

NSM-3 and SSM-3E

RMS Signal Monitor Operations Manual

THIS MANUAL CONTAINS TECHNICAL INFORMATION FOR THE NSM-3 and SSM-3E
SERIES SIGNAL MONITOR UNIT.

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THE NSM-3 AND SSM-3E SERIES MONITORS ARE DESIGNED AND MANUFACTURED
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MAINTENANCE NOTE

**THIS EBERLE DESIGN INC. AUXILIARY MONITOR UNIT HAS BEEN
CAREFULLY INSPECTED AND TESTED TO ENSURE PROPER
OPERATION. IT IS RECOMMENDED THAT THE AUXILIARY
MONITOR UNIT BE TESTED AT LEAST ANNUALLY TO ENSURE
PROPER OPERATION AND COMPLIANCE WITH FACTORY
SPECIFICATIONS.**

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Section 1 Standard Functions

1.1 INTRODUCTION

The NSM-3 and SSM-3E Signal Monitors are devices used in a traffic controller assembly to monitor traffic signals at an intersection for conflicting proceed indications or the absence of voltage on all of the field signal outputs of a channel caused by malfunctions of the controller, load switches, or miswiring of the cabinet. The NSM-3 and SSM-3E Signal Monitors also provide error sensing of two +24VDC supplies and the controller power supplies via +24V-1, +24V-2, and Controller Voltage Monitor (CVM) inputs respectively. Both units are directly interchangeable with a standard NEMA Signal Monitor and meets with or exceeds all specifications outlined in Chapter 6 (Conflict Monitors) of the *Traffic Control Systems Specifications (NEMA TS 1-1994)*.

The NSM-3 and SSM-3E Signal Monitors are 3 channel monitors. Each channel has the capability of monitoring a Green, a Yellow, a Red, and a Walk field signal output at the field terminals. The NSM-3 and SSM-3E Signal Monitor detects the presence of conflicting Green or Yellow or Walk signals on the AC field terminations between any two or more channels. The Red Enable input, when active, enables the Red Monitoring capabilities of the monitor causing the unit to trigger when it detects the absence of voltage on all four of the field signal inputs of a channel. The monitoring circuitry can detect either full wave or positive and negative half-wave field signal outputs at the specified voltage levels.

When triggered by the detection of a fault condition which exists longer than the minimum period defined by the NEMA Traffic Control Systems Specifications (TS-1, part 6), the NSM-3 and SSM-3E Signal Monitor will enter the fault mode causing the Output relay to de-energize and two sets of contacts on the Output relay to transfer. The cabinet assembly should be wired such that the closure of the signal monitor Output relay contacts will cause an automatic switching of the field signal outputs from normal operation to flashing operation. The NSM-3 and SSM-3E Signal Monitor will then display the appropriate fault status along with the proceed indications active at the time of the fault. The NSM-3 and SSM-3E Signal Monitor will remain in this fault mode until a reset command is issued via the front panel RESET button or External Test Reset Input. The loss of AC+ power will not reset the fault mode of the Output relay contacts. In the event of AC+ power loss the NSM-3 and SSM-3E Signal Monitor will retain the status of all fault and channel indicators and will display the correct fault and channel status upon restoration of AC+ power.

1.2 CONFLICT MONITORING

The NSM-3 and SSM 3E Signal Monitor is capable of monitoring 3 channels. Each channel monitors a Red, Yellow, Green, and Walk field signal output at the field terminals. The NSM-3 and SSM 3E Signal Monitor detects the presence of conflicting Green or Yellow or Walk signals on the AC field terminations between any two or more channels. The monitoring circuitry is capable of detecting either full wave or positive and negative half-wave field signal outputs at the specified voltage levels. Upon detecting a Conflict fault, the NSM-3 and SSM 3E Signal Monitor will enter the fault mode, de-energize the Output relay contacts to the Fault position, and illuminate the CONFLICT indicator.

1.3 RED FAILURE MONITORING

When voltages on all inputs (R, Y, G, and W) to a channel are sensed as inactive for more than 1000 msec, the NSM-3 and SSM-3E Signal Monitor will enter the fault mode, de-energize the Output relay contacts to the Fault position, and illuminate the RED FAIL indicator. The unit will remain in the fault mode until the unit is reset by the Reset button or the External Reset input. When voltages on all inputs to a channel are sensed as inactive

for less than 700 msec, the unit will not transfer the Output relay contacts to the Fault position.

