
Pacific Scientific OC930 Servo Drive

Application Note

This document describes how to configure a Paradigm operator interface terminal to allow communications with a Pacific Scientific OC930 Servo Drive. The communications protocol supports access to drive commands and variables. Please read this document carefully before attempting to configure communications with these devices.

Introduction

The EDICT-97 configuration software has been designed to allow the user to enter an identifier in a manner that should be familiar to the user of a Pacific Scientific OC930. The driver allows the exchange of data with the drive.

Accessing Data

The OC930 communications protocol allows access to a number of commands and variables over a serial communications link. The driver described here supports the commands and variables in the table below.

| Identifier | Description | Type | Access |
|------------|---|------|--------|
| ACCELLMT | Slew rate limit on actual velocity - RPM/sec | FL | RW |
| ADF0 | First order low-pass filter corner freq - Hertz | FL | RW |
| ADOFFSET | Analog command input steady-state offset - Volts | FL | RW |
| AINNULL | Null dc in AnalogIn to 0 (1/0) | IN | RW |
| ANALOGIN | Analog input - Volts | FL | RO |
| ANALOGOUT1 | Analog output 1 - Volts | FL | RW |
| ANALOGOUT2 | Analog output 2 - Volts | FL | RW |
| ARF0 | Anti-resonance low-pass corner freq. 1 - Hertz | FL | RW |
| ARF1 | Anti-resonance low-pass corner freq. 2 - Hertz | FL | RW |
| ARZ0 | First velocity loop compensation 0 - Hertz | FL | RW |
| ARZ1 | Second velocity loop compensation 0 - Hertz | FL | RW |
| AXISADDR | Axis Address - 0-255 | IN | RO |
| BDIN1 | BDIO1 State (1/0) | IN | RO |
| BDIN2 | BDIO2 State (1/0) | IN | RO |
| BDIN3 | BDIO3 State (1/0) | IN | RO |
| BDIN4 | BDIO4 State (1/0) | IN | RO |
| BDIN5 | BDIO5 State (1/0) | IN | RO |
| BDIN6 | BDIO6 State (1/0) | IN | RO |
| BDIOMAP1 | Logical Function of BDIOMap1 (+/-32 Bit Integer) | IN | RW |
| BDIOMAP2 | Logical Function of BDIOMap2 (+/-32 Bit Integer) | IN | RW |
| BDIOMAP3 | Logical Function of BDIOMap3 (+/-32 Bit Integer) | IN | RW |
| BDIOMAP4 | Logical Function of BDIOMap4 (+/-32 Bit Integer) | IN | RW |
| BDIOMAP5 | Logical Function of BDIOMap5 (+/-32 Bit Integer) | IN | RW |
| BDIOMAP6 | Logical Function of BDIOMap6 (+/-32 Bit Integer) | IN | RW |
| BDLGCTHR | Switching Threshold of discrete inputs (24V/5V) | IN | RW |
| BDOUT1 | Set Output State of BDIO1 (1/0) | IN | RW |
| BDOUT2 | Set Output State of BDIO2 (1/0) | IN | RW |
| BDOUT3 | Set Output State of BDIO3 (1/0) | IN | RW |
| BDOUT4 | Set Output State of BDIO4 (1/0) | IN | RW |
| BDOUT5 | Set Output State of BDIO5 (1/0) | IN | RW |
| BDOUT6 | Set Output State of BDIO6 (1/0) | IN | RW |
| BLKTYPE | Specifies Block Type (Pos., Vel., Torque) | IN | RW |
| BRAKE | Mechanical Brake required when motor is off (1/0) | IN | RO |
| CCDATE | Control Card date code | IN | RO |
| CCSNUM | Control Card serial Number | IN | RO |

