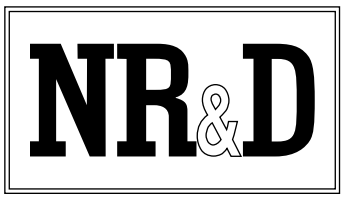
DSD4

Installation and Programming Manual

This Manual describes the DSD4 conveyor controller, its uses and set up. This manual also covers the DSDH Hand Held programmer for the DSD4.

Effective: 5 January, 1998



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Introduction

The Niobrara DSD4 is an intelligent powered roller conveyor controller featuring integrated sensor inputs and motor drivers capable of controlling up to four zones per unit. Multiple DSD4s may be networked together using a Seriplex network or hard-wiring to provide sophisticated conveyor operation including Transfer, Accumulate, and Singulate movement of containers. Supervisory computer or PLC control is possible using the built in Seriplex network interface.

The zone motor outputs are reversible and provide programmable current limiting for normal Transfer running, Regenerative Dynamic Braking and Reverse Braking The motor power is provided by an external 24Vdc supply.

The DSD4 includes sensor and sensor quality inputs for each zone as well as an auxiliary input. Internal pull-ups are supplied for open-collector sensors. The threshold is around 2.5 volts. The active polarity is individually programmable for each bit with the DSDH hand-held parameter unit.

The DSD4 uses switching technology for it's internal power supply regulators as well as the motor drivers. This reduces the power consumption of the system by a factor of 3 or more over comparable systems with conventional linear supplies. Further energy savings are realized by using the regenerative braking feature.

The Auxiliary output is a form A relay contact and is normally open. The contacts close when the selected function is active. These two pins are isolated from other functions.

The +24V sensor power supplied on the zone and aux I/O connector comes from the Seriplex +24V bus. Sensor and aux-in common pins are the Seriplex power common. The Seriplex power supply must be sized for the load of all Seriplex devices plus the sensors on each DSD4.

The DSD4 contains Seriplex technology and conforms to the latest Seriplex standard with the following limitations: the Seriplex interface operates in Mode 2 only (Host/Slave) up to 32KHz. The external Seriplex host provides the clock for the Seriplex network. The DSD4 may be configured for non-multiplexed or multiplexed Seriplex operation and requires 8 contiguous bits per active zone. The Seriplex address for the unit must be 16 or higher.

Specifications

Required Seriplex Addressing

Mode 2, 8 bits per active zone, 32 bits maximum.

Current Draw on Seriplex power supply

50 mA @ 24Vdc excluding sensor loads

Current Draw on Motor power supply

50 mA @ 24Vdc excluding Motor loads; a minimum 10 Amp supply is recommended.

Current Limits per motor

Programmable per zone up to 1.9 Amps.
Maximum continuous operation of 1.75 Amps

Operating Temperature

0 to 60 degrees C operating. -40 to 80 degrees C storage.

Humidity Rating

up to 90% noncondensing

Pressure Altitude

-200 to +10,000 feet MSL

Seriplex Communication Port

5 pin male and female Phoenix contact connectors. Variable frequency up to 32KHz Seriplex protocol. Supports Mode 2 only in non-Multiplexed or Multiplexed I/O.

Indicator lights

3 LEDs: Green Network Power OK, Green Motor Power OK, Red Fault.

Physical Dimensions

Wt.:2 lb. max
W: 9 in.
H: 1.3 in.
D: 4.2 in.

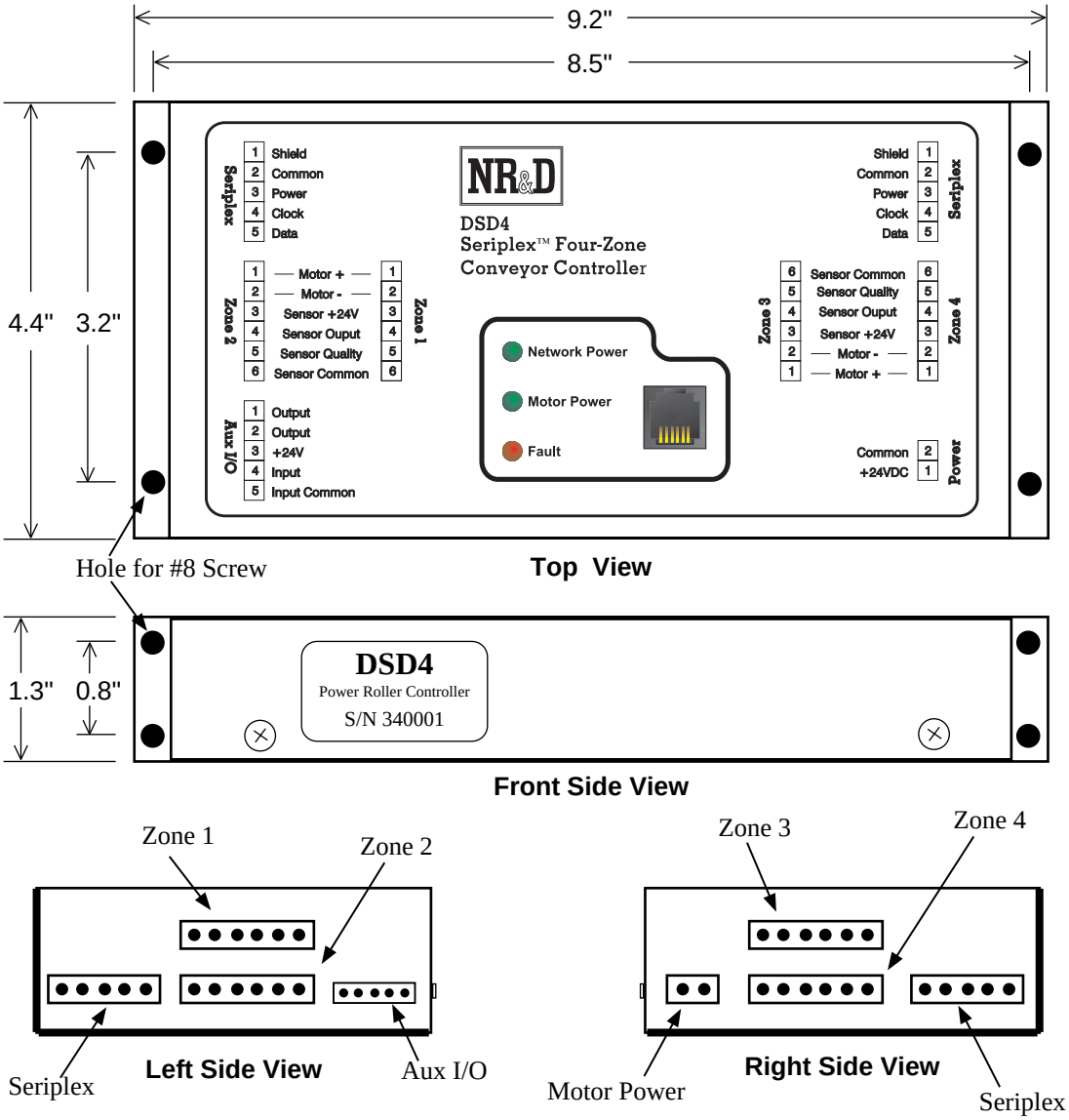

Figure 1-1 DSD4 Image Views

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Installation

Mounting Instructions

The DSD4 should be mounted securely during normal operation using four #8 screws. The unit may be mounted using the tabs on the bottom or side of the case. The actual orientation is not critical but it is suggested that the unit be mounted to allow access to the connectors and observation of the LEDs.

Mating Connectors

The DSD4 does not include mating connectors. Table 2-1 displays the connectors and their Phoenix Contact and Niobrara part numbers.

Table 2-1 Phoenix Contact Connectors

Connector	NR&D Part #	Phoenix Part #	Phoenix Order #	# used per DSD4
Zone	DWP6S1T	MC 1,5/6-STF-3,81	18 27 74 5	4
Left Seriplex	DWX5S1T-F	MSTB 2,5/5-STF-5,08	17 78 01 4	1
Right Seriplex	DWX5P1T	IC 2,5/5-STF-5,08	18 25 34 9	1
Aux I/O	DWQ5S1T	MC 1,5/2-STF-3,5	18 47 08 4	1
Power	DWX2S1T-2	MSTB 2,5/2-STF-5,08	17 77 98 9	1

Seriplex installation

Seriplex Connector

The DSD4 connects to the Seriplex network using its 5 pin Phoenix Contact ports. The pinout of these connectors and the suggested wire colors for the Seriplex network cable are shown in Table 2-2.

Table 2-2 DSD4 Seriplex Connector

Pin	Function	Suggested Wire Color
1	No Connection (Shield)	Bare
2	Seriplex Common	Black
3	Seriplex power, +12 or +24VDC	Red
4	Seriplex clock	Green
5	Seriplex data	White

Seriplex mating connectors have been selected so they may be connected together bypassing the DSD4 unit for maintenance or testing.

Seriplex Power Supply

An isolated 24VDC power supply is recommended for the Seriplex network. Square D recommends using a source with line regulation of +/- .05% for a 10% AC line change. With a 50% load change, the voltage output should change no more than +/- .05% and the output ripple should be 5.0mV PK-PK maximum. It is recommended that the current capacity be rated at 1.2 times the total load current of the network. Also, long cable runs may result in voltage drop, so multiple power supplies may need to be included in the network.

Seriplex Clock Module

The DSD4 requires the clock signal for the Seriplex network to be provided by the Master or a Clock Module.

