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# TecNote 1102 - Twice Per Cycle Left-Turns

One problem often experienced during long cycle lengths is the situation where a queue in a left-turn lane backs up into a through lane and reduces the capacity of the through movement. The City of Richardson, Texas has used "Twice Per cycle Left-Turn" (TPCLT) operation for over 15 years to reduce this left-turn "spill-over" problem. During TPCLT, a protected left-turn phase is serviced twice per cycle as a leading and lagging left-turn which minimizes the blockage problem for the lagging through movement.

TPCLT operation is even more effective when dual-left-turn lanes are used. Often a dual-left-turn lane is effectively reduced to a single lane if the split time exceeds the capacity of the the dual-left-turn lanes.

## TPCLT Operation

This operation differs from conditional-service which only allows a protected left-turn phase to be re-serviced if the opposing through movement gaps out. TPCLT is typically used during congested periods when all phases tend to max out. The desired TPCLT sequence is as follows:

120" cycle / Phase 5 as the Twice Per Cycle Left-Turn (TPCLT)

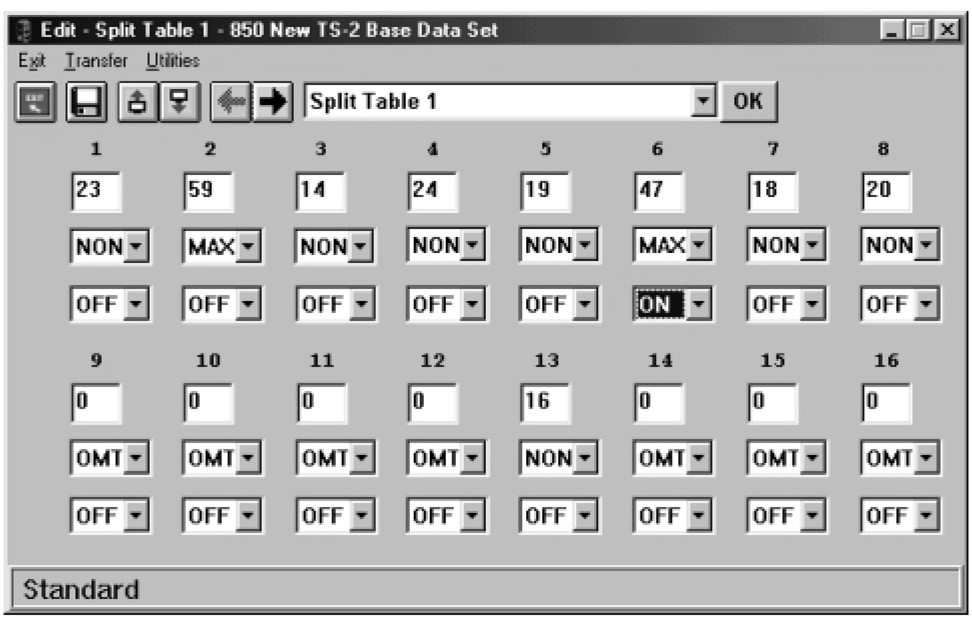
<table>
<tr><td>ø1 / 23"</td><td colspan="2">ø2 / 59"</td><td>ø3 / 14"</td><td>ø4 / 24"</td></tr>
<tr><td>ø5 / 19"</td><td>ø6 / 51"</td><td>ø5 / 16"</td><td>ø7 / 14"</td><td>ø8 / 20"</td></tr>
</table>

NTCIP only provides one split times per phase, so the left-turn movement must be driven off of an overlap made up of phase 5 and a separate phase. In Richardson, Texas the TPCLT sequence is:

120" cycle / Overlap 13 (Phases 5 + 13) Drive the Twice Per Cycle Left-Turn (TPCLT)

<table>
<tr><td>ø1 / 23"</td><td colspan="2">ø2 / 59"</td><td>ø3 / 14"</td><td>ø4 / 24"</td></tr>
<tr><td>ø5 / 19"<br>(OL 13)</td><td>ø6 / 51"</td><td>ø13 / 16"<br>(OL 13)</td><td>ø7 / 14"</td><td>ø8 / 20"</td></tr>
</table>

Notice that the left-turn is now serviced twice per cycle using overlap 13 whenever phases 5 and 13 are serviced. In this case, Overlap 13 is actually driving the load switch outputs for the protected left-turn arrow. So all that is actually required to set up this timing plan in StreetWise is to provide the following split times for the active phases as shown below. Notice how phases 9-12 and 14-16 are omitted for this split using the OMT mode option.



