	KWP 5-baud
Retry interval (min)				
Time Bus idle before 'tester' transmits address	> 2 *T0*	> 2 *W0*	> 300 *W5*	> 300 *W5*
Tester transmits address	5 baud 1 start, 7 data, odd parity, 1 stop	5 baud 1 start, 8 data, no parity 1 stop	5 baud 1 start, 7 data, odd parity, 1 stop	5 baud 1 start, 7 data, odd parity, 1 stop
Time	2 - 2000 *T1*	60 - 300 *W1*	60 - 300 *W1*	60 - 300 *W1*
ECU transmits synch byte	variable baud rate 8 data bits, alternating	10 400 baud 8 data bits, alternating	10 400 baud 8 data bits, alternating	variable baud rate 8 data bits, alternating
Time	2 - 1200 *T2*	5 - 20 *W2*	5 - 20 *W2*	5 - 20 *W2*
ECU transmits Keyword #1	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop
Time	0.2 - 1200 *T3*	0 - 20 *W3*	0 - 20 *W3*	0 - 20 *W3*
ECU transmits Keyword #2	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop
Time	| |	25 - 50 *W4*	25 - 50 *W4*	25 - 50 *W4*
Tester transmits inverted Keyword #2	| | | |	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop
Time	| |	25 - 50 *W4*	25 - 50 *W4*	25 - 50 *W4*
ECU transmits inverted Address	| | | |	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop	1 start, 7 data, odd parity, 1 stop
All subsequent communications	Subsequent actions are determined by the keywords	10 4000 baud, 1 start, 8 data, no parity, 1 stop	10 4000 baud, 1 start, 8 data, no parity, 1 stop	10 4000 baud, 1 start, 8 data, no parity, 1 stop

Data taken from:

ISO 9141 dated: 1989 - 10 - 01
ISO 9141-2 dated: 1994 - 02 - 01
ISO 14230 - 2 dated: 1999 - 03 - 15

Change Record

4 February 2002.

Updated to reflect actual AVT-718 implementation.

3 November 2003.

Updated to reflect actual AVT-718 implementation.

28 July 2004.

Combined both documents: "INIT_01" and "INIT_02" into this one document.
Added AVT-512 and AVT-418 units.

14 September 2005.

Corrected the table on page 8.

16 September 2005.

Added KWP Special Mode #3 initialization method.
Corrected information in KWP Special Mode #1 table.
Updated format of KIE initialization mode table.

22 April 2009

Corrected the summary of "KWP 61 14" on page 9. Comms are at 9600 baud.
Added notes about Special Mode #4 support for "KW 82."