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| Identifier | Description | Type | Access |
|------------|---|------|--------|
| CCWINH | Clamp VelCmdA as Positive (1/0) | IN | RW |
| CFGD | Configuration state of the drive's RAM | IN | RO |
| CMDGAIN | Scale Factor of the Analog Input | FL | RW |
| CMDGAIN2 | Scale Factor of Analog Input via BDIO Input | FL | RW |
| COMMENBL | Allow/Disallow normal commutation (1/0) | IN | RW |
| COMMOFF | Sets Origin for commutation angle- Degrees | FL | RW |
| COMMSRC | Incr. encoder/Resolver commutation feedback (1/0) | IN | RW |
| CWINH | Clamp VelCmdA as Negative (1/0) | IN | RW |
| DECELLMT | Slew Limit on Vel. Command decreases - RPM/sec | FL | RW |
| DM1FO | DAC Monitor 1 output frequency - Hertz | FL | RW |
| DM2FO | DAC Monitor 2 output frequency - Hertz | FL | RW |
| DM1GAIN | Scale Factor of DM1Map signal | FL | RW |
| DM2GAIN | Scale Factor of DM2Map signal | FL | RW |
| DM1MAP | Selects signal sent to DAC Monitor 1 Output | IN | RW |
| DM2MAP | Selects signal sent to DAC Monitor 2 Output | IN | RW |
| DM1OUT | Value of output to DAC Monitor 1 | FL | RO |
| DM2OUT | Value of output to DAC Monitor 2 | FL | RO |
| ELECANGTAU | Low Pass Filter on Electrical Angle | IN | RW |
| ENABLE | Enable Drive (1/0) | IN | RW |
| ENABLE2 | Enable Drive mapped to BDIO pin (1/0) | IN | RW |
| ENABLED | Power can flow to the motor (1/0) | IN | RO |
| ENCADIST | Encoder Alignment Test Distance | IN | RW |
| ENCARAMPI | Encoder Alignment Current Ramp | IN | RW |
| ENCATIME | Encoder Alignment Time | IN | RW |
| ENCFREQ | Freq. of ext. encoder - Quad counts or steps/sec | FL | RO |
| ENCIN | Line count - Count or Steps/quarter rev | IN | RW |
| ENCINFO | Freq. on Incremental Encoder Input - Hertz | FL | RW |
| ENCMODE | Command expected at Incremental pos. command port | IN | RW |
| ENCOUT | Resolution of the Incr. encoder output | IN | RW |
| ENCPOS | Pos. of Ext. Enc. or # of Step Inputs | IN | RO |
| EXTFAULT | Additional Info. on Fault Code | IN | RO |
| FAULT | Drive Faulted or Disabled | IN | RO |
| FAULTCODE | Faulted if not 0 or 8 | IN | RO |
| FAULTRESET | Disable Drive. Try to clear latched fault (1/0) | IN | RW |
| FVELERR | Commanded Velocity-Measured Velocity - RPM | FL | RO |
| FWV | 930 Firmware Version Number | IN | RO |
| HSTEMP | Heat Sink Temperature - Degrees C | FL | RO |
| HWV | Hardware Version Number | IN | RO |
| ICMD | Commanded Motor Torque Current - Amperes | FL | RO |
| IFB | Measured Motor Torque Current - Amperes | FL | RO |
| ILMTMINUS | CCW Max allowable Torque Current - % Peak I | IN | RW |
| ILMTPLUS | CW Max allowable Torque Current - % Peak I | IN | RW |
| INPUTS | State of BDIO Inputs | IN | RO |
| IPEAK | Maximum 0-peak current rating of drive - Amperes | FL | RO |
| IR | Motor Phase R current - Amperes | FL | RO |
| IS | Motor Phase S current - Amperes | FL | RO |
| IT | Motor Phase T current - Amperes | FL | RO |
| ITFO | I*t thermal protection corner frequency - Hertz | FL | RW |
| ITFLT | Input to i*t thermal protection fault - % Peak I | FL | RO |
| ITTHRESH | Sets Max. continuous current - % Peak I | IN | RW |
| ITTHRESHA | Reads Max. continuous current - % Peak I | FL | RO |