## Phase Sequence and Concurrent Phases Required for TPCLT

The operating mode of the controller must be initialized to standard 8 phase for TPCLT. To initialize the controller database, one of the following "Operating Modes" under menu MM->8->4->1 must be selected::

1. A user defined sequence indicated by the selection NONE
2. Standard 8 phase - dual ring operation indicated by the selection STD-8Ø
3. Diamond phasing indicated by the selection DIAMOND

After you select the Operating Mode on screen MM->8->4->1 and press ENTER, all of the existing database in the controller is replaced by a set of defaults corresponding to the "Operating Mode" that you selected. Always remember to turn the "Run Timer" on after you initialize a controller.

```
       Clear & Initial Controller
    Select Operating Mode: STD-8Ø
       then press ENTR to continue,
       press ESC to go back.....
```

After initializing a controller to STD-8Ø, you must change the "Phase Mode" unit parameter to USER. Go to screen MM->1->2->1 and enter the "Page Down" key to see the following screen:

```
             UNIT PARAMETERS
Allow <3 sec Yel OFF  ^ Tone Disable   ON
  Allow skip Yel OFF    H/W Stn ID  OFF
  Start Red Time 0.0    Phase Mode  USER
```

You must change "Phase Mode" to USER to before you can enter the phases needed for Twice Per Cycle Left-Turns (TPCLT). Always turn the Run Timer OFF (MM->1->7) before you change the operating mode of the controller and turn the Run Timer ON after the mode is changed. This is a safety feature that insures that none of the controller outputs are active while the core database in the controller is being reprogrammed.

If you toggle through the "Phase Mode" selections, you will see the the STD8Ø, QSeq, 8Seq, DIAM. The "Phase Mode" must be set to USER before you can program the phase sequence required for TPCLT.

After the Phase Mode is changed to USER, the phase sequence for TPCLT can be programmed. This sequence is defined as sequence 16 in the Sequence Table (MM->1->2->4) as follows:

| Seq# | Ring | Sequence.of.Phases | | | | | |
|---|---|---|---|---|---|---|---|
| 16 | 1 | 1 | 2 | 9 | 3 | 4 | 11 |
| 16 | 2 | 5 | 6 | 13 | 7 | 8 | 15 |

The concurrent phases for this sequence are defined in the table MM->1->1->4. Concurrent phases define the "barriers" for multi-ring controllers under NTCIP.

| P | Ring | StartUp | Concurrent Ps | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | RED | 5 | 6 | 13 | 0 | 0 | 0 | 0 | 0 |
| 2 | 1 | RED | 5 | 6 | 13 | 0 | 0 | 0 | 0 | 0 |
| 3 | 1 | RED | 7 | 8 | 15 | 0 | 0 | 0 | 0 | 0 |
| 4 | 1 | RED | 7 | 8 | 15 | 0 | 0 | 0 | 0 | 0 |
| 5 | 2 | RED | 1 | 2 | 9 | 0 | 0 | 0 | 0 | 0 |
| 6 | 2 | RED | 1 | 2 | 9 | 0 | 0 | 0 | 0 | 0 |
| 7 | 2 | RED | 3 | 4 | 11 | 0 | 0 | 0 | 0 | 0 |
| 8 | 2 | RED | 3 | 4 | 11 | 0 | 0 | 0 | 0 | 0 |
| 9 | 1 | RED | 5 | 6 | 13 | 0 | 0 | 0 | 0 | 0 |
| 10 | 1 | RED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 1 | RED | 7 | 8 | 15 | 0 | 0 | 0 | 0 | 0 |
| 12 | 0 | RED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 2 | RED | 1 | 2 | 9 | 0 | 0 | 0 | 0 | 0 |
| 14 | 0 | RED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 2 | RED | 3 | 4 | 11 | 0 | 0 | 0 | 0 | 0 |
| 16 | 0 | RED | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

TPCLT operation is quite easy to implement once you have defined the overlaps, detector calls and load switch assignments. The remainder of this TecNote deals with the base controller data required to implement TPCLT.

WARNING!!!: Twice Per Cycle Left-Turn (TPCLT) operation should be avoided when protected and permitted left-turn displays are used in the same signal head. This operation can result in a "Yellow Trap" situation that practitioners avoid because of safety concerns (see pages related to NCHRP 3-54 research for more information). If you must lag a left-turn after the through movement, insure that **both** opposing lag left-turns run together to avoid the "Yellow Trap" or that the leading left-turn is protected only. Many cities overcome the "Yellow Trap" using the Dallas PPLT display (see the NCHRP 3-54 site). The Naztec controller also provides the ability to omit the permissive indications for the leading left turn when the opposing turn lags (this also overcomes the problem with the "Yellow Trap").