Zone Connector Installation

Each of the four Zone connectors are identical and include the following pinouts:

Table 2-3 Zone Connector Pinout

Pin	Function
1	Motor +
2	Motor -
3	Sensor +24V
4	Sensor Output
5	Sensor Quality
6	Sensor Common

Motor Connection

The powered roller should be connected with the red wire to the Motor + connector (Pin 1) and the black wire to the Motor - connector (Pin 2). This will ensure that all motors will run in the same forward direction. If your DC motor has more than two wires (typically 8), refer to the motor instructions to determine which two wires to connect to the DSD4. Single wire motors, with their return internally connected to frame ground, are not supported.

The zone motor outputs are driven by a bridge to allow reversing. They are supplied by the motor supply and isolated from the Seriplex power supply. The motor drivers are designed for continuous operation at up to 1.75 amps. The motor current can be programmed up to 1.9 amps. Applications using current > 1.75 amps should limit motor operation to a 50% duty cycle with a maximum on period of 60 seconds.

CAUTION: Current limiting is performed by switching the negative motor lead at a variable pulse width. This means there is no current limiting between positive output (which may be either pin 1 or 2 depending on the motor rotation) and motor power return. Shorting motor leads to

motor power, motor power return, or other zone motor outputs can cause permanent damage. A damaged motor driver will cause the Fault Lamp to light.

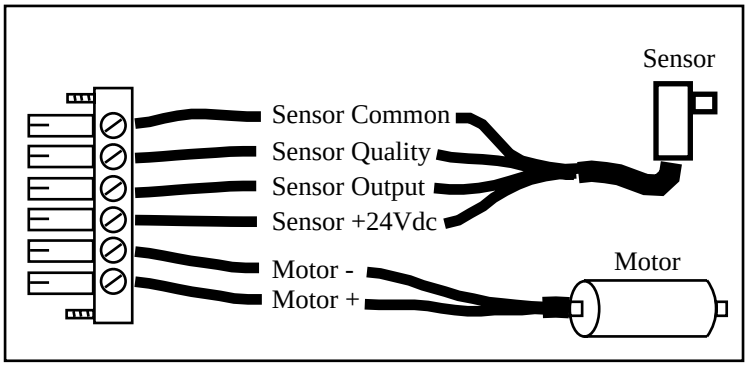

Figure 2-1 Zone Connector

Sensor Connection

The sensor and sensor quality inputs are +24Vdc inputs. Internal 4.7K pull-ups to 24V are supplied for open-collector (NPN) sensors (See Figure 2-2). These may be omitted on special order. The threshold is around 2.5 volts. The active polarity is individually programmable for each bit with the DSDH hand-held parameter unit. The +24V sensor power on the zone and aux i/o connectors comes from the Seriplex +24V bus. Sensor and aux-in common pins are the Seriplex power common.

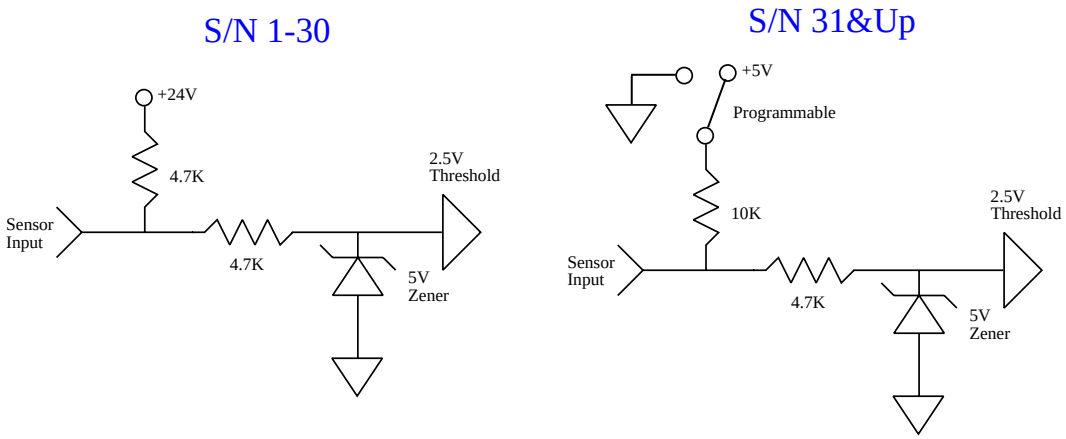

Figure 2-2 Sensor and Aux Input Circuit

Aux I/O Connection

The Auxiliary output is a form A relay contact and is normally open. The contacts close when the selected function is active. These two pins are isolated from other functions. The contacts are rated for 3A at 125VAC or 30Vdc.

The Auxiliary input is a +24Vdc input like the sensor and sensor quality (See Figure 2-2). Internal 4.7K pull-ups to 24V are supplied for open-collector output sensors. The threshold is around 2.5 volts. The active polarity is individually programmable with the DSDH.

Table 2-4 Aux I/O Pinout

Pin	Function
1	Output
2	Output
3	+24Vdc
4	Input
5	Input Common

Motor Power

The Motor Power bus should be connected to the two pin Phoenix Contact Power connector. Pin 1 should be connected to +24Vdc and Pin 2 to the Common. The DSD4 will light its green Motor Power LED if the voltage is acceptable for normal operation.

The motor power is isolated internally from the Seriplex/sensor power. It is recommended that separate supplies be used for the Seriplex and Motor power to aid troubleshooting and to isolate motor current switching transients from the Seriplex network.

Table 2-5 Motor Power Pinout

Pin	Function
1	+24Vdc
2	Common

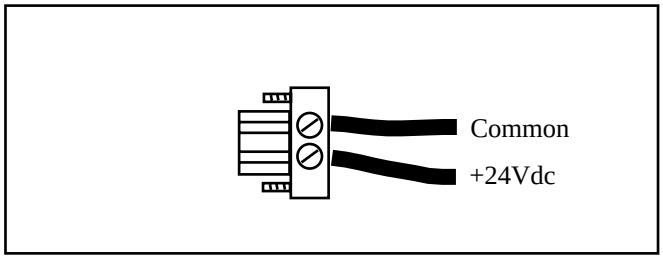

Figure 2-3 Motor Power Connector

3

Conveyor Descriptions

This chapter will define the features of a conveyor system and how the DSD4 relates to these features.

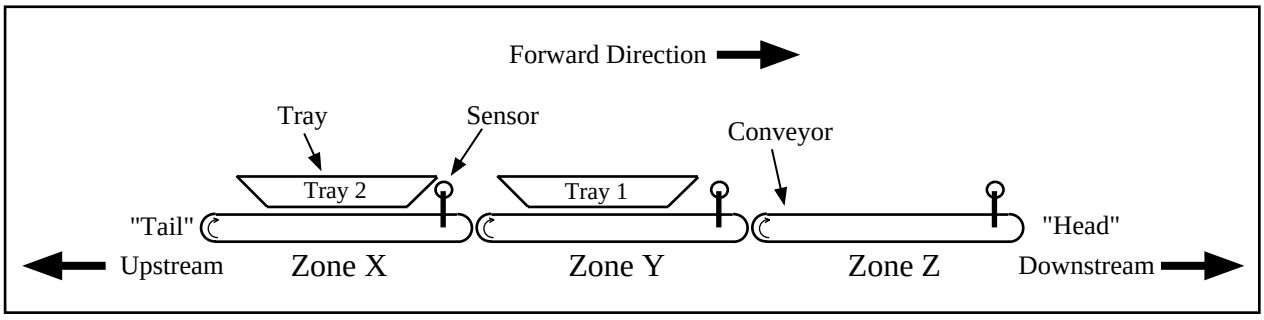

Figure 3-1 Conveyor

Zone Element Definitions

Zone

Figure 3-1 shows three zones of a conveyor. Each zone typically consists of a powered roller connected by a belt to other non-powered rollers to form a motorized segment. Each zone is usually the same length but this is not a requirement for the DSD4. The powered rollers are typically geared to provide the same speed of travel when the motor is on. The direction of travel of the zone is determined by the direction of rotation of the powered roller. The examples in this document will use **Forward** as the direction of travel of a tray from the **"Tail"** to the **"Head"** of the conveyor system. **Downstream** will be defined as in the forward direction towards the "Head" and **Upstream** will be towards the "Tail."

Sensor

Each zone includes a sensor to determine if a tray is present in the zone. The sensors are typically an optical blockage detector but may be of other types such as mechanical or electrical. The sensor will provide a signal to the DSD4 when the sensor is "blocked" and a different signal when the sensor is "clear". The DSD4 is configurable for the polarity of this signal. The sensor may also provide a **quality** signal to indicate if the signal is "good".

Tray

The tray is the container that travels on the conveyor. The trays are usually the same size and are built with trapezoidal ends in ensure a gap between trays when they are touching. The sensors are aligned to detect the gap between adjacent trays.

Normal "Transfer" Operation

The Transfer operation simply refers to the movement of trays from the tail of the conveyor to the head. In Figure 3-1, trays move from Zone X to Zone Y, to Zone Z. When there are no trays on the conveyor, the zone motors are stopped. As a tray enters a zone, an upstream signal informs the zone to start its motor to accept the tray. As the tray enters the zone, it moves along and eventually triggers the zone's sensor and signals the downstream zone to start to accept the tray. After the tray has cleared the zone, the motor is turned off to conserve power, lower mechanical wear, and reduce noise.

Multiple timers are employed for each zone to ensure that the transfer is smooth and jams are detected. When a start signal is detected from the upstream zone, the **Arrival Timer** (see page 19) is started. If the tray doesn't arrive at the zone's sensor by the time the Arrival timer expires, the motor is turned off. As the tray passes by the zone's sensor, the **Jam Timer** (see page 20) is started. The tray must clear the sensor before the Jam timer expires or the zone is placed in Jam condition. As the tray clears the sensor, the **Clear Timer** (see page 20) is started. The motor runs for the length of the Clear timer to ensure that the tray has been passed onto the next zone.