Red Failure Monitoring is disabled when the Red Enable input is not active.

1.3.1 WALK DISABLE (RED MONITORING)

This option will modify the operation of Red Monitoring on the SSM-3E Signal Monitor. When enabled, the Red Monitoring function will not monitor the Walk field outputs. Absence of signals on the Green, Yellow, and Red field outputs of a channel will place the SSM 3E Signal Monitor into the fault mode causing the Output relay contacts to transfer. This function is enabled by the front panel option switch labeled "WALK DISABLE".

1.4 VOLTAGE MONITORING

Inputs are provided for monitoring two +24VDC supplies and the Controller Voltage Monitor (CVM) output from the controller. Should loss of proper signal occur at any of these inputs, the NSM-3 and SSM-3E Signal Monitor will de-energize the Output Relay causing the two sets of contacts to transfer and will illuminate the appropriate front panel indicator(s). The Monitor will automatically reset when the correct input signals are restored to these inputs if the unit had not already been triggered by a previous fault condition. A 24V Monitor Inhibit input is provided to facilitate the use of these monitors with pre-timed mechanical controller installations.

1.4.1 VOLTAGE MONITOR FAULT LATCH

When the 24V Latch option is enabled by the front panel switch labeled "24V LATCH", the absence of the proper voltage level at either of the two 24VDC inputs (24V-I & 24V-II) will place the NSM-3 and SSM-3E Signal Monitor into the fault mode causing the Output relay contacts to transfer. The "24V-2" and / or the 24V-1 indicator(s) will be displayed on the Fault Status Display along with the field output signals active at the time of the voltage fault. Restoration of the voltage levels will not reset the fault state of the Monitor. Only a Manual Reset or External Test Reset command will reset the Monitor.

1.4.2 CVM FAULT LATCH

When the CVM Latch option is enabled by the front panel switch labeled "CVM LATCH", the absence of the True state at the CVM Input will place the NSM-3 and SSM-3E Signal Monitor into the fault mode causing the Output relay contacts to transfer. The "CVM" indicator will be displayed on the Fault Status Display along with the field output signals active at the time of the voltage fault. Restoration of the True state will not reset the fault state of the Monitor. Only a Manual Reset or External Test Reset command will reset the Monitor.

1.5 AC+ BROWN-OUT / INTERRUPTION DETECTION

When the AC+ line voltage is below the drop-out level for 475 msec (± 25 msec) the NSM-3 and SSM-3E Signal Monitor will suspend all fault monitoring functions, de-energize the Output relay, and de-energize the Start relay. The AC indicator on the front panel will flash at a rate of 2Hz to indicate the brown-out status.

When the AC+ line voltage returns above the restore level for 100 msec (± 16 msec) the monitor will resume normal operation and the AC power indicator on the front panel will remain illuminated. After a 2.5 second (± 1 second) delay the Start relay will be energized. After a programmable delay determined by the minimum flash function switches on the front panel the Output relay will be energized.

The AC+ and AC- inputs are used to generate the internal voltage supplies required to operate the monitor. AC- also serves as return for all AC signals including Red Enable. Chassis Ground provides an independent connection to the chassis of the unit and is isolated from AC- and Logic Ground. A Logic Ground input is provided for functions which

are isolated from AC- (i.e. +24V monitors, CVM, Ext Reset, and 24V Inhibit). Logic Ground may, however, be tied to AC- if desired.

Section 2 Extended Features

The following extended features are provided on the NSM-3 and SSM 3E Signal Monitor for additional monitoring functions, and to increase the reliability of the monitor's operation.

2.1 HARDWARE FEATURES

The NSM-3 and SSM 3E Signal Monitor is a microprocessor based unit. All monitoring functions and features are firmware programmable which permits upgrades or modifications by simply replacing the EPROM device containing the firmware with the upgraded version. Thus, most changes to the NSM-3 and SSM 3E Signal Monitor specifications may be accommodated without modifying the hardware.

Since all critical timing functions are accomplished by the microprocessor, the quartz crystal based accuracy results in very precise and repeatable measurements. This accuracy is maintained on functions from timing fault conditions to implementing a unique firmware based digital sampling and filtering algorithm. This algorithm is applied to all AC field signals to help eliminate false detection in a "noisy" AC line environment.