## Redefining the Output Channels for TPCLT

NTCIP and TS-2 refer to a load switches as a "channel". The controller software allows you to drive a load switch with any vehicle, ped or phase output. In the Naztec TS-2 controller, this assignment is made from the Main Menu using the sequence MM->1->3->1.

```
     Chan..1....2.....3...4....5...6.....7....8 ->
  Ø/Olp#   9    2    11 . 4   13   6    15    8
  Type    OLP  VEH  OLP .VEH  OLP  VEH  OLP   VEH
 Flash    RED  RED  RED .RED  RED  RED  RED   RED
```

These channel (Chan) assignments are required to drive the protected left-turn displays using overlaps 9, 11, 13 and 15. These overlaps are defined by *standard* left-turn phases 1, 3, 5 and 7 and *auxiliary* left-turn phases 9, 11, 13 and 15.

The important thing to note here is that the outputs for the protected left-turn displays are reassigned in software without having to modify the field wiring in the controller cabinets. The same load switches are used to drive the protected left-turn displays, but are now driven by an overlap rather than a single phase.

## Enabling the Auxiliary Left-Turn Phases for TPCLT

The *auxiliary* left-turn phases 9, 11, 13 and 15 are enabled from the Main Menu using key sequence MM->1->1->2. Use your right arrow to cursor to the right-hand screen from this menu.

```
Options      Ø..9..10..11..12..13..14..15..16
      Enable Ø  X . . . X . . . X . . . X . .
   Min Recall   .   .   .   .   .   .   .   .
   Max Recall   .   .   .   .   .   .   .   .
```

Even though these *auxiliary* left-turn phases are enabled, they are not serviced unless the controller is running sequence 16 because these phases are not included in sequences 1-15. Since free operation runs, sequence 1, you do will not service any of these *auxiliary* left-turn phases unless you specifically call for sequence #16 in a timing pattern.

## Overlap Definitions for TPCLT

Overlaps for TPCLT are defined using the controller sequence MM->1->5->2. The following example illustrates how overlap Overlap 9 was programmed for parent phases 1 and 9.

*Note: NEMA has traditionally labeled overlaps using a character sequence. For example, Overlap 1 is also referred to as overlap A, Overlap 2 is Overlap B. In this example, Overlap 9 is Overlap I:*

Overlap 9 (Overlap I) Programming: MM->1->5->2->9 ENTER ->1

```
   Ovrlp I    Øs.....................
Included Øs    5  9  0  0  0  0  0  0
Modifier Øs    0  0  0  0  0  0  0  0
Type:NORMAL  Grn: 0  Yel: 3.5  Red: 1.5
```

Overlaps 9, 11, 13 and 15 are used for TPCLT and are summarized as follows. Note that the overlap numbers and the auxiliary left-turn phases numbers for TPCLT operation are the same and that the auxiliary left-turn is the same as the left-turn phase plus eight. This numbering was chosen to simplify the phase numbers for TPCLT and to keep overlaps 1 through 8 open for the user to define.

| Load Switch Channel Output | Overlap Assigned To Channel | Phases Assigned To Overlap |
|---|---|---|
| 1 | 9 ( I ) | 1, 9 |
| 3 | 11 ( J ) | 3, 11 |
| 5 | 13 ( K ) | 5, 13 |
| 7 | 15 ( L ) | 7, 15 |

## Calling Two Phases With One Detector

You typically want the same left-turn detector to call each phase in the the TPCLT overlap.

120" cycle / Overlap 13 (Phases 5 + 13) Drive the Twice Per Cycle Left-Turn (TPCLT)

<table>
<tr><td colspan="2">Ø1 / 23"</td><td colspan="2">Ø2 / 59"</td><td>Ø3 / 14"</td><td>Ø4 / 24"</td></tr>
<tr><td>Ø5 / 19"<br>(OL 13)</td><td colspan="2">Ø6 / 47"</td><td>Ø13 / 16"<br>(OL 13)</td><td>Ø7 / 14"</td><td>Ø8 / 24"</td></tr>
</table>

For TPCLT (Overlap 13) to remain actuated, phase 5 and phase 13 must be called by the same left-turn detector. However, if you look closely at NTCIP TS 3.5, section 2.3 - Detector Parameters, you will notice that NTCIP only allows a detector to call a single phase. Naztec, Inc. chose to provide the ability for each detector to call multiple phases as a MIB enhancement to the NTCIP protocol.