Accumulate Operation

During the course of operation, it is sometimes desirable to have a particular zone stop and accumulate trays. The Accumulate signal is triggered by the downstream zone or device (or Seriplex Host) and instructs the zone to turn off its motor as soon as a tray blocks its sensor. This zone then sets an accumulate signal for its upstream zone. As the trays come down the conveyor, they accumulate with one tray per zone. If the Accumulate signal is removed on the most downstream zone, it will transfer its tray downstream and remove its accumulate signal for the upstream zones to allow all trays to move forward.

The DSD4 operates in a "bumpless" transfer sequence by noticing when more than one tray is in a zone and self accumulating upstream zones. While a zone is in the Arrival timer and waiting for a tray to reach its sensor, it tells its upstream zone to accumulate until its sensor is blocked. This ensures only one tray is ever in a zone.

In applications where the last zone on a conveyor (head) feeds a machine that will only accept one tray at a time, the Aux Input may be connected to a "give me a box" output from the machine. The Aux Input would be configured for LAST ACCUMULATE. If this signal is pulsed to the inactive state momentarily, the conveyor will deliver one box.

Singulate Operation

Singulate is an extension of Accumulate that automatically allows each tray to be sent downstream from that zone with one zone length plus one box length of separation. This is accomplished by the singulate zone holding the upstream accumulate signal until the tray has cleared its sensor.

Jam Operation

If a zone motor is running normal (not jog) and the sensor for that zone is blocked longer than the Jam timer, then the zone enters a Jam state. The Jam Seriplex bit will be set and if the Unjam Timer (see page 21) is set to zero, the motor is turned off. If the Unjam Timer is greater than zero then the motor will reverse and attempt to clear the sensor for the length of the Jam timer. If the Unjam timer expires without clearing the sensor, the motor will be turned off, and the Fault LED will flash. Jams may be cleared by manually clearing the tray from the sensor.

Jog Operation

The Seriplex Host may take control of the zones by turning on the Jog output bits for the zones. The Jog bit turns on the motor and bypasses the DSD4 internal logic. The Jog may operate in Forward or Reverse direction.

Sensor Location

The logic in the DSD4 assumes that no tray can fit between the sensor and the end of the zone. To ensure proper operation of the DSD4 units, the distance from any sensor to the end of its zone should be less than the length of the smallest tray expected on the conveyor.

If the sensor is placed close enough to the end of the zone, the Clear Timer may be set to 0.0 seconds, relieving the importance of setting that timer properly. With the Clear Timer set to 0.0, when two touching trays cross the sensor, the zone will stop immediately after the second box is sensed. For this to work properly, the leading box must have traveled far enough into the next zone that it is not stopped or slowed by the upstream zone stopping.

4

Timer Descriptions

Arrival Timer

Description

The arrival timer determines the maximum time a zone must run its motor after receiving a start command from the upstream zone before its sensor detects the package. If this timer expires before a package is detected, the zone logic assumes that the package has been removed from the conveyor, and turns the motor off.

Calculation

Minimum Arrival Timer (seconds) = 5 * D1 / S

where:

D1 = Maximum distance between consecutive sensors, (inches)

S = Typical package speed (feet / minute)

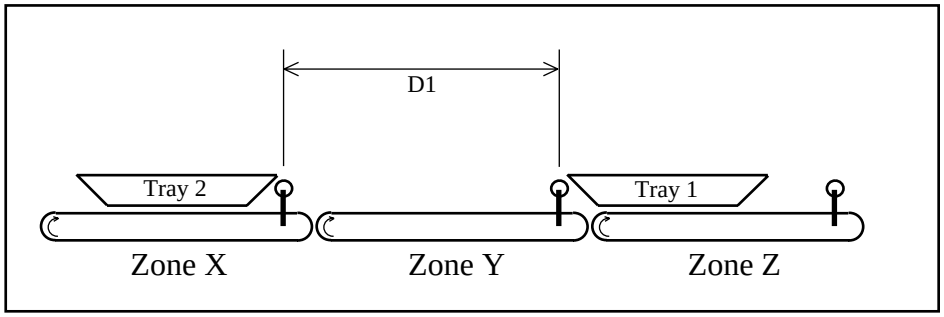

Figure 4-1 Arrival Timer

Significance

If this timer is set to a time longer than ideal, the motor will run longer than is necessary if a package is removed from the conveyor between zones. If this timer is set too short, a package may be lost when the controller decides it has been removed from the conveyor when in fact it has not yet reached the sensor. It is recommended that this timer is set considerably longer (approximately 30%) than its minimum value.

Clear Timer

Description

The clear timer determines how long a zone will run its motor after a package has cleared its sensor to move the package completely onto the next zone.

Calculation

Clear Timer = 5 * D2 / S

where:

D2 = Distance a package must travel to clear the zone's rollers after clearing its sensor (inches)

S = Typical package speed (feet / minute)

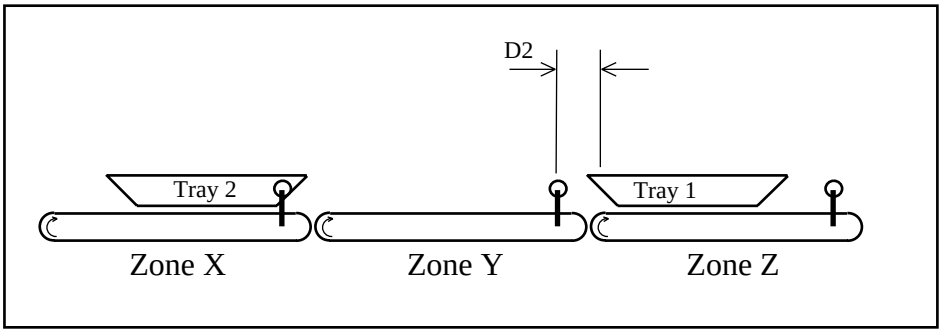

Figure 4-2 Clear Timer

Significance

Of all the timer settings, this is the most critical. If this timer is set shorter than the ideal value, a zone's motor will stop before a package has completely left the zone, possibly preventing it from moving onto the next zone. If the clear timer is set too long, the motor may roll the second of two closely spaced packages partly onto the next conveyor section. It is recommended that this timer is set as accurately as possible.

In certain cases, the Clear Timer may be set to 0.0 seconds, making this timer non-critical. In this case, when a tray clears the zone's sensor, the zone's motor will run until the next tray reaches the sensor, or until the tray reaches the next zone's sensor. Note that this will stop a zone's motor as soon as the second of two touching trays is "seen" by the sensor. If the sensor is far enough from the end of the zone that the leading tray get slowed or stopped when the upstream zone stops, then the Clear Timer must be set to a non-zero value.

Jam Timer

Description

The jam timer determines the maximum time a zone must run its motor after detecting a package before the package clears the zone's sensor. If this timer expires before the sensor is cleared, the zone will enter a Jam condition, and possibly attempt to unjam the zone (See Unjam Timer, below). **NOTE: The jam timer may be set to 0.0s to ignore jam conditions (i.e. motor will continue running forward until jam is cleared).**

Calculation

Minimum Jam Timer = 5 * D3 / S

where:

D3 = Length of the longest expected package (inches)

S = Typical package speed (feet / minute)

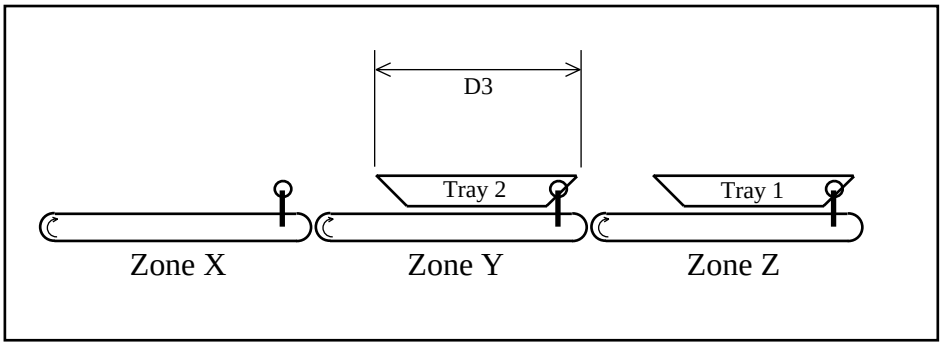

Figure 4-3 Jam Timer

Significance

If this timer is set longer than ideal, then the zone will run its motor longer than necessary before recognizing a jam condition. If this timer is set too short, then the zone will detect a jam condition and possibly attempt to unjam when there is no jam condition. It is recommended that this timer's value is calculated from the longest package which will be seen on the conveyor, and that an allowance (about 20%) is then added to this calculated value.

Unjam Timer

Description

If a zone detects a jam (i.e. the Jam timer expires before the package clears zone's sensor) the zone will attempt to unjam itself by running the rollers backward for the duration of the unjam timer. If, during this time, the sensor is cleared, the motor will change to the forward direction and return to normal operation. If the unjam timer expires before the sensor is cleared, the motor will stop, and set its Seriplex jam flag. Setting the unjam timer to zero disables the unjam feature.

Significance

If the unjam procedure succeeds in dislodging a jammed package, it could take as long as the duration of the Jam Timer before the sensor is clear. Until experience suggests otherwise, use the Jam Timer value for this timer.

