ORMEC

Quick Reference

ORMEC's ServoWire Drive Network uses IEEE-1394 communications to bring a new level of performance to networking servodrives. All-digital operation simplifies drive setup. All motion control & drive parameters are software-driven. No off-line computer setup required, simplifying field replacement of drives. (No jumpers, potentiometer adjustments, etc.) See Drive Setup on the ServoWire Drive LED's Quick reference.

ServoWire Cable: Part number CBL-SW/# ... 1,2,6,14 lengths in feet. Each ServoWire network can be thought of as a bus. There is no "in" or "out" distinction between the J1 and J2 connectors. No cabling loops allowed. One ServoWire Axis Module per network. No more then eight ServoWire axes per network.

ServoWire Axis Module: (SAM) plugs into an ORION Industrial PC-based controller, and supports up to eight servomotors and drives. ServoWire Axis Module part number ORN-SW-AM/# ...0,4,8 the number of optional analog 12-bit inputs. ServoWire Axis Module LED's when lit, indicate the following:

LED Name	color	Action
DSP OK	Green	**Axis Module is operating properly.** No internal faults.
MDATA	Green	Receiving MotionDATA communications.
S-WIRE	Red	ServoWire Network configuration error. _Examples:_

LED ON when two ServoWire Axis Module's are cabled together.
Network connected in a ring. Too many drives on network

Axis A - H LED's are status indicators. Dual color, Green and Red.
The AXIS LED's, labeled A through H, are assigned in ascending order based on the drives ID's that are attached to the Axis Module ServoWire network. The lowest drive ID will be assigned to AXIS A LED. The next higher drive ID will be assigned to AXIS B and so on. Pacer and Virtual axes are also assigned a ServoWire AXIS Status LED.

color(s)	Action
Green	**Axis OK,** AFAULT@=0
Red	see Axis fault error code, AFAULT@
Red / Green	Alternating (flashing) both Green and Red indicates mismatch in project vs Drive ID's setup. See "Drive Setup" on ServoWire Drive LED's Quick Reference.

Axis Module

ServoWire Drives Power Considerations.

Supply Power:

To prevent power line accidents due to grounding error, contact error, or to protect the system from a fire, circuit breakers or fuses must be installed according to the number and size (current capacity) of ServoWire Drives used. Slow-blow circuit breakers or fuses should be used because the servodrives draw substantial inrush current at power up.

Shielding, Power Line Filtering & Noise Suppression:

The Servodrive uses high voltage switching power transistors in the main DC Bus circuit. When these transistors are switched, switching noise may sometimes prove objectionable depending on the wiring and/or grounding method. The Servodrive also utilizes a microprocessor, which can be susceptible to power line interference caused either by the output switching transistors or other equipment on the power line, such as welders, electrical discharge machines, induction heating equipment, etc. Careful layout of wiring and power line filtering will help prevent noise interference. Recommendations with respect to wiring and grounding are described in the ServoWire Drives Manual. Further information is available in the "Shielding & Grounding Electrical Panels" Application Note, which is available in the ORION Installation & Operation Manual, as well as ORMEC's Web Site (www.ormec.com).

It is recommended that line filters be installed to eliminate electromagnetic interference coming into the system from the power line, as well as block switching noise from being transmitted back out to the power line from the Servodrives.

ORMEC ServoWire Drive Quick Reference

WARNING: DO NOT SERVICE THE SERVODRIVE WHEN THE BUS POWER LED IS EVEN DIMLY ILLUMINATED. WAIT FOR THE BUS POWER LED TO BE COMPLETELY OFF. SERVODRIVE BUS MUST BE FULLY DISCHARGED BEFORE SERVICING. THIS CAN TAKE SEVERAL MINUTES. Check for zero volts across Bus+, Bus- before servicing.

Understanding the ServoWire Series Servodrive Model Number:
Example: **SAC - SW 2 ## / E P D A N**
Subgroup Type
Cont. rated DC Bus current, Amps 3,5,10,17,20
Encoder feedback
Options: **P**acer encoder, **D**elay counter
Absolute encoder support, **N**o Phoenix connectors.

Terminal Connections:

r,t .... **Control Power Input** (r,t) 110 VAC(-20%) to 240 VAC(+10%)
Single phase, 50/60 Hz. _Absolute MAX is 265 VAC for AC inputs!_

L1,L2,L3 Main Power Input (L1,L2,L3) 110 VAC(-20%) to 240 VAC(+10%)
SAC-SW203 - 205 : Single phase connect power to (L1,L2)
SAC-SW210 - 220 : Three phase connect power to (L1,L2,L3)
⏚ .... Ground for Control and Main Power Inputs.
GROUND DRIVE TO PANEL using multi strand wire!

Bus + ... Used when connecting bus power between servodrives.
Bus - Nominal Bus voltage: 156 VDC for 110 VAC input.
325 VDC for 230 VAC input.

RG .... External Regen Resistor Option on SAC-SW210, 217, 220 only.
When used, resistor is connected between Bus + and RG.