Input voltages are measured using a true Root Mean Squared (RMS) technique. A microprocessor based RMS-Engine™ controls the analog to digital (A/D) hardware which samples each AC input voltage a minimum of 32 times per cycle. The RMS-Engine™ then calculates the true RMS voltage value producing accurate results which are virtually insensitive to changes in frequency, phase, wave shape, and distortion. Voltage references are temperature compensated for constant voltage levels within the operating temperature range.

A nonvolatile EEPROM device is utilized to retain fault status information in the event of an AC Line power interruption. The correct fault indications will be displayed upon restoration of AC Line power. This EEPROM device requires no battery back-up. No monitor configuration programming is stored under battery power.

2.2 DUAL INDICATION MONITORING

This monitoring function detects simultaneous indications of active Green, Yellow, Walk, and Red field signal outputs on the same channel on the SSM-3E Signal Monitor. A Dual Indication fault places the SSM 3E Signal Monitor into the fault mode causing the Output relay contacts to transfer. Dual Indication Monitoring is enabled concurrently with Sequence Monitoring on a per channel basis via the front panel SSM switches.

The formula used to determine a Dual Indication fault is [(G or W) and Y] or [(G or W or Y) and R]. This is equivalent to only Green and Walk allowed On simultaneously for each channel.

Dual Indication Monitoring is disabled when the Red Enable input is not active.

An open or no load condition (i.e., burned-out bulb) may be detected as an active signal depending on the output impedance characteristics of the load switch, and may cause a Dual Indication fault. Dual Indication Monitoring may also anticipate a possible Conflict in the event that a proceed signal on a channel is constantly detected as active.

2.2.1 GY-DUAL INDICATION MONITORING

This monitoring function detects a simultaneous indication of active Green and Yellow field signal outputs on the same channel on the SSM-3E Signal Monitor. It can be used to monitor channels which have an unused Red field signal output tied to AC+ (i.e. five section signal head) and is enabled by placing the front panel option switch labeled "GY ENABLE" in the ON position. A GY-Dual Indication fault places the SSM 3E Signal Monitor into the fault mode causing the Output relay contacts to transfer. GY-Dual Indication Monitoring

may be enabled concurrently with Dual Indication Monitoring. When GY-Dual Indication Monitoring is enabled, ALL channels which have NOT been selected for Dual Indication Monitoring via the front panel SSM switches will be individually monitored for simultaneous indications of active Green and Yellow field signal outputs. Any channels which have been selected for Dual Indication Monitoring by the SSM switches will function as described above in Section 2.2.

GY-Dual Indication Monitoring is disabled when the Red Enable input is not active.

2.3 SEQUENCE (SHORT OR ABSENT YELLOW) MONITORING

This function detects the absence of a minimum 2.7 second period of an active Yellow field signal output during a Green to Yellow to Red signal sequence on the SSM-3E Signal Monitor. Sequence Monitoring is enabled concurrently with Dual Indication Monitoring on a per channel basis via the front panel SSM switches.

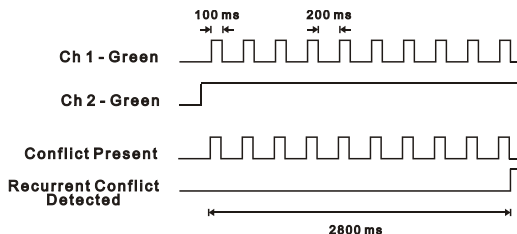
Sequence Monitoring is disabled when the Red Enable input is not active.

A Sequence (short or absent Yellow) fault condition will place the SSM 3E Signal Monitor into the fault mode causing the Output relay contacts to transfer. This occurs when a Red input signal to a channel is active following the termination of an active Yellow input signal which is less than 2.7 seconds in duration.

2.4 RECURRENT PULSE DETECTION (RP DETECT)

This error detection function supplements the normal Conflict, Dual Indication, and Red Fail monitoring algorithms for sensing faults which are intermittent or pulsing in nature. The RMS-Engine is designed to filter out short term transients commonly found on the electrical service and provide noise immunity against false signal detections. The Recurrent Pulse detection function is designed to respond to fault conditions which are intermittent in nature and do not meet the continuous timing requirements of the normal detection algorithms, yet may still produce improper signal displays. These input conditions are differentiated by their longer time constant and fault response times.

