



## MotoHawk support for ISO 15765

The Woodward Custom ISO15765 Blockset provides a MotoHawk application with an interface to a PC-based diagnostics application or a scan tool.

### What is ISO 15765?

ISO 15765 is the specification for the CAN transport layer for Unified Diagnostic Services (UDS) and also legislated On Board Diagnostics (OBD) protocol as found in ISO 15031. UDS is an ISO standard which can be found in ISO 14229. ISO 15765 is a common way to add OBD and provides the MotoHawk application with the capability of reporting self-diagnostics and trending information. The Woodward Custom ISO15765 blockset *by themselves* do not provide diagnostics. It is the *application logic* which must be designed with the diagnostic capabilities and the mechanism for reporting the diagnostic information via a standardized protocol is through the use of these blocks. For more general information regarding OBD systems, see the [wikipedia page for OBD](#).

OBD provides a valuable source of information when troubleshooting problems inside a control system. Information parameters (PIDS or DIDS) and diagnostic Trouble Codes (DTCs) are exposed through OBD. Valuable data collected at the time a failure occurs is also available through OBD.

The Woodward Custom ISO15765 blockset provides the following services:

- DTC reporting / clearing
- Suspend of DTC logging
- Emissions
- Parameter reading / writing
- Overrides
- On demand self tests
- Snapshot records
- Module reflashing (requires bootloader support)

Follow this link for the complete list of supported [services and subfunctions](#).

### Getting Started

You can start to utilize ISO 15765 communications in a MotoHawk application by adding a CAN definition block and the [Woodward Custom ISO15765 Handler](#) block. You can use the convenient MATLAB script language to specify which ISO 15765 services you would like to have supported in your application. Services with a Service ID code of 0x0A or less are legislated services, also called Modes. Services with a

Service ID Code greater than 0x0A belong to UDS.

The Woodward Custom ISO15765 blocks can be found in the Simulink library browser.

<b>General</b>	<p><b>Woodward Custom ISO15765 Handler Instance</b>  <b>Instance:</b> ISO15765_Handler  <b>CAN BUS:</b> CAN_2  <b>Func Rx ID:</b> 0x000007DF (std)  <b>Rx ID:</b> 0x000007E0 (std)  <b>Tx ID:</b> 0x000007E8 (std)</p>																																																												
<b>Legislated</b>	<p><b>OBD Services</b></p> <table border="1"> <thead> <tr> <th>Service</th> <th>Service Description</th> </tr> </thead> <tbody> <tr> <td>01</td> <td>Request current powertrain diagnostic data</td> </tr> <tr> <td>03</td> <td>Request Emission-Related Diagnostic Trouble Codes</td> </tr> <tr> <td>04</td> <td>Clear/Reset Emission-Related Diagnostic Information</td> </tr> <tr> <td>07</td> <td>Request Emission-Related Diagnostic Trouble Codes Detected During Current or Last Completed Driving (</td> </tr> <tr> <td>09</td> <td>Request vehicle information</td> </tr> <tr> <td>0A</td> <td>Request Emission-Related Diagnostic Trouble Codes with Permanent Status</td> </tr> </tbody> </table>	Service	Service Description	01	Request current powertrain diagnostic data	03	Request Emission-Related Diagnostic Trouble Codes	04	Clear/Reset Emission-Related Diagnostic Information	07	Request Emission-Related Diagnostic Trouble Codes Detected During Current or Last Completed Driving (	09	Request vehicle information	0A	Request Emission-Related Diagnostic Trouble Codes with Permanent Status																																														
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Figure 1: ISO15765 Instance Definition

As can be seen from Figure 1, the ISO 15765 handler mask is divided into general information, OBD legislated services supported and UDS services supported.

## UDS Sessions

A collection of UDS services are made available in a session. There are three commonly defined UDS sessions: the default session (session ID = 0x01), the programming session (session ID = 0x02) and the extended session (session ID = 0x03). Many more sessions can be defined by the application. Figure 1 shows an example use of some sessions. Note that the Write Data By Identifier service is not available for use in the default session in this example. The controller always starts in the default session and always returns to the default session after communications have ceased.

## Security

UDS services may have a security mechanism applied, whereas legislated services may not. As shown in Figure 1, services with a security mechanism are designated with the appropriate security level name in the column where the security applies. UDS defines 33 security levels for general use and there is no assumed relationship between levels. See the [Woodward Custom ISO15765 Security Definition](#) block for more information on how to implement security for UDS services.

