SPAT MIB Support Document

Overview

This document describes the Signal Phase and Timing (SPaT) support in ASC/3 group. The ASC/3 supports NTCIP 1202 with 16 phases and 16 overlaps.

Scope of Operation

To limit the inherent complexities of the controller during the initial concept phase, we have agreed to support only NTCIP 1202 defined controller programming.

General NTCIP Operation	**Implemented**	**Basic Testing Complete**
Fixed Time Vehicle Only	Yes	Yes
Fixed Time with Ped	Yes	Yes
Actuated Free	Yes	Yes
Actuated Free with Ped	Yes	Yes
Coordinated	Yes	Yes
Floating Force-Off/Fixed	Yes	Yes
Transition Dwell/Smooth/Add	Yes	Yes
Pattern Recalls Min/Max/Ped	Yes	Yes
Overlaps	Partial	Partial
Included	Yes	Yes
Lag Green, Yellow, Red	No	No
Modifier (aka Not Included)	No	No

SNMP Objects For SPaT MIB

Please refer to the SPaT MIB documentation for more details.

Objects

```
1.3.6.1.4.1.1206.3.47.1       spatTimeToChangeTable          NODE   (0)
1.3.6.1.4.1.1206.3.47.1.1     spatTimeToChangeEntry           NODE   (1)
1.3.6.1.4.1.1206.3.47.1.1.1   spatTimeToChangePhaseNumber       LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.1.1.2   spatVehMinTimeToChange            LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.1.1.3   spatVehMaxTimeToChange            LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.1.1.4   spatPedMinTimeToChange            LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.1.1.5   spatPedMaxTimeToChange            LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.2       spatOvlpTimeToChangeTable       NODE   (0)
1.3.6.1.4.1.1206.3.47.2.1     spatOvlpTimeToChangeEntry        NODE   (1)
1.3.6.1.4.1.1206.3.47.2.1.1   spatTimeToChangeOvlpNumber        LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.2.1.2   spatOvlpMinTimeToChange           LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.2.1.3   spatOvlpMaxTimeToChange           LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.3       spatDiscontinuousChangeFlag       LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.4       spatFlashingOutputPhaseStatus     LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.5       spatFlashingOutputOverlapStatus  LEAF  INTEGER
1.3.6.1.4.1.1206.3.47.6       spatIntersectionStatus            LEAF  INTEGER
```

NTCIP-Based 100ms Broadcast Interface

Byte-Map Structure of the Broadcast Message, Version #2.

```
byte 0: DynObj13 response byte (0xcd)
byte 1: number of phase/overlap blocks below (16)
bytes 2-14:
    0x01 (phase#)                             (1 byte)
    VehMinTimeToChange.1                      (2 bytes)
    VehMaxTimeToChange.1                      (2 bytes)
    PedMinTimeToChange.1                      (2 bytes)
    PedMaxTimeToChange.1                      (2 bytes)
    OvlpMinTimeToChange.1                     (2 bytes)
    OvlpMaxTimeToChange.1                     (2 bytes)
    ...
   < repeat for each phase and overlap – bytes 15-196 >
    ...
bytes 197-209:
    0x10 (phase#)                             (1 byte)
    VehMinTimeToChange.16                     (2 bytes)
    VehMaxTimeToChange.16                     (2 bytes)
    PedMinTimeToChange.16                     (2 bytes)
    PedMaxTimeToChange .16                    (2 bytes)
    OvlpMinTimeToChange .16                   (2 bytes)
    OvlpMaxTimeToChange .16                   (2 bytes)
bytes 210-215:
    PhaseStatusReds                           (2 bytes bit-mapped for phases 1-16)
    PhaseStatusYellows                        (2 bytes bit-mapped for phases 1-16)
    PhaseStatusGreens                         (2 bytes bit-mapped for phases 1-16)
bytes 216-221:
    PhaseStatusDontWalks                      (2 bytes bit-mapped for phases 1-16)
    PhaseStatusPedClears                      (2 bytes bit-mapped for phases 1-16)
    PhaseStatusWalks                          (2 bytes bit-mapped for phases 1-16)
bytes 222-227:
    OverlapStatusReds                         (2 bytes bit-mapped for overlaps 1-16)
    OverlapStatusYellows                      (2 bytes bit-mapped for overlaps 1-16)
    OverlapStatusGreens                       (2 bytes bit-mapped for overlaps 1-16)
bytes 228-229:
    FlashingOutputPhaseStatus                 (2 bytes bit-mapped for phases 1-16)
bytes 230-231:
    FlashingOutputOverlapStatus               (2 bytes bit-mapped for overlaps 1-16)
byte 232:
   IntersectionStatus (1 byte)                (bit-coded byte)
Byte 233:
   TimebaseAscActionStatus (1 byte)           (current action plan)
byte 234:
   DiscontinuousChangeFlag (1 byte)           (upper 5 bits are msg version #2, 0b00010XXX)
byte 235:
   MessageSequenceCounter (1 byte)            (lower byte of up-time deciseconds)
Byte 236-238:
   SystemSeconds (3 byte)                     (sys-clock seconds in day 0-84600)
Byte 239-240:
   SystemMilliSeconds (2 byte)                (sys-clock milliseconds 0-999)
Byte 241-242:
   PedestrianDirectCallStatus (2 byte)        (bit-mapped phases 1-16)
Byte 243-244:
   PedestrianLatchedCallStatus (2 byte)       (bit-mapped phases 1-16)
```

