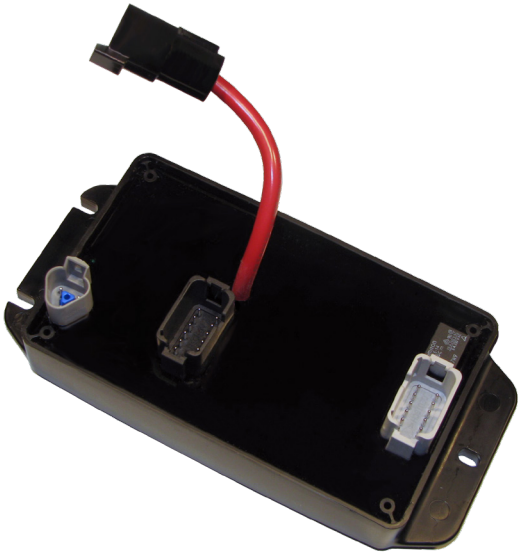
Product Manual

ioBLOC

100A Output Module



Part Number

100000798

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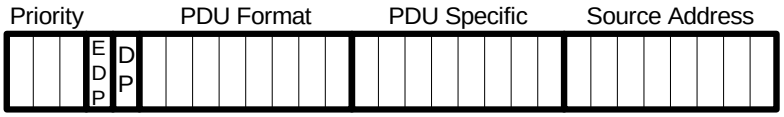
Communications:

Protocol Details:

CAN Protocol: J1939 Compliant, Extended IDR
Baud Rate: 250Kbps (Fixed)



All Messages:
Priority = 0b000, EDP = 0b0, DP = don't care

Incoming Messages (Point to Point):
PDU Format = 0xEF (J1939 Proprietary A)
PDU Specific = Unit Address (0x60 thru x6F, see CAN Addressing Section)
Source Address = Controller Source Address (0x00 through 0xFF)

Outgoing Point to Point Messages:
PDU Format = 0xEF (J1939 Proprietary A)
PDU Specific = Controller Source Address
Source Address = Unit Address (0x60 thru 0x6F, see CAN Addressing Section)

Outgoing Broadcast Messages:
PDU Format = 0xFF (J1939 Proprietary B)
PDU Specific = 0x00
Source Address = Unit Address (0x60 thru 0x6F, see CAN Addressing Section)

CAN Addressing:

Ground Matrix Addressing Scheme

Address Input Value	CAN Address
0b0000	0x60
0b0001	0x61
0b0010	0x62
0b0011	0x63
0b0100	0x64
0b0101	0x65
0b0110	0x66
0b0111	0x67
0b1000	0x68
0b1001	0x69
0b1010	0x6A
0b1011	0x6B
0b1100	0x6C
0b1101	0x6D
0b1110	0x6E
0b1111	0x6F

Note: Binary 1 is input grounded, binary 0 is input floating or high.

Most Significant Address Input: DTF15-12PB (Black 12 Pin Connector) Pin 8
DTF15-12PB (Black 12 Pin Connector) Pin 7
DTF15-12PB (Black 12 Pin Connector) Pin 6
Least Significant Address Input: DTF15-12PB (Black 12 Pin Connector) Pin 5

Messages

Outgoing (From Unit) Messages:

Module's State Message, 0x01, Broadcast Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	MM	DD	YY(MSB)	YY(LSB)	REV(MSB)	REV(LSB)	STATE
0x01	0x??	0x??	0x??	0x??	0x??	0x??	0x??

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x01 is the module state.
1	MM	Month of Firmware Revisions in Hexadecimal (0x10 = October).
2	DD	Day of Month for Firmware Revisions in Hexadecimal (0x31 = 31st).
3	YY(MSB)	Most Significant Digits of Year for Firmware Revision in Hexadecimal (0x20 = 20XX).
4	YY(LSB)	Least Significant Digits of Year for Firmware Revision in Hexadecimal (0x16 = XX16).
5	REV(MSB)	Revision of Code Most Significant Byte in Hexadecimal.
6	REV(LSB)	Revision of Code Least Significant Byte in Hexadecimal.
7	STATE	Module Current Operational State. 0x00 = Requires Output Configuration 0x01 = Configuration OK 0x02 = Unit Configuration Unknown (Power Up Default, See 0x12 Message) 0x05 = Communications Lost 0x06 = Unit Operational

Output Fault Status, 0x90, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	UNUSED	OUT 1/2	OUT 3/4	OUT 5/6	OUT 7/8	OUT 9/10	UNUSED
0x90	0xFF	0x??	0x??	0x??	0x??	0x??	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x90 is Output Fault Status.
1	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.
2	OUT 1,2	Output 1 (MS Nibble) and Output 2 (LS Nibble) Fault Status.
3	OUT 3,4	Output 3 (MS Nibble) and Output 4 (LS Nibble) Fault Status.
4	OUT 5,6	Output 5 (MS Nibble) and Output 6 (LS Nibble) Fault Status.
5	OUT 7,8	Output 7 (MS Nibble) and Output 8 (LS Nibble) Fault Status.
6	OUT 9,10	Output 9 (MS Nibble) and Output 10 (LS Nibble) Fault Status.