Assume that phase 1 through 8 are called by detectors 1 through 8. This is the default when you initialize a Naztec controller. Look at the "Detector Parameters" under screen MM->5->1

| Det# | Call | Switch | Delay | Extend | Queue | -> |
|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0.0 | 0.0 | 0 | |
| 2 | 2 | 0 | 0.0 | 0.0 | 0 | |
| 3 | 3 | 0 | 0.0 | 0.0 | 0 | |
| 4 | 4 | 0 | 0.0 | 0.0 | 0 | |
| 5 | 5 | 0 | 0.0 | 0.0 | 0 | |
| 6 | 6 | 0 | 0.0 | 0.0 | 0 | |
| 7 | 7 | 0 | 0.0 | 0.0 | 0 | |
| 8 | 8 | 0 | 0.0 | 0.0 | 0 | |

Notice that each detector calls a single phase. However, for TPCLT, we want:

- Det#1 to call phases 1 and 9
- Det#3 to call phases 3 and 11
- Det#5 to call phases 5 and 13
- Det#7 to call phases 7 and 15

We could use a "Switch" phase because the "Switch" phase is called when the "Call" phase is yellow or red and the "Switch" phase is green. But this only extends the "Switch" phase once it is green. In our example above, we want the same left-turn detector to call both phases 5 and 13 to provide. If we assigned phase 5 as the "Call" phase and phase 13 as the "Switch" phase for Det#5, then phase 13 would never be serviced because the switch phase only receives a call once it is green. Switch phases are useful when you want to extend a through phase with a left-turn detector during permitted left-turn operation.

Naztec chose to provide an extended feature that allows a detector to call more than one phase. This feature allows one detector to indirectly call another detector by allowing you to change the *Source* of each detector.

This Source (Src) feature is provided on screen MM->5->3 from the Main Menu.

```
Det#   Occ:   G   Y   R   Delay.PS   Mode    Src
  1           .   .   .   0     0    NORMAL    0
  2           .   .   .   0     0    NORMAL    0
  3           .   .   .   0     0    NORMAL    1
```

When the default setting for "Src" is zero, each Det# is called by it's associated detector input. In this case, Det#1 is called by the input for detector 1 and Det#2 is called by detector input 2. However, in the example above, Det#3 is now sourced from detector input 1, so detector 1 now calls Det#1 and Det#3.

This "Src" option is used to indirectly call the auxiliary phases for TPCLT operation as follows.

```
Det#   Occ:   G   Y   R   Delay.PS   Mode    Src
 51           .   .   .   0     0    NORMAL    1
 52           .   .   .   0     0    NORMAL    0
 53           .   .   .   0     0    NORMAL    3
 54           .   .   .   0     0    NORMAL    0
 55           .   .   .   0     0    NORMAL    5
 56           .   .   .   0     0    NORMAL    0
 57           .   .   .   0     0    NORMAL    7
 58           .   .   .   0     0    NORMAL    0
```

The auxiliary phases are then called using the "Detector Parameters" under screen MM->5->1

| Det# | Call | Switch | Delay | Extend | Queue | -> |
|---|---|---|---|---|---|---|
| 51 | 9 | 0 | 0.0 | 0.0 | 0 | |
| 52 | 0 | 0 | 0.0 | 0.0 | 0 | |
| 53 | 11 | 0 | 0.0 | 0.0 | 0 | |
| 54 | 0 | 0 | 0.0 | 0.0 | 0 | |
| 55 | 13 | 0 | 0.0 | 0.0 | 0 | |
| 56 | 0 | 0 | 0.0 | 0.0 | 0 | |
| 57 | 15 | 0 | 0.0 | 0.0 | 0 | |
| 58 | 0 | 0 | 0.0 | 0.0 | 0 | |

These detector assignments allow a single left-turn detector to call both phases assigned to the overlap for TPCLT operation. The next section will illustrate how the *auxiliary* phases can be disabled by pattern allowing you to run TPCLT by time-of-day.

## Preemption Concerns

If the left-turn phases 1, 3, 5 and 7 are specified as preemption dwell phases, you do not want the situation when a preempt call comes in during an auxiliary left-turn phase (such as phase 9) and moves to the complementary turn phase (such as phase 1).