**Motor Cable:** When using ORMEC standard motor cable, the colors are:
U,V,W ... **U** - RED, **V** - WHITE, **W** - BLACK
⏚ .... Ground - SILVER (Shield) & GREEN (Motor) wires.

ServoWire 1394 Cable Connectors:

J1,J2 ..... To ORMEC ServoWire Axis Module or next ServoWire Drive.

Feedback Cables:

J3 .... From Motor Encoder Feedback.

J4 .... From Auxiliary Encoder Feedback. (optional)

GROUND DRIVE
TO PANEL
using Braided wire
or multi strand wire.

Servodrive Terminal Block One a & b:

TB1a (pins 1-11)

AS - A Sensor	High Speed Sensor Inputs.
BS - B Sensor	Software configurable pull-up's
CS - C Sensor	2.38K, 20K (NPN), None (PNP)

Sh - Shield, connected at drive only!

In order to use discrete Inputs / Outputs, (I/O) DC Power supply must be connected!
V+ I/O Power supply input, 5-24 VDC.
V- Common for I/O power.

LR,LF Travel Limit Reverse and Forward.

DL - Delay Counter Output (Optional)

TB1b (pins 12-22)

A1 - Torque Monitor: 3 vDC = rated torque.
A2 - Velocity monitor: Scaling depends on MDsetting:
MtrSpdLim=1999 rpm or below, 5 vDC=1000 rpm.
MtrSpdLim=2000 to 4999 rpm, 2 vDC=1000 rpm.
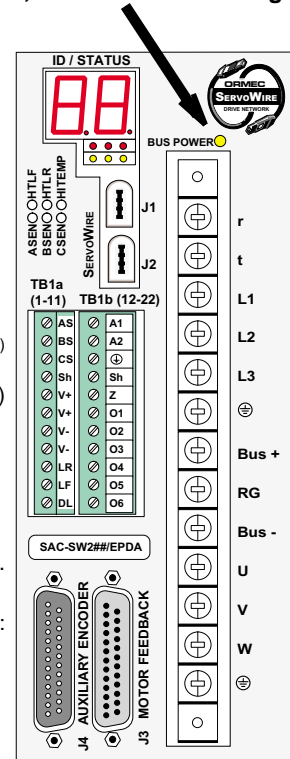_MtrSpdLim=5000 rpm or above, 1 vDC=1000 rpm._

⏚ - Analog common.

Sh - Shield, connected at drive only!

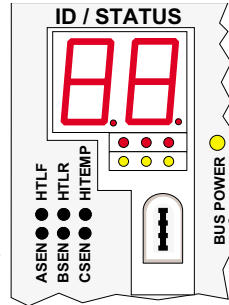**Z** - ZOUT Encoder Reference Output.
Outputs below when using **MotionBASIC ver 5.0**
O1,O2,O3 - PLS Outputs for Motor axis
O4,O5,O6 - PLS Outputs for auxiliary encoder axis.

WARNING: DO NOT SERVICE THE SERVODRIVE WHEN THE BUS POWER LED IS EVEN DIMLY ILLUMINATED. WAIT FOR THE BUS POWER LED TO BE COMPLETELY OFF. SERVODRIVE BUS MUST BE FULLY DISCHARGED BEFORE SERVICING. THIS CAN TAKE SEVERAL MINUTES.
Check for zero volts across Bus+, Bus- before servicing.

ID / STATUS

HTLF, HTLR, HITEMP
ASEN, BSEN, CSEN
BUS POWER

ServoWire Drive ID / STATUS display
consists of a 2-digit, 7-segment LED with two dots.

AXIS ID: Axis identification number is displayed and used to control the drive by the ServoWire Axis Module. Valid axis numbers are in the range 1-32 and are shipped from the factory with a Drive ID set to 1.

Drive SETUP: A recessed push-button located on top of the drive (when pressed) will increase the drives ID by 1, up to a maximum value of 32. After 32 is displayed, it will roll over back to 1, and continue increasing again from there. When changing drive ID's, a ServoWire Bus Reset will occur, and generate a controller error #1922 ServoWire network fault. This is normal operation. For ServoWire Drives with the "/P" pacer option, if the auxiliary axis (connector J4) is used, this auxiliary axis ID is **one less** than the Drive ID. *Ex: The pacer axis ID will be 1, Motor ID will be 2 and displayed on the status display.*

Flashing AXIS ID: indicates two ServoWire Drives have duplicate axis ID's on the same Orion controller. The flashing duplicate axis ID 1, may belong to a pacer axis (ID=one less than the displayed Drive ID).

Flashing both AXIS ID and ALARM ID: If an alarm condition is present on the ServoWire Drive, an error code (HEX value) is displayed on the ID/STATUS display. See alarm code table to right or chapter 7 in the ServoWire Drives Manual for more detail display code descriptions. The decimal equivalent error code can be obtained by the ORION controller by accessing the ORMEC variable ALARM@. See Orion HELP System - ALARM@ for error code description.

ServoWire Communications indicator: **(Middle Dot on ID/STATUS Display)**
Slow Flash: (ON for one second, OFF for one second) indicates SW communications NOT functioning.
Rapid Flash: (ON for half second, OFF for half second) indicates SW communications functioning.
Solid ON or Solid OFF: Indicates a drive failure that is recoverable only by cycling control power (r,t).