7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

Nibble Value	Fault Status
0x0	No Fault
0x1	Open Load (current < 1A) (Disabled by default, see 0x96 message).
0x2	Shorted Ground (Battery -)
0x3	Shorted Battery +
0x4	Over Current Limit (non-dead short)

Output 1-4 Current Values, 0x91, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	UNUSED	OUT 1	OUT 2	OUT 3	OUT 4	UNUSED	UNUSED
0x91	0xFF	0x??	0x??	0x??	0x??	0xFF	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x91 is Output 1-4 Current Values.
1	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.
2	OUT 1	Output 1 Current Value in Amps.
3	OUT 2	Output 2 Current Value in Amps.
4	OUT 3	Output 3 Current Value in Amps.
5	OUT 4	Output 4 Current Value in Amps.
6	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.
7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

Current Value has resolution of 0.1A per bit and is +/-20% full scale tolerance.

Output 5-10 Current Values, 0x92, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	UNUSED	OUT 5	OUT 6	OUT 7	OUT 8	OUT 9	OUT 10
0x92	0xFF	0x??	0x??	0x??	0x??	0x??	0x??

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x92 is Output 5-8 Current Values.
1	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.
2	OUT 5	Output 5 Current Value in Amps.
3	OUT 6	Output 6 Current Value in Amps.
4	OUT 7	Output 7 Current Value in Amps.
5	OUT 8	Output 8 Current Value in Amps.
6	OUT 9	Output 9 Current Value in Amps.
7	OUT 10	Output 10 Current Value in Amps.

Current Value has resolution of 0.1A per bit and is +/-20% full scale tolerance.

Read Output Duty Cycle %, 0x93, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	SUBSET	0x00	OUT D	OUT C	OUT B	OUT A	UNUSED
0x93	0xFF	0x00	0x??	0x??	0x??	0x??	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x93 is Read Output Duty Cycle %.
1	SUBSET	Output Subset, see table below.
2	0x00	Will Tx as 0x00.
3	OUT D	Output (4 + Subset * 4) Duty Cycle %
4	OUT C	Output (3 + Subset * 4) Duty Cycle %
5	OUT B	Output (2 + Subset * 4) Duty Cycle %
6	OUT A	Output (1 + Subset * 4) Duty Cycle %
7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

Subset 0 will show values for Outputs 1-4, Subset 1 for Outputs 5-8, and Subset 2 for Outputs 9-10
Value will be the on-time percentage. Value of 0 (0x00) is off, Value of 100 (0x64) is full on).

Incoming (To Unit) Messages:

Set Communications Failure Timeout, 0x10, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	TIMEOUT	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED
0x10	0x??	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x10 is Set Comm. Fail Timeout Message
1	TIMEOUT	Timeout value for Comm. Fail. Resolution is 0.1s per bit. Default is 7 seconds.
2-7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

The 0x10 message is used to set the Comm. Fail timeout. If no valid CAN Message is received by the unit within the timeout period the unit will change state to Communications Lost and all outputs will shut off. To keep communications alive it is recommended that the 0x65 or 0x7F message is sent periodically. This message will be accepted as long as the current module state is not Unit Configuration Unknown.

Reset Unit, 0x11, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	CODE A	CODE B	CODE C	CODE D	CODE E	RESET	UNUSED
0x11	0x01	0xA5	0x5A	0x49	0x94	0x??	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x11 is Reset Unit Message
1	CODE A	Code A for Reset Message, MUST MATCH 0x01 EXACTLY TO ACCEPT MESSAGE
2	CODE B	Code B for Reset Message, MUST MATCH 0xA5 EXACTLY TO ACCEPT MESSAGE
3	CODE C	Code C for Reset Message, MUST MATCH 0x5A EXACTLY TO ACCEPT MESSAGE
4	CODE D	Code D for Reset Message, MUST MATCH 0x49 EXACTLY TO ACCEPT MESSAGE
5	CODE E	Code E for Reset Message, MUST MATCH 0x94 EXACTLY TO ACCEPT MESSAGE
6	TYPE	0x00 = Tx Module's Current State; Outputs unaffected. 0x01 = Module Reset, same as power cycle.
7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

This message will be accepted in any module state.