The diagram below shows an example of a recurrent Conflict fault. Channel 1 Green is detected active due to a malfunction of the load switch which caused the output to “flicker” On for 100 ms approximately every 200 ms. Since normal Conflict detection requires a continuous fault of at least 350 ms typical, this event could go undetected. The Recurrent Pulse detection algorithm will combine these pulses into one event and trigger a Conflict fault once the longer recurrent timing threshold is exceeded.



When triggered by a recurrent fault condition, the NSM-3 and SSM-3E Signal Monitor will enter the fault mode causing the Output relay contacts to transfer and illuminate the appropriate CONFLICT, DUAL INDICATION, or RED FAIL indicator along with the RP DETECT indicator. The unit will remain in the fault mode until reset by the Reset button or the External Reset input. Fault response times will vary depending on the pulse width and frequency of the recurrent inputs, but will range from 1000 ms minimum to 10.4 seconds

maximum. Recurrent Pulse detection can be disabled with the RP DISABLE option switch, see Section 3.3.

2.5 NON-VOLATILE FAULT MEMORY

The loss of AC+ power to the monitor will not reset a fault condition (Conflict, Dual Indication, Red Failure, Sequence or a Voltage Monitor Fault if the 24V Latch or CVM Latch options are enabled). The NSM-3 and SSM 3E Signal Monitor stores the fault and channel indicator status into a non-volatile EEPROM memory device. Should an AC+ power interruption occur while the monitor is in the fault mode, then upon restoration of AC+ power, the Output relay will remain in the fault mode and the correct fault and channel information will be displayed. This fault mode is maintained until the monitor receives a reset command from the RESET button or the External Test Reset input.

2.6 INTERNAL WATCHDOG

The NSM-3 and SSM 3E Signal Monitor generates an internal watchdog pulse from the microprocessor. If the internal hardware does not detect a watchdog pulse within 300 milliseconds, the NSM-3 and SSM 3E Signal Monitor will enter the fault mode causing the Output relay contacts to transfer. The "DIAGNOSTIC" indicator on the front panel will illuminate to indicate a monitor hardware and/or firmware failure.

This type of failure is configured as non-latching. If the microprocessor resumes operation the unit may return to normal operation. If latching operation is desired, jumper E1 may be inserted. With latching operation, only a loss of AC Line will restore operation.

2.7 RESET INPUT DETECTION

This function prevents the cabinet controller from being operated with the monitor disabled due to a faulty Reset button or External Reset input. The NSM-3 and SSM 3E Signal Monitor monitors the state of the front panel Reset button and the External Reset input. While a Reset command is detected from either input, the NSM-3 and SSM 3E Signal Monitor will remain in the reset mode with all indicators illuminated, the Output and Start relays energized, and monitoring functions disabled. If the Reset command lasts longer than 300 milliseconds the monitor will then automatically enter the normal mode and begin monitoring functions, ignoring the state of the reset inputs.

2.8 DISPLAY LED TEST

The monitor will illuminate all front panel LED indicators for 500ms when a Reset command is issued by the front panel RESET button or External Test Reset input. This function provides a way to check the operation of all front panel indicators.

2.9 MEMORY TEST

The NSM-3 and SSM 3E Signal Monitor verifies the proper operation of the memory (RAM, EEPROM, & EPROM) devices required to operate the monitor. This test is performed when AC+ power is applied or a Reset Command is issued to the monitor and periodically during operation. If a memory failure is detected, the NSM-3 and SSM 3E Signal Monitor will enter the fault mode causing the Output relay contacts to transfer. The "DIAGNOSTIC" indicator on the front panel will illuminate to indicate a monitor hardware and/or firmware failure. Due to the nature of these hardware/firmware failures, other fault indicators that may be concurrently displayed may not be valid for trouble shooting purposes.