Flashing Output Status Words

Two bit-mapped words (2 bytes) indicate which phases and overlaps are currently flashing. These, used in conjunction with the existing Green, Yellow and Red status bytes will provide enough information to determine a flashing color on a movement. For example, a flashing green phase or a FYA (Flashing Yellow Arrow) overlap.

These words will only be valid during normal or programmed flash operation. If the cabinet has switched to relay-flash, the controller will not be able to provide an accurate representation of these output states. If the controller can detect such a condition, the expected status information has not yet been defined.

Intersection Status Byte

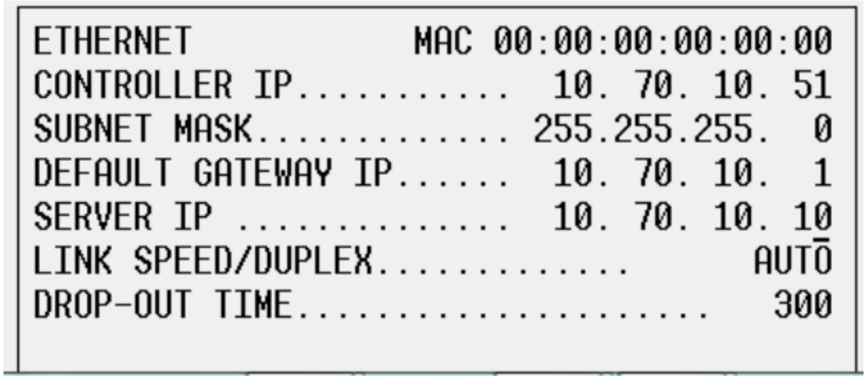
Bit #	Feature	Description of Bit (1 = SET)
0	Manual Control Enable Active	Set if Manual Control Enable operation has been activated.
1	Stop Time (all rings) Active	Set only if the controller has been commanded to stop timing on ALL RINGS.
2	Fault Flash Active	Set if, for any reason, the controller has dropped CVM due to a Failure condition. Failure conditions include MMU faults such as conflict or short yellow, Preempt faults such as Interlock or Gate Down failures, communications faults such as SDLC (TS-2 type 1) problems.
3	Preempt Active	Set if ANY of the preempt runs is active; it will not be set if there is a call for a preempt run but that run has not been activated for whatever reason.
4	TSP Active	Set if ANY of the TSP runs is active; it will not be set if there is a call for a TSP run but that run has not been activated for whatever reason.
5	Coordination Active (IN STEP)	Set if the controller is currently running an IN-STEP coordination pattern.
6	Coordination-in-Transition (DWELL, ADD, SUBTRACT)	Set whenever the controller is trying to get a coordination pattern IN-STEP. The controller may be using one of three methods- DWELL, ADD, SUBTRACT.
7	Programmed Flash Active	Set if the controller is in flash other than fault flashes. Example of programmed flash include scheduled, Preempt, remote, or auto flash.