Controller Wakeup Message, 0x12, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	Serial # (MSB)	Serial #	Serial #	Serial # (LSB)	UNUSED	ECHO DUTY	ECHO CONFIG
0x12	0x??	0x??	0x??	0x??	0xFF	0x??	0x??

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x12 is Controller Wakeup Message
1-4	Serial #	Set Vehicle or System Serial / Model Number. Defined by controller or end customer. Cannot be 0x00000000 or 0xFFFFFFFF. Any other combination is acceptable. (Default is 0x00000000).
5	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.
6	ECHO DUTY	0x00 or 0xFF = Do not Echo Duty Messages (0x65) (Default) 0x01 = Echo Duty Messages (0x65)
7	ECHO CONFIG	0x00 or 0xFF = Do not Echo Config Messages (0x60, 0x96) (Default) 0x01 = Echo Config Messages (0x60, 0x96)

The 0x12 message is used to set the vehicle or system serial number. If this number matches the saved value then the module will transmit a Configuration OK State followed by a Unit Operational State. The unit will then be able to have its duty cycles set on the configured outputs. If the serial number does not match, then the unit will go into a Requires Output Configuration State after receiving the 0x12 message. A 0x60 message can be used to configure each output and cause the unit go into a Configuration OK state followed by Unit Operational State which will allow the duty cycles to be set with a 0x65 message. This 0x12 message will be accepted in any module state.

Save Configuration, 0x13, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	Serial # (MSB)	Serial #	Serial #	Serial # (LSB)	UNUSED	UNUSED	UNUSED
0x13	0x??	0x??	0x??	0x??	0xFF	0xFF	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x13 is Save Configuration Message.
1-4	Serial #	Vehicle or System Serial / Model Number. Defined by controller or end customer. Cannot be 0x00000000 or 0xFFFFFFFF. Any other combination is acceptable. (Default is 0x00000000).
5-7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

The 0x13 message is used to save the current serial number (as sent via 0x12 message and which cannot be 0x00000000 or 0xFFFFFFFF), the Output Configuration (as sent via 0x60 messages), and Open Load Diagnostics Enable (as sent via 0x96 message) to non-volatile memory. This message will be accepted as long as the current module state is not Unit Configuration Unknown or Requires Output Configuration.

Output Configuration Message, 0x60, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	OUTPUT	ENABLE	PWM FREQ	AMP LIMIT	LIMIT DELAY	ON SLEW TIME	OFF SLEW TIME
0x60	0x??	0x??	0x??	0x??	0x??	0x??	0x??

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x60 is Output Configuration Message.
1	OUTPUT #	OUTPUT = Output Number – 1 *(i.e. 0x00 controls Output 1)*
2	ENABLE	0x00 = Disable (Default) 0x10 = Enable
3	PWM FREQ	Valid values are 32 to 255 (0x20 to 0xFF)
4	AMP LIMIT	Current Limit for Output. Resolution is 0.1A per bit.
5	LIMIT DELAY	Time Delay for Overcurrent Trip after Current Limit has been reached or exceeded. Resolution is 0.01 seconds.
6	ON SLEW TIME	Time over which output will change from lower PWM value to higher PWM value. Resolution is 0.01 seconds, 0 = instant.
7	OFF SLEW TIME	Time over which output will change from higher PWM value to lower PWM value. Resolution is 0.01 seconds, 0 = instant.

The 0x60 message is used to configure the outputs before they can be turned on. One message must be sent for each output to be configured after power up unless a previous configuration was saved using the 0x13 message. If an output is not to be used then it is not necessary to send a 0x60 message for that output. The 0x60 message must be sent before the 0x65 message for each given output. The 0x60 message is normally sent only once after power up and the 0x12 message have been sent. This message will be accepted as long as the current module state is not Unit Configuration Unknown.

Set Output Duty Cycle %, 0x65, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	SUBSET	0x00	OUT D	OUT C	OUT B	OUT A	UNUSED
0x65	0x??	0x00	0x??	0x??	0x??	0x??	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x65 is Set Output Duty Cycle %.
1	SUBSET	Output Subset, see table below.
2	0x00	Must Be Rx as 0x00.
3	OUT D	Output (4 + Subset * 4) Duty Cycle %
4	OUT C	Output (3 + Subset * 4) Duty Cycle %
5	OUT B	Output (2 + Subset * 4) Duty Cycle %
6	OUT A	Output (1 + Subset * 4) Duty Cycle %
7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

Subset 0 will show values for Outputs 1-4, Subset 1 for Outputs 5-8, and Subset 2 for Outputs 9-10
Value will be the on-time percentage. Value of 0 (0x00) is off, Value of 100 (0x64) is full on).
Any duty cycle larger than 100% will be reduced to 100%.