The Naztec controllers overcome this problem by allowing you to specify the overlaps that dwell during preemption. If the controller is in phase 9 when the preempt comes in, the overlap that drives the left-turn display will continue to stay green as the controller moves to phase 1 because Overlap 9 includes phases 1 & 9. So, you won't see the left-turn signal clear phase 9 and come back as phase 1 during preemption because the left-turn display is driven off Overlap 9 which is programmed to dwell during preemption.

## TPCLT and Lead/Lag Pattern Examples

The phase sequence chart assigns TPCLT to phase sequence 16 as follows:

| Seq# | Ring | Sequence.of.Phases | | | | | |
|---|---|---|---|---|---|---|---|
| 16 | 1 | 1 | 2 | 9 | 3 | 4 | 11 |
| 16 | 2 | 5 | 6 | 13 | 7 | 8 | 15 |

Twice per cycle left-turns are selectable by time-of-day because they are enabled (or disabled) by the split table and split tables can be assigned to a time-of-day ***pattern.*** Patterns are defined by a cycle length, offset, split number and sequence number from the Pattern Table accessed by MM->2->4 from the Main Menu.

| Pat# | Cycle | Offset | Split | Seqnc |
|---|---|---|---|---|
| 1 | 60 | 0 | 1 | 16 |
| 2 | 60 | 0 | 2 | 16 |
| 3 | 60 | 0 | 3 | 16 |
| 4 | 60 | 0 | 4 | 16 |
| ... | | | | |

This TecNote will develop the four patterns above to illustrate how the same sequence can be used to implement a variety of left-turn sequences by using the omit (OMT) option in the split table. The following four patterns use the phase sequence 16 to run TPCLT and lead/lag operation.

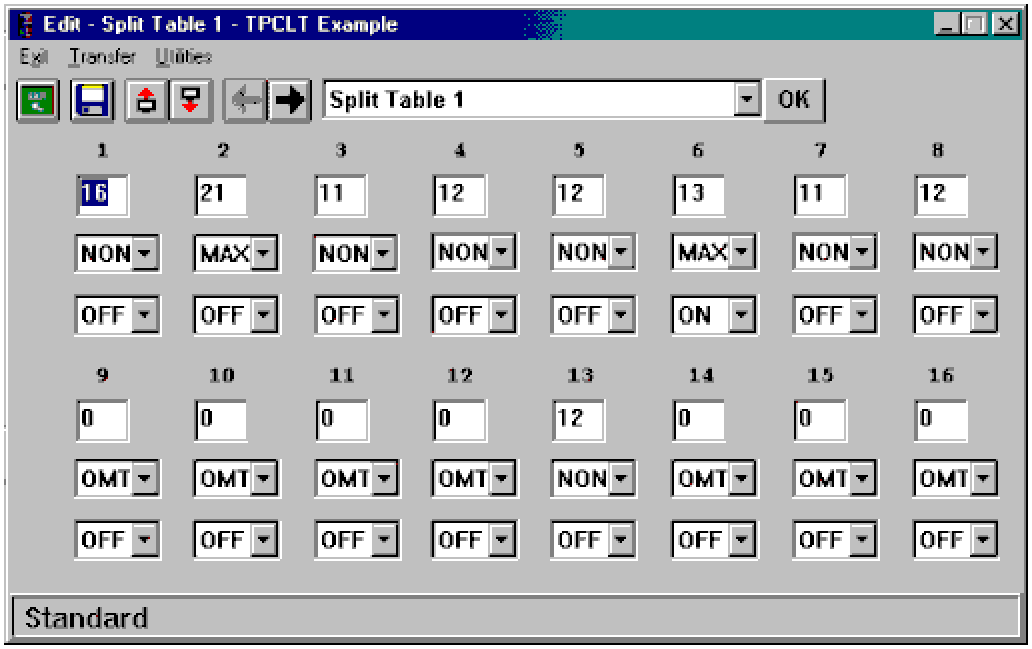
## Pattern #1 - TPCLT using Ø5 & Ø13

60" cycle / Overlap 13 (Phases 5 + 13) Drive the Twice Per Cycle Left-Turn (TPCLT)

| | | | | |
|---|---|---|---|---|
| ø1 / 16" | ø2 / 21" | | ø3 / 11" | ø4 / 12" |
| ø5 / 12" (OL 13) | ø6 / 13" (C) 0" > | ø13 / 12" (OL 13) | ø7 / 11" | ø8 / 12" |

*Note: The notation (C) 0" > references the 0" offset to the end of phase 6 (the (C)oordinated phase). Offset references are fully discussed in [TecNote 1101 - NTCIP Coordination by Example.]*