Broadcast Configuration

IP Address

To set the controller to send the push packet to a particular IP address, use the following instructions:

1. Press Main Menu (MM) on the Front Panel
2. Press 1 (Configuration)
3. Press 5 (Communication)
4. Press 1 (Ethernet)
5. Move cursor down to the row for **SERVER IP** and specify your ***Destination IP*** as seen below

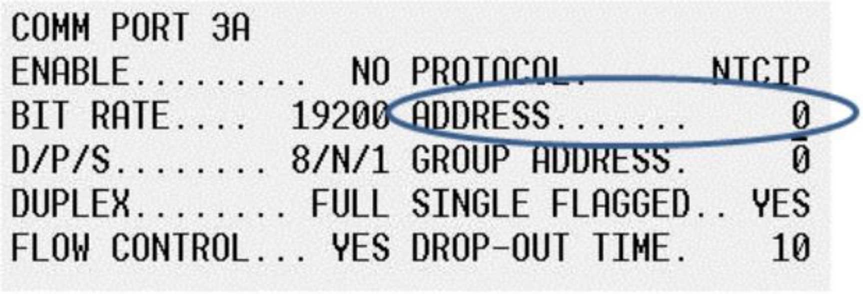


```
ETHERNET              MAC 00:00:00:00:00:00
CONTROLLER IP...........   10. 70. 10. 51
SUBNET MASK.............  255.255.255.  0
DEFAULT GATEWAY IP......   10. 70. 10.  1
SERVER IP ..............   10. 70. 10. 10
LINK SPEED/DUPLEX............        AUTO
DROP-OUT TIME.....................    300
```

6. Restart the application for the push packet thread to take the new settings

UDP Port

The Destination Port for the UDP packet may be selected in MM-1-5-3: Communications Port 3A Address as circled in the screen shot below. As long as the value is GREATER THAN 24, the controller will attempt to open a socket on that port number for the SPaT broadcast.



```
COMM PORT 3A
ENABLE.........   NO PROTOCOL.      NTCIP
BIT RATE....   19200 ADDRESS.......     0
D/P/S........ 8/N/1 GROUP ADDRESS.      0
DUPLEX........ FULL SINGLE FLAGGED..  YES
FLOW CONTROL...  YES DROP-OUT TIME.    10
```

Enabling SPaT Operation

In order to enable the SPaT objects in the ASC/3 and enable the push packet (100ms SPaT MIB broadcast), the user must send an NTCIP SET asc3ViiMessageEnable to a value of 2 or 6. This signifies the message format.

SNMP Set Value	Resulting Broadcast Message Description
2	Original SPAT proposal as of June 2012
6	Original SPAT plus additional Pedestrian Information

In the NEMA MIB Tree, the enable is listed as follows:

```
1.3.6.1.4.1.1206.3.5.2.9.44.1  asc3ViiMessageEnable           LEAF  INTEGER
```

The actual OID value sent in an SNMP message would be **1.3.6.1.4.1.1206.3.5.2.9.44.1.0** to address asc3ViiMessageEnable object.

NOTE: an extra .0 is added onto the end to signify that this LEAF is not part of a table and does not require an index.

The SET message should look something like this
30 2d 02 01 00 04 06 70 75 62 6c 69 63 a3 20 02 01 00 02 01 00 02 01 00 30 15 30 13 *06 0e 2b 06 01 04 01 89 36 03 05 02 09 2c 01 00 02 01 02*

Where *06 0e 2b 06 01 04 01 89 36 03 05 02 09 2c 01 00* specifies the OID

06 0e	OID type (06) , 14 bytes (0e)
2b 06 01 04 01 89 36 03 05 02 09 2c 01 00	1.3.6.1.4.1.1206.3.5.2.9.44.1.0

And where *02 01 02* is the SET Data
02 01 02 Integer type (02), 1 byte (01) and data value 2 (02)

Below is the actual MIB Definition of asc3ViiMessageEnable as implemented in the ASC/3:

```
asc3ViiMessageEnable  OBJECT-TYPE
    SYNTAX      INTEGER (0..255)
    ACCESS      read-write
    STATUS      mandatory
    DESCRIPTION
    "This object is a bit-map of enables related to
     Connected Vehicle applications and will be used
     to enable/disable the broadcast of the Signal
     Phase and Timing message transport.

     Currently only two are implemented:
     bit 0: Vehicle Infrastructure Integration (VII)
            UDP Subnet Broadcast on configurable port
     bit 1: Battelle research for NTCIP broadcast (SPAT)
    "
::= { asc3Vii 1 }
```