Manual Tuning

Though timer values may be calculated using the above described formulae, it is also easy to properly tune the timers using an assembled conveyor system. The following procedure outlines the method for manually tuning the DSD4 timers.

Initial Values

To begin testing, enter the timer values from Table 4-1 into the DSD4:

Table 4-1 Timer Inital Values

Timer	Initial Value
Arrival	10.0
Clear	5.0
Jam	10.0
Unjam	2.0

With these values programmed into the DSD4, the conveyor should transport a single tray across the four zones without interruption. Test these values by placing a tray in front of the Zone 1 sensor. If the tray is carried smoothly through Zones 2 and 3 without interruption, proceed to Arrival Timer Tuning. If the tray stopped on any zone, or if any zone reversed its motor, double the values for the Arrival, Clear, and Jam timers and test another single tray.

Arrival Timer Tuning

The purpose of tuning this timer is to find the minimum Arrival Timer value necessary to get a package to the sensor of a zone. The process involves setting the Arrival Timer to a overly short value, then increasing the timer in minimal increments until a package is passed from one zone to the next without stopping before reaching the sensor. This minimum value is then increased by 30% to allow for tray inconsistency. Trays of any length may be used for this tuning process.

1 Measure the time (approximately) it takes for a tray to travel from one sensor to the next. Set the Arrival Timer to 1 second less than this value.

2 Drop a tray in front of the Zone 1 sensor. If the tray does not reach the *Zone 3 sensor* before stopping, increase the Arrival Timer by 0.2s, and repeat Step 2.

3 The Arrival Timer is now set to the minimum time necessary for operation. In order to allow for variance caused by tray weight and slippage, increase this value by 30% (multiply by 1.3), rounding up as necessary.

Clear Timer Tuning

The purpose of this section is to determine whether the Clear Timer must be used, and if necessary, the ideal value for this timer. The Clear Timer may be set to 0.0 if two trays which are touching as they enter zone 1 are properly separated at the end of Zone 1 (i.e. the leading box is not stopped or slowed when the Zone 1 motor stops). If the Clear Timer must be used, the timer is set correctly when the point at which two trays are touching as they enter Zone 1 is aligned with the end of Zone 1 when the Zone 1 motor stops. This timer, if used, is critical, and must remain at this ideal setting. The shortest trays which will be used in the system should be used for this tuning process.

1 Set the Clear Timer to 0.0s, then feed two trays (touching, end-to-end) into the Zone 1 sensor. The zone motor will start running, and will stop when the front of the second tray reaches the sensor. Note whether the leading tray stops or slows when the Zone 1 motor stops. If the leading tray is unaffected when the Zone 1 motor stops, leave the Clear Timer set at 0.0s, and go on to Jam Timer Tuning.

2 Increase the Clear Timer to 0.2s.

3 Feed two trays (again: touching, end-to-end) into the Zone 1 sensor. Watch where the leading edge of the second box stops, relative to the end of the zone. If the second box stopped before reaching the end of the zone, increase the timer by 0.2 seconds, and repeat Step 3.

With the Clear Timer programmed to the ideal value, the leading edge of the second tray will stop at the end of the zone. If no value stops the tray *exactly* at the end of the zone, use the value which stops the tray *closest* to the end of the zone.

Jam Timer Tuning

The purpose of tuning the Jam Timer is to determine how long the longest tray used in the system blocks the sensor during normal transport operation. This minimum value is found by decreasing the Jam timer until a tray transported by the conveyor section causes the Zone motors to reverse (attempting to Unjam). The next higher value (plus 20% to allow for slippage, etc.) is used as the Jam Timer value. The longest trays which will be used in the system should be used for this tuning process.

1 Set the Jam Timer to the value in the Arrival Timer. (If the longest trays are much shorter than a zone, a smaller initial value may be used).

2 Set a tray in front of the Zone 1 sensor. Observe the rollers in Zones 2 and 3 as the tray travels across them. If the tray passes through the zones without the rollers reversing, reduce the Jam Timer by 0.2s and repeat Step 2. Repeat this process until the zone rollers reverse while transporting a tray.

3 Add 0.2s to the timer value, then add 20% (multiply by 1.2), rounding up as necessary, to allow for slippage, etc.

Unjam Timer

The proper setting for this timer will vary depending on the application; an initial value equal to the Jam Timer is suggested.

5

DSDH Operation

The DSDH hand-held parameter unit is used to configure the DSD4 for operation.

Battery Charging

Charge the DSDH for 12 hours with the TR92 before initial use. Remove the charger after recharging; overcharging will reduce the life of the battery. Use only 8.4V NiCd rechargeable or 9V Alkaline single use batteries. Don't connect the charger transformer when an Alkaline battery is installed. The unit may be operated from the charger when no battery is installed.

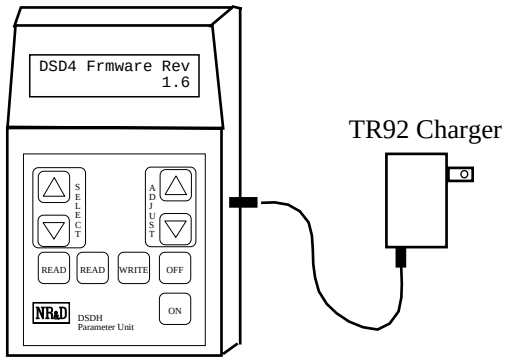

Figure 5-1 TR92 Charger with DSDH

The DSD4 will display a low battery warning symbol when the battery needs charging in the first character of the second row of the display as shown in Figure 5-2. **WARNING:** Writing configuration data to DSD4 units while the low battery indicator is on may fail, leaving the DSD4 with an invalid configuration.

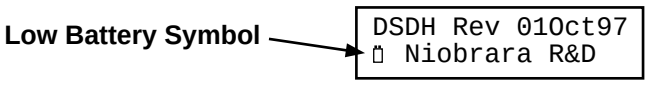

Figure 5-2 Low Battery Symbol

Operation

The DSDH includes a 9-key keyboard (Figure 5-3) and a two-line 16 character/line LCD. Operation of the keyboard is described as follows.

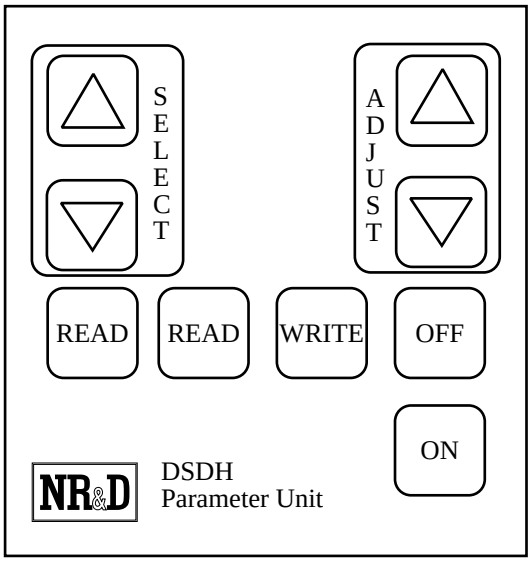

Figure 5-3 DSDH Keyboard

ON Key

Turn on the DSDH by pressing and holding the ON key until the display shows something like the Figure 5-4.

```
DSDH Rev 01Oct97
  Niobrara R&D
```

Figure 5-4 DSDH Opening Screen

The date code 01Oct97 indicates the firmware revision of the DSDH itself. This date will change with different firmware releases of the DSDH.

After four seconds of inactivity, the display will then change to show the current revision of the DSD4 Firmware loaded in the DSDH.

```
DSD4 Frmware Rev
             1.0
```

Figure 5-5 DSD4 Firmware Rev Screen

NOTE: The DSDH does not save the parameters when switched off. Leave the unit on to preserve settings between configurations of DSD4s.

NOTE: The DSDH will turn itself off after approximately 5 minutes of non-use to conserve battery power.

OFF Key

The DSDH is turned off by pressing the OFF Key. The display will look like Figure 5-6 before the unit is powered off.

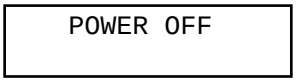

Figure 5-6 Power Off Screen

READ Key

The Read key fetches the configuration from the connected DSD4. Pressing the Read key will cause the DSDH to display "PLEASE WAIT" and when finished "READ COMPLETE". The display will then change to show the current revision of the DSD4 Firmware loaded in the attached DSD4.

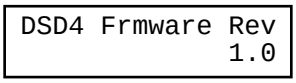

Figure 5-7 DSD4 Firmware Rev Screen

MODE Key

The MODE key controls the operation of the WRITE key. The ADJUST keys are used to select the possible modes including:

- NORMAL WRITE - Simply writes the parameter values from the DSDH into the DSD4.
- AUTO-INCREMENT - Automatically increments the Seriplex addresses from one unit to the next.
- DWNLOAD FIRMWARE - Copies the DSD4 firmware that is embedded within the DSDH into the DSD4.

WRITE Key

The WRITE key sends the configuration set in the DSDH into the connected DSD4.

SELECT Keys

The SELECT Keys are used to step though each of the adjustable parameters in the DSDH.

ADJUST Keys

The ADJUST Keys modify the selected parameter by scrolling through the available options.

DSDH Screen Fields

The SELECT keys move up and down through theses fields. The ADJUST keys are used to alter the fields.

DSD4 Firmware Rev

The revision of the firmware in the DSD4 unit most recently READ by the DSDH.

Zone 1 Mux Chanl

The Seriplex multiplex channel of the zone I/O bytes. The options include channels 0 through 15. Select mux chanl = 0 for non-multiplexed Seriplex operation. The default value is 0.