2.10 NO FAULT DIAGNOSTIC DISPLAY

When the NSM-3 or SSM-3E SIGNAL MONITOR is not in the fault state, the unit can display the active Red, Yellow, Green, and Walk field status individually. To enter this

display mode depress and hold the Reset button. Each time the Reset button is activated and held, the next set of colors will be displayed on the channel status indicators. The display will continue to show the selected color as long as the Reset button is activated. This mode only affects the monitor display and normal fault processing will continue to occur. The sequence is as follows:

<u>Reset</u>	<u>Fault Status LEDs</u>	<u>Channel Status LEDs</u>
#1	(R) CONFLICT LED flashes	Red field status 1-3
#2	(Y) RED FAIL LED flashes	Yellow field status 1-3
#3	(G) CVM LED flashes	Green field status 1-3
#4	(W) 24V-2 LED flashes	Walk field status 1-3
...	(repeats back to top)	

Section 3 Installation

3.1 MINIMUM FLASH DIP SWITCH PROGRAMMING

Programming of the minimum flash period is in a binary encoded format:

MINIMUM FLASH SWITCHES				DELAY PERIOD
8	4	2	1	
OFF	OFF	OFF	OFF	0.6 seconds (test purposes only)
OFF	OFF	OFF	ON	4 seconds
OFF	OFF	ON	OFF	4 seconds
OFF	OFF	ON	ON	4 seconds
OFF	ON	OFF	OFF	4 seconds
OFF	ON	OFF	ON	5 seconds
OFF	ON	ON	OFF	6 seconds
OFF	ON	ON	ON	7 seconds
ON	OFF	OFF	OFF	8 seconds
ON	OFF	OFF	ON	9 seconds
ON	OFF	ON	OFF	10 seconds
ON	OFF	ON	ON	11 seconds
ON	ON	OFF	OFF	12 seconds
ON	ON	OFF	ON	13 seconds
ON	ON	ON	OFF	14 seconds
ON	ON	ON	ON	15 seconds

It is recommended that the Minimum Flash Time be programmed on the NSM-3 and SSM 3E Signal Monitor to exceed the initialization time of all cabinet assembly components following an AC+ restoration.

The amount of flash time is typically equal to the amount programmed on the controller, so that if the controller fails to execute a minimum flash period, the signal monitor will serve as a backup to provide the minimum flash time. The 0.6 second minimum flash time setting is used for out-of-cabinet bench testing of the NSM-3 and SSM 3E Signal Monitor.

3.2 SSM DIP SWITCH PROGRAMMING

The SSM dip switches are labeled "1", "2", A3". Positioning a switch in the ENABLE position (to the right) enables a channel for Dual Indication AND Sequence Monitoring on the SSM-3E Signal Monitor. The corresponding channel dip switch must be placed in the DISABLE position (to the left) when an unused Red field output terminal is connected to AC+.

3.3 OPTION DIP SWITCH PROGRAMMING

The SSM 3E Signal Monitor provides five independently programmed options:

- 24V Latch Enable (see section 1.4.1)
- RP Disable (see section 2.4)
- CVM Latch Disable (see section 1.4.2)
- GY-Dual Indication Monitoring Enable (see section 2.2.1)
- Walk Disable (see section 1.3.1)

The NSM 3 Signal Monitor provides three independently programmed options:

- 24V Latch Enable (see section 1.4.1)
- CVM Latch Disable (see section 1.4.2)
- RP Disable (see section 2.4)

These features are activated by placing the respective switch of the Option dip switch in the ON position (to the right).

3.4 HARNESSING CONNECTORS

All field terminations are brought into the NSM-3 and SSM 3E Signal Monitor by means of Military Specification MIL-C-26482 connectors. The outside harnesses are not interchangeable between any of the 6, 12, or 18 channel monitors as defined by NEMA Traffic Control Systems Specification (TS-1, part 6), i.e., a 6 channel harness assembly will not mate with a 3 channel signal monitor.

Section 4 Front Panel Description

4.1 FAULT STATUS DISPLAY

AC Indicator

The AC LED indicator will flash at a rate of 2Hz when the AC+ line voltage goes below the drop-out level. It will illuminate steadily when the AC+ line voltage returns above the brown-out restore level. The indicator will extinguish when the AC+ line voltage is below approximately 70 Vrms.

(R) CONFLICT Indicator

The CONFLICT indicator will be illuminated when a conflicting proceed signal fault is detected. The Channel Status display will show the active proceed signals (Green or Yellow or Walk) for each channel at the time of the conflict. If the unit is in the Diagnostic Display mode the CONFLICT indicator will flash ON at 4Hz to indicate the Channel Status display is showing active Red channel status.