Torque Enabled indicator: **(Right Dot of ID/STATUS Display)**
Solid OFF: Torque disabled at the motor.   Solid ON: Torque enabled at the motor.

ServoWire Drive LED's (below ID / STATUS display)
At powerup, three red LED's (HTLF, HTLR, & HITEMP) blink once per second to indicate that the drive is not configured. The statement MP.CONFIG will configure the drive.
After the statement MP.CONFIG is run, the ServoWire Drive LED's when lit, indicate the following:

Hardware Travel Limit Forward / Reverse:
HTLF, HTLR ... Red ...... **LED ON when there is an error, axis motion is prohibited.**
Project has ENABLED HTL's and NOT conducting current at SW Drive TB1a.
          Error #1614 Fwd hardware travel limit. Error #1615 Rev hardware travel limit.
Project has DISABLED HTL's and conducting current at SW Drive TB1a.
          Error #1617 Hardware travel limit Configuration Error.

High Temp:
HITEMP .... Red ...... Motor Over Temperature indicator LED.
Project has ENABLED motor high temp alarm and NOT conducting current by motor thermal switch.
          Error 1628 The thermal contact in the motor is open.
Project indicates NO motor thermal switch, and conducting current.
          Error 1629 Configuration conflict.

Input Sensors A, B, C: *LED ON when voltage is held low.*

ASEN ..... Yellow ...... Sensor ASEN   All three are individually configurable in MotionDESK software.
BSEN ..... Yellow ...... Sensor BSEN   NPN type sensor:2.38K pullup (10 mA @24VDC) or 20K (1.2 mA @ 24VDC)
CSEN ..... Yellow ...... Sensor CSEN   PNP type sensor: NO pullup resistor, current depends on pulldown resistor used.

ServoWire Drive ID/Status Alarm Code	Status	Description: MB = MotionBASIC is the Orion Motion Controller operating software. MD = MotionDESK is the development software running on a PC. SW = ServoWire, all-digital communications, used to network drives.
90-99 9A-9F	Internal Drive Error	An unexpected failure has occured in the ServoWire Drive software or hardware. This alarm may require cycling control power to clear. Report to Customer Service if problem persists. (716) 385-3520.
A0	Drive RMS Over Current	The actual RMS current has exceeded the drive's rated continuous current longer than the allowed time. (2 seconds)
A1	Peak Over Current	The peak current rating for the drive or motor was exceeded.
A2	Power Module Fault	The Power Module's self-protection has detected a short circuit, over current, over temperature or control supply under voltage.
A3	Low Bus Voltage	The bus voltage is too low. (Usually due to disabled main power). Bus Power LED is off. When nominal AC input voltage is: **110** VAC, trip point = 94 VDC, **230** VAC, trip point = 205 VDC
A4	High Bus Voltage	The Bus voltage is excessive. The trip point depends on the rated voltage of the motor, a MotionDesk software setting: Motor rated for **110** VAC trip point = 237 VDC, **230** VAC or above trip point = 425 VDC Alarm cannot be cleared until bus voltage falls below trip point.
A5	Dirve / Project Mismatch	MotionBASIC detected that the drive hardware does not match the MotionDesk project settings. Ether: a) The size of the drives current rating doesn't match the drive selected in the MotionDesk project settings. -or- b) The drive doesn't have the auxiliary encoder option (/P) that the MotionDesk project has an axis defined for it. -or- c) The drive doesn't have the absolute encoder option (/A) that the MotionDesk project expects it.
A6	Drive Not Configured	An attempt was made to enable torque before the drive's setup parameters have been configured. (MP.CONFIG must be run each time the drive's control power is cycled on.)
E0	ServoWire Protocol Incompatibility	The ServoWire communications protocol in the drive is not compatible with the one in MotionBASIC.
E1	ServoWire Timeout	Isochronous communications (i.e. torque commands) from the SW Axis Module were lost. The middle DOT on the Drive ID/Statue display will indicate by a slow flash if communications is not functioning properly. Fast Flash indicates communications has been re-established.
E2	ServoWire Cycle Time Exceeded	This alarm will happen when LOOP.RATE@ is set too high to allow all drives on the ServoWire network to send their isochronous packets.
F0	Motor RMS Over Current	The motor's rating for continuous current has been exceeded by the actual RMS current for longer than allowed by the thermal time constant of the motor. (MotionDESK software setting.)
F1	Motor Encoder Open Wire	At least one motor encoder feedback channel is not connected properly. (J3 pins 1,2,3,4)
F2	Auxiliary Encoder Open Wire	At least one auxiliary feedback channel is not connected properly. (J4 pins 1,2,3,4) This fault will NOT disable the motor axis.
F3	Invalid Hall State	The hall track feedback from the motor is improperly wired. This fault can also occur if the feedback type in MotionDesk has been improperly identified.
F4	Motor Over Temperature	Open contact at J3 pins 19-20. Motor must be sufficiently cool to reset fault. See Section 4.5 in the ServoWire Drives Manual.