Zone 1 Bit Addrs

The Seriplex bit address (within the mux channel specified above) of the first bit (the sensor state input, singulate output) of Zone 1. For Zone 2, 3, and 4, add 8, 16, and 24 respectively. The possible settings are 16 through 248 inclusive. The default value is 16.

Number of Zones

Number of zones in the box 1..4 which are active. Disabled zones perform no Seriplex I/O, turn off their motors, and ignore the state of their inputs. The specified number of zones enabled starts at zone 1. A box with two enabled zones, for instance, has zones 1 and 2 active and occupies 16 bits of the Seriplex bus. The default value is 4.

Arrival Timer, Clear Timer, Jam Timer, Unjam Timer

See Chapter 4 on page 19 for complete explanations of these timers. These timers may be set to 2/10 second resolution.

Zone 1 Current, Zone 2 Current, Zone 3 Current, Zone 4 Current

The current limit for the motor of Zone X when the motor is running. The value is set in milliamps with a default of 1099mA. The possible settings are 0 through 1960 mA in approximately 7.5mA increments.

Zone 1 Braking, Zone 2 Braking, Zone 3 Braking, Zone 4 Braking

If set to "DYNAMIC", when the motor is stopped, the motor is shorted for braking up to the current specified by Zone x Current limit. If the motor and load momentum is able to generate more current than this, extra energy is dumped onto the motor power bus.

If braking is set to a current level, then when the motor should be stopped, it is actually reversed at the specified current limit. This is useful for down-slope applications. In this case, "reverse" is the opposite direction from that defined by the state of Seriplex output bit 3.

The default value is "DYNAMIC" braking.

Aux Input Mode

Defines the function of the auxiliary input. The state of the aux input is always reported to Seriplex input bit 7 of Zone 1. This parameter defines an additional function:

- SERIPLEX ONLY - No additional function.
- ZONE 1 START - The input supplies the start signal to zone 1.
- LAST ACCUMULATE - The input instructs the last enabled zone in the unit to accumulate.
- LAST SINGULATE - The input instructs the last enabled zone in the unit to singulate.

Aux Output Mode

Defines the function of the auxiliary output. The output relay can always be forced on by setting Seriplex output bit 7 of Zone 1. This parameter defines an additional function that can activate the output. The extra function is ORed with the Seriplex output bit.

- SERIPLEX ONLY - No additional function. The Aux Output relay is closed when the Seriplex output bit 7 for Zone 1 is set.
- DOWNSTREAM START - Active when the next zone downstream of the last enabled zone in the unit should start. May also be used to instruct a machine to accept a box.
- UPSTM ACCUMULATE - Active when Zone 1 of the unit wants the next zone upstream to accumulate.

Start Mux Chanl

Seriplex Multiplex channel of the Start bit for zone 1. Select mux chanl = 0 for non-multiplexed Seriplex operation. Possible values are 0 through 15 with the default = 0.

Start Bit Addrs

Seriplex bit address within the multiplex channel defined above of the Start bit. The Start bit is a Seriplex input in another Seriplex device that Zone 1 of the DSD4 monitors to know when to start running to accept a package. This bit may be the Downstream Start bit of the last enabled zone of an upstream DSD4 or it may be a discrete Seriplex input block. This start command is ORed with the Aux Input when the latter is programmed for ZONE 1 START and with Seriplex Output, bit 5. When Start Mux Chanl is equal to Zone 1 Mux Chanl, Start Bit Addrs must be less than Zone 1 Bit Addrs. When Start Mux Chanl is equal to Accumulate Mux, Start Bit Addrs must be less than Accumulate Bit.

Accumulate Mux

Seriplex Multiplex channel of the Downstream Accumulate bit for the last enabled zone. Select mux chanl = 0 for non-multiplexed Seriplex operation. The possible values are 0 through 15 with the default = 0.

Accumulate Bit

Seriplex bit address within the multiplex channel defined above of the Downstream Accumulate bit. This is a Seriplex input within another device. The last enabled zone of the box monitors this input and accumulates when it is active. This bit is ORed with Seriplex output bit 1 and the Aux Input if programmed for ACCUMULATE mode. Accumulate overrides Singulate.

The default value is 69.

Aux In Polarity

Determines the active polarity of the Auxiliary Input.

- ACTIVE HIGH - The input is active (On) when voltage is present on the pin. This will also make the input active (On) when the input is open (disconnected) and the internal pull-up is enabled.
- ACTIVE LOW - The input is active when no voltage is present on the pin, i.e. when the input is connected to the input common.

Quality 1 Mode

Defines the function of the Sensor Quality pin of Zone 1. The state of this input is always reported on Seriplex input bit 1 of zone 1.

- SENSOR QUALITY - The pin has no other function. The quality signal from the sensor is echoed into Seriplex bit 1 for that zone.
- ZONE 1 START - The pin in the active state starts Zone 1 to accept a box. This function is ORed with the Seriplex start bit, the Auxiliary Input if in ZONE 1 START mode, and Seriplex Output bit 5.

If No Seriplex

Determines action taken when no Seriplex clock is detected, or when Seriplex clock signal is lost.

- STOP - Halts all motors when no seriplex clock is detected. This setting allows systems with a Seriplex network to fail safe if the supervisory computer halts.
- RUN STANDALONE - Executes zone logic normally when no Seriplex clock is detected. This mode should be used when operating DSD4s without a Seriplex network, or in systems where all motors halting would be a hazard.

Input Pull-ups

Determines the polarity of the internal Pull-ups in the sensor and Aux Input circuits (See Figure 2-2 on page 13.)

- ENABLED - Inputs are pulled high internally, and will read HIGH if left unconnected.

- DISABLED - Inputs are pulled low internally, and will read LOW if left unconnected.

Tray Clear Start

The tray clear start parameter controls how the DSD4 behaves when it is first powered up. The default configuration for this parameter is ENABLED, which will allow the DSD4 to "find" packages which may have stopped between sensors during a power loss.

- ENABLED - When tray clear start is enabled the DSD4 will, after a 2 second delay, consecutively start the motor in each zone which does not already have a package blocking its sensor. The motors will run until a package appears at the sensor, or until the Arrival Timer expires. When all zone's motors have stopped this initial process, the DSD4 resumes normal operation.
- DISABLED - With the tray clear start disabled, the DSD4 will still delay operation after power up, but will not run motors on any zones unless the zone's sensor is blocked. This setting will prevent the motors from running on power-up, so packages could be lost between sensors during a power loss on the Seriplex network. Note that if a package is lost on the conveyor, the DSD4 will "find" the package when another package travels down the conveyor system.

Zone 1 Sensor, Zone 2 Sensor, Zone 3 Sensor, Zone 4 Sensor

Determines the active polarity of the zone's sensor input. To the DSD4, an active sensor input is a sensor which detects the presence of a package in the zone.

- ACTIVE HIGH - The input is active (On) when voltage is present on the pin. This will also make the input active (On) when the input is open (disconnected) and the internal pull-up is enabled.
- ACTIVE LOW - The input is active when no voltage is present on the pin, i.e. when the input is connected to the input common.

Zone 1 Quality, Zone 2 Quality, Zone 3 Quality, Zone 4 Quality

Determines the active polarity of the zone's sensor quality or fault input. These inputs, when used as quality inputs, are not processed by the DSD4, except that they are reported to the Seriplex network. In this case, an "active" input will be reported as a 1, or logic high on the Seriplex network. In Zone 1, the quality input can be used as a Zone 1 start signal, in which case "Active High" or "Active Low" would have the same meaning as the sensor polarities above.

- ACTIVE HIGH - The input is active (On) when voltage is present on the pin. This will also make the input active (On) when the input is open (disconnected) and the internal pull-up is enabled.
- ACTIVE LOW - The input is active when no voltage is present on the pin, i.e. when the input is connected to the input common.

Connecting the DSDH to the DSD4

WARNING

Connecting the DSDH to an active DSD4 may interrupt the Seriplex operation of the network and result in unpredictable equipment behavior and possible operator injury. Always stop the Seriplex network or disconnect the DSD4 from the Seriplex network when configuring the DSD4 or download new firmware.

The DSDH will interfere with the normal operation of the DSD4 when connected. The Seriplex network should be either disabled or disconnected from the DSD4 to be modified before the DSDH is connected.

Connect the DSDH to the DSD4 using the supplied 6 conductor retractile RJ12 cable to the RJ12 Connector on the DSD4.

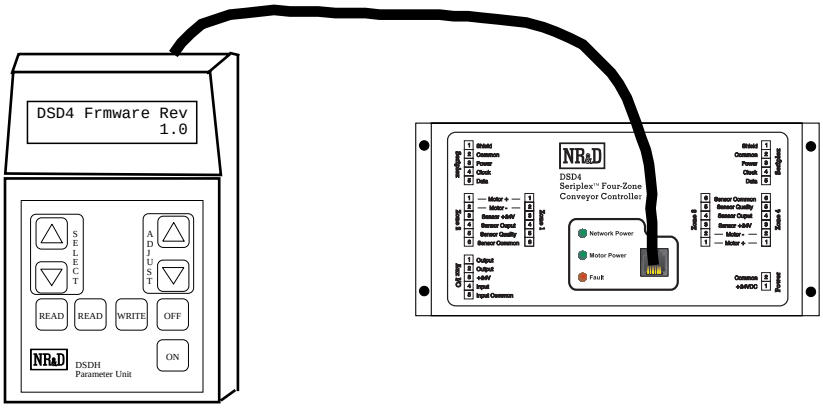

Figure 5-8 DSDH Connection

Depending upon the exact setup, the Network Power, Motor Power, and Fault lights might come on when the DSDH is connected to the DSD4. At the least, the Network Power light should come on when connected.