In this example, the protected left-turn displays driven by overlap 13 are serviced twice per cycle by the parent phases 5 and 13. This operation is accomplished by omitting (OMT) phases 9, 11 and 15 in the split table for this pattern as shown below (StreetWise split table screen):



## Pattern #2 - TPCLT using Ø1 & Ø9

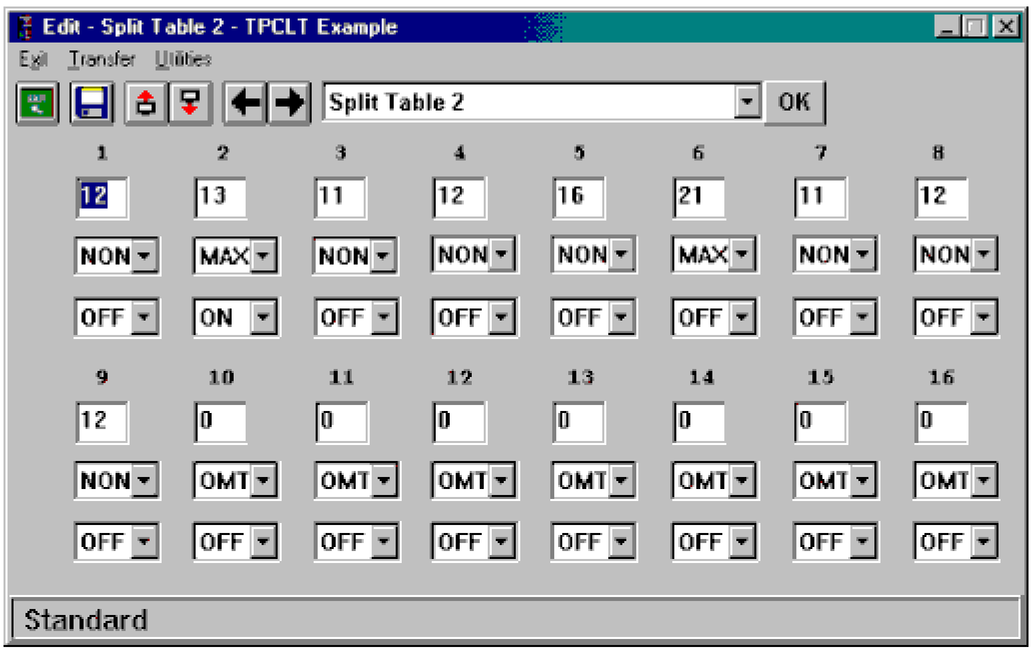
60" cycle / Overlap 9 (Phases 1 + 9) Drive the Twice Per Cycle Left-Turn (TPCLT)

| | | | | |
|---|---|---|---|---|
| Ø1 / 12" (OL 9) | Ø2 / 13" (C) 0" > | Ø9 / 12" (OL 9) | Ø3 / 11" | Ø4 / 12" |

| | | | |
|---|---|---|---|
| Ø5 / 16" | Ø6 / 21" | Ø7 / 11" | Ø8 / 12" |

In this example, the left-turn displays driven by overlap 9 are serviced twice per cycle when parent phases 1 and 9 are serviced. All other auxiliary left-turn phases (11, 13 and 15) are omitted (with the OMT) selection in the split table.

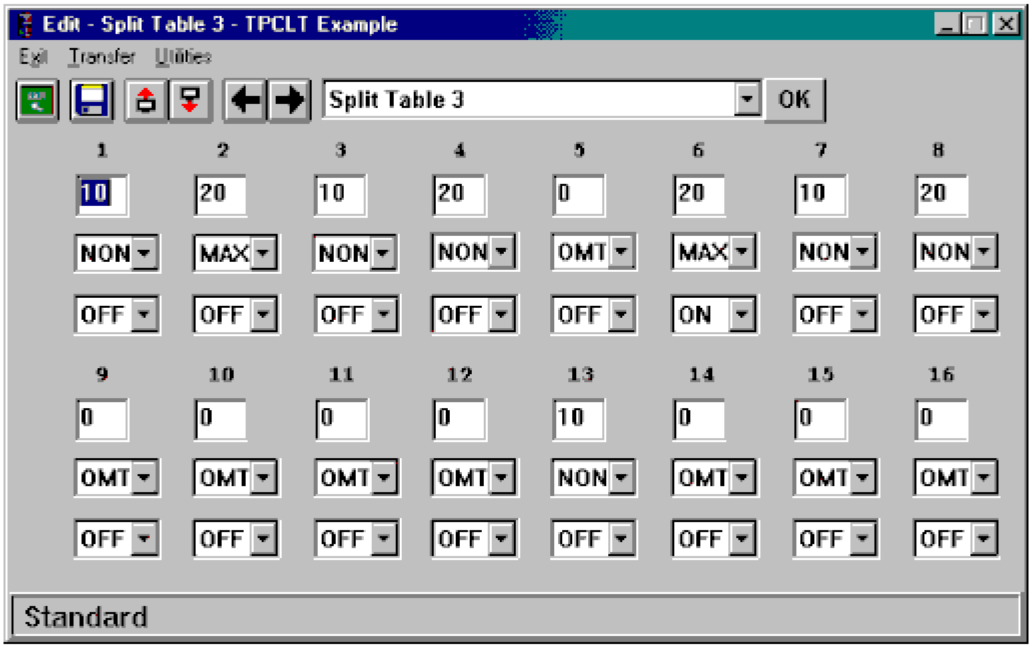
Also notice that MAX recalls are placed on the main street through phases 2 and 6. Because Det#1 calls phase 1 and phase 9, the lagging turn is actuated and the controller will remain in phases 2 and 6 until phase 6 is forced off.