(Y) RED FAIL Indicator

The RED FAIL indicator will be illuminated when an absence of signal (dark signal head) is detected on a channel(s). The Channel Status display will show all channels on which the fault occurred. If the Red Enable input is not active the RED FAIL indicator will flash once every two seconds to indicate that Extended Monitoring functions are disabled. If the unit is in the Diagnostic Display mode the RED FAIL indicator will flash ON at 4Hz to indicate the Channel Status display is showing active Yellow channel status.

(G) CVM Indicator

The CVM indicator will be illuminated when a Controller Voltage Monitor Fault is detected. The Channel Status display will show all active proceed field input signals at the time of the CVM fault. If the CVM Latch option is enabled and the unit is triggered by a CVM fault condition, the CVM indicator will remain illuminated until the unit receives a reset command from the manual reset or external reset input. If the unit is in the Diagnostic Display mode the CVM indicator will flash ON at 4Hz to indicate the Channel Status display is showing active Green channel status.

(W) 24V-2, 24V-1 Voltage Monitor Indicators

These indicators will be illuminated if the corresponding voltage input is below the minimum specified level. If the Voltage Monitor Latch (24V LATCH) option is enabled and the unit is triggered by a improper voltage condition, the corresponding indicator(s) will remain illuminated until the unit receives a reset command from the manual reset or external reset input. The Channel Status display will show the active proceed signals (Green or Yellow or Walk) for each channel at the time of the voltage fault condition. If the 24V INHIBIT input is active the 24V-2 and 24V-1 indicators will flash once every two seconds to indicate that 24V Monitoring functions are disabled. If the unit is in the Diagnostic Display mode the 24V-2 indicator will flash ON at 4Hz to indicate the Channel Status display is showing active Walk channel status.

DIAGNOSTIC Indicator

The DIAGNOSTIC indicator will illuminate when one of the following internal monitor failures are detected: internal watchdog failure, memory test failure, hardware failure, or internal power supply failure. This indicator is used to inform the service technician of a monitor hardware and/or firmware failure.

Due to the nature of these hardware/firmware failures, other fault indicators that may be concurrently displayed may not be valid for trouble shooting purposes.

RP DETECT Indicator

The RP DETECT indicator will illuminate when the Recurrent Pulse detection function has triggered a Conflict, Dual Indication, or Red Fail fault. See Section 2.4.

DUAL INDICATION Indicator (SSM-3E Only)

The DUAL INDICATION indicator will be illuminated when a Dual Indication fault is detected on a channel(s). The Channel Status display will show all channels on which the fault occurred.

SEQUENCE FAIL Indicator (SSM-3E Only)

The SEQUENCE FAIL indicator will be illuminated when no Yellow or a short (less than 2.7 seconds) Yellow signal is detected on a channel(s) during a Red to Green to Yellow to Red sequence. The Channel Status display will show all channels on which the fault occurred.

4.2 CHANNEL STATUS DISPLAY

Channel Status Indicators

During normal operation the Channel Status indicators will display all active proceed signals (Green or Yellow or Walk).

In the fault mode the Channel Status indicators will display the proceed signals active at the time of a conflicting signal fault (Conflict) or voltage monitoring fault (CVM, 24V-I, or 24V-II). In the event of a Red Failure, Dual Indication fault, or Sequence fault only the channels on which the fault occurred will be displayed. The monitor retains this display until a Reset command is issued via the front panel Reset button or External Test Reset Input.

4.3 BUTTONS

RESET Button

Depressing the Reset button resets the NSM-3 and SSM 3E Signal Monitor after it has been triggered by a fault. The monitor remains in the reset mode only if the fault condition has been restored to normal. While the Reset button is depressed (300 milliseconds maximum) all front panel indicators will be illuminated and the Output and Start relays will remain energized.

In the event of a monitor hardware or firmware fault (DIAGNOSTIC indicator is illuminated) the Reset button may not reset the monitor.