If the Seriplex 24V power is up on the DSD4, it will be used to power the DSDH.

NOTE: The DSDH does not save the parameters when switched off. Leave the unit on to preserve settings between configurations of DSD4s.

NOTE: The DSDH will turn itself off after approximately 5 minutes of non-use to conserve battery power.

6

Seriplex Operation

Recommended Seriplex addressing

The recommended Seriplex addressing for the conveyor controller allows configuration of 112 four zone boxes on a 240 bit, 16 channel multiplex Seriplex network. The network can be widened to accommodate additional functions in bits 240..255 in addition to the conveyor controllers.

Unless special application requirements dictate otherwise, the DSD4 units should be addressed as follows:

Table 6-1 Recommended Seriplex Addressing

DSD4 Box	Zone		Start		Accumulate	
	Mux	Bit	Mux	Bit	Mux	Bit
1	0	16	15	240	0	53
2	0	48	0	47	0	85
3	0	80	0	79	0	117
4	0	112	0	111	0	139
5	0	144	0	143	0	181
6	0	176	0	175	0	213
7	0	208	0	207	1	21
8	1	16	0	239	1	53
9	1	48	1	47	1	85
10	1	80	1	79	1	117
...	...	...	...	...	...	...
111	15	176	15	175	15	213
112	15	208	15	207	0	240

The box 1, Zone 1 Start bit at 15/240 is a dummy. No Seriplex device is addressed at this location. The same is true of the Accumulate input for the last zone at 0/240. Typically, the start input for the first zone of the conveyor and an accumulate or singulate input for the last zone can be connected with the Auxiliary Input. Seriplex inputs can be used for these functions as long as the rules for Start Bit < Zone 1 Bit < Accumulate Bit when in the same mux channel are obeyed. A four-zone conveyor may be con-

figured in a single box by using either a Seriplex block or the Zone 1 Quality input for the start input and the Auxiliary Input for the accumulate or singulate input.

The Auto-Increment write mode of the handheld supports the recommended layout by advancing the 6 address parameters according to the above scheme automatically after each successful write.

Safety Considerations

DSD4 units, by default, run standalone if no Seriplex clock is present. The "If No Seriplex" parameter should be changed from "Run Standalone" to "Stop" in any system designed to utilize a Seriplex network. Then, if the clock should fail, or if the supervisory computer should halt, all motors on the conveyor will stop until the problem is corrected.

Seriplex Inputs

Each zone contains 8 Seriplex Inputs that are read by adjacent DSD4 zones as well as the Seriplex Master.

Table 6-2 Seriplex Zone Input Bits

Seriplex Zone Bit	Description	Notes
0	Sensor State	This sensor is downstream of the motor in Fwd direction.
1	Sensor Fault	Not used internally, just reported to Seriplex Host.
2	Jam	
3	Motor ON	
4	Device Present	Always ON if zone present.
5	Upstream should accumulate	ORed with host Accumulate command.
6	Aux Input state	Only in the first zone.
7	Downstream start command bit	

Seriplex Outputs

Each zone contains 8 Seriplex Outputs for controlling DSD4 operation from a Seriplex Host.

Table 6-3 Seriplex Zone Output Bits

Seriplex Zone Bit	Description	Notes
0	Singulate	
1	Accumulate	Overrides Singulate
2	Jog	Unconditional Run.
3	Reverse	
4	Stop	Overrides Jog
5	Start	ORed with other start signals.
6	Reserved	
7	Aux Output	Only in first zone in module.

7

Non-Seriplex Operation

Notice that the quality inputs are only reported to the Seriplex host. They're not used internally. So, if you don't have a network, you have extra inputs to play with! There is a (handheld-programmable) option to have the Zone 1 Quality input mean Zone 1 start. So, if you want to hook up a string of boxes without a network, you:

1 Connect the last sensor to both the Zone 4 sensor input on its box and the Zone 1 Quality input on the downstream box. This supplies Start to the downstream box. Program the Zone 1 Quality input for the Start function.

2 Connect the Aux Out of each box to the Aux In of the upstream box. Program the Aux Out mode to be Upstream Accumulate and program the Aux In mode to be Accumulate.

3 Program the "If No Seriplex" setup parameter to RUN STANDALONE.

4 If you want this stand-alone conveyor to singulate, program the Aux In mode of the last zone (the Head) to be the Singulate command and hard-wire it active. (Which can be programming it active-high and leaving it open. The pull-up will keep it on.)

5 If you want the conveyor to feed a machine that has a "give me a box" output, program the Aux In mode of the last zone to be the Accumulate command. Wire this input to the "give me a box" signal from the machine. While this signal is inactive, the conveyor will deliver boxes. If this signal is pulsed to the inactive state momentarily, the conveyor will deliver one box. Note that the polarity of this input is programmable.

The only problem with this stand-alone scheme is that the Zone 1 roller of each box will run continuously when the upstream zone is jammed but Zone 1 is not jammed.

8

Examples

Example 1, PLC Monitored Seriplex System

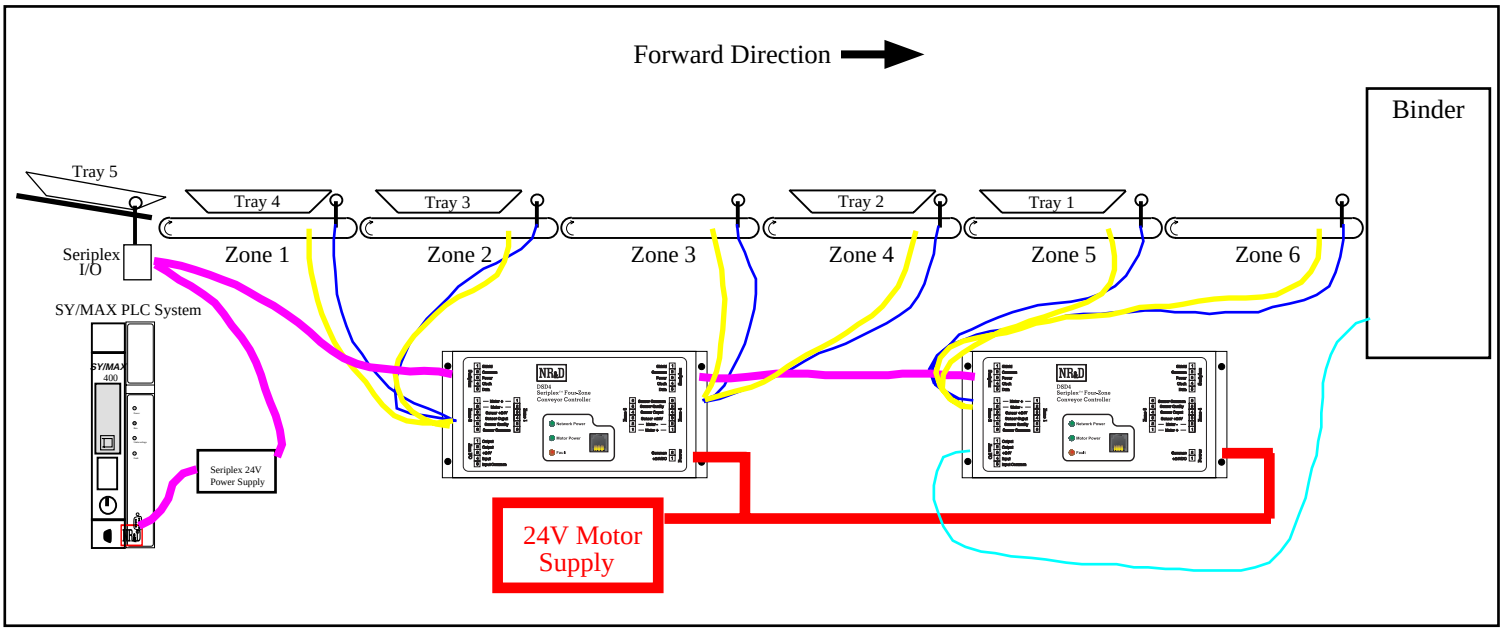

Figure 8-1 Example 1

Example 1 consists of a 6 zone conveyor driven by two DSD4 units. One DSD4 controls zones 1, 2, 3, and 4 while the other DSD4 controls zones 5 and 6. The DSD4s are on a Seriplex system which includes an NR&D SPXM master, a Square D I/O block, and a 24V power supply. The SPXM is located in a SY/MAX PLC rack with a Square D Model 400 PLC and provides the Seriplex clock. The Seriplex I/O block is connected to a sensor for detecting incoming gravity fed trays. Zone 6 feeds a Binder machine which will only accept one tray at a time. The Binder has a "give me a box" output that has been connected to the Aux Input of the second DSD4.

The powered rollers operate at 90 fpm with a maximum current rating of 750mA. It is desired to limit the torque in this application, so the zone currents have been set down to about 500mA. It doesn't matter what values are set for the Zone 3 and 4 current limits on DSD4#2 since these zones are not active.

The zone lengths are 30 inches and the longest trays are about 26 inches long where the sensors are blocked.

The minimum Arrival timer has been calculated to be 1.8 seconds (5)(30")/(90ft/min) (rounding up). We will add 30% to this for some variance in the speeds and set the value to 2.4 seconds.

The Sensor is located 4" from the end of the zone so the Clear Timer would be at 0.2 seconds (5)(4")/(90ft/min). On this conveyor, the sensor is close enough to the end of the zone to allow use of the 0.0s Clear Timer, so the Clear Timer is set to 0.0s.

The minimum Jam Timer should be 1.6 seconds (5)(26")/(90ft/min). Adding 20% gives us about 2.0 seconds.