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| Identifier | Description | Type | Access |
|-------------|--|------|--------|
| KED | Encoder Alignment Derivative Gain | IN | RW |
| KEI | Encoder Alignment Integral Gain | IN | RW |
| KEP | Encoder Alignment Proportional Gain | IN | RW |
| KII | Integral gain of current loops - Hertz | FL | RW |
| KIP | Proportional gain of the current loop - V/A | FL | RW |
| KPP | Proportional gain of the position loop - Hertz | FL | RW |
| KVFF | Offset to Vel. command - % Vel. feed fwd signal | FL | RW |
| KVI | Integral gain of velocity loop | FL | RW |
| KVP | Proportional gain of the Vel. loop - A/Rad/sec | FL | RW |
| MODEL | Drive Model Number | IN | RO |
| MOTOR | First 4 characters of motor part number | IN | RO |
| NVLOAD | Update all NV parameters | CM | RW |
| NVLOADOPT | Update all NV parameters from option card | CM | RW |
| NVSAVE | Save all parameters in NV memory | CM | RW |
| NVSAVEOPT | Save all parameters in option card NV memory | CM | RW |
| OCDATE | Option Card date code | IN | RO |
| OCSNUM | Option Card serial number | IN | RO |
| OUTPUTS | State of BDIO Outputs | IN | RW |
| POLECOUNT | Pole count or quad counts/cycle | IN | RW |
| POSCMDSET | Change Commanded Position - Counts | IN | RW |
| POSCOMMAND | Position being commanded - Counts | IN | RO |
| POSError | Position Command-Actual Position - Counts | IN | RO |
| POSErrorMAX | Max allowable following error - Counts | IN | RW |
| POSITION | Measured resolver position - Resolver Counts | IN | RO |
| PULSESFOUT | Fractional Resolver Move per Pulse In - Counts | IN | RW |
| PULSESIN | Gear Ratio Select - Steps or quad encoder counts | IN | RW |
| PULSESOUT | Integer Resolver Move per Pulse In - Counts | IN | RW |
| REMOteFB | Source of Feedback signal for the loops | IN | RW |
| RESPOS | Resolver position in motor housing - Counts | IN | RO |
| RUNSTOP | Brake & Clutch off at 0 speed | IN | RW |
| STOPTIME | Max. time to disable drive for RunStop - secs | FL | RW |
| UNCFGDRV | Unconfigure control card NV memory | CM | RW |
| UNCFGOPT | Unconfigure option card NV memory | CM | RW |
| VBUS | Voltage of HVDC supply - Volts | FL | RO |
| VBUSTHRESH | Low voltage fault threshold of VBus | FL | RW |
| VDCMD | PWM Duty cycle amplitude - % | FL | RO |
| VELCMD | Net desired velocity loop command input - RPM | FL | RW |
| VELCMDA | Actual velocity loop command - RPM | FL | RO |
| VELCMD2 | NV second velocity command - RPM | FL | RW |
| VELCMDSRC | Set VelCmd to VelCmd2 or via BlkType - (1/0) | IN | RW |
| VELERR | Commanded Velocity-Measured Velocity - RPM | FL | RO |
| VELFB | Instantaneous value of the velocity - RPM | FL | RO |
| VELLMTHI | Max VelCmdA and VelFB overspeed fault level- RPM | FL | RW |
| VELLMTLO | Min VelCmdA and VelFB overspeed fault level- RPM | FL | RW |
| VELOCITY | Velocity passed through 3.5Hz filter - RPM | FL | RO |
| ZEROSPEED | Threshold speed for Zero-speed output - RPM | FL | RW |

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The driver converts the OC930 float variables to signed 32-bit data, and provides up to 4 decimal place accuracy. The accuracy is specified by placing an integer representing the desired decimal point position in parenthesis after the identifier. For example:

Analog Input, with 2 decimal places.

ANALOGIN(2)

Velocity, with 4 decimal places.

VELOCITY(4)

PWM Duty Cycle Amplitude - %, with no decimal places.

VDCMD or VDCMD(0)

Knowledge of Unit Operation Is Assumed

In all cases, the simple principle of 'pass-through' is maintained: there is no attempt to validate a value in terms of the end use of the unit: both familiarity with the drive functions and knowledge of system operation are assumed.

Communications

Communications with the Pacific Scientific OC930 is via an RS-232 point to point link, or via RS-485. Default serial communications format is 9600 baud rate, 8 data bits, No parity, and 1 stop bit. The default Device Address is 255. The connection details are described in the tables below.

| Paradigm RS232 Port | OC930 RS232 Serial Port, DB-9 |
|----------------------------|--------------------------------------|
| Pin 1 (Tx) Pin 2 (Rx) | Pin 3 (RXD) Pin 2 (TXD) |
| Pin 3 (RTS) Pin 4 (CTS) | |
| Pin 5 (Comm.) | Pin 5 (RTN) |

In addition a link must be fitted between Pin 3 (RTS) and Pin 4 (CTS) on the Paradigm unit.

| Paradigm RS485 Port | OC930 RS485 Serial Port, DB-9 |
|----------------------------|--------------------------------------|
| Pin 6 (TxA) | Pin 8 (RXD +) |
| Pin 7 (TxB) Pin 8 (RxA) | Pin 9 (RXD -) Pin 6 (TXD +) |
| Pin 9 (RxB) | Pin 7 (TXD -) |
| Pin 10 (Comm.) | Pin 5 (RTN) |

In addition a 1k8 resistor must be fitted between Pin 9 (RxB) and Pin 10 (Comm.) on the Paradigm unit.