## Pattern #3 - Lead / Left-Turn (Lagging Ø13)

60" cycle / Lagging Left-Turn on Overlap 13 Driven by ø13

| | | | |
|---|---|---|---|
| ø1 / 10" | ø2 / 20" | ø3 / 10" | ø4 / 20" |
| ø6 / 20" (C)0"> | ø13 / 10" (OL 13) | ø8 / 20" | ø7 / 10" |

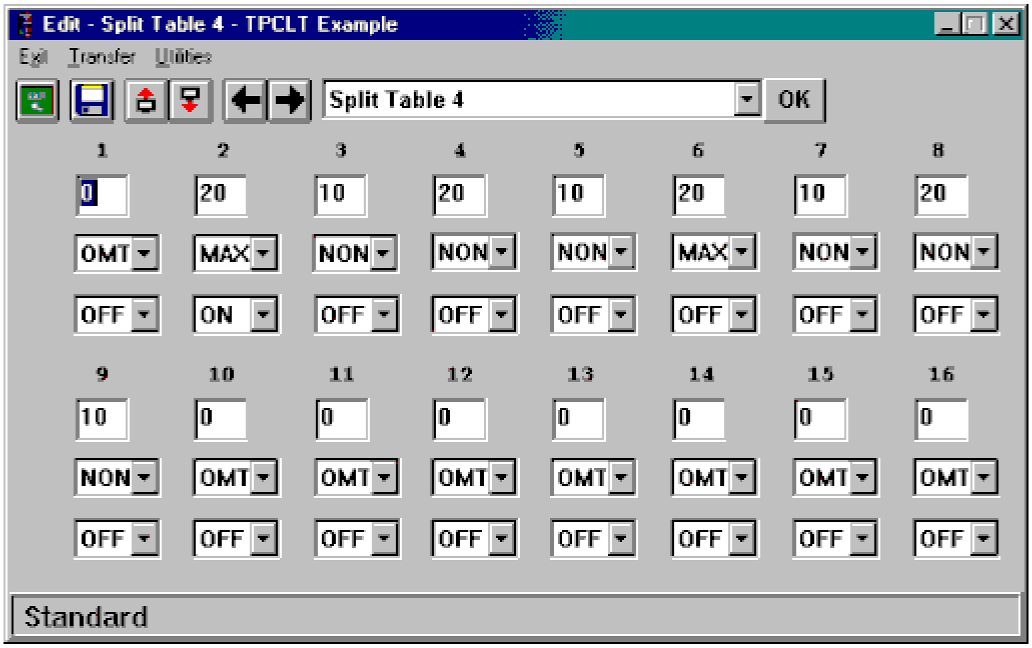



In this example, Overlap 13 (OL 13) provides a lagging left-turn phase on phase 13 by omitting (OMT) phase 5 and auxiliary left-turn phases (9, 11 and 15). Lagging left-turn operation is essentially the same as TPCLT with the overlap serviced once per cycle on the lag side. This example illustrates how TPCLT and lagging left-turn operation can share the same left-turn sequence. However, it is recommend that separate left-turn sequences be used for lead/lag left-turns because the sequence number provides a quick verification of the phase sequence used. Without this sequence number reference, you would need to go back and interpret the omits in the split table to determine the sequence of the pattern.