The 0x65 message is used to set the duty cycle for each output that has been configured with a 0x60 message previously. This message will be accepted as long as the current module state is not Unit Configuration Unknown or Requires Output Configuration and the particular output has been configured. Any unconfigured (not enabled) output contained in bytes 3-6 will be ignored.

Get Status of Outputs, 0x7F, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	DATA	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED
0x7F	0x??	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x7F is Get Output Status Message.
1	DATA	Data Requested 0x00 = Output Fault Status (0x90 Message) 0x01 = Output 1-4 Current Values (0x91 Message) 0x02 = Output 5-10 Current Values (0x92 Message) 0x03 = Output Fault/Current Values (0x90, 0x91, 0x92 messages) 0x04 = Read Output Duty Cycle % (0x93 Message) 0x05 to 0xFF = reset comm. timeout counter only.
2-7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

The 0x7F message is used to request information about the outputs. This message may also be used to reset the communications timeout counter and keep the unit from going into communications fail. If no data is desired, but it is still desired to reset the comm. timeout counter then send data above 0x04. This message can be sent while in Unit Operational state for data requests. Reset comm. timeout only can be sent in any mode.

Set Open Load Diagnostics Enable, 0x96, Point to Point Message:

BYTE 0	BYTE 1	BYTE 2	BYTE 3	BYTE 4	BYTE 5	BYTE 6	BYTE 7
MESSAGE	DIAG CTRL	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED	UNUSED
0x96	0x??	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

BYTE #	BYTE NAME	BYTE DESCRIPTION
0	MESSAGE	Message type – 0x96 is Set Open Load Diagnostics Enable.
1	DIAG CTRL	Diagnostic Control 0x00 = Turn off open load detection fault (in 0x90 message) (default). 0x01 = Turn on open load detection fault (in 0x90 message).
2-7	UNUSED	Unused Byte, Tx as 0xFF per J1939 Standard.

The 0x96 message is used to configure the open load detection as enabled or disabled. By default open load detection is disabled and as such loads less than 1A will not be detected as open. If enabled, then loads of less than 1A will create an open load fault in the 0x90 message. The 0x13 message can be used to save this configuration to non-volatile memory. This message will be accepted as long as the current module state is not Unit Configuration Unknown or Requires Output Configuration.

Example Communications:

1. Power up unit with light (or some load that's output status can easily be determined) on output 1 to ground. Ensure that no address lines are tied to ground so that the unit has an address of 0x60.
2. 58-0020 unit sends heartbeat message with module state of 0x02 (from 0x01FF0060, data of 0x01 0x08 0x18 0x20 0x11 0x05 0x01 **0x02**) (module state in bold)
3. Send wakeup message (from 0x00EF600A, data of 0x12 0x21 0x22 0x23 0x24 0xFF 0x01 0x01).
4. Heartbeat from 58-0020 unit changes to module state of 0x00 (from 0x01FF0060, data of 0x01 0x08 0x18 0x20 0x11 0x05 0x01 **0x00**) (module state in bold)
5. Start send request for info to keep unit from entering comm fail (from 0x00EF600A, data of 0x7F 0x02 0xFF 0xFF 0x00 0x00 0x00 0x00, cycle time is 500ms)
6. Unit starts sending out a 0x92 message in response to the above 0x7F (from 0x01EF0A60 data of 0x92 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF, cycle time same as in 5 above)
7. Send Output Config Message, 0x60 (from 0x00EF600A, data of 0x60 0x00 0x10 0x64 0xFF 0xFF 0xFF 0xFF), this enables the output (output 0) as PWM 100Hz frequency and an current/amp limit of 25.5A, 2.55sec delay, 2.55 sec slew on, 2.55 sec slew off. The output will not turn on yet – it is just configured.
8. Heartbeat from HCOM unit changes to status of 0x06, unit operational (from 0x01FF0060, data of 0x01 0x08 0x18 0x20 0x11 0x05 0x01 **0x06**) (status in bold)
9. Send Set Output Duty Cycle % message, 0x65 (from 0x00EF600C, data of 0x65 0x00 0x00 0x00 x00 0x00 0x64 0xFF) to turn on output 1 to 100% (0x64) duty.
10. Output 1 (light) slews on slowly from 0% to 100% (over 2.55 seconds per the 0x60 message)