## Managing Faults

In order to properly support services which manage the fault logic, the ISO 15765 handler block requires the MotoHawk OBD Fault Manager block to be in the model. This applies to the following services:

- **0x03** Request Emission-Related Diagnostic Trouble Codes
- **0x04** Clear/Reset Emission-Related Diagnostic Information
- **0x07** Request Emission-Related Diagnostic Trouble Codes Detected During Current or Last Completed Driving Cycle
- **0x0A** Request Emission-Related Diagnostic Trouble Codes with Permanent Status
- **0x14** Clear DTC Information
- **0x19** Read DTC Information

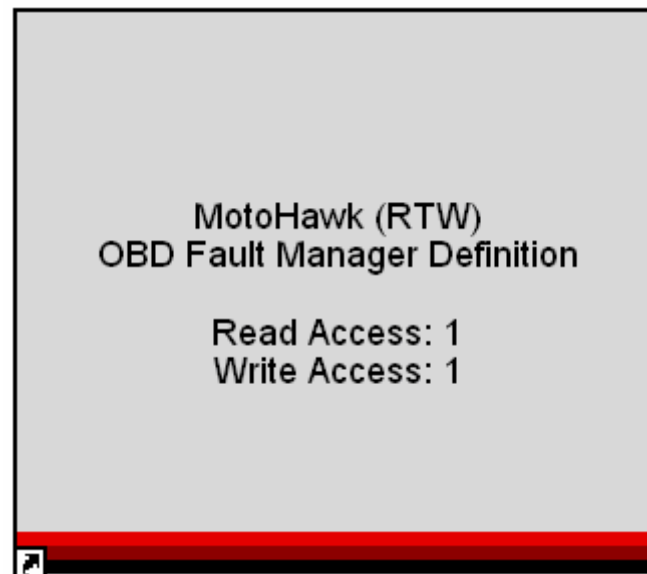


Figure 2: MotoHawk OBD Fault Manager

The DTC format for legislated OBD fault services may be different than that of UDS. The ISO 15765 handler block links the the application's construction for DTC format through the use of the MotoHawk OBD Fault Manager's custom fields. The name of the custom field for the legislated OBD services and the name of the custom field for the DTC format used in the UDS services must be provided.

## ISO 15765 Examples

The Woodward Custom ISO15765 blockset contains an example model in the "Examples" sub-directory called HelloWorld.mdl. This model provides a number of examples of using the ISO15765 blocks and shows the proper integration with the MotoHawk OBD Fault Manager. Browse to the appropriate directory and open HelloWorld.mdl.

## ODX Support

The Woodward Custom ISO15765 has the ability to export a description of the configured ISO15765 protocol in ASAM ODX format. See the [ODX Export](#) topic for more information.

## Services Supported

Woodward has designed the ISO 15765 blockset to the specification in ISO 14229-1 (2007) and the following services are supported:

Service ID	Description
0x01	Request Current Powertrain Diagnostic Data
0x03	Request Emission-Related Diagnostic Trouble Codes
0x04	Clear/Reset Emission-Related Diagnostic Information
0x07	Request Emission-Related Diagnostic Trouble Codes Detected During Current or Last Completed Driving Cycle
0x09	Request Vehicle Information  <b>Subfunctions</b> 0x02: Vehicle Identification Number 0x04: Calibration Identifications 0x06: Calibration Verification Number 0x0A: ECU Name 0x0D: Engine Serial Number 0x0F: Exhaust Regulation Or Type Approval Number
0x0A	Request Emission-Related Diagnostic Trouble Codes with Permanent Status
0x10	Diagnostic Session Control
0x11	ECU Reset  <b>Subfunctions</b> 0x01: Hard Reset 0x02: Key Off On Reset

	0x03: Soft Reset <i>Other: Defined by application</i>
0x14	Clear DTC Information
0x19	Read DTC Information  <b>Subfunctions</b> 0x01: Report Number of DTC by Status Mask 0x02: Report DTC by Status Mask 0x03: Report DTC Snapshot Identification 0x04: Report DTC Snapshot Record by DTC Number 0x05: Report DTC Snapshot Record by Record Number 0x06: Report DTC Extended Data Record by DTC Number 0x0A: Report Supported DTC
0x22	Read Data by Identifier
0x27	Security Access
0x28	Communication Control ( <i>All subfunctions handled in application</i> )
0x2E	Write Data by Identifier
0x2F	Input Output Control by Identifier
0x31	Routine Control  <b>Subfunctions</b> 0x01: Start Routine 0x02: Stop Routine 0x03: Request Routine Result
0x3E	Tester Present
0x85	Control DTC Setting  <b>Subfunctions</b> 0x01: DTC Setting ON 0x02: DTC Setting OFF