It is desired to have the system try to unjam automatically by reversing the roller. We will set the Unjam timer to the same value as the Jam timer: 2.0 seconds.

It is desired, in the event of Seriplex network failure, to have all motors shut off until network communications is re-established. We will set the "If No Seriplex" parameter to STOP.

This system is using a Seriplex I/O module for sensing the incoming gravity feed trays. We could have used the Aux Input of DSD4#1 for this signal (and set the Aux In Mode to ZONE 1 START) but the PLC needs the other I/O on the block for other purposes. The DSD4#1 is directly monitoring the Seriplex bit of this block for its Start bit. Since it is on the same Mux channel 0, we must set the blocks Seriplex address lower than the Zone 1 bit address of DSD4#1. The blocks Seriplex address are set to 16 and 17. This forces us to change the starting bit number of both DSD4s from the recommended Seriplex addressing on page 33. We could have started on address 18, but instead we chose to use 48 to be on the next boundary.

The DSD4s were configured as in Table 8-1. The SPXM configuration is shown in Figure 8-2 and assumes that it is rack addressed as registers 1 through 11.

```
                  Seriplex SPXM Rack Address Map
                  ==============================
Niobrara R&D Corp

Seriplex operation in host controlled mode 2.
Seriplex bus size 80 bits
including 80 non-multiplexed bits and 0 multiplexed words.
Seriplex clock speed  16 kilohertz.
Halt PLC on Seriplex fault.

Set configuration to 0004 hex, 4 decimal, or 4 unsigned for RESET.
Set configuration to 8004 hex, -32764 decimal, or 32772 unsigned for RUN.

Register  Direction   Seriplex Bits    Seriplex Channel
--------  ---------   ---------------  ----------------
      1   PLC Output  SPXM Configuration, set to -32764.
      2   PLC Input     0 through  15
      3   PLC Input    16 through  31
      4   PLC Input    32 through  47
      5   PLC Input    48 through  63
      6   PLC Input    64 through  79
      7   PLC Output    0 through  15
      8   PLC Output   16 through  31
      9   PLC Output   32 through  47
     10   PLC Output   48 through  63
     11   PLC Output   64 through  79
```

Figure 8-2 SPXM Configuration

Table 8-1 Example 1 Configuration

Parameter	DSD4 #1	DSD4 #2
Zone 1 Bit Addrs	48	80
Number of Zones	4	2
Arrival Timer	2.4 seconds	2.4 seconds
Clear Timer	0.0 seconds	0.0 seconds
Jam Timer	2.0 seconds	2.0 seconds
Unjam Timer	2.0 seconds	2.0 seconds
Zone 1 Current	499 milliamps	499 milliamps
Zone 1 Braking	Dynamic	Dynamic
Zone 2 Current	499 milliamps	499 milliamps
Zone 2 Braking	Dynamic	Dynamic
Zone 3 Current	499 milliamps	499 milliamps
Zone 3 Braking	Dynamic	Dynamic
Zone 4 Current	499 milliamps	499 milliamps
Zone 4 Braking	Dynamic	Dynamic
Aux Input Mode	Seriplex Only	Last Accumulate
Aux Output Mode	Seriplex Only	Seriplex Only
Start Mux Chanl	0	0
Start Bit Addrs	16	79
Accumulate Mux	0	0
Accumulate Bit	85	117
Aux In Polarity	Active Low	Active Low
Quality 1 Mode	Sensor Quality	Sensor Quality
If No Seriplex	STOP	STOP
Input Pull-Ups	Enabled	Enabled
Tray Clear Start	Enabled	Enabled
Zone 1 Sensor	Active Low	Active Low
Zone 1 Quality	Active Low	Active Low
Zone 2 Sensor	Active Low	Active Low
Zone 2 Quality	Active Low	Active Low
Zone 3 Sensor	Active Low	Active Low
Zone 3 Quality	Active Low	Active Low
Zone 4 Sensor	Active Low	Active Low
Zone 4 Quality	Active Low	Active Low

Table 8-2 SPXM SY/MAX Register Bit Assignments

SY/MAX Register	Bit 16	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
1																
2																
3															17	16
4	z2b7	z2b6	z2b5	z2b4	z2b3	z2b2	z2b1	z2b0	z1b7	z1b6	z1b5	z1b4	z1b3	z1b2	z1b1	z1b0
5	z4b7	z4b6	z4b5	z4b4	z4b3	z4b2	z4b1	z4b0	z3b7	z3b6	z3b5	z3b4	z3b3	z3b2	z3b1	z3b0
6	z6b7	z6b6	z6b5	z6b4	z6b3	z6b2	z6b1	z6b0	z5b7	z5b6	z5b5	z5b4	z5b3	z5b2	z5b1	z5b0
7																
8															17	16
9	z2b7	z2b6	z2b5	z2b4	z2b3	z2b2	z2b1	z2b0	z1b7	z1b6	z1b5	z1b4	z1b3	z1b2	z1b1	z1b0
10	z4b7	z4b6	z4b5	z4b4	z4b3	z4b2	z4b1	z4b0	z3b7	z3b6	z3b5	z3b4	z3b3	z3b2	z3b1	z3b0
11	z6b7	z6b6	z6b5	z6b4	z6b3	z6b2	z6b1	z6b0	z5b7	z5b6	z5b5	z5b4	z5b3	z5b2	z5b1	z5b0

Table 8-2 displays the active Seriplex bits in the SPXM SY/MAX register mapping. The Seriplex block I/O inputs appear in SY/MAX S3-1 and S3-2 respectively while the outputs are in S8-1 and S8-2. The DSD4 zone input bits show up in registers S4, S5, and S6 and the outputs are in S9, S10, and S11.

Example 2, Standalone (Non-Seriplex) System

This example demonstrates a system of DSD4 conveyor controllers configured to run without a Seriplex master or clock module. Three DSD4s control ten zones of conveyors, and are configured such that packages will be transported up to the last zone and held there until removed by a person. This arrangement will provide "zero pressure" accumulation, such that when a package is stopped at the last zone, the next package will stop at the end of the next upstream zone, and so forth (see Figure 8-3, below). When the package at the end of the conveyor is removed, all waiting trays will index forward to the next downstream zone.

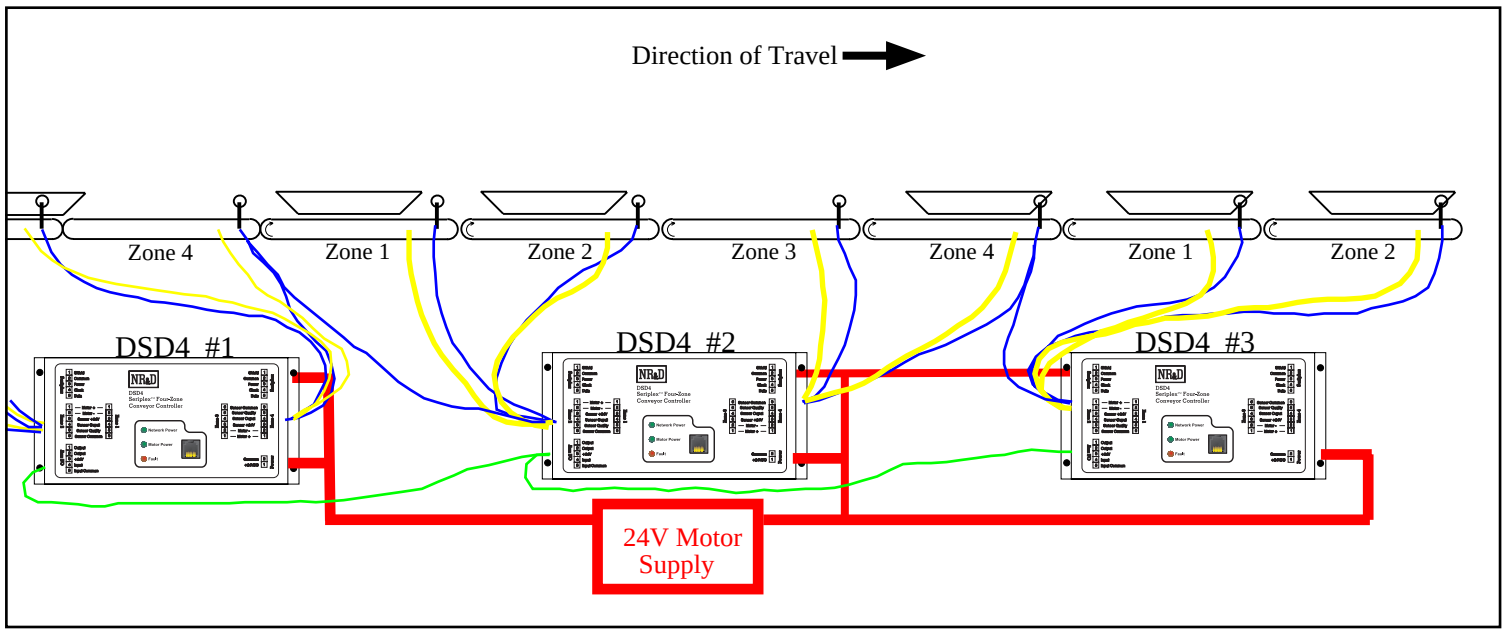

Figure 8-3 Example 2

Figure 8-3 shows the layout of the system described in this example. Note that the power supply is connected to both the Motor Power and the Network (Seriplex) connection. Even though the Seriplex network is not being used, it is necessary to power the network processor, and it may be powered from the same power supply as the motors in non-network applications.