Section 5 Specifications

5.1 ELECTRICAL

Power Requirements

Operating Line Voltage	75 to 135 VAC RMS
Operating Line Frequency	60 +_3Hz
Power Consumption.....	5W (nominal)

AC Voltage Monitors (Positive or Negative half wave input)

Green Signal Inputs	(no detect)	less than 15 Vrms
	(detect)	greater than 25 Vrms
Yellow signal Inputs	(no detect)	less than 15 Vrms
	(detect)	greater than 25 Vrms
Walk Signal Inputs	(no detect)	less than 15 Vrms
	(detect)	greater than 25 Vrms
Red Signal Inputs	(no detect)	less than 50 Vrms
	(detect)	greater than 70 Vrms
Red Enable Input	(no detect)	less than 50 Vrms
	(detect)	greater than 70 Vrms
AC Line Voltage Monitor		
	(drop-out).....	less than 92 +_2 Vrms
	(restore).....	greater than 96 +_2 Vrms

DC Voltage Monitor

+24 VDC Inputs	(inactive)	less than +18 Vdc
	(active)	greater than +22 Vdc

Logic Inputs

Controller Voltage Monitor, External Reset, +24V Monitor Inhibit		
	(active)	less than +8 Vdc
	(inactive)	greater than +16 Vdc

5.2 TIMING FUNCTIONS

Conflict	(no fault)	less than 200 milliseconds
	(fault)	greater than 450 milliseconds
	(typical).....	350 milliseconds
Red Fail	(no fault)	less than 700 milliseconds
	(fault)	greater than 1000 milliseconds
	(typical).....	850 milliseconds
Controller Voltage Monitor, +24V Monitors		
	(no fault)	less than 100 milliseconds
	(fault)	greater than 300 milliseconds
	(typical).....	150 milliseconds

Dual Indication	(no fault)	less than 200 milliseconds
	(fault)	greater than 450 milliseconds
	(typical)	400 milliseconds
Sequence Fail		
Short Yellow	(fault)	less than 2.6 seconds
	(no fault)	greater than 2.8 seconds
AC+ Interruption (disable).....	greater than 475 milliseconds +_25 milliseconds	
Minimum Flash after disable.....	4 to 15 seconds +_1 second	
Start Delay Relay timer.....	2.5 seconds +_1 second	

5.3 MECHANICAL

Height	7.0 inches
Width	3.0 inches
Depth	9.5 inches

5.4 ENVIRONMENTAL

Storage Temperature Range.....	55 to +90 oC
Operating Temperature Range	37 to +74 oC
Humidity Range.....	0 to 95% Relative

Section 6 Wiring Assignments

6.1 NSM-3 AND SSM-3E MONITOR UNIT CONNECTOR A

The NSM-3 and SSM-3E Connector mates with a "MS 3116 20-41S" plug.

<u>TAG#</u>	<u>PIN#</u>	<u>Function</u>
1	A	AC+ I
2	B	AC+ II
3	C	OUTPUT RELAY 1 COMMON
4	D	OUTPUT RELAY 1 OPEN
5	E	OUTPUT RELAY 2 COMMON
6	F	OUTPUT RELAY 2 CLOSED
7	G	START DELAY RELAY COMMON
8	H	START DELAY RELAY OPEN
9	J	CHANNEL 3 GREEN
10	K	CHANNEL 3 YELLOW
11	L	CHANNEL 2 GREEN
12	M	CHANNEL 2 YELLOW
13	N	CHANNEL 1 GREEN
14	P	CHANNEL 1 YELLOW
15	R	CHANNEL 1 WALK
16	S	+24V MONITOR II
17	T	CONTROLLER VOLTAGE MONITOR
18	U	+24V MONITOR
19	V	LOGIC GROUND
20	W	CHASSIS GROUND
21	X	AC-
22	Y	CABINET INTERLOCK A
23	Z	OUTPUT RELAY 1 CLOSED
24	a	OUTPUT RELAY 2 OPEN
25	b	START DELAY RELAY CLOSED
26	c	CHANNEL 3 WALK
27	d	CHANNEL 3 RED
28	e	CHANNEL 2 WALK
29	f	CHANNEL 2 RED
30	g	CHANNEL 1 RED
31	h	RESET
32	l	RED ENABLE
33	j	+24V MONITOR INHIBIT
34	k	SPARE 1
35	m	CABINET INTERLOCK B
36	n	SPARE 2
37	p	SPARE 3
38	q	SPARE 4
39	r	SPARE 5
40	s	SPARE 6
41	t	SPARE 7