## Pattern #4 - Lead / Left-Turn (Lagging Ø9)

60" cycle / Lagging Left-Turn on Overlap 9 Driven by ø9

| | | | |
|---|---|---|---|
| (C)0"> ø2 / 20" | ø9 / 10" (OL 9) | ø4 / 20" | ø3 / 10" |
| ø5 / 10" | ø6 / 20" | ø7 / 10" | ø8 / 20" |




This final example shows how Overlap 9 can be used to accomplish a lagging left-turn sequence on phase 9. Again, it is recommended that you use 8-phase sequence combinations to accomplish lead/lag left-turns so you can use the sequence number to identify the controller sequence.

## Conclusions

Twice Per Cycle Left-Turn (TPCLT) operation is a useful tool in situations where left-turn bays are over capacity and queues spill over into the adjacent through lanes. TPCLT operation is even more effective when dual-left-turn lanes are used. Often a dual-left-turn lane is effectively reduced to a single lane if the split time exceeds the capacity of the the dual-left-turn lanes.

Even this TecNote illustrate how lagging left-turn operation can be implemented using the methods developed for TPCLT, we recommend that you define separate left-turn sequences for lead/lag left-turns because the sequence number is gives you a quick indication of the sequence used for each timing pattern. Without this sequence number, you would need to go back and interpret the sequence from the split table to see which left-turn phases were omitted.

The user is reminded of the "Yellow Trap" safety problem that exists when TPCLT or lagging left-turn operation is used with protected/permitted left-turn operation. (see pages related to NCHRP 3-54 research for more information). If you must lag a left-turn after the through movement, insure that **both** opposing lag left-turns run together or that the leading left-turn is protected only. You also may want to consider one of the signal displays discussed on the NCHRP 3-54 site to safely run a lagging left-turn sequence with protected/permitted signal displays.

The following phase sequence chart was developed for NTCIP controllers in Richardson Texas. Note that phase sequence 16 is used to accomplish TPCLT operation. Sequences 1-15 are used to accomplish all combinations of 8-phase dual-ring lead/lag left-turn operations except for a lag-lag sequence which can be accomplished with TPCLT by omitting phases 1, 3, 5 and 7.

## Standard Phase Sequence Chart

| Sequence # | Left Barrier | Right Barrier | Controller Seq. |
|---|---|---|---|
| 1 | 1+5 lead | 3+7 lead | Ring1: 1 2 3 4<br>Ring2: 5 6 7 8 |
| 2 | 1 lead | 3+7 lead | Ring1: 1 2 3 4<br>Ring2: 6 5 7 8 |
| 3 | 5 lead | 3+7 lead | Ring1: 2 1 3 4<br>Ring2: 5 6 7 8 |
| 4 | 1+5 lag | 3+7 lead | Ring1: 2 1 3 4<br>Ring2: 6 5 7 8 |
| 5 | 1+5 lead | 3 lead | Ring1: 1 2 3 4<br>Ring2: 5 6 8 7 |
| 6 | 1 lead | 3 lead | Ring1: 1 2 3 4<br>Ring2: 6 5 8 7 |
| 7 | 5 lead | 3 lead | Ring1: 2 1 3 4<br>Ring2: 5 6 8 7 |
| 8 | 1+5 lag | 3 lead | Ring1: 2 1 3 4<br>Ring2: 6 5 8 7 |
| 9 | 1+5 lead | 7 lead | Ring1: 1 2 4 3<br>Ring2: 5 6 7 8 |
| 10 | 1 lead | 7 lead | Ring1: 1 2 4 3<br>Ring2: 6 5 7 8 |
| 11 | 5 lead | 7 lead | Ring1: 2 1 4 3<br>Ring2: 5 6 7 8 |
| 12 | 1+5 lag | 7 lead | Ring1: 2 1 4 3<br>Ring2: 6 5 7 8 |
| 13 | 1+5 lead | 3+7 lag | Ring1: 1 2 4 3<br>Ring2: 5 6 8 7 |
| 14 | 1 lead | 3+7 lag | Ring1: 1 2 4 3<br>Ring2: 6 5 8 7 |
| 15 | 5 lead | 3+7 lag | Ring1: 2 1 4 3<br>Ring2: 5 6 8 7 |
| 16 | 1+5 lag | 3+7 lag | Ring1: 2 1 4 3<br>Ring2: 6 5 8 7 |
| 16 (Alt.) | Twice Per Cycle LeftTurns | | R1: 1 2 9 3 4 11<br>R2: 5 6 13 7 8 15 |

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