The powered rollers operate at 170 fpm with a maximum current rating of 1.1A. It is desired that the motors run at the fastest possible rate, so the zone currents have been set at 1099mA. It doesn't matter what values are set for the Zone 3 and 4 current limits on DSD4#3 since these zones are not active.

The zone lengths are 60 inches and the longest trays are 22 inches long at the height where the sensors are blocked.

The minimum Arrival timer has been calculated to be 1.8 seconds (5)(60")/(170ft/min) (rounding up). We will add 30% to this to allow for some variance in the speeds and set the value to 2.4 seconds.

The Sensors are all located 16" from the end of the zone so the Clear Timer would be at 0.4 seconds (5)(16")/(170ft/min), rounded to the nearest 0.2s. On this conveyor, the sensor is not close enough to the end of the zone to allow use of a 0.0s Clear Timer, so the Clear Timer is set to 0.4s.

The minimum Jam Timer should be 0.8 seconds (5)(22")/(170ft/min), rounded up. Adding 20% gives us about 1.0 seconds.

It is desired to have the system try to unjam automatically by reversing the roller. To give the DSD4 every chance to clear any jams without intervention, we will set the Unjam timer considerably longer than the Jam timer: 3.0 seconds.

DSD4 #2 and DSD4 #3 (see Figure 8-3) have their Quality inputs connected to the Zone 4 sensor of the next upstream DSD4.

The first zone of the conveyor (DSD4 #1, Zone 1, not shown in the Figure) will be fed by a person, so an additional sensor is arranged such that it can "see" then entire zone. This sensor is connected to the Zone 1 Quality of DSD4 #1. This will start the zone when a tray is dropped anywhere in Zone 1.

Quality 1 Mode of all three DSD4s will be set to "Zone 1 Start", so they will be triggered to start by the upstream sensor (in the case of DSD4 #2 and #3), or by a tray being dropped into the zone (DSD4 #1).

The Auxillary I/O on the DSD4 modules in this standalone example are used to pass the accumulate signal upstream. The Aux Output Mode is set to "Upstream Accumulate", and the Aux Input Mode is set to "Last Accumulate" on all three DSD4 modules. Figure 8-4 shows the Aux I/O connection for the DSD4s in this Example. In this example, DSD4 #1 will have no Upstream connection, and DSD4 #3 will have no downstream connection, because they are at the extreme ends of the conveyor.

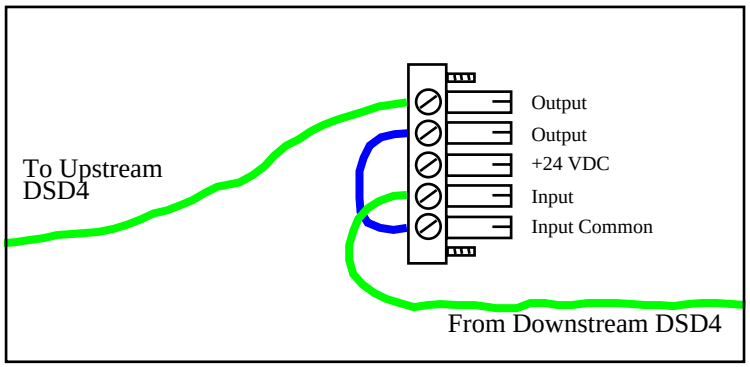

Figure 8-4 Aux I/O Connection for Non-Seriplex DSD4 Connection

In order to hold the last zone in Accumulate mode, we will set Aux In Polarity on DSD4 #3 to "Active High." Since the Aux In of DSD4 #3 is not connected to anything, and it is pulled up internally, it will always be high, thus the last zone will always accumulate.

Table 8-3 shows the parameter configuration for all three DSD4s. Although the Seriplex bit addresses are meaningless in this application, the definitions must still follow the rule (Start Bit < Zone 1 < Accumulate Bit).

Table 8-3 Example 2 Configuration

Parameter	DSD4 #1	DSD4 #2	DSD4 #3
Zone 1 Mux Chanl	0	0	0
Zone 1 Bit Addrs	16	16	16
Number of Zones	4	4	2
Arrival Timer	1.8 seconds	1.8 seconds	1.8 Seconds
Clear Timer	0.4 seconds	0.4 seconds	0.4 Seconds
Jam Timer	1.0 seconds	1.0 seconds	1.0 Seconds
Unjam Timer	3.0 seconds	3.0 seconds	3.0 Seconds
Zone 1 Current	1099 mA	1099 mA	1099 mA
Zone 1 Braking	Dynamic	Dynamic	Dynamic
Zone 2 Current	1099 mA	1099 mA	1099 mA
Zone 2 Braking	Dynamic	Dynamic	Dynamic
Zone 3 Current	1099 mA	1099 mA	1099 mA
Zone 3 Braking	Dynamic	Dynamic	Dynamic
Zone 4 Current	1099 mA	1099 mA	1099 mA
Zone 4 Braking	Dynamic	Dynamic	Dynamic
Aux Input Mode	Last Accumulate	Last Accumulate	Last Accumulate
Aux Output Mode	Upstm Accumulate	Upstm Accumulate	Upstm Accumulate
Start Mux Chanl	0	15	15
Start Bit Addrs	240	240	240
Accumulate Mux	0	0	0
Accumulate Bit	53	53	53
Aux In Polarity	Active Low	Active Low	Active High
Quality 1 Mode	Zone 1 Start	Zone 1 Start	Zone 1 Start
If No Seriplex	Run Standalone	Run Standalone	Run Standalone
Input Pull-Ups	Enabled	Enabled	Enabled
Tray Clear Start	Enabled	Enabled	Enabled
Zone 1 Sensor	Active High	Active High	Active High
Zone 1 Quality	Active High	Active High	Active High
Zone 2 Sensor	Active High	Active High	Active High
Zone 2 Quality	Active Low	Active Low	Active Low
Zone 3 Sensor	Active High	Active High	Active High
Zone 3 Quality	Active Low	Active Low	Active Low
Zone 4 Sensor	Active High	Active High	Active High
Zone 4 Quality	Active Low	Active Low	Active Low

9

Trouble Shooting

Network Power Light OFF

When the voltage on the Seriplex network falls below the minimum working range, the green Network Power light is turned off. Undervoltages may occur due to a cable break between the DSD4 and the Seriplex power module, a loss of power to the power module, a cable short somewhere on the network, or a faulty power module. A DC voltage meter is a handy tool for tracing power problems.

After the undervoltage problem is solved, the DSD4 will automatically rejoin the Seriplex bus.

When the Network Power light is off, sensors will not function and the DSD4 will stop all motors.

Motor Power Light OFF

When the voltage on the Motor Power bus falls below the minimum working range, the green Motor Power light will be turned off.

Fault Light ON

The red Fault light comes on when the DSD4 has an illegal configuration, if the main CPU is not started, or if the motor power supply is overloaded, possibly by a blown motor driver. The most common fault condition is to have the Seriplex Start bit set to a number greater than or equal to the Seriplex address of Zone 1 if on the same Mux channel.

If loading a valid configuration doesn't clear the Fault light verify that both 24V power supplies are in tolerance and that none of the motor outputs are shorted, if the fault light still glows, replace the unit.

Other Troubleshooting

Additional Troubleshooting ideas are listed in Table 9-1.

Table 9-1 Additional Troubleshooting

Symptom	Probable Cause	Remedy
Motors suddenly reverse while transporting packages.	Jam Timer too short.	Lengthen Jam Timer.
Packages stop between sensors.	Arrival Timer too short.	Lengthen Arrival Timer.
Conveyor stops before packages are completely off end of section.	Clear Timer too short.	Lengthen Clear Timer.
Accumulated packages hang over onto next downstream zone.	Clear Timer too long.	Shorten Clear Timer.
Zone 1 motor does not start when package arrives.	Wrong Seriplex start address	Start Mux Channel and Start Bit Address must point to upstream sensor or the downstream start command bit of the last zone of the upstream DSD4.
Zone 1 motor starts and stops erratically		
Motors runs immediately after DSD4 power-up, stops, then works improperly.	Sensor logic inverted	Change zone's sensor configuration to match sensor logic.
Motors runs immediately after DSD4 power-up, reverses, stops, then works improperly.		
Fault light stays on.	Invalid Seriplex bit assignment.	Ensure that Seriplex addresses are in logical order: Start Bit Address < Zone 1 Bit Address < Accumulate Bit Address
	Invalid or corrupted configuration	Replace the handheld parameter unit's batteries if low battery indicator is on, then: Write a known good (default) configuration to DSD4.
	Motor driver circuit damaged.	Replace DSD4 unit.
Fault light blinks.	One or more zones in Jam condition	Remove trays from conveyor.
		Check sensor connection, sensor polarity parameter.
Network Power light not lit.	Seriplex power is undervoltage or not present.	Supply proper 24VDC power on Seriplex network.
Motor Power light not lit.	Motor power is undervoltage or not present.	Supply proper 24VDC power to Power connector.

Symptom	Probable Cause	Remedy
Motors twitch or jerk randomly	Seriplex clock too fast.	Reduce Seriplex clock speed to 32 kHz or slower.
	Seriplex clock module common (ground reference) is not tied to DSD4 network common.	Ensure that the Seriplex clock and the DSD4 units Commons are electrically connected.
	Multiple DSD4s addressed to the same Seriplex address	Ensure that consecutive DSD4s are separated by at least 32 bit addresses.

Appendix A: NR&D Internet

Niobrara is on the World Wide Web! Visit our home page at **http://www.niobrara.com** to see product information, cutsheets, application notes, and ftp current software releases.

Technical support questions may be E-mailed to

techsupport@niobrara.com

Marketing questions may be E-mailed to:

marketing@